

Technical Report

TR14-1 January 2014

Colorado  
State  
University

*Agricultural  
Experiment Station*

College of  
Agricultural Sciences

Department of  
Soil and Crop Sciences

Extension

Plainsman  
Research Center

2013 Sorghum Hybrid Performance  
Trials in Eastern Colorado

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

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

C. E. Jahn, Assistant Professor, Dept. of Bioagricultural Sciences and Pest  
Management

S. M. Sauer, Research Associate, Dept. of Soil and Crop Sciences

B. T. Pettinger, Research Associate, Plainsman Research Center

Funded by the National Sorghum Producers, the Colorado Sorghum Producers and  
the Colorado Agricultural Experiment Station,

Crop Management and Sorghum Improvement, USDA, NIFA 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.

## 2013 SORGHUM HYBRID PERFORMANCE TRIALS IN EASTERN COLORADO

	Page
Introduction:	
Seed Companies that Participated in Trials	2
Experimental Methods and Evaluations	3
Statistical Method	4
Acknowledgments	4
References	5
Dryland Grain Sorghum Hybrid Performance Trial at Brandon	6
Dryland Grain Sorghum Hybrid Performance Trial at Walsh	10
Dryland Forage and Sweet Sorghum Performance Trial at Fort Collins	14
Irrigated Forage and Sweet Sorghum Performance Trial at Fort Collins	16
Dryland Forage and Sweet Sorghum Performance Trial at Greeley	18
Irrigated Forage and Sweet Sorghum Performance Trial at Greeley	20

SORGHUM HYBRID PERFORMANCE TRIALS IN EASTERN COLORADO, 2013  
K.J. Larson, J.J. Johnson, C.E. Jahn, S.M. Sauer and B.T. Pettinger \1

The 2013 Colorado grain sorghum crop was estimated at 6.72 million bushels, 2.24 times greater than the 2012 sorghum crop of 3.00 million bushels. For Colorado, the 2013 grain sorghum crop of 6.72 million bushels was the third highest in the last 10 years. The increase in sorghum production this year was due to the highest planted acres (400,000) and the highest harvested acres (240,000) for the last 10 years. This year, the highest harvested acreage resulted in the third highest total production for the last 10 years because yield was estimated at 28.0 bu/acre. This low yield was due to a dry growing season, only the drought years of 2002 and 2012 produced lower yields, averaging 20 bu/acre for both years. Sorghum silage statistics are not published during the current year; however, Colorado sorghum silage statistics are available for last year. In 2012, 140,000 tons of sorghum silage was produced. The average yield was 7 tons/acre from 20,000 harvested acres. (USDA and National Agricultural Statistics Service, Colorado Field Office, 2013).

This publication is a progress report of the sorghum hybrid performance trials conducted by the Department of Soil and Crop Sciences and the Department of Bioagricultural Sciences and Pest Management at Colorado State University, Colorado Agricultural Experiment Station (AES), and Colorado State University Extension. The grain sorghum trials were conducted at three sites in eastern Colorado: Akron, Brandon, and Walsh. Irrigated and dryland forage/sweet sorghum trials were conducted at Greeley, Fort Collins, and Walsh. The dryland grain trial at Akron failed to produce a crop due to extreme drought conditions. No data was reported from the dryland and irrigated forage sorghum trials at Walsh due to drought and lack of applied irrigation.

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, phone (970) 491-1454, email [Jerry.Johnson@colostate.edu](mailto:Jerry.Johnson@colostate.edu); or Kevin Larson, phone (719) 324-5643, email [Kevin.Larson@colostate.edu](mailto:Kevin.Larson@colostate.edu) for further details. Names and addresses of firms submitting entries in 2013 are shown in Table 1. Each firm selected entries for testing and furnished seed for the trials. AES researchers selected closed-pedigree hybrids as standards of comparison.

Summary tables for weather data (CoAgMet and NOAA, 2013), 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 certain trial locations. Other information, where available, was included: site description, emergence date, irrigation, pest control, field history, and pertinent comments.

\1 Superintendent and Research Scientist II, Plainsman Research Center, Walsh;  
Associate Professor and Extension Specialist, Dept. of Soil and Crop Sciences;  
Assistant Professor, Dept. of Bioagricultural Sciences and Pest Management  
Research Associate, Dept. of Soil and Crop Sciences;  
Research Associate, Plainsman Research Center, Walsh.

Table 1.--Entrants in the 2013 Colorado Sorghum Performance Trials.

Brand	Entered by
ADVANTA	Advanta US, 2001 E. 1 <sup>st</sup> St., P.O. Box 2420, Hereford, TX 79045
AERC	Agriculture Environmental Renewal Canada (AERC) Inc., 58 Lakspur Drive, Ottawa, Ontario, K2H 6L1
GAYLAND WARD SEED	Gayland Ward Seed Co. Inc., 4395 US Hwy 60, Hereford, TX 79045
MONSANTO	Monsanto Company, 800 N. Lindbergh Blvd., St. Louis, MO 63167
MYCOGEN	Mycogen Seeds, 9330 Zionsville Rd., Indianapolis, IN 46268
RICHARDSON SEEDS	Richardson Seeds, Ltd., P.O. Box 60, 3095 CR 26, Vega, TX 79092
SORGHUM PARTNERS	Sorghum Partners, LLC, P.O. Box 189, 403 South Monroe, New Deal, TX 79350
TRIUMPH SEED	Triumph Seed Co., Inc., P.O. Box 1050, Hwy 62 Bypass, Ralls, TX 79357

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. Hand-harvested samples from the forage and sweet sweet plots were taken for silage production.

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 adjusted 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 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 (Brix), 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 or biweekly. 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 type.

### Statistical Method

Trials 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  $\alpha = 0.05$  and 0.20 for all trials. 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 Colorado Sorghum Producers to support these performance trials. We are also appreciative to the staffs at the Central Great Plains Research Station at Akron, Agricultural Research, Development and Education Center (ARDEC) at Fort Collins, USDA-NRS Limited Irrigation Research Farm (LIRF) at Greeley, and Plainsman Research Center at Walsh for their assistance in conducting these trials. We would like to extend a special thank you to Burl Scherler, grower-cooperator, for his assistance with the Brandon trial.

## References

- National Agricultural Statistics Service, Colorado Field Office. 2013. Colorado agricultural statistics 2013. USDA, NASS, CDA. 55p.
- NOAA, May-October, 2013. Climatological data, Colorado. vol. 118, 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.
- USDA, National Agricultural Statistics Service. November 8, 2013. Crop production report. USDA, NASS. 56p.



## 2013 Dryland Grain Sorghum Hybrid Performance Trial at Brandon

COOPERATOR: Burl Scherler, Sand Creek, Inc., Brandon, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2750 sorghum heat units in loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 43,600 seed/a. PLANTED: June 10. HARVESTED: October 28.

PEST CONTROL: Preemergence Herbicides: Glyphosate 32 oz/a, Atrazine 0.9 lb/a, Metal 24 oz/a. Post Emergence Herbicides: 2,4-D amine (with drops). CULTIVATION: None. INSECTICIDES: None.

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

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	0.85	569	17	8	20
July	1.92	799	19	5	51
August	5.30	755	16	1	82
September	1.61	580	8	0	112
October	0.00	54	0	0	117
Total	9.68	2757	60	14	117

\1 Growing season from June 10 (planting) to October 5 (first freeze, 23 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

COMMENTS: Planted in dry soil. Weed control was poor with puncture vine and kochia predominating. Precipitation for the growing season was near the average of the past 27 years, although precipitation timing was skewed: it was dry early in the season and August was very wet. No greenbug infestation. Yields and test weights were fair, especially considering the lack of early season precipitation and heavy infestation of puncture vine. Because of the early season dry weather, later maturing hybrids did not fully mature and subsequently had low test weights and poor yields.

SOIL: Loam for 0-8" and 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"	7.6	0.4	0.9	3	8.2	364	0.5	2.7
8"-24"				7				
Comment	Alka	VLo	Low	Lo	Lo	VHi	VLo	Lo
Manganese and Copper levels were adequate.								

Summary: Fertilization.

Fertilizer	N	P <sub>2</sub> O <sub>5</sub>	Zn	Fe
	-----lb/a-----			
Recommended	0	20	2	0
Applied	60	0	0	0
Yield Goal: 40 bu/a.				
Actual Yield: 15 bu/a.				

### Available Soil Water Dryland Grain Sorghum, Brandon, 2013

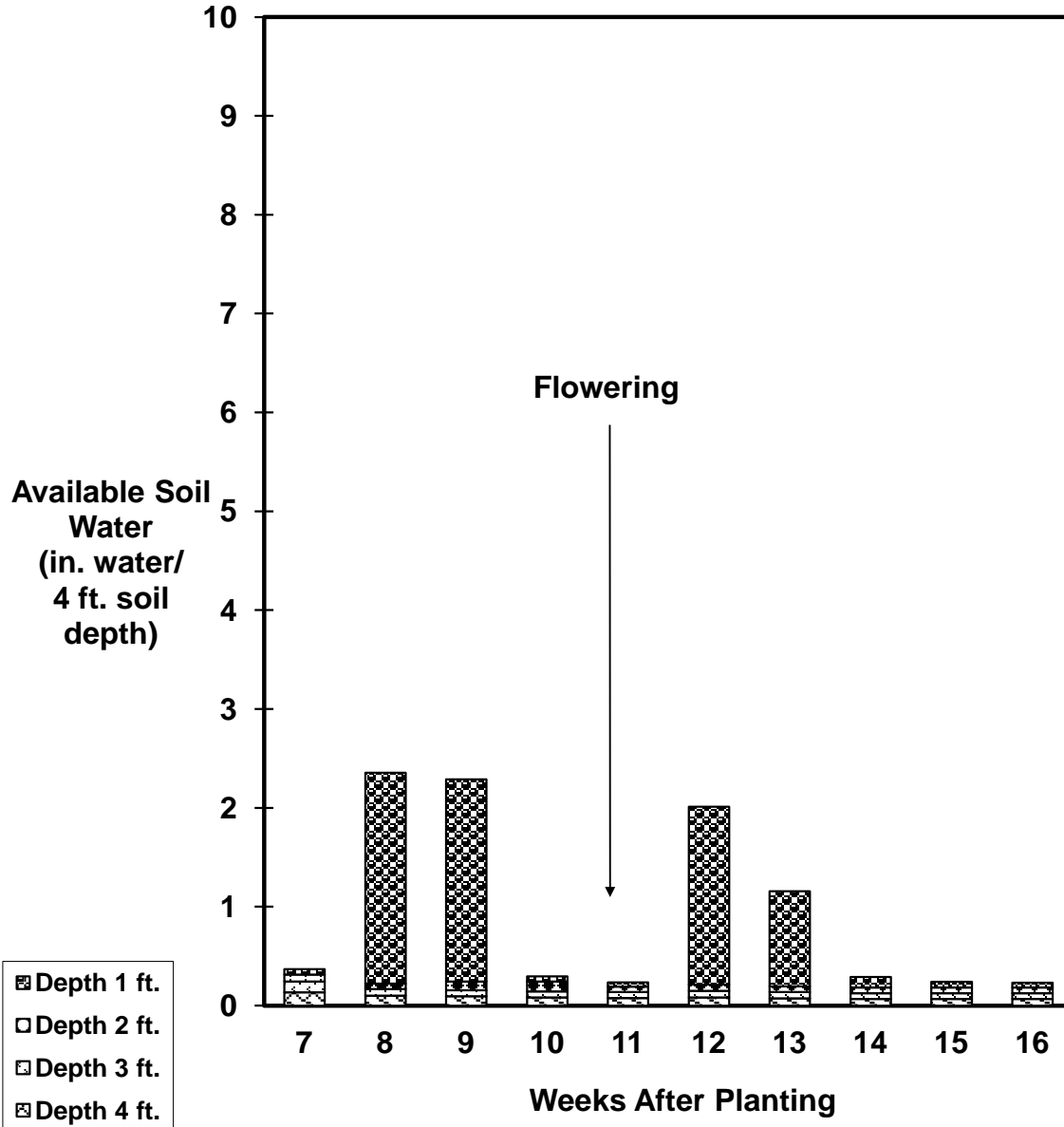


Fig. 1. Available soil water in dryland grain sorghum at Brandon. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Brandon from planting to first freeze was 9.68 in. Any increase in available soil water between weeks is from rain.

**Table 2. 2013 Dryland Grain Sorghum Hybrid Performance Trial at Brandon**

Source	Hybrid	Grain Yield <sup>a</sup>	Yield Percent of		Lodging	Harvest Plant Population	Plant Height	50% Bloom	GDD <sup>b</sup>	50% Mature <sup>c</sup>	Maturity Group <sup>d</sup>
			Trial Average	Test Weight							
		bu/ac	percent	lb/bu	percent	plants/ac	in	days after planting		days after planting	
Monsanto	DKS29-28	24.2	166	58	0	25,800	36	70	1793	106	E
Advanta	AG1202	21.5	147	59	11	28,900	40	69	1768	105	E
Mycogen	1G557	18.1	124	58	2	28,700	30	70	1793	106	E
Triumph Seed	TR424	17.9	123	59	2	24,000	41	71	1819	107	E
Advanta	AG1101	17.4	119	57	1	20,700	33	71	1819	107	E
AERC	CGSH-28	16.3	112	58	4	21,900	45	68	1744	104	E
Monsanto	DKS28-05	12.2	84	57	16	25,400	41	71	1819	107	E
Advanta	AG1201	16.7	114	57	1	24,200	32	80	2064	114	ME
Richardson Seeds	O413	15.2	104	56	0	23,200	38	85	2195	117	ME
Richardson Seeds	92123	14.9	102	57	1	25,200	32	81	2093	115	ME
Richardson Seeds	96173	13.9	95	56	1	24,200	45	86	2224	117	ME
Triumph Seed	TR438	13.4	92	57	1	28,100	42	82	2143	115	ME
Richardson Seeds	10413	12.3	84	57	0	27,300	42	83	2143	117	ME
Mycogen	E32294	10.8	74	57	1	29,400	33	80	2064	115	ME
Richardson Seeds	50113	5.1	35	54	1	29,200	41	90	2361	ED	M
Richardson Seeds	O6173	3.5	24	53	0	27,100	34	92	2386	ED	M
<b>Average</b>		<b>14.6</b>		<b>57</b>	<b>3</b>	<b>25,800</b>	<b>38</b>	<b>78</b>	<b>2014</b>	<b>111</b>	

<sup>e</sup>LSD (P<0.05)

13.42

5.2

<sup>e</sup>LSD (P<0.20)

8.61

3.4

<sup>a</sup>Yields adjusted to 14% moisture and hybrids ranked by yield within maturity group.

<sup>b</sup>GDD: Growing degree-days to 50% bloom date.

<sup>c</sup>Days after planting or maturation of seed at first freeze. ED=early dough.

<sup>d</sup>Maturity Group: E=early; ME=medium-early; M=medium.

<sup>e</sup>If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

**Table 3. Summary: Dryland Grain Sorghum Hybrid Performance Trials at Brandon, 2011-2013.**

Brand	Hybrid	Maturity Group <sup>a</sup>	Grain Yield					Yield as % of Test Average				
			2011	2012	2013	2-Year Avg	3-Year Avg	2011	2012	2013	2-Year Avg	3-Year Avg
MONSANTO	DKS29-28	E	--	45	24	35	--	--	133	166	138	--
MONSANTO	DKS28-05	E	37	40	12	26	30	197	118	84	104	129
MYCOGEN	1G557	E	26	45	18	32	30	139	131	124	126	129
TRUIMPH SEED	TR424	E	32	51	18	35	34	172	149	123	138	146
TRUIMPH SEED	TR438	ME	--	45	13	29	--	--	132	92	116	--
Average			19	34	15	25	23					

<sup>a</sup>Maturity Group: E, early; ME, medium early.

Grain Yields were adjusted to 14.0% seed moisture content.

## 2013 Dryland Grain Sorghum Hybrid Performance Trial at Walsh

COOPERATOR: Plainsman Agri-Search Foundation, Walsh, Colorado.

PURPOSE: To identify high yielding hybrids under dryland conditions with 2900 sorghum heat units in a silt loam soil.

PLOT: Four rows with 30 in. row spacing, 50 ft. long. SEEDING DENSITY: 43,600 seed/a. PLANTED: June 12. HARVESTED: October 24.

PEST CONTROL: Preemergence Herbicides: Atrazine 1lb/a, Dual II Magnum 21 oz/a, Glyphosate, 28 oz/a; 2,4-D, 0.5 lb/a, Banvel 4 oz/a. Post Emergence Herbicides: Huskie 16 oz/a, Banvel 4.0 oz/a, Atrazine 0.5 lb/a, AMS 1 lb/a. CULTIVATION: None. INSECTICIDES: None.

FIELD HISTORY: Previous 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	2.89	527	15	6	18
July	3.92	824	19	5	49
August	1.38	823	20	3	80
September	5.82	633	9	2	110
October	0.00	79	0	0	116
Total	14.01	2886	63	16	116

\1 Growing season from June 12 (planting) to October 6 (first freeze, 31 F).

\2 GDD: Growing Degree Days for sorghum.

\3 DAP: Days After Planting.

COMMENTS: Planted in dry soil. Weed control was good. No greenbug infestation. The growing season precipitation was above average, but the flowering period (August) was very dry and the majority of rains during September came too late to increase yields. Grain yields were poor due to dry weather during flowering.

SOIL: Richfield silt loam for 0-8" and silt 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"	7.8	0.5	1.3	14	8.3	292	0.6	2.7
8"-24"				31				
Comment	Alka	VLo	Mod	VHi	Lo	VHi	Lo	Lo

Manganese and Copper levels were adequate.

Summary: Fertilization.

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

Yield Goal: 40 bu/a.

Actual Yield: 5 bu/a.

### Available Soil Water Dryland Grain Sorghum, Walsh, 2013

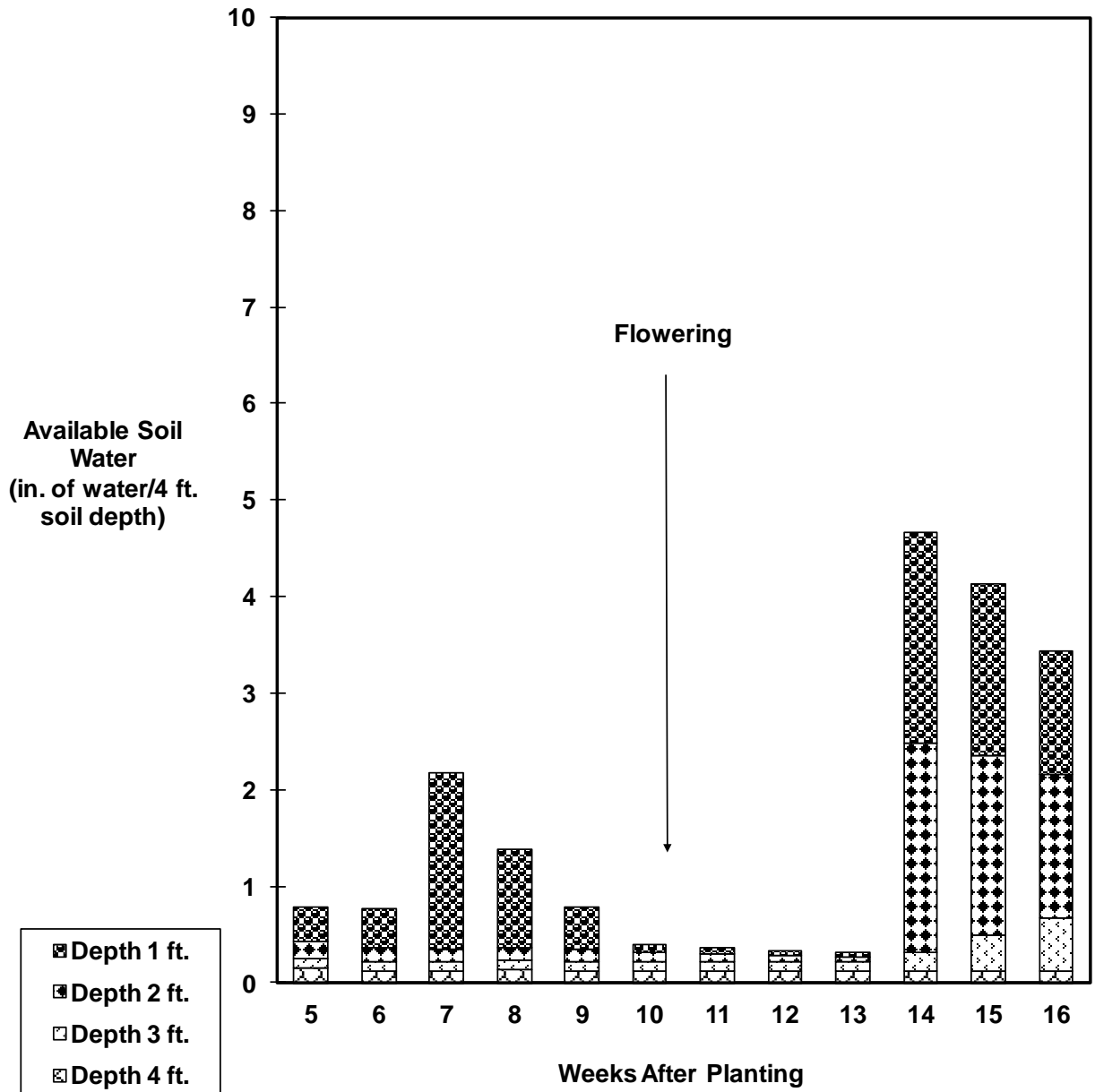


Fig. 2. Available soil water in dryland grain sorghum at Walsh. Gypsum block measurements taken to 4 ft. with 1 ft. increments. Total rainfall at Walsh from planting to first freeze was 14.01 in. Any increase in available soil water between weeks is from rain.

**Table 4. 2013 Dryland Grain Sorghum Hybrid Performance Trial at Walsh.**

Source	Hybrid	Yield Percent		Test Weight	Harvest Plant Population	Plant Height	50% Bloom <sup>b</sup>	GDD <sup>c</sup>	50% Mature <sup>d</sup>	Maturity Group <sup>e</sup>
		Grain Yield <sup>a</sup>	of Trial Average							
		bu/ac	percent	lb/bu	plants/ac	in	days after planting		days after planting	
Triumph Seed	TR424	10.4	217	59	21,700	33	68	1810	98	E
Sorghum Partners	251	5.7	119	59	19,200	32	65	1733	93	E
Sorghum Partners	SP3303	4.5	94	58	23,400	37	69	1838	101	E
Advanta	AG1202	3.6	75	57	17,400	34	68	1810	98	E
Advanta	AG1101	3.4	71	57	18,200	30	69	1838	99	E
Triumph Seed	TR438	7.1	148	58	20,300	37	72	1931	104	ME
AERC	CGSH-28	5.9	123	57	11,200	35	74	1991	112	ME
Advanta	AG1201	4.8	100	57	19,000	31	73	1961	105	ME
Richardson Seeds	92123	4.3	90	56	16,500	36	82	2231	116	ME
Sorghum Partners	KS310	4.2	88	56	23,800	35	72	1931	106	ME
Monsanto	DKS44-20	4.2	88	56	17,400	35	82	2231	115	ME
Monsanto	DKS38-88	3.7	77	56	20,300	36	80	2174	114	ME
Richardson Seeds	10413	2.7	56	55	17,800	37	83	2258	HD	ME
Richardson Seeds	O413	2.7	56	55	19,400	34	83	2258	HD	ME
Richardson Seeds	O6173	--	--	--	16,800	42	B	--	--	M
Richardson Seeds	96173	--	--	--	20,500	38	B	--	--	M
Richardson Seeds	50113	--	--	--	17,400	37	B	--	--	M
<b>Average</b>		<b>4.8</b>		<b>57</b>	<b>18,800</b>	<b>35</b>	<b>74</b>	<b>2000</b>	<b>105</b>	<b>ME</b>
<sup>f</sup> LSD (P<0.05)		5.78								
<sup>f</sup> LSD (P<0.20)		3.73								

<sup>a</sup>Yields adjusted to 14% moisture and hybrids ranked by yield within maturity group.

<sup>b</sup>Days after planting or plant development. B=boot.

<sup>c</sup>GDD: Growing degree-days to 50% bloom date.

<sup>d</sup>Days after planting or maturation of seed at first freeze. HD=hard dough.

<sup>e</sup>Maturity Group: E=early; ME=medium-early; M=medium.

<sup>f</sup>If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

**Table 5. Summary: Dryland Grain Sorghum Hybrid Performance Trials at Walsh, 2011-2013.**

Brand	Hybrid	Maturity Group <sup>a</sup>	Grain Yield					Yield as % of Test Average				
			2011	2012	2013	2-Year Avg	3-Year Avg	2011	2012	2013	2-Year Avg	3-Year Avg
MONSANTO	DKS44-20	ME	56	36	4	20	32	130	143	88	133	133
SORGHUM PARTNERS	KS310	E	43	24	4	14	24	99	98	88	93	99
SORGHUM PARTNERS	251	E	32	18	6	12	19	75	74	119	80	78
TRUIMPH SEED	TR424	E	48	37	10	24	32	111	149	217	157	132
TRUIMPH SEED	TR438	ME	50	29	7	18	29	115	116	148	120	119
Average			43	25	5	15	24					

<sup>a</sup>Maturity Group: E, early; ME, medium early.

Grain Yields were adjusted to 14.0% seed moisture content.

The site was pre-irrigated with furrow irrigation in 2011.



## 2013 Dryland Forage and Sweet Sorghum Performance Trial at Fort Collins

COOPERATOR: Agricultural Research, Development and Education Center (ARDEC).

PURPOSE: To identify high yielding hybrids under dryland conditions with 1850 sorghum heat units in a loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. SEEDING DENSITY: 69,700 seed/a. PLANTED: May 24. HARVESTED: August 26.

WEED CONTROL: Starane 6.4 oz/ac.

CULTIVATION: None.

SOIL: Fort Collins loam.  
FERTILIZER: Nitrogen 100 lb/ac, phosphate 80 lb/ac, and zinc 5 lb/ac.

Summary: Growing Season Precipitation and Temperature \1  
Fort Collins, Larimer County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
May	0.50	0.00	110	0	0	8
June	0.50	1.00	576	9	0	38
July	1.50	0.00	653	8	0	69
August	0.50	0.00	517	11	0	95
Total	3.00	1.00	1856	28	0	95

\1 Growing season from May 24 (planting) to August 26 (harvest).

\2 Total in-season water from irrigation and precipitation was 4.00 in/a.

\3 GDD: Growing Degree Days for sorghum.

\4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Corn. FIELD PREPARATION: Light tillage.

COMMENTS: Planted in dry soil and irrigated for stand establishment with 1.0 in./ac from an overhead linear-move sprinkler system. Weed and pest pressures were minimal throughout the season. Late season heavy rains caused moderate lodging, particularly for the taller hybrids. Forage yields were very good.

**Table 6. 2013 Dryland Forage and Sweet Sorghum Variety Performance Trial at Fort Collins**

Brand	Plant Type	Variety	Forage Yield <sup>b</sup> tons/ac	Brix (Stem Sugar) percent	Plant Height in	Stem Diameter in	Harvest Index <sup>a</sup>			Maturity Group <sup>c</sup>
							Leaf	Stem	Panicle	
Sorghum Partners	Sweet Sorghum	CHR-FS4	14.4	15.3	73.8	0.69	0.29	0.65	0.06	L
Gayland Ward Seed	Forage Sorghum	Super Sugar	12.7	14.9	73.0	0.45	0.23	0.63	0.15	E
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Six BMR	12.2	15.0	69.8	0.53	0.22	0.56	0.22	E
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Forever BMR	12.0	13.9	63.8	0.66	0.38	0.60	0.03	PS
Gayland Ward Seed	Forage Sorghum	GW 400 BMR	12.0	17.0	63.7	0.60	0.33	0.65	0.02	ME
Gayland Ward Seed	Sorghum-Sudangrass	GW 300 BMR	11.3	14.6	67.9	0.66	0.36	0.62	0.02	ME
Sorghum Partners	Grain/Forage Sorghum	CHR-FS3	11.0	14.4	43.5	0.60	0.24	0.48	0.28	M
Gayland Ward Seed	Forage Sorghum	GW2120	10.7	16.8	56.7	0.64	0.35	0.63	0.03	M
Sorghum Partners	Sorghum-Sudangrass	CHR-SG1	10.6	13.5	68.1	0.63	0.43	0.57	0.00	PS
Gayland Ward Seed	Forage Sorghum	Sweet Forever	9.2	14.6	61.2	0.64	0.46	0.53	0.01	PS
Sorghum Partners	Forage Sorghum	CHR-FS9	8.9	14.8	51.6	0.75	0.49	0.51	0.00	PS
Sorghum Partners	Sudangrass	CHR-SS2	8.5	15.1	66.2	0.51	0.37	0.59	0.04	PS
AERC, Inc.	Pearl Millet	CSSPM-7	7.8	13.3	52.7	0.58	0.43	0.54	0.04	E
<b>Average</b>			<b>10.9</b>	<b>14.8</b>	<b>62.5</b>	<b>0.61</b>	<b>0.35</b>	<b>0.58</b>	<b>0.07</b>	
<sup>d</sup> LSD (P<0.05)			3.5							
<sup>d</sup> LSD (P<0.20)			2.2							

<sup>a</sup>Harvest index is the proportion of the specified plant tissue biomass (leaf, stem, panicle/grain head) to the total plant biomass.

<sup>b</sup>Yields are adjusted to 70% moisture content based on oven-dried samples.

<sup>c</sup>Maturity Group: E=early; ME=medium-early; M=Medium; L=late, PS=Photoperiod sensitive.

<sup>d</sup>If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

## 2013 Irrigated Forage and Sweet Sorghum Performance Trial at Fort Collins

COOPERATOR: Agricultural Research, Development and Education Center (ARDEC).

PURPOSE: To identify high yielding hybrids under irrigated conditions with 1850 sorghum heat units in a loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. SEEDING DENSITY: 113,250 seed/a. PLANTED: May 24. HARVESTED: August 26.

WEED CONTROL: Starane 6.4 oz/ac.

CULTIVATION: None.

SOIL: Fort Collins loam.  
FERTILIZER: Nitrogen 100 lb/ac, phosphate 80 lb/ac, and zinc 5 lb/ac.

Summary: Growing Season Precipitation and Temperature \1 Fort Collins, Larimer County.						
Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
May	0.50	0.00	110	0	0	8
June	0.50	5.00	576	9	0	38
July	1.50	4.00	653	8	0	69
August	0.50	5.00	517	11	0	95
Total	3.00	14.00	1856	28	0	95

\1 Growing season from May 24 (planting) to August 26 (harvest).  
 \2 Total in-season water from irrigation and precipitation was 17.00 in/a.  
 \3 GDD: Growing Degree Days for sorghum.  
 \4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Corn FIELD PREPARATION: Light tillage.

COMMENTS: Planted in dry soil and irrigated for stand establishment and throughout the season. The site was irrigated with an overhead linear-move sprinkler system. Weed and pest pressures were minimal. Late season heavy rains caused moderate lodging, particularly for the taller hybrids. Forage yields were good.

**Table 7. 2013 Irrigated Forage and Sweet Sorghum Variety Performance Trial at Fort Collins**

Brand	Plant Type	Variety	Forage Yield <sup>b</sup>	Brix (Stem Sugar)	Plant Height	Stem Diameter	Harvest Index <sup>a</sup>			Maturity Group <sup>c</sup>
							tons/ac	percent	in	
Sorghum Partners	Sweet Sorghum	CHR-FS4	21.9	8.5	116.9	0.57	0.27	0.64	0.09	L
Gayland Ward Seed	Sorghum-Sudangrass	GW 300 BMR	20.3	8.5	116.5	0.67	0.27	0.68	0.05	ME
Gayland Ward Seed	Forage Sorghum	Super Sugar	20.0	9.6	110.3	0.48	0.19	0.65	0.16	E
Gayland Ward Seed	Forage Sorghum	GW 400 BMR	19.9	11.0	107.7	0.70	0.23	0.70	0.07	ME
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Six BMR	19.7	8.5	100.4	0.52	0.21	0.58	0.21	E
Sorghum Partners	Sudangrass	CHR-SS2	19.1	7.8	125.0	0.50	0.30	0.66	0.04	PS
Sorghum Partners	Grain/Forage Sorghum	CHR-FS3	19.1	5.8	71.4	0.54	0.22	0.52	0.25	M
Gayland Ward Seed	Forage Sorghum	Sweet Forever	19.1	6.5	115.0	0.63	0.32	0.65	0.03	PS
Sorghum Partners	Sorghum-Sudangrass	CHR-SG1	18.8	9.0	115.0	0.58	0.34	0.64	0.02	PS
Sorghum Partners	Forage Sorghum	CHR-FS9	18.5	8.9	113.6	0.72	0.37	0.63	0.00	PS
Gayland Ward Seed	Forage Sorghum	GW2120	17.3	11.2	91.5	0.63	0.25	0.67	0.08	M
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Forever BMR	15.7	9.9	110.5	0.69	0.28	0.66	0.06	PS
AERC, Inc.	Pearl Millet	CSSPM-7	12.1	9.2	99.9	0.65	0.23	0.67	0.10	E
<b>Average</b>			<b>18.6</b>	<b>8.8</b>	<b>107.2</b>	<b>0.61</b>	<b>0.27</b>	<b>0.64</b>	<b>0.09</b>	
<sup>d</sup> LSD (P<0.05)			4.9							
<sup>d</sup> LSD (P<0.20)			3.2							

<sup>a</sup>Harvest index is the proportion of the specified plant tissue biomass (leaf, stem, panicle/grain head) to the total plant biomass.

<sup>b</sup>Yields are adjusted to 70% moisture content based on oven-dried samples.

<sup>c</sup>Maturity Group: E=early; ME=medium-early; M=Medium; L=late, PS=Photoperiod sensitive.

<sup>d</sup>If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

## 2013 Dryland Forage and Sweet Sorghum Performance Trial at Greeley

COOPERATOR: USDA-NRS, Limited Irrigation Research Farm (LIRF).

PURPOSE: To identify high yielding hybrids under dryland conditions with 2200 sorghum heat units in a loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. SEEDING DENSITY: 69,700 seed/ac. PLANTED: June 11. HARVESTED: September 24.

WEED CONTROL: Starane 6.4 oz/ac. Spot treated with 2,4-D.

CULTIVATION: None.

SOIL: Fort Collins loam. FERTILIZER: Nitrogen 80 lb/ac (40 lb N/ac two times via irrigation).

Summary: Growing Season Precipitation and Temperature \1  
Greeley, Weld County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
June	0.10	1.00	451	11	0	20
July	1.10	1.00	672	11	0	51
August	1.40	1.00	668	12	0	82
September	3.80	0.00	433	7	0	106
Total	6.40	3.00	2224	41	0	106

\1 Growing season from June 11 (planting) to September 24 (harvest).

\2 Total in-season water from irrigation and precipitation was 9.40 in/a.

\3 GDD: Growing Degree Days for sorghum.

\4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Corn. FIELD PREPARATION: Tilled.

COMMENTS: Planted in dry soil and irrigated for stand establishment with 1.0 in./ac from a portable overhead sprinkler. Two in-season subsurface drip irrigations of 1.0 in./ac each were used to apply nitrogen fertilizer. Some areas of the field experienced substantial cocklebur infestations, which had a moderate impact on yield in the in those areas. Late season heavy rains caused moderate lodging, particularly for the taller hybrids. Forage yields were very good.

**Table 8. 2013 Dryland Forage and Sweet Sorghum Variety Performance Trial at Greeley**

Brand	Plant Type	Variety	Forage Yield <sup>b</sup> tons/ac	Brix (Stem Sugar) percent	Plant Height in	Stem Diameter in	Harvest Index <sup>a</sup>			Maturity Group <sup>c</sup>
							Leaf	Stem	Panicle	
Sorghum Partners	Sweet Sorghum	CHR-FS4	17.6	13.1	67.4	0.64	0.23	0.59	0.18	L
Sorghum Partners	Sudangrass	CHR-SS2	17.5	12.0	75.5	0.52	0.30	0.62	0.08	PS
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Forever BMR	16.8	11.7	72.5	0.73	0.29	0.61	0.10	PS
Gayland Ward Seed	Sorghum-Sudangrass	GW 300 BMR	15.7	10.1	74.9	0.64	0.27	0.61	0.12	ME
Gayland Ward Seed	Forage Sorghum	GW 400 BMR	14.2	14.2	62.0	0.73	0.30	0.62	0.08	ME
Sorghum Partners	Grain/Forage Sorghum	CHR-FS3	13.9	9.5	43.6	0.64	0.26	0.37	0.37	M
Gayland Ward Seed	Forage Sorghum	Super Sugar	13.2	11.3	60.8	0.55	0.29	0.49	0.22	E
AERC, Inc.	Pearl Millet	CSSPM-7	12.4	9.1	62.3	0.53	0.29	0.48	0.22	E
Gayland Ward Seed	Forage Sorghum	Sweet Forever	12.3	8.8	69.8	0.74	0.40	0.56	0.04	PS
Sorghum Partners	Sorghum-Sudangrass	CHR-SG1	11.7	10.7	69.2	0.62	0.42	0.56	0.02	PS
Gayland Ward Seed	Forage Sorghum	GW2120	11.4	12.4	51.9	0.65	0.30	0.61	0.09	M
Sorghum Partners	Forage Sorghum	CHR-FS9	11.2	9.8	61.2	0.85	0.49	0.51	0.00	PS
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Six BMR	10.5	11.1	60.1	0.57	0.28	0.47	0.25	E
<b>Average</b>			<b>13.7</b>	<b>11.1</b>	<b>63.9</b>	<b>0.65</b>	<b>0.32</b>	<b>0.55</b>	<b>0.14</b>	
<sup>d</sup> LSD (P<0.05)			5.6							
<sup>d</sup> LSD (P<0.20)			3.6							

<sup>a</sup>Harvest index is the proportion of the specified plant tissue biomass (leaf, stem, panicle/grain head) to the total plant biomass.

<sup>b</sup>Yields are adjusted to 70% moisture content based on oven-dried samples.

<sup>c</sup>Maturity Group: E=early; ME=medium-early; M=Medium; L=late, PS=Photoperiod sensitive.

<sup>d</sup>If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.

## 2013 Irrigated Forage and Sweet Sorghum Performance Trial at Greeley

COOPERATOR: USDA-NRS, Limited Irrigation Research Farm (LIRF).

PURPOSE: To identify high yielding hybrids under irrigated conditions with 2200 sorghum heat units in a loam soil.

PLOT: Four rows with 30 in. row spacing, 35 ft. long. SEEDING DENSITY: 113,250 seed/ac. PLANTED: June 11. HARVESTED: September 24.

WEED CONTROL: Starane 6.4 oz/ac. Spot treated with 2,4-D.

CULTIVATION: None.

SOIL: Fort Collins loam. FERTILIZER: Nitrogen 80 lb/ac (40 lb N/ac two times via irrigation).

Summary: Growing Season Precipitation and Temperature \1  
Greeley, Weld County.

Month	Rainfall	Irrigation \2	GDD \3	>90 F	>100 F	DAP \4
	in	in		-----no. of days-----		
June	0.10	2.75	451	11	0	20
July	1.10	3.50	672	11	0	51
August	1.40	4.00	668	12	0	82
September	3.80	3.00	433	7	0	106
Total	6.40	13.25	2224	41	0	106

\1 Growing season from June 11 (planting) to September 24 (harvest).

\2 Total in-season water from irrigation and precipitation was 19.65 in/a.

\3 GDD: Growing Degree Days for sorghum.

\4 DAP: Days After Planting.

FIELD HISTORY: Previous Crop: Corn. FIELD PREPARATION: Tilled.

COMMENTS: Planted in dry soil and irrigated for stand establishment with 1.0 in./ac from a portable overhead sprinkler. Except for the initial sprinkler irrigation for stand establishment, all subsequent irrigations were via a subsurface drip irrigation system. Two in-season subsurface drip irrigations of 1.0 in./ac each were used to apply nitrogen fertilizer. Some areas of the field experienced substantial cocklebur infestations, which had a moderate impact on yield in the in those areas. Late season heavy rains caused moderate lodging, particularly for the taller hybrids. Forage yields were very good.

**Table 9. 2013 Irrigated Forage and Sweet Sorghum Variety Performance Trial at Greeley**

Brand	Plant Type	Variety	Forage Yield <sup>b</sup> tons/ac	Brix (Stem Sugar) percent	Plant Height in	Stem Diameter in	Harvest Index <sup>a</sup>			Maturity Group <sup>c</sup>
							Leaf	Stem	Panicle	
Gayland Ward Seed	Sorghum-Sudangrass	GW 300 BMR	27.2	11.0	106.4	0.65	0.21	0.64	0.14	ME
Sorghum Partners	Sorghum-Sudangrass	CHR-SG1	26.8	13.3	118.8	0.63	0.24	0.71	0.04	PS
Sorghum Partners	Forage Sorghum	CHR-FS9	26.6	11.6	102.6	0.71	0.38	0.62	0.00	PS
Sorghum Partners	Sweet Sorghum	CHR-FS4	24.8	12.5	109.6	0.74	0.21	0.58	0.21	L
Gayland Ward Seed	Forage Sorghum	GW2120	24.1	14.5	90.0	0.62	0.20	0.62	0.19	M
Sorghum Partners	Sudangrass	CHR-SS2	23.4	15.3	121.5	0.51	0.22	0.71	0.07	PS
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Forever BMR	23.3	13.2	104.8	0.69	0.23	0.67	0.10	PS
Sorghum Partners	Grain/Forage Sorghum	CHR-FS3	23.1	7.8	57.7	0.56	0.21	0.29	0.50	M
Gayland Ward Seed	Forage Sorghum	Sweet Forever	23.0	10.7	111.6	0.71	0.28	0.66	0.06	PS
Gayland Ward Seed	Forage Sorghum	GW 400 BMR	22.3	13.5	93.1	0.65	0.23	0.63	0.14	ME
Gayland Ward Seed	Sorghum-Sudangrass	Sweet Six BMR	20.4	10.9	89.5	0.49	0.14	0.45	0.41	E
Gayland Ward Seed	Forage Sorghum	Super Sugar	19.5	11.1	98.7	0.51	0.14	0.50	0.35	E
AERC, Inc.	Pearl Millet	CSSPM-7	16.9	8.8	86.7	0.55	0.21	0.50	0.29	E
<b>Average</b>			<b>23.2</b>	<b>11.9</b>	<b>99.3</b>	<b>0.62</b>	<b>0.22</b>	<b>0.58</b>	<b>0.19</b>	
<sup>d</sup> LSD (P<0.05)			4.1							
<sup>d</sup> LSD (P<0.20)			2.6							

<sup>a</sup>Harvest index is the proportion of the specified plant tissue biomass (leaf, stem, panicle/grain head) to the total plant biomass.

<sup>b</sup>Yields are adjusted to 70% moisture content based on oven-dried samples.

<sup>c</sup>Maturity Group: E=early; ME=medium-early; M=Medium; L=late, PS=Photoperiod sensitive.

<sup>d</sup>If the difference between two varieties yields equals or exceeds the LSD value, there is a 95% (at P<0.05) or 80% (at P<0.20) chance the difference is statistically significant.