Sorghum Irrigation Management Evaluations 2009-2013

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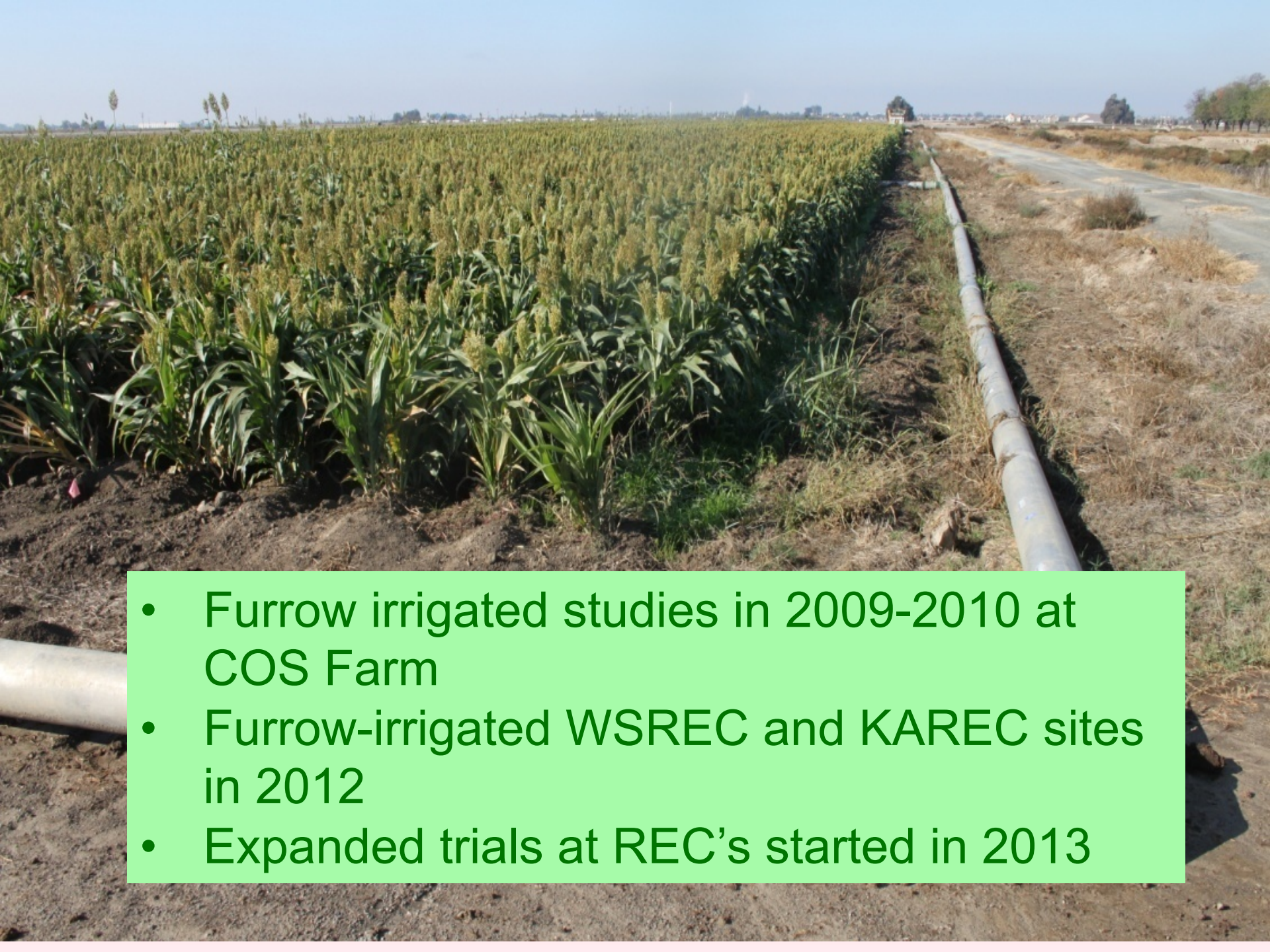


- Furrow irrigated studies in 2009-2010 at COS Farm
- Furrow-irrigated WSREC and KAREC sites in 2012
- Expanded trials at REC's started in 2013

Planting / Soil Characteristics / Irrigation Method

Tulare COS Farm 2009 and 2010 Silage sorghum studies

Soil Type	Tagus loam soil, Tulare-area College of Sequoias farm
Row Spacing	30 inch rows
Plot width / length	16 beds in width per irrigation treatment replication Approximately 125 feet plot length, 3 field reps
Irrig X Variety split	16 beds are split plot, with two varieties per irrigation rep

Depth range in soil profile (ft)	Available Soil Water held Per foot of soil profile (inches)
0 – 3	1.6 – 1.8
3 - 8	1.4 – 1.5

Irrigation Method	10 inch gated pipe, one gate per planted row
	Border ridge separates reps each end of plots
	Plots irrigated individually so water application amounts could be determined
	Typical amount / applic. = 4.5 to 5.5 inches

Planting / Soil Characteristics / Irrigation Method

West Side and Kearney REC 2012 Silage sorghum studies

Soil Types	WSREC (clay loam soil); Kearney REC (sandy loam soil)
Row Spacing	30 inch rows
Plot width / length	8 beds in width per irrigation treatment replication Approximately 65 feet plot length, 4 field reps
Irrig X Variety split	two varieties by 8 rows per irrigation rep

Depth range in soil profile (ft)	**Available Soil Water held Per foot of soil profile (inches)**	
	West Side REC	Kearney REC
0 – 3	2.0 – 2.3	1.3 – 1.45
3 - 8	1.9 – 2.2	1.2 – 1.4

Irrigation Method	6 inch gated pipe, one gate per planted row
	Border ridge separates reps each end of plots
	Plots irrigated individually so water application amounts could be determined
	Typical amount / applic. = 2.0 to 2.6 (KAREC) and 3.5 to 5.0 inches (WSREC)

Irrigation Dates and Amounts –

Tulare COS Farm 2009 and 2010 Silage sorghum studies

Irrig. Treat-ment #	**2009 Irrigation Dates and Amounts (inches water)** *Planted 6/25* ***Preplant irrigation of 7 inches***				**2010 Irrigation Dates and Amounts (inches water)** *Planted 8/04* ***Preplant irrigation of 8 inches***			
Date	7/29	8/18	9/10	Total	9/02	9/24	10/18	Total
Days after planting	34	54	77		29	51	75	
T1	5.7	4.7	4.9	**15.3**	6.1	4.5	3.9	**14.5**
T2	5.7	4.6	-	**10.3**	6.1	4.4	-	**10.5**
T3	-	5.2	5.3	**10.5**	-	4.8	4.6	**10.4**
T0	-	-	-	**0**	-	-	-	**0**

Irrigation Dates and Amounts –

WSREC and KAREC 2012 Silage sorghum studies

Irrig. Treat-ment #	2012 Kearney KAREC Irrigation Dates and Amounts (inches water) - *Planted 6/22* - ***Two pre-irrigations to apply total of 6.5 to 7 inches***								
Date	7/06	7/23	8/02	8/10	8/20	8/30	9/10	9/19	Total
T1	2.59	1.8	2.1	2.0	1.96	2.08	2.1	1.93	**16.6**
T2	2.59	1.8	2.06	2.0	1.96	2.08			**12.7**
T3	2.59		2.06		1.96	2.08	2.1	1.93	**12.5**
T0	2.59		2.1						**4.7**

Soil conditions not suited to a non-irrigated treatment for T-0 treatment

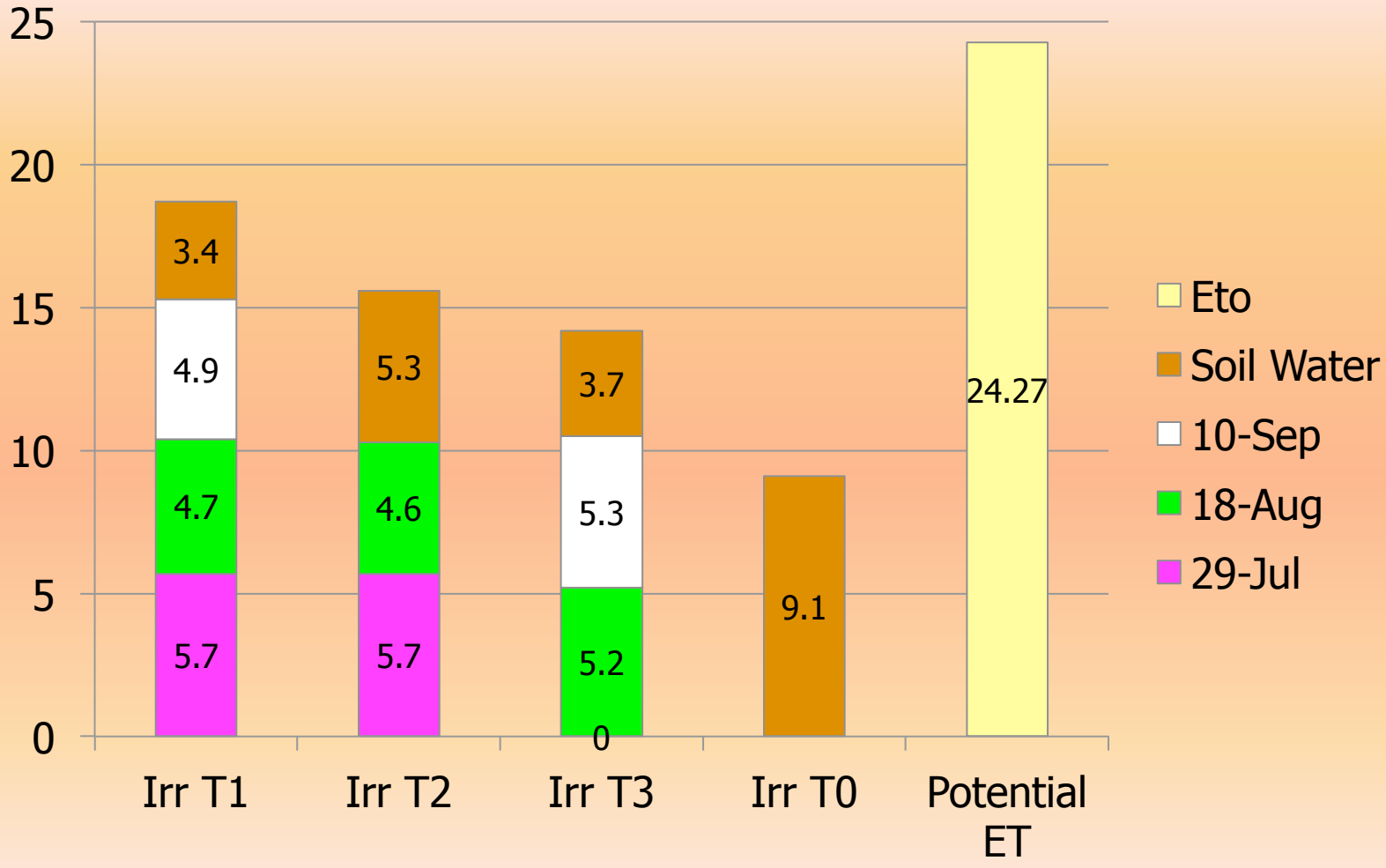
Irrigation Dates and Amounts –

WSREC and KAREC 2012 Silage sorghum studies

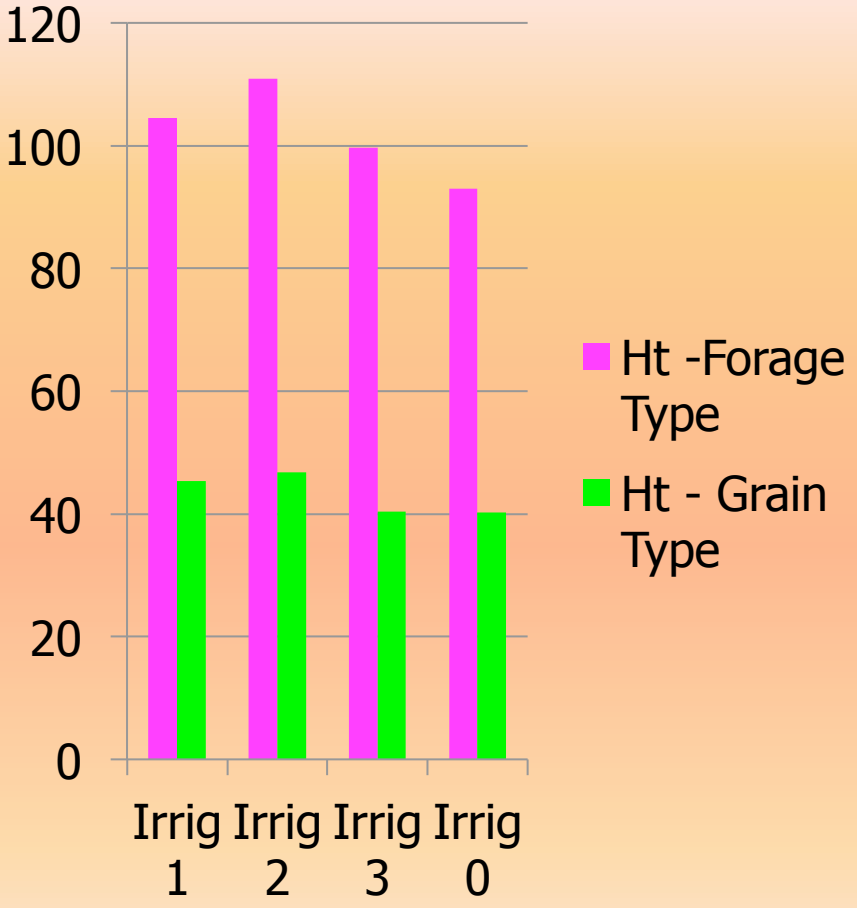
Irrig. Treat - ment #	2012 West Side REC Irrigation Dates and Amounts (inches water) - *Planted 6/23* - ***Large pre-plant irrigation (8-9 inches)***									
Date	6/26	7/01	7/23	7/29		8/20	8/30	9/10	9/19	Total
T1	3.2		3.0	1.6		3.4	3.0	2.9		**17.1**
T2	3.2		3.0	1.6		3.4	2.1			**13.3**
T3	3.2					3.4	3.0	3.7		**13.3**
T0	3.2	3.6								**6.8**

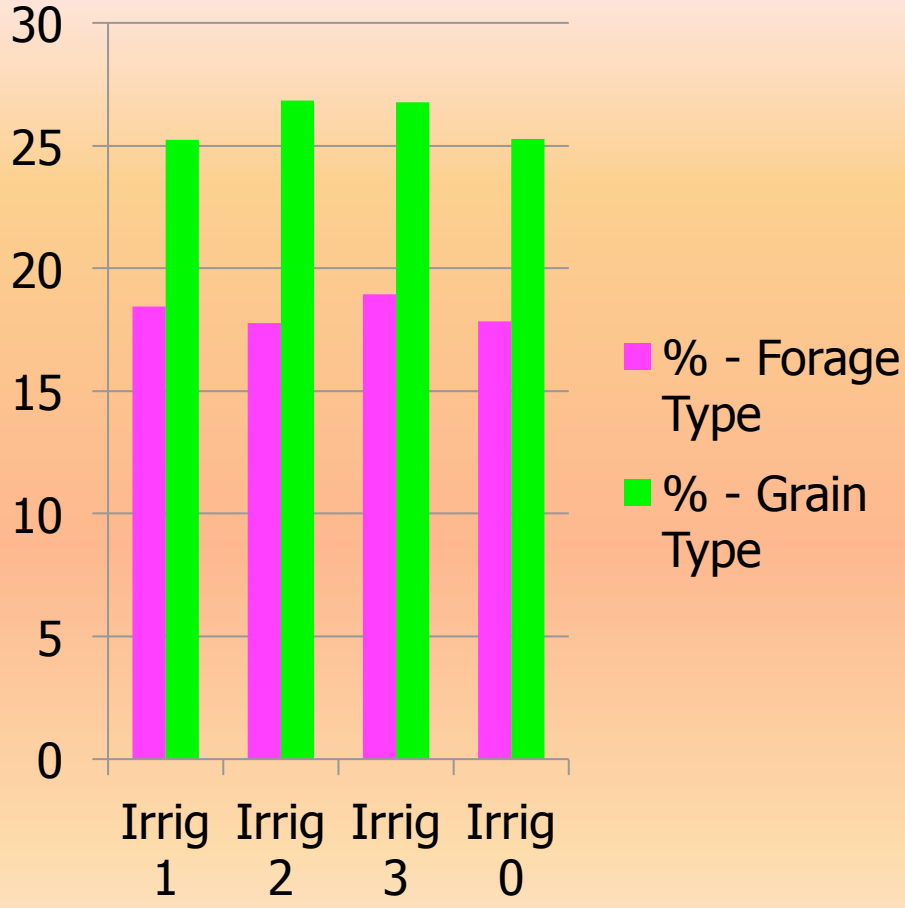
Soil conditions not suited to a non-irrigated treatment for T-0 treatment

Sorghum Applied Irrigation plus Soil Water Use 2009 – COS site *(inches applied or soil water use)*



Plant Ht (in) and Grain Head as % of total fresh weight





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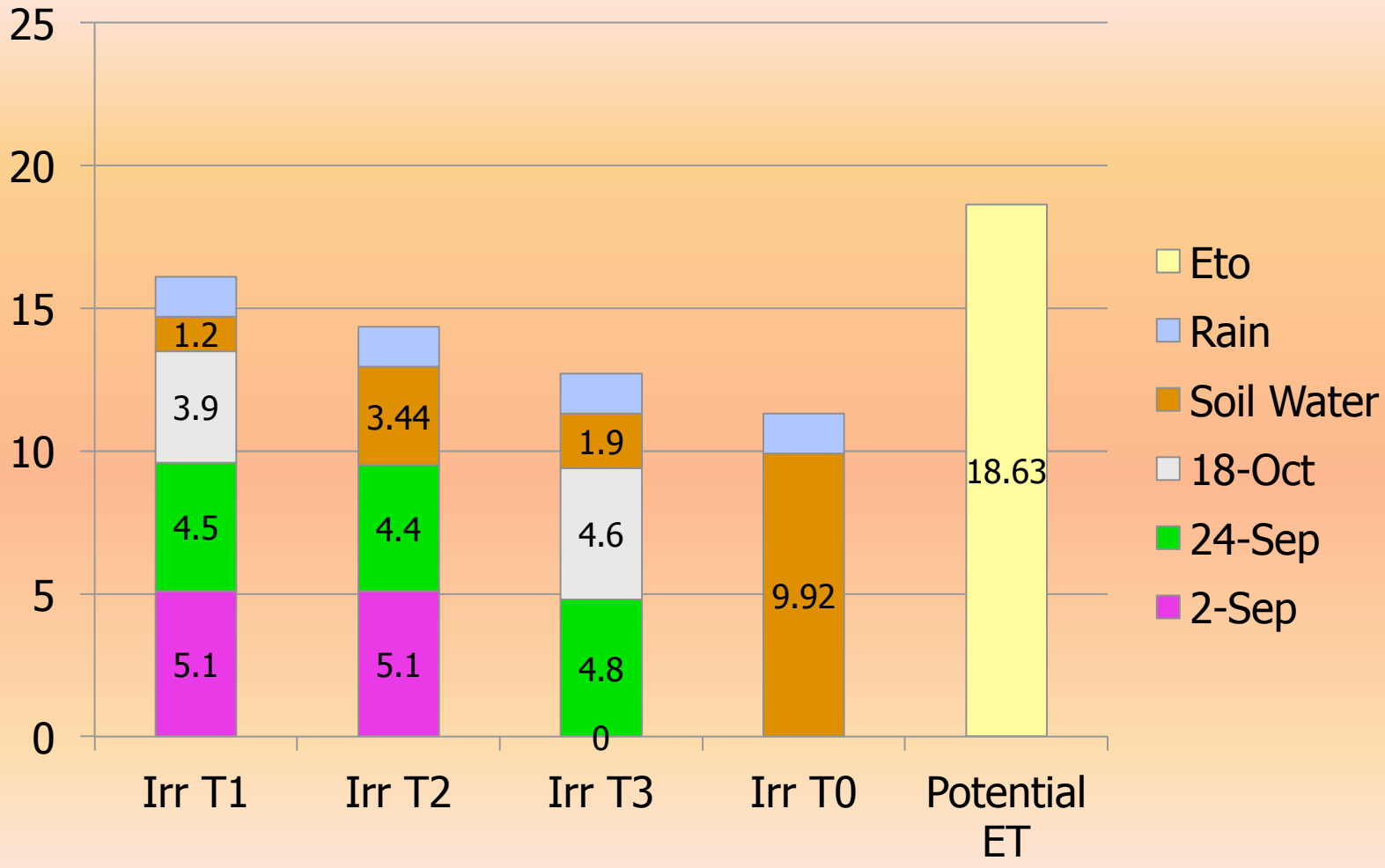
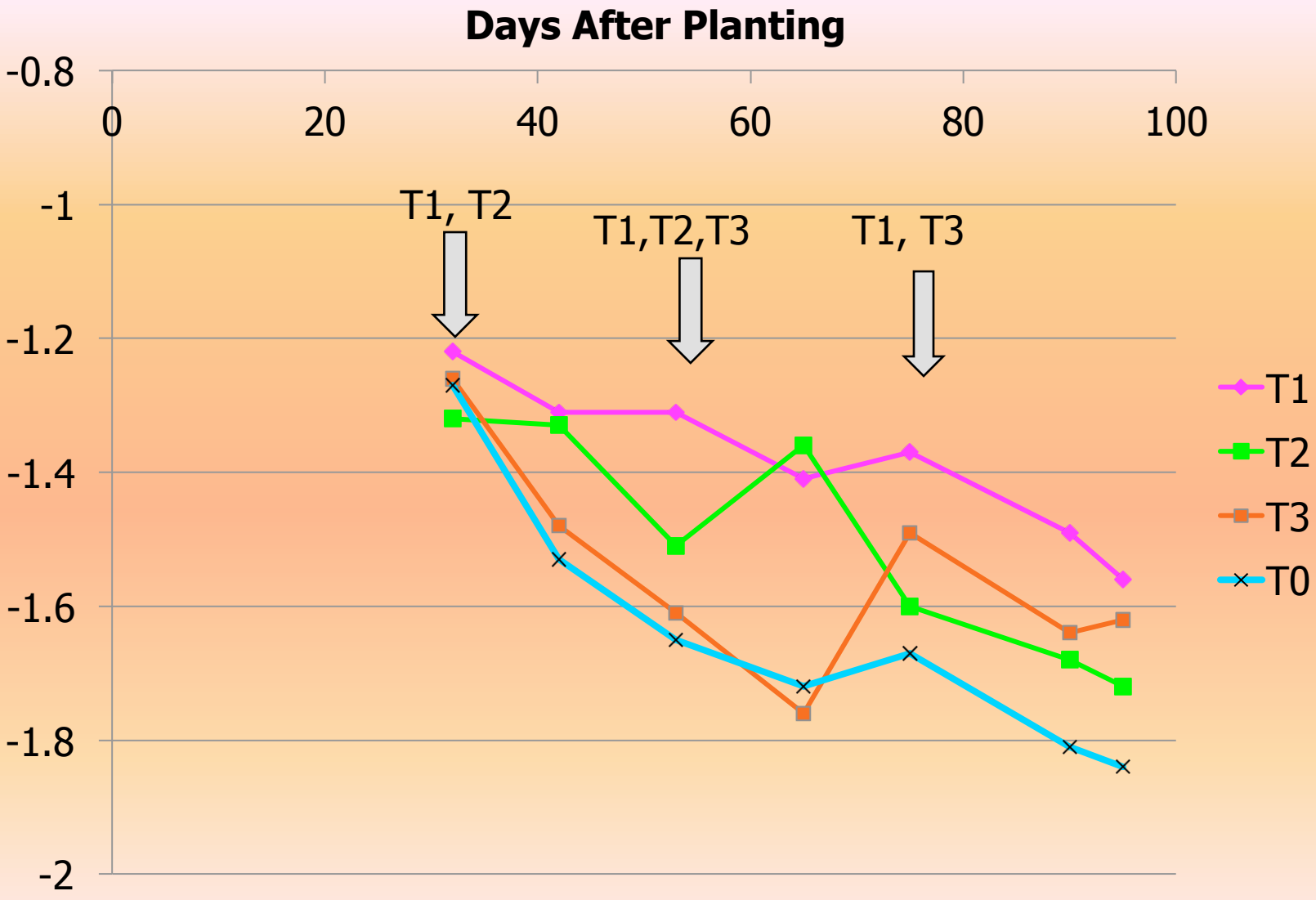


Degree days accumulated – 2009 versus 2010

Year	Location and Type weather data	Degree Days (DD60) (heat units, single triangle method, base 60F)			
		Days after planting (DAP)			
		30 days	60 days	90 days	At harvest (102 DAP – 2009; 108 DAP – 2010)
2009	Porterville CIMIS	597	1131	1624	1753
2009 June planted	Portable–on site	558	1090	1510	1645
2010	Porterville CIMIS	511	904	1096	1151
2010 August planted	Portable-on site	480	862	1110	1234

Leaf Water Potential (Bars)

College of Sequoias Farm - 2009 Irrigation Trial



Sorghum Calculated Evapotranspiration

2009 – COS site *(inches applied or soil water use) - loam soil*

Year	Type of Sorghum	Irrigation Trt #	In-Season Applied Water (inches)	Soil Water Use (in)	Total Est. Etc (in)
2009	Grain Sorghum	1	15.3	-2.8	18.1
		2	10.3	-4.0	14.3
		3	10.5	-2.5	13.0
		0	0	-8.6	8.6
2009	Forage Sorghum	1	15.3	-4.0	19.3
		2	10.3	-6.6	16.9
		3	10.5	-4.9	15.4
		0	0	-9.6	9.6

Sorghum Calculated Evapotranspiration

2010 – COS site *(inches applied or soil water use) - loam soil*

Year	Type of Sorghum	Irrigation Trt #	In-Season Applied Water (inches)	Soil Water Use (in)	Total Est. Etc (in)
2010	Grain Sorghum	1	14.5	-0.6	16.5
		2	10.5	-2.9	14.8
		3	10.4	-1.4	13.2
		0	0	-8.9	10.3
2010	Forage Sorghum	1	14.5	-1.9	17.8
		2	10.5	-4.0	15.9
		3	10.4	-2.4	14.2
		0	0	-10.8	12.2

Sorghum Calculated Evapotranspiration

2012 – Kearney REC site *(inches applied or soil water use) - sandy loam soil*

Year	Type of Sorghum	Irrigation Trt #	In-Season Applied Water (inches)	Soil Water Use (in)	Total Est. Etc (in)
2012	Grain Sorghum	1	16.6	-1.0	17.6
		2	12.7	-3.0	15.7
		3	12.5	-3.9	16.4
		0	4.7	-6.9	11.6
2012	Forage Sorghum	1	16.6	-2.3	18.9
		2	12.7	-4.1	16.8
		3	12.5	-4.4	16.9
		0	4.7	-8.5	13.2

Sorghum Calculated Evapotranspiration

2012 – West Side REC site *(inches applied or soil water use) - sandy loam soil*

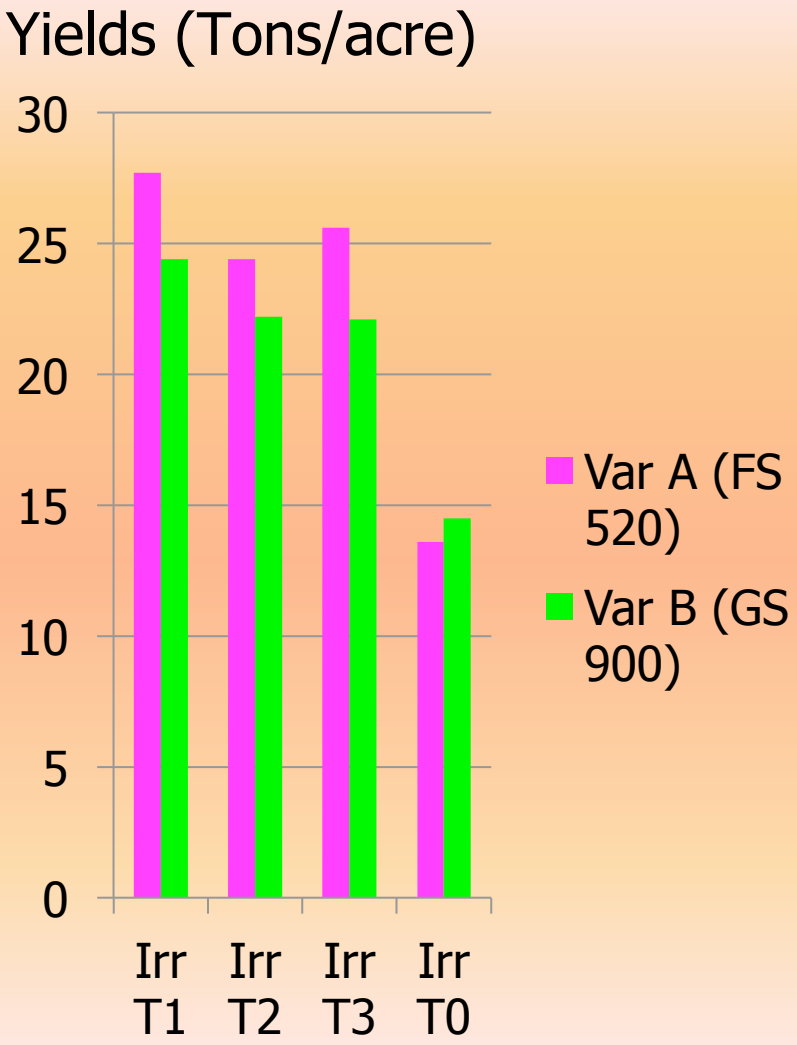
Year	Type of Sorghum	Irrigation Trt #	In-Season Applied Water (inches)	Soil Water Use (in)	Total Est. Etc (in)
2012	Grain Sorghum	1	17.1	-2.3	19.4
		2	13.3	-2.4	16.7
		3	13.3	-2.8	16.1
		0	6.8	-6.9	13.7
2012	Forage Sorghum	1	17.1	-3.1	20.2
		2	13.3	-4.0	17.3
		3	13.3	-3.3	16.6
		0	6.8	-7.6	14.4

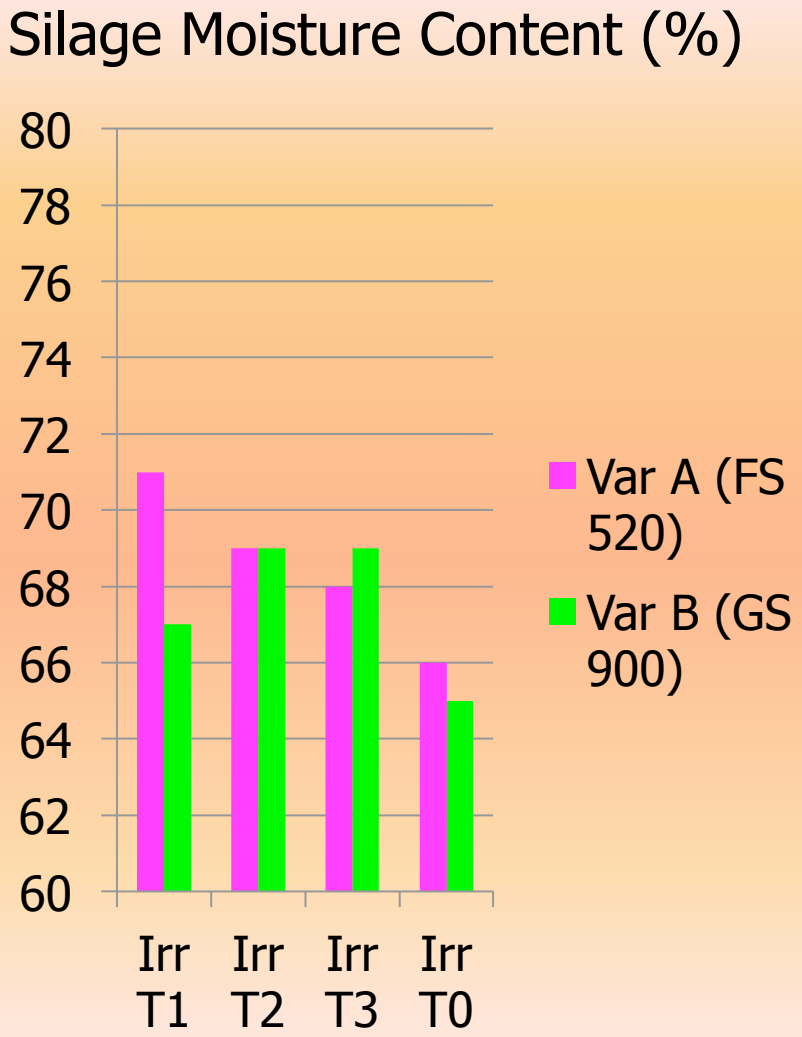
HARVEST OPERATIONS

1) At COS site = Commercial Silage Harvest equipment & whole plot weights
2) At REC sites = hand harvest

Subsamples by hand for moisture %

Sorghum Silage Yields and Average Moisture Content 2009 – COS site





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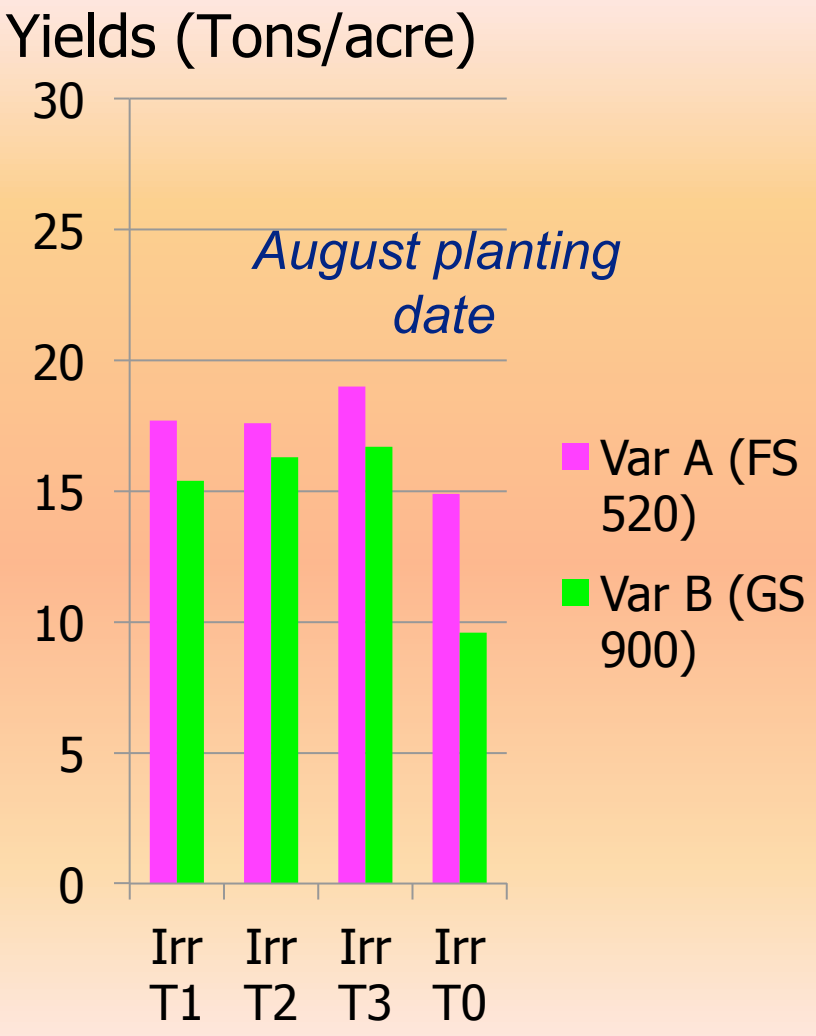
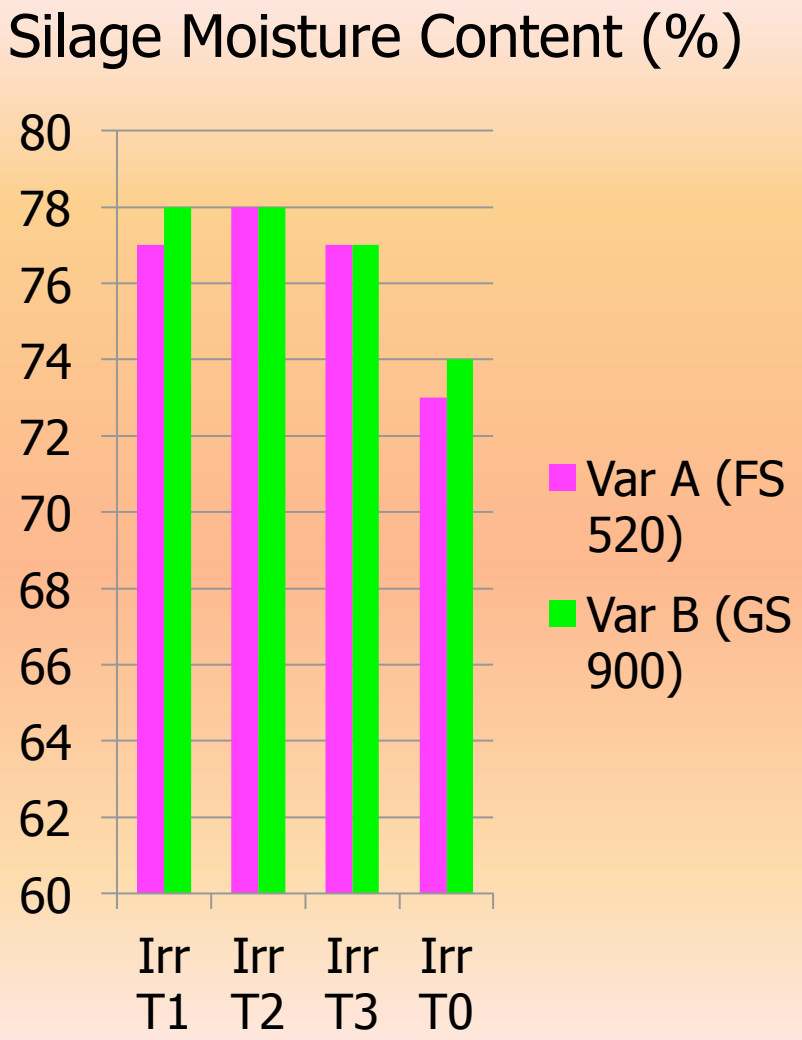
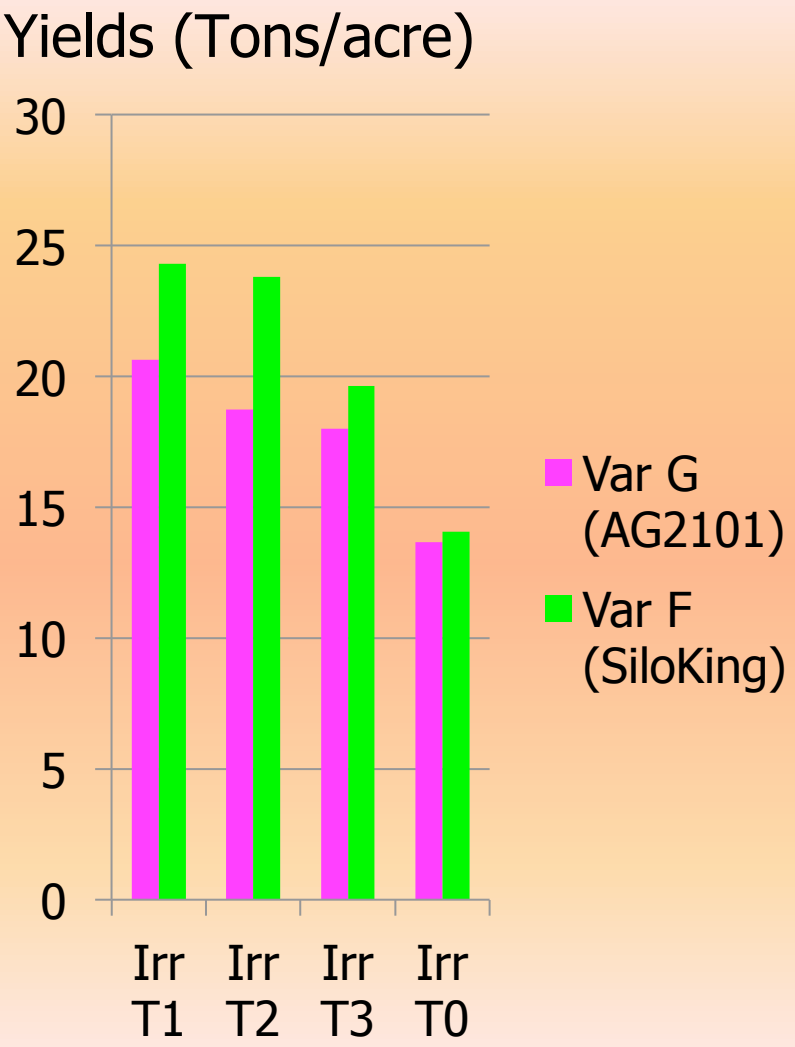
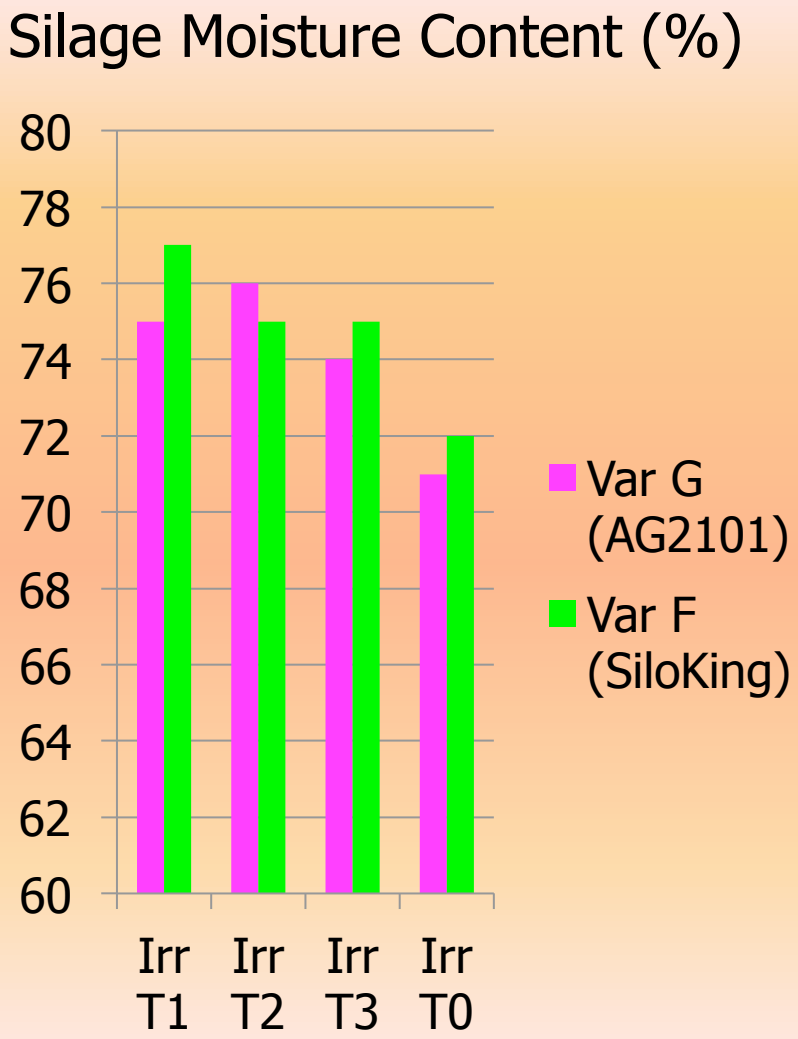


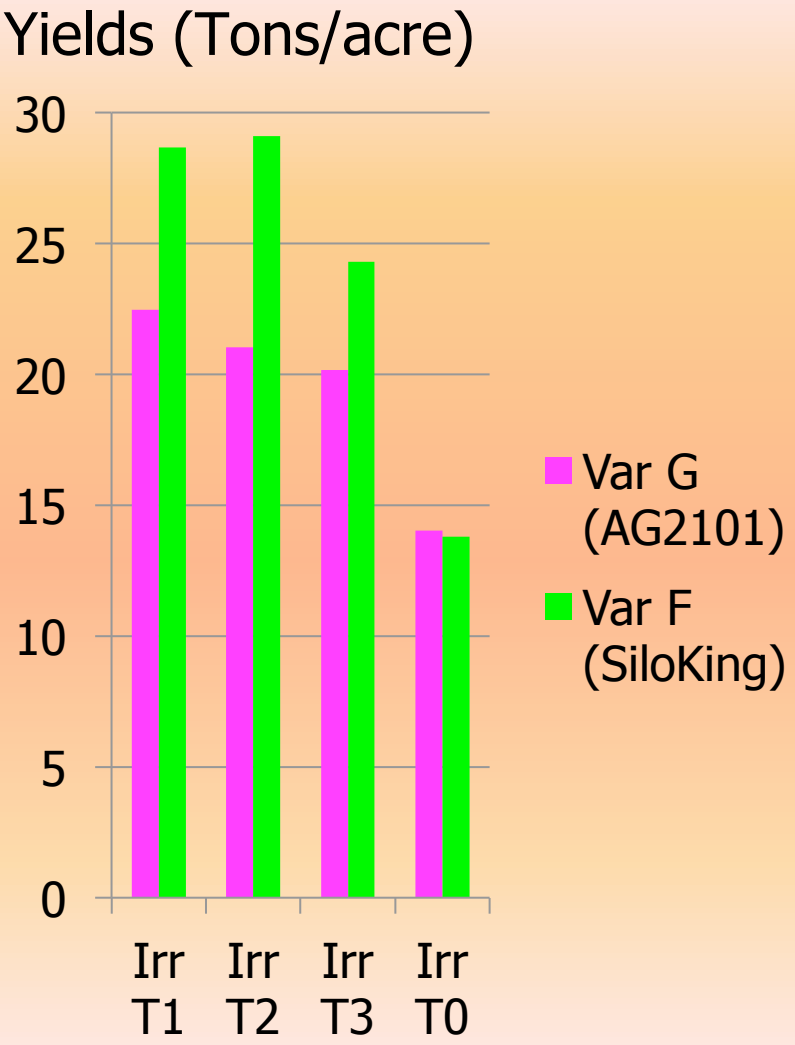


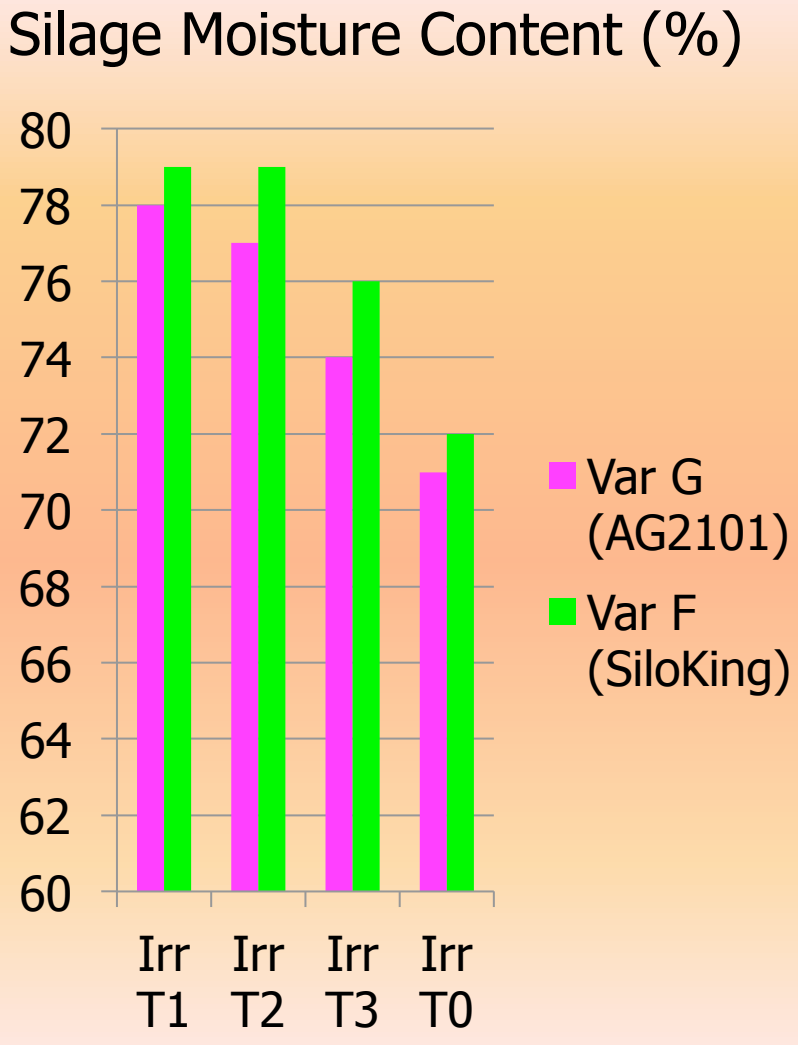
Sorghum Silage Yields and Average Moisture Content 2012 – West Side REC site



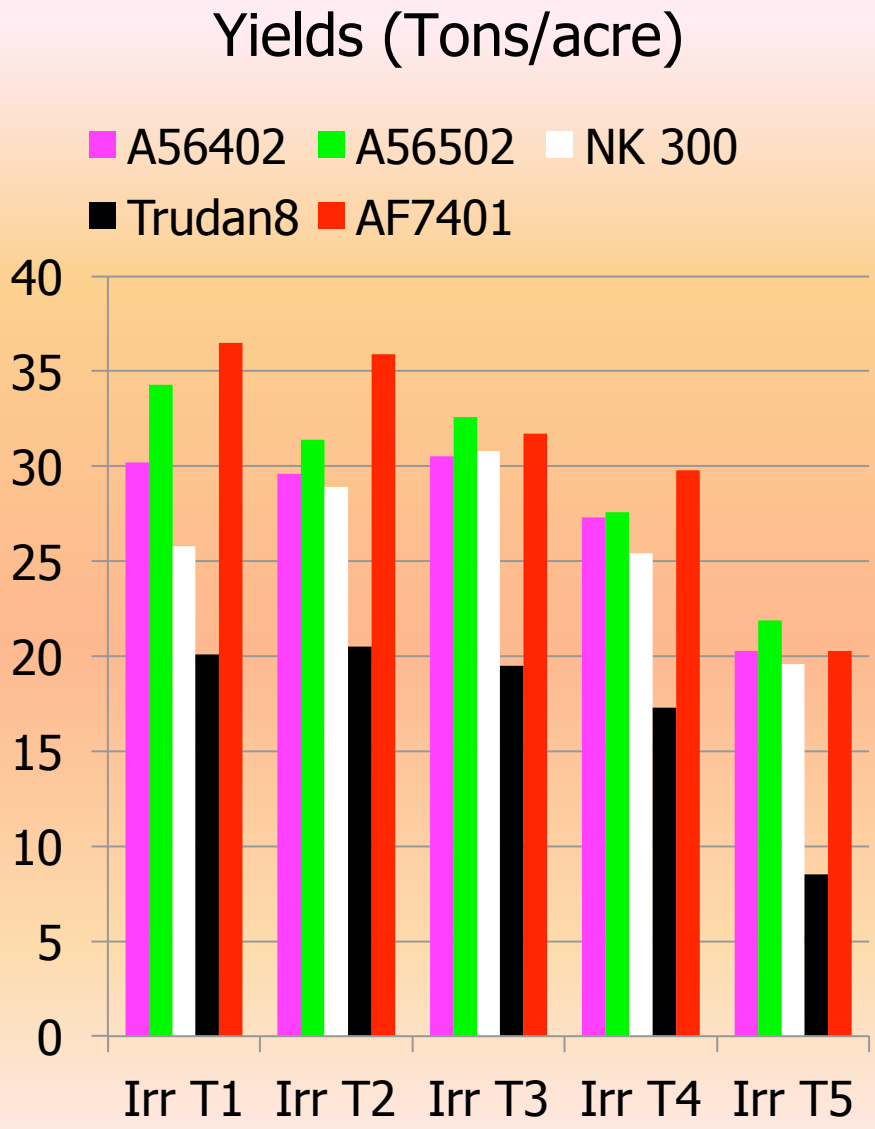


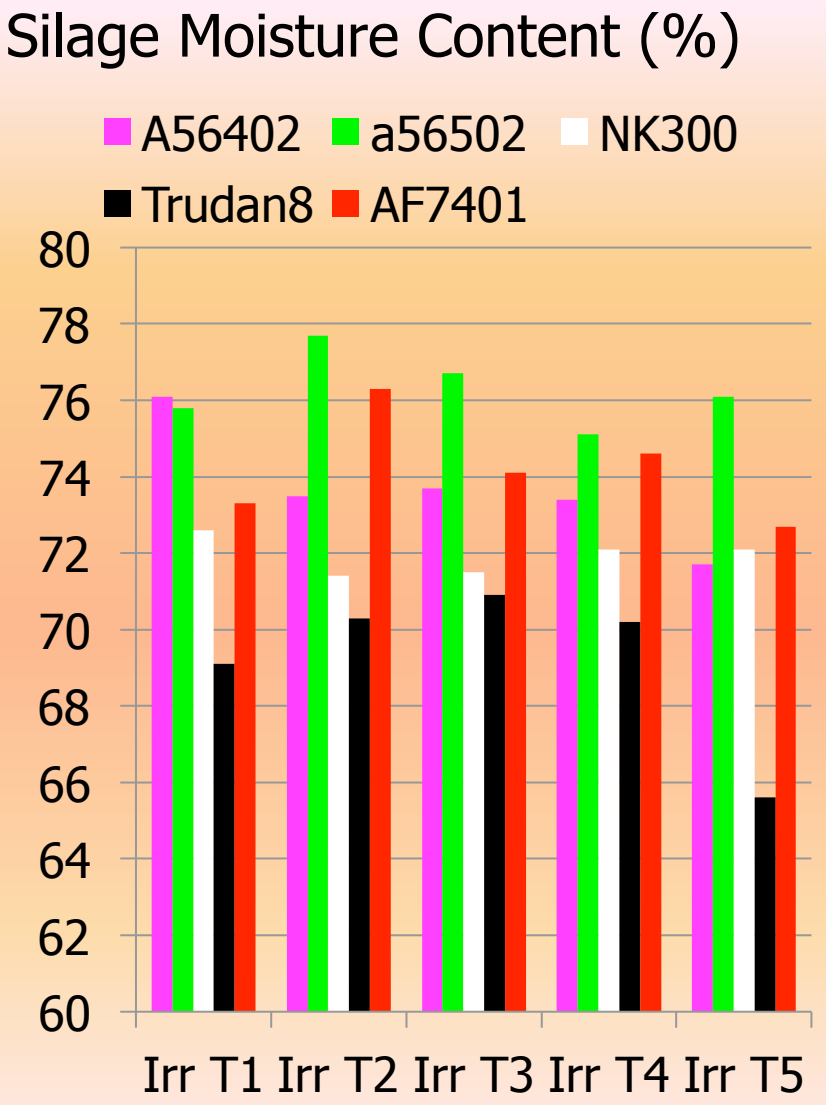
Sorghum Silage Yields and Average Moisture Content 2012 – Kearney REC site



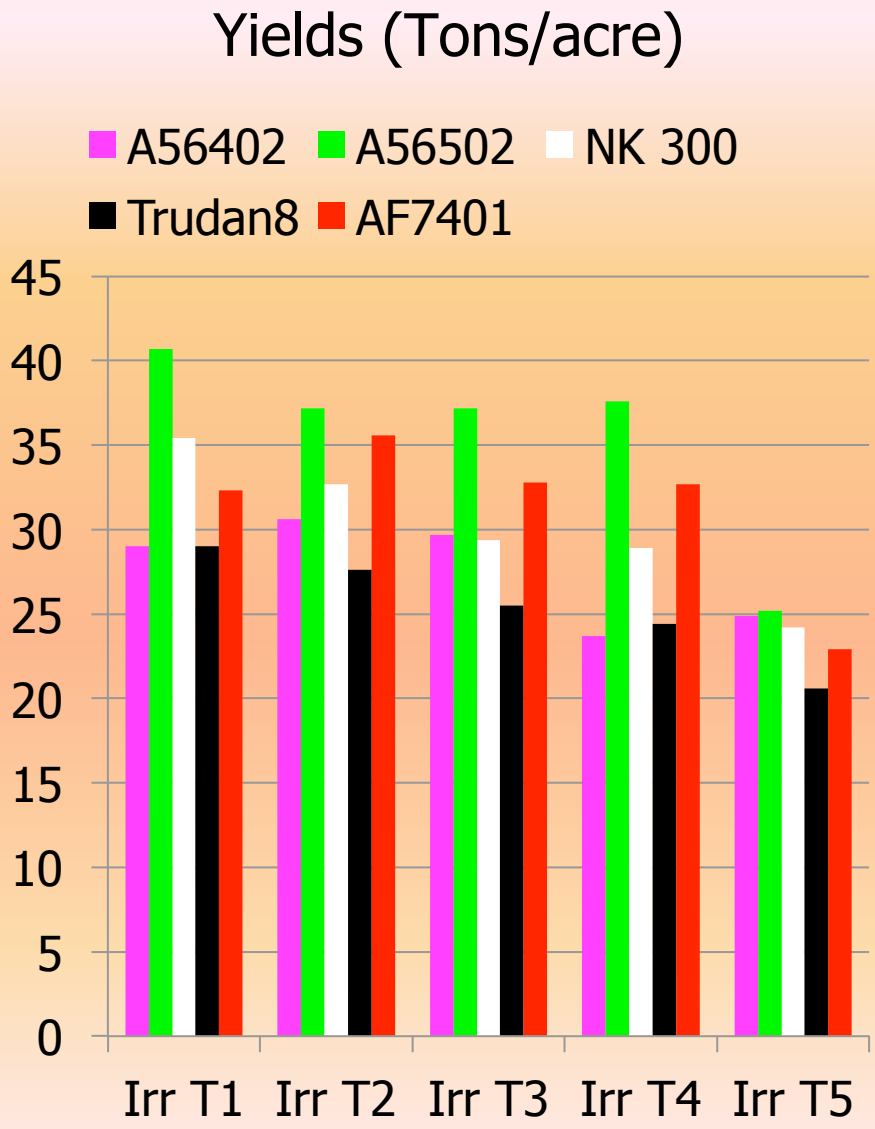


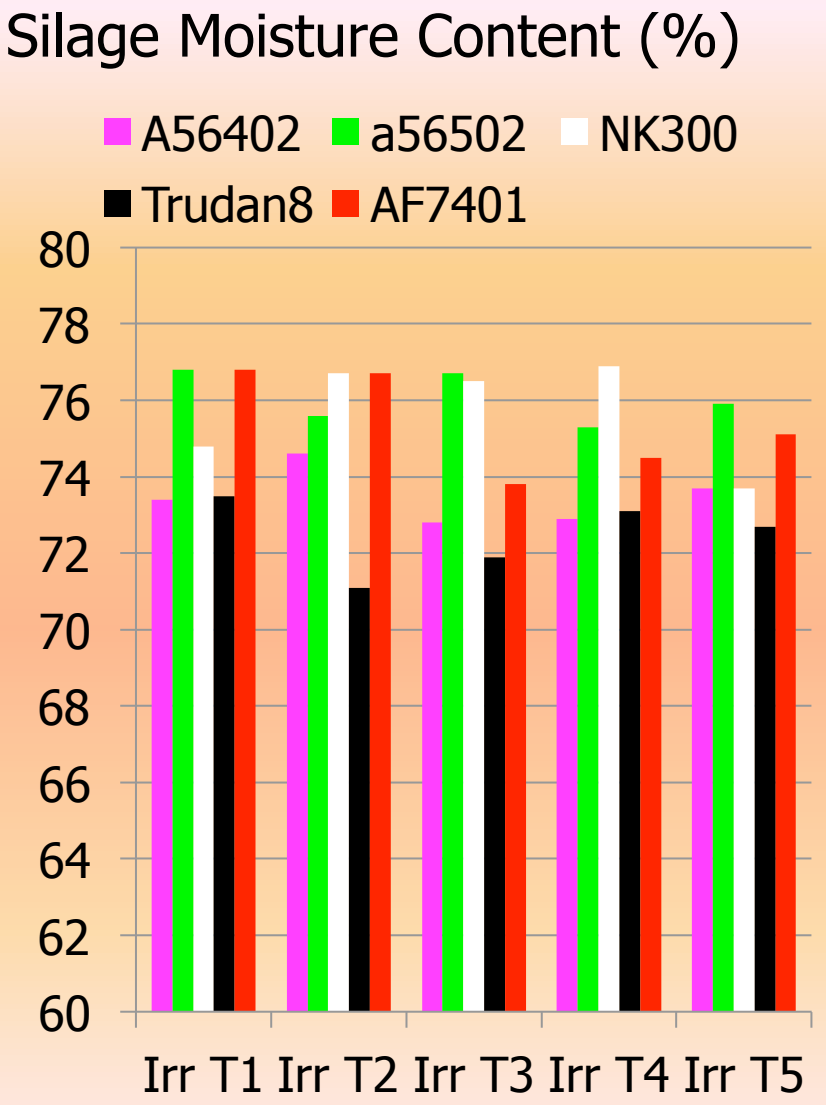
FORAGE SORGHUM Yields and Average Moisture Content 2013 – Kearney REC site



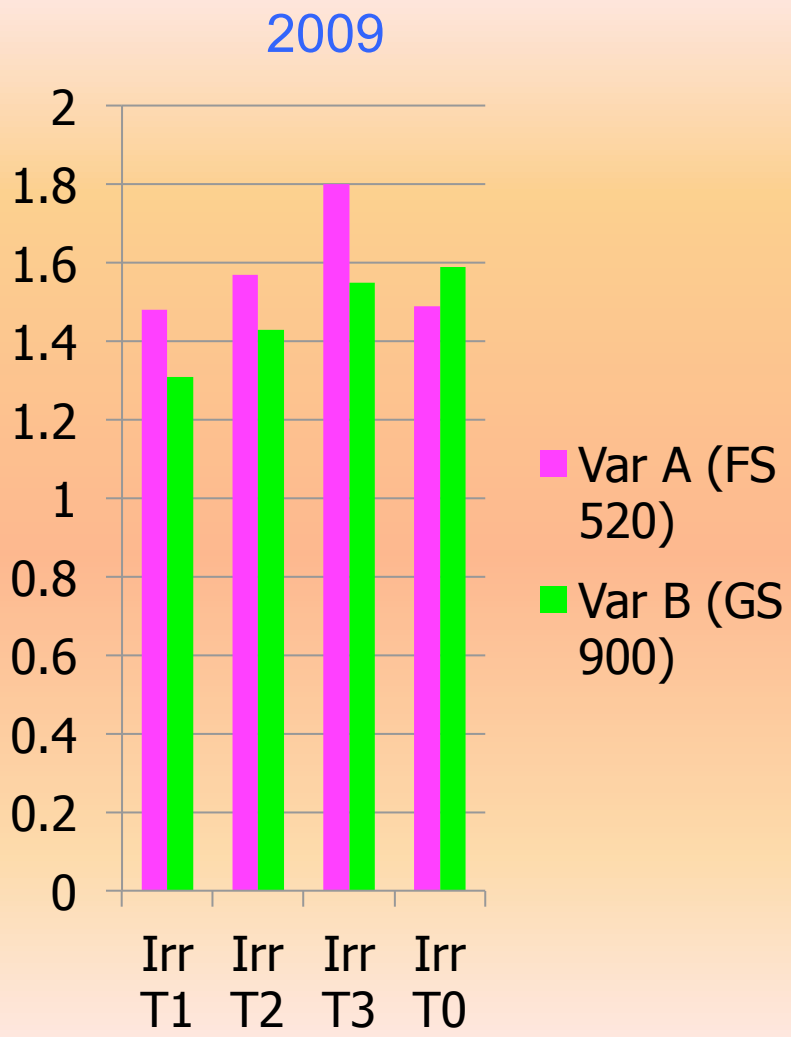


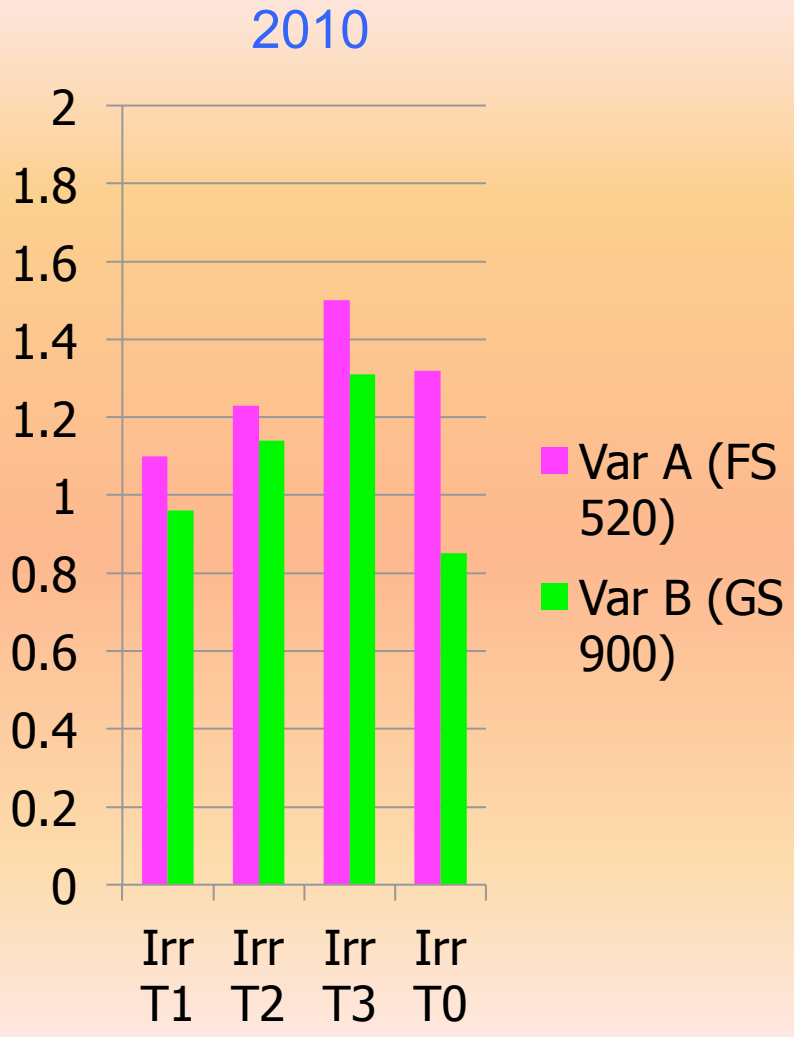
FORAGE SORGHUM Yields and Average Moisture Content
2013 – West Side REC site





Sorghum Silage Yields per Unit Crop Etc
2009 & 2010 – COS site *(Tons/acre per inch of water)*





Silage Quality Summary – selected analyses 2010

Variety	Irrig Trt #	Dry Matter (%)	Crude Protein (% DM)	Soluble Protein (% CP)	Acid Deterg Fiber (% DM)	Neutral Deterg Fiber (% DM)	TDN (% DM)
FS-520	T1	87.4	11.3	46.2	36.9	58.2	59.1
	T2	90.9	10.9	45.4	37.3	57.8	58.6
	T3	88.7	10.7	45.9	36.4	57.0	59.3
	T0	90.3	10.7	47.3	36.9	58.3	58.8
GS 900	T1	86.8	11.2	47.8	35.8	56.6	59.8
	T2	87.6	10.8	46.6	35.4	55.3	59.7
	T3	90.1	10.8	45.9	36.6	56.6	58.6
	T0	90.5	11.1	46.8	35.5	55.9	59.7
average			**10.9**	**46.5**	**36.3**	**56.9**	**59.2**

Research Efforts in sorghum irrigation trials will continue in 2014 and 2015

THANK YOU FOR YOUR INTEREST IN UNIVERSITY OF CALIFORNIA RESEARCH PROGRAMS