



# Corn and Sorghum Response to Different Irrigation Management Practices

17<sup>th</sup> Annual Crop Clinic  
March 29<sup>th</sup>, 2016; Goodwell, OK

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# Drought Map

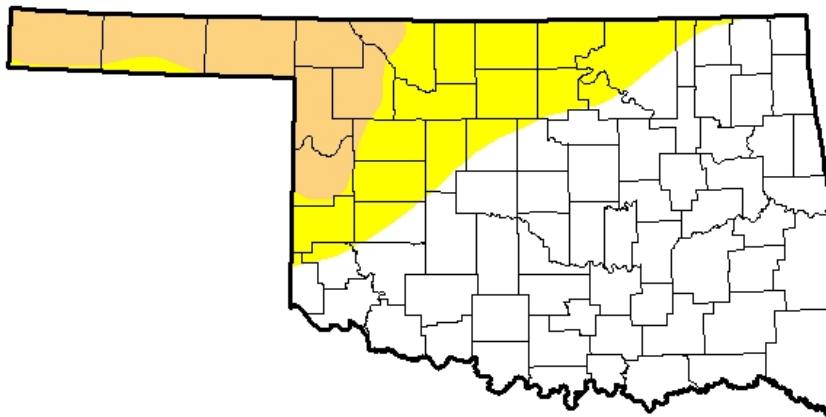


## U.S. Drought Monitor Oklahoma

**March 22, 2016**  
(Released Thursday, Mar. 24, 2016)  
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
<b>Current</b>	65.15	20.59	14.26	0.00	0.00	0.00
<b>Last Week</b> <i>3/15/2016</i>	65.59	26.01	8.39	0.00	0.00	0.00
<b>3 Months Ago</b> <i>12/22/2015</i>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> <i>1/22/2016</i>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> <i>9/29/2015</i>	52.60	30.61	10.42	5.40	0.97	0.00
<b>One Year Ago</b> <i>3/24/2015</i>	14.36	15.23	19.44	15.22	27.33	8.41



### Intensity:

D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought
D2 Severe Drought	

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

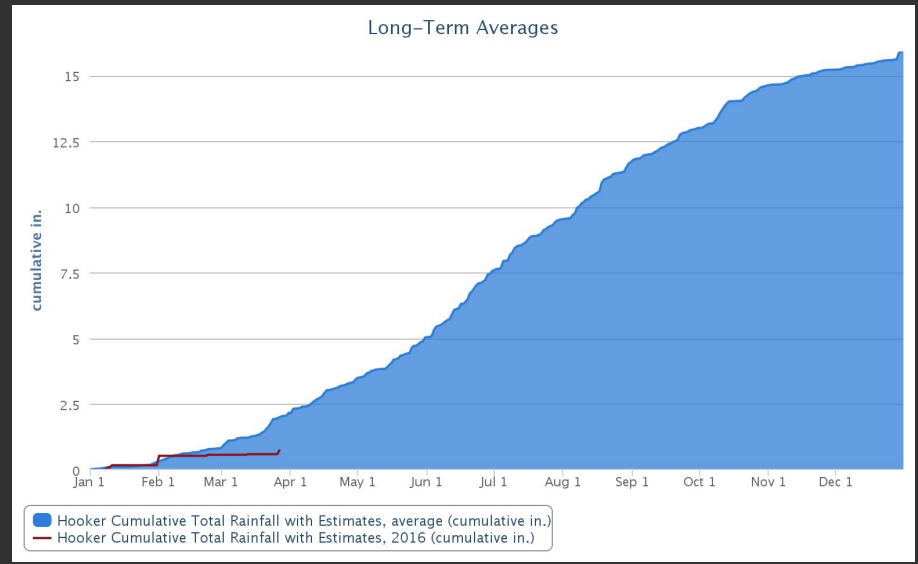
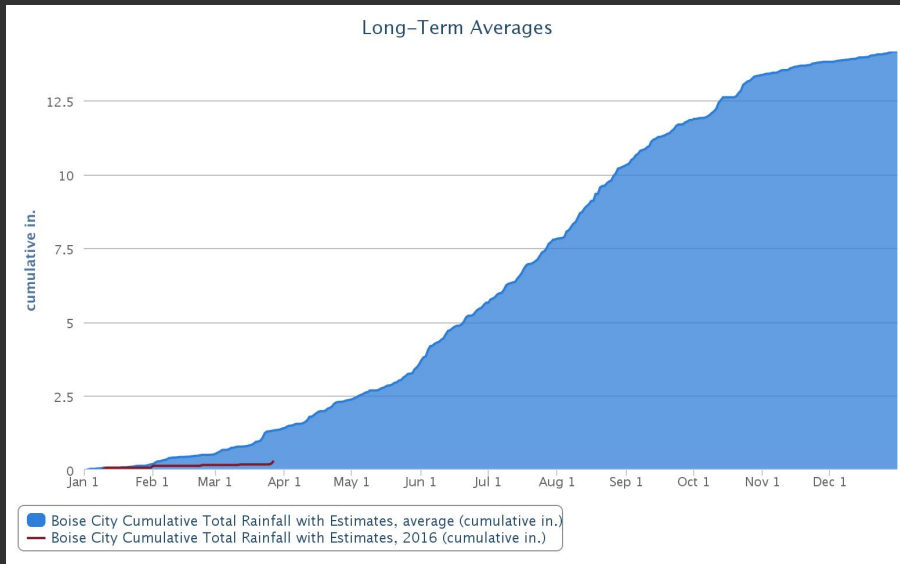
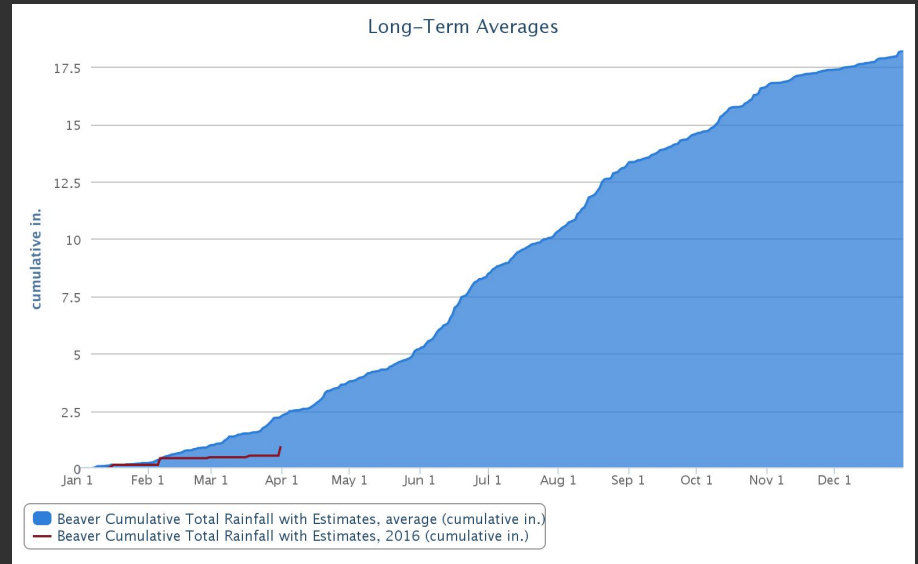
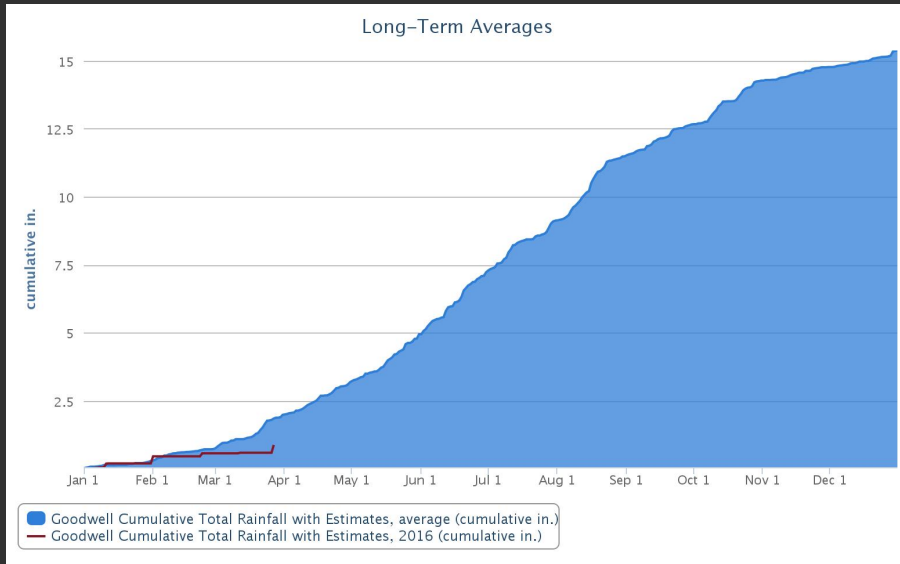
### Author:

Brad Rippey  
U.S. Department of Agriculture

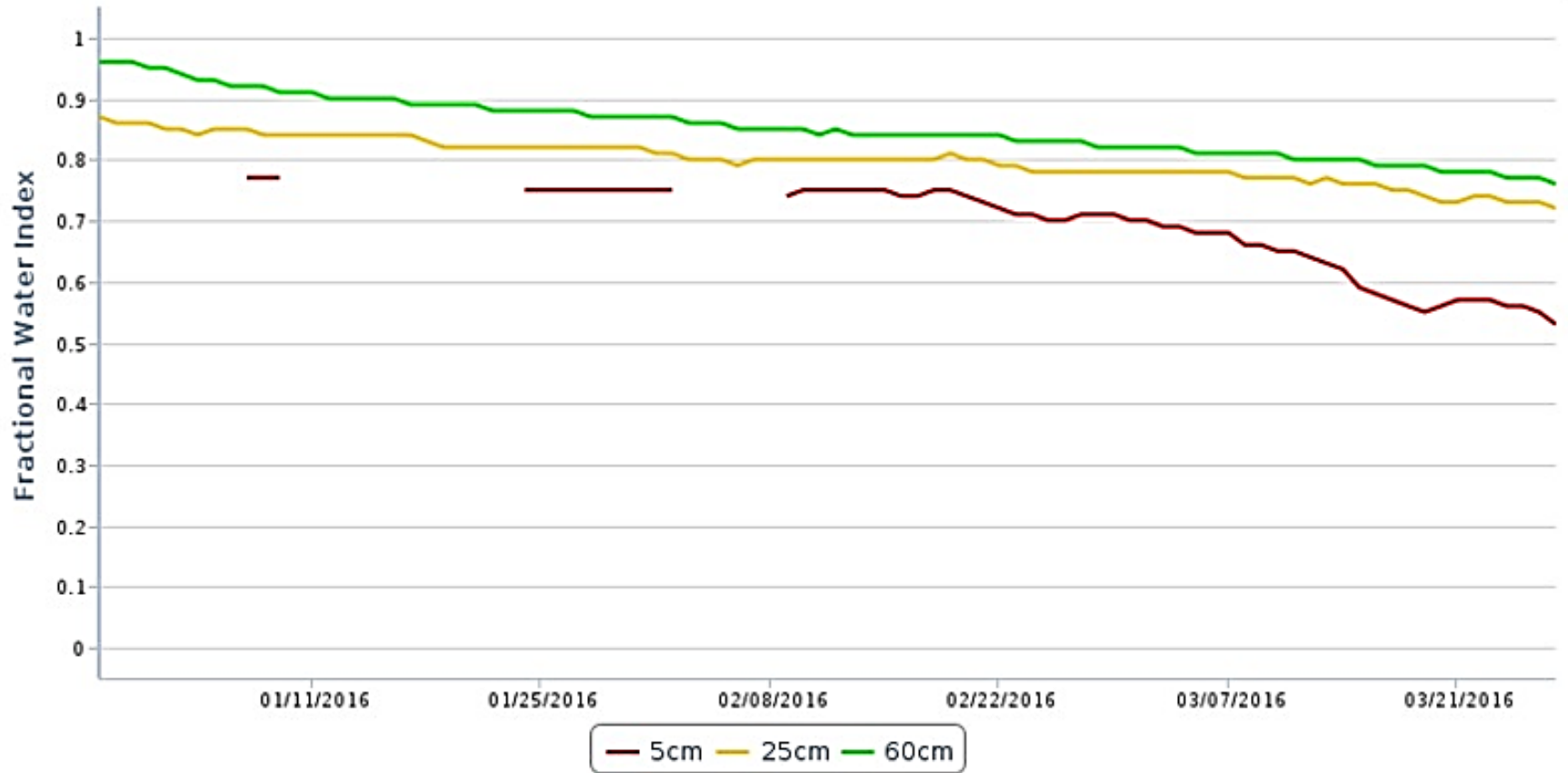


<http://droughtmonitor.unl.edu/>

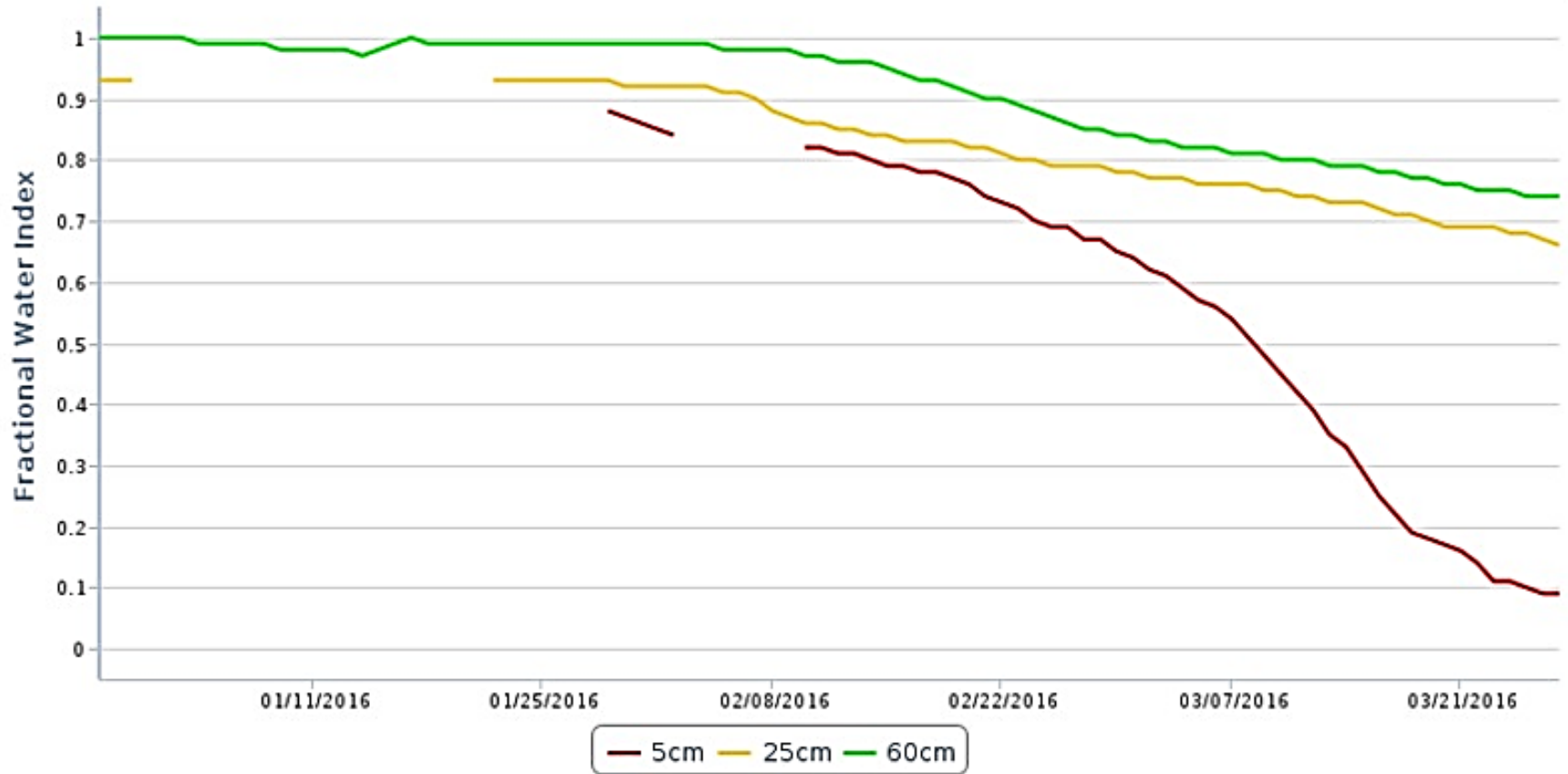
# 2016 Rainfall



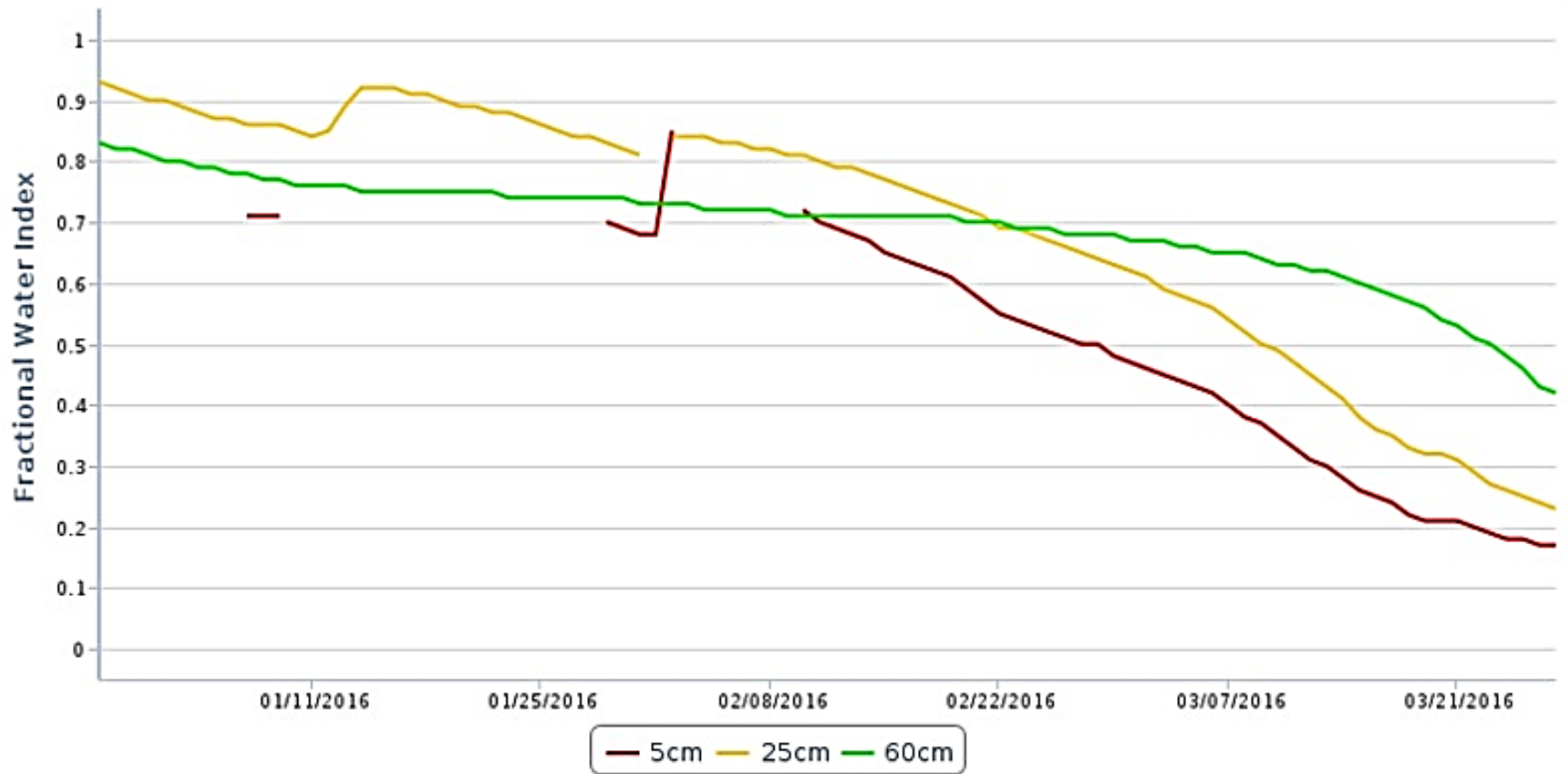
# Soil Moisture: Goodwell (Beaver)



# Soil Moisture: Boise City



# Soil Moisture: Hooker





# Pre-planting irrigation

- **Root development**
- **Rainfall utilization**

# Root Development



Trt 1: 100-100-100

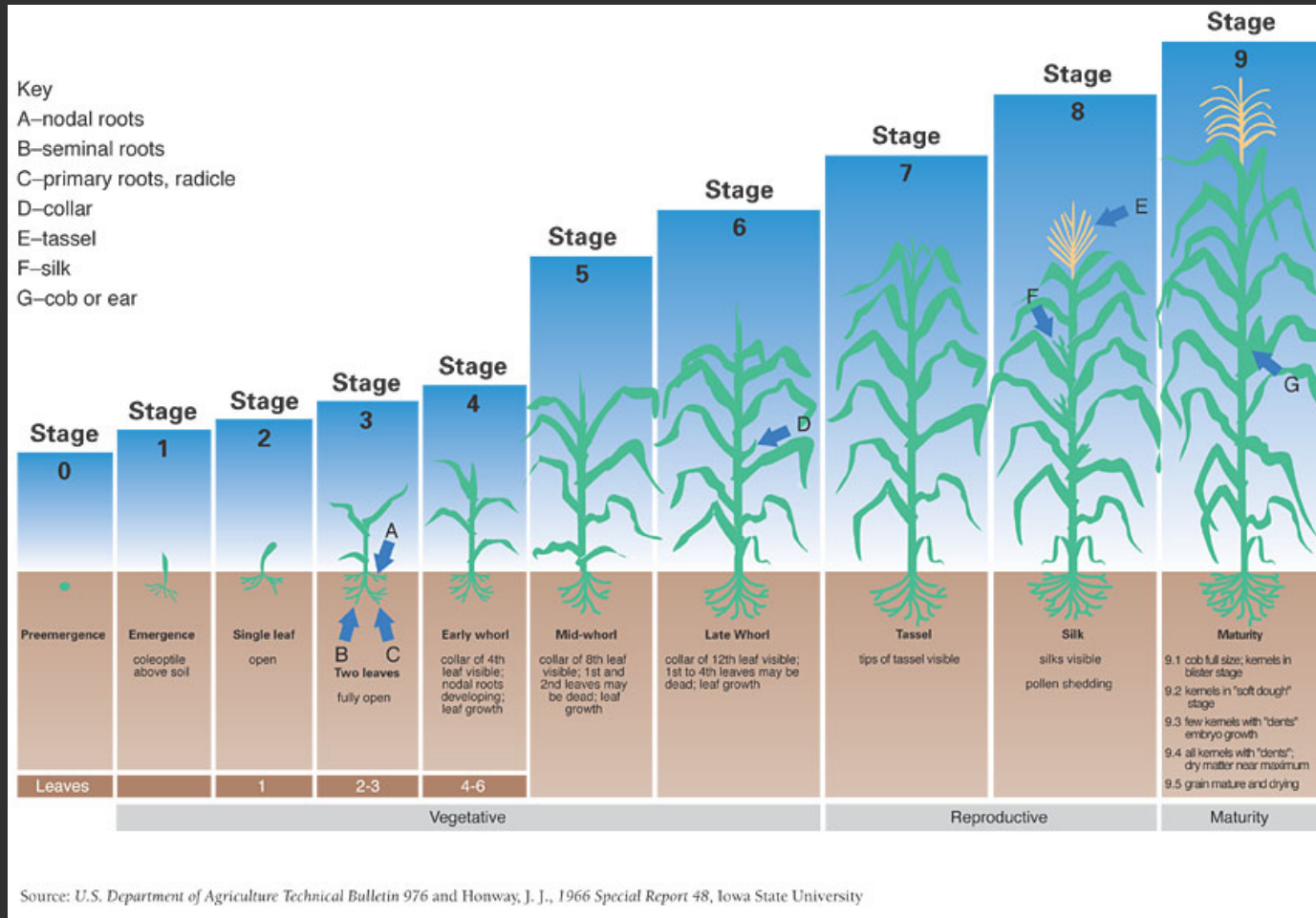
Trt 2: 100-100-50

Trt 3: 80-100-80

Trt 6: 80-100-40

Trt 10: 65-100-40

Trt 12: 40-100-40



Source: U.S. Department of Agriculture Technical Bulletin 976 and Honway, J. J., 1966 Special Report 48, Iowa State University



# Root Development



Trt 1: 100-100-100

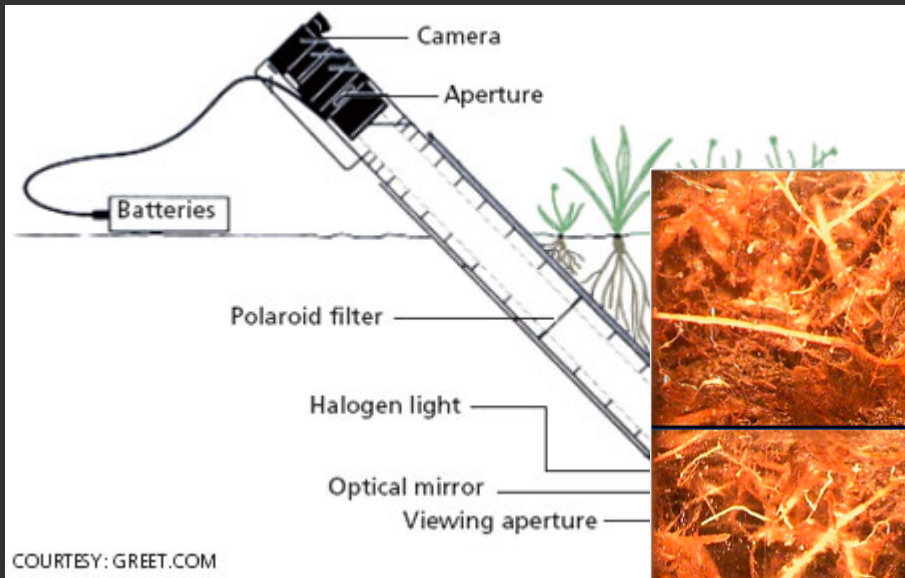
Trt 2: 100-100-50

Trt 3: 80-100-80

Trt 6: 80-100-40

Trt 10: 65-100-40

Trt 12: 40-100-40



# Root Development



Trt 1: 100-100-100

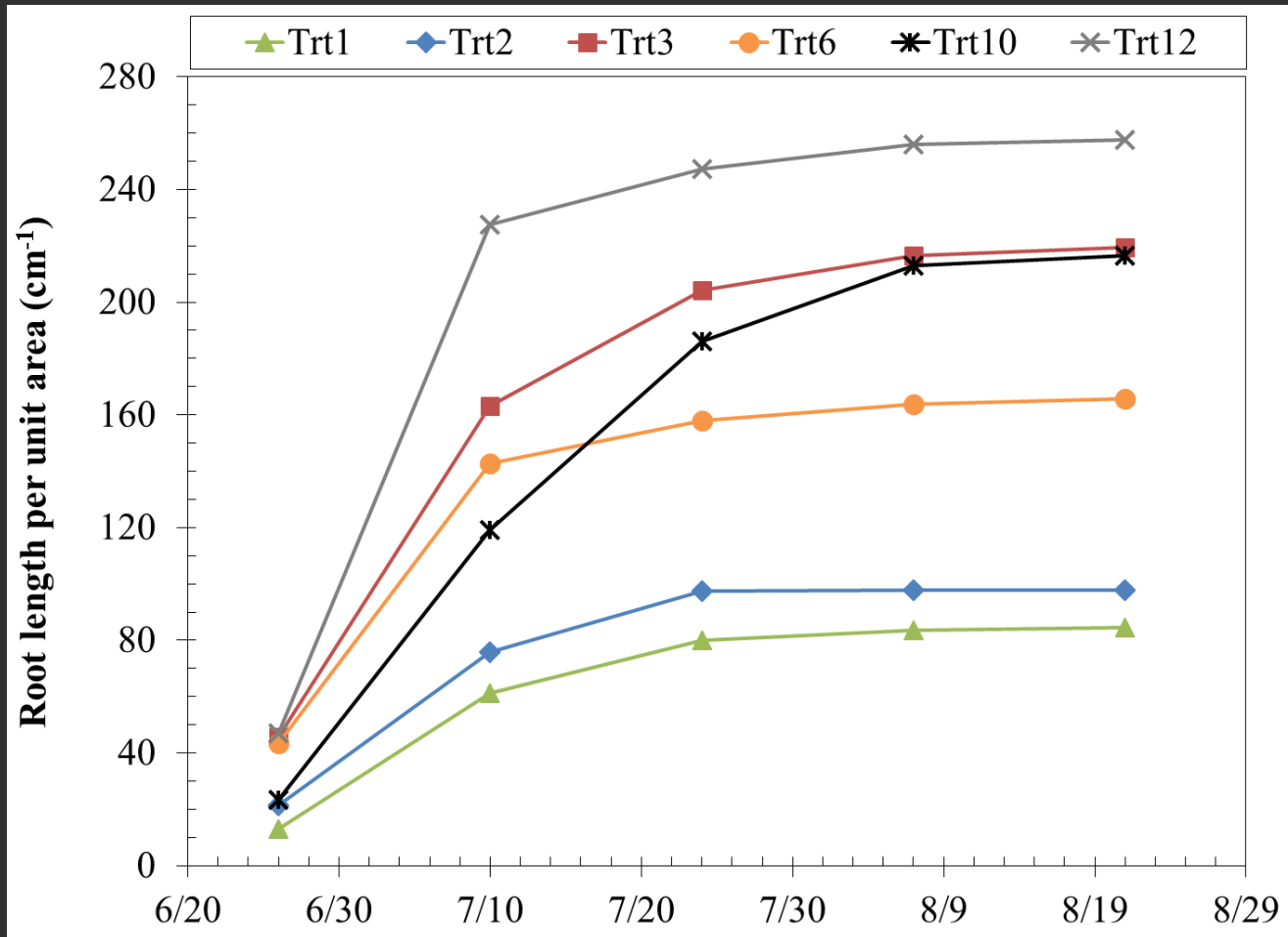
Trt 2: 100-100-50

Trt 3: 80-100-80

Trt 6: 80-100-40

Trt 10: 65-100-40

Trt 12: 40-100-40

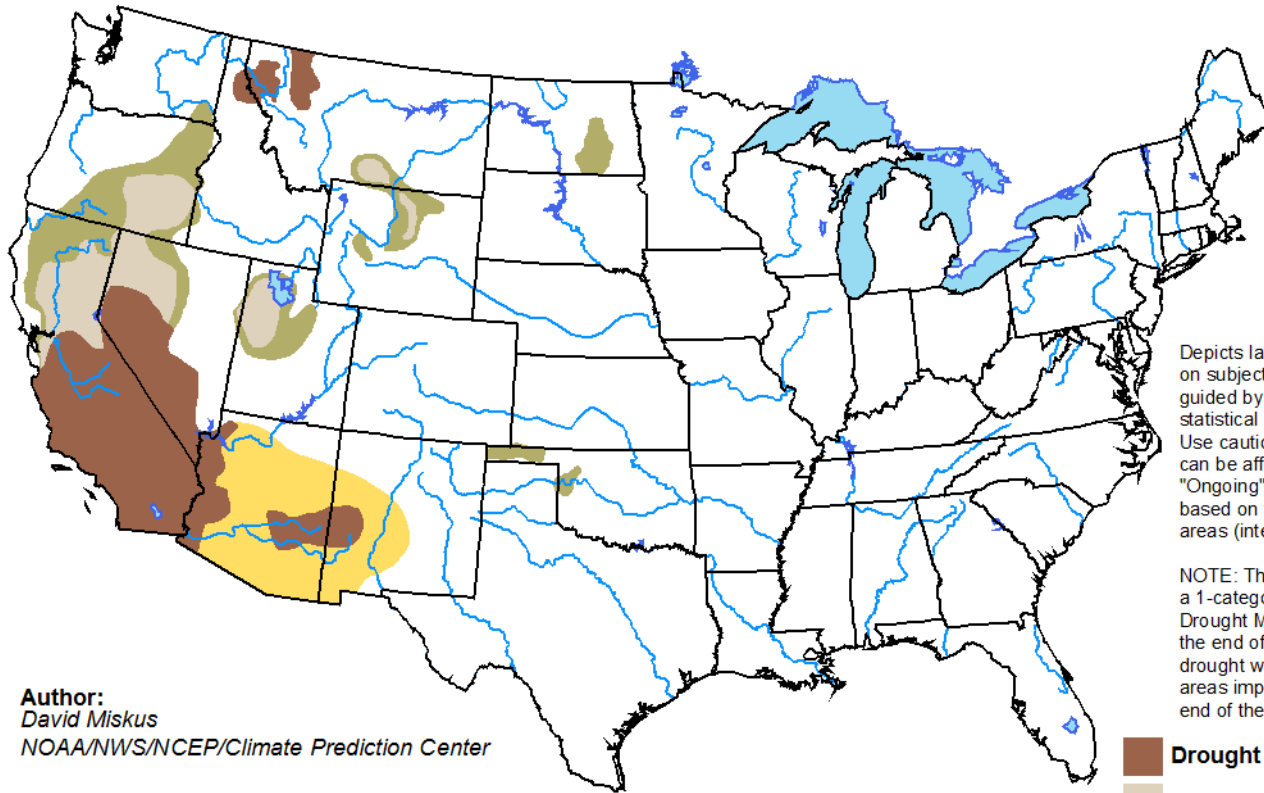


# Rainfall Utilization



## U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for March 17 - June 30, 2016  
Released March 17, 2016

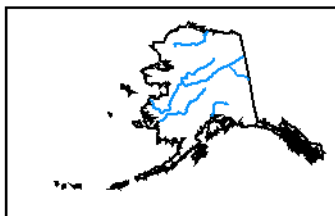


Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

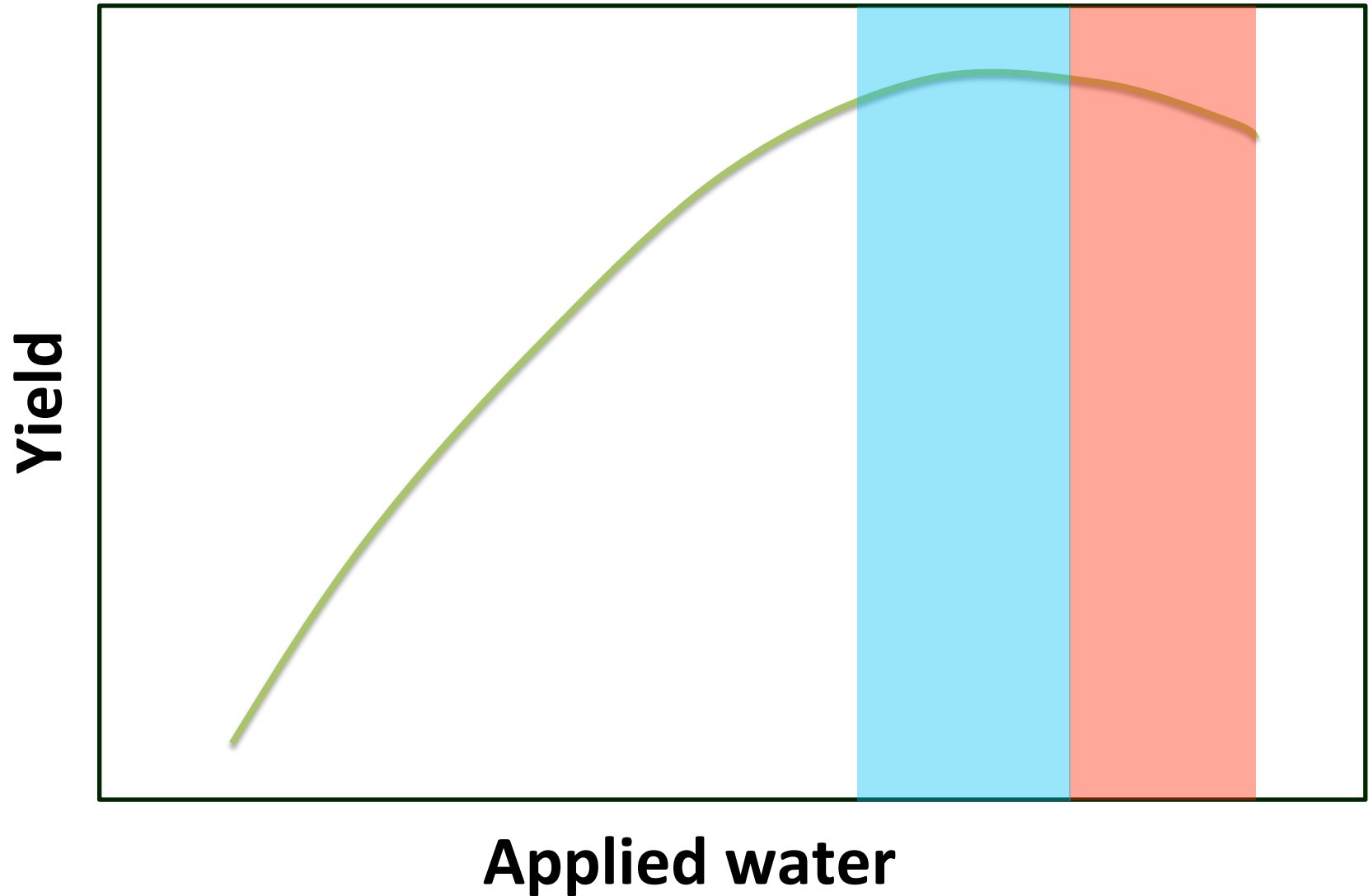
Author:  
David Miskus  
NOAA/NWS/NCEP/Climate Prediction Center

- Drought persists
- Drought remains but improves
- Drought removal likely
- Drought development likely

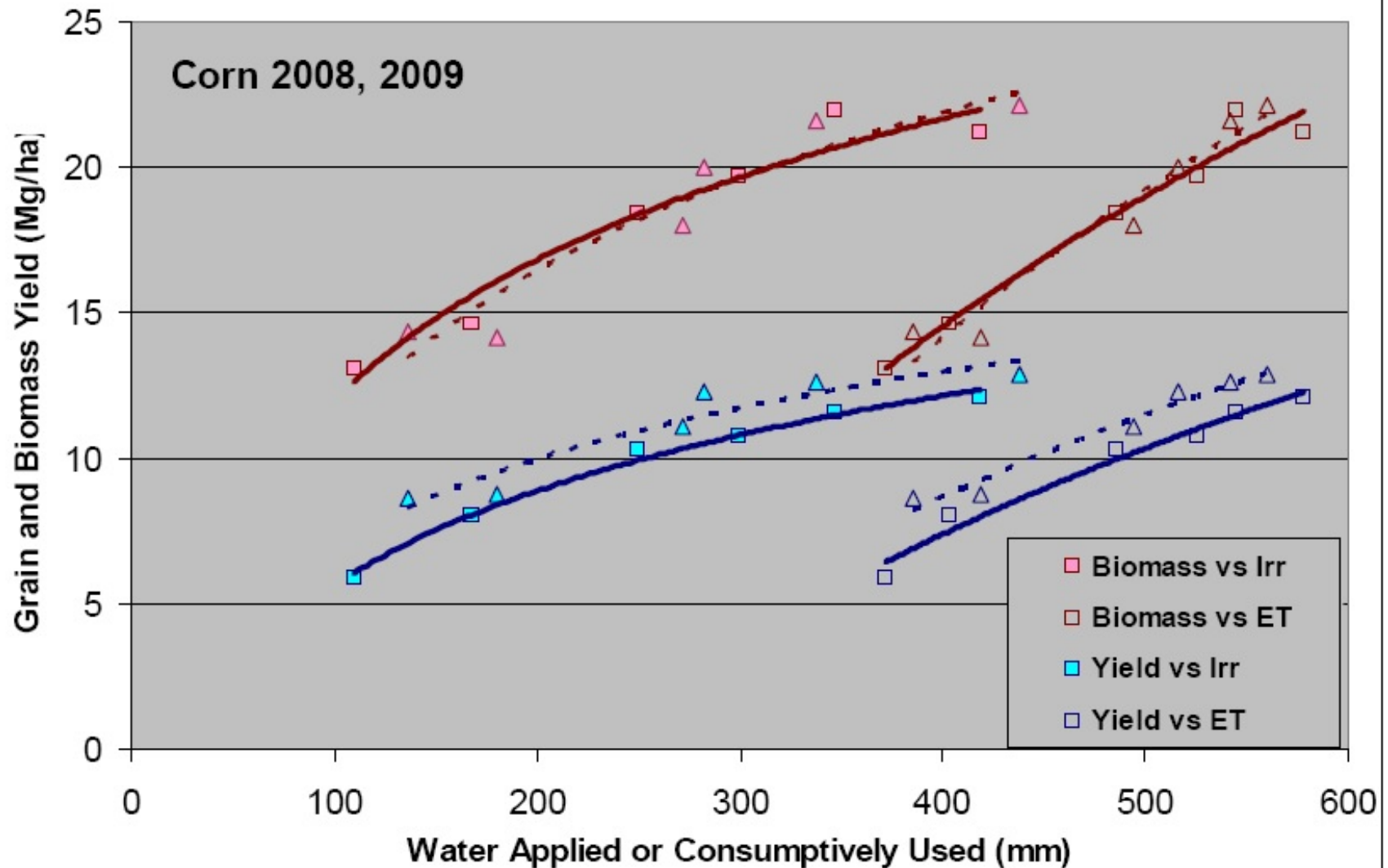


<http://go.usa.gov/3eZ73>

# Crop Response to Irrigation



# Crop Response to Irrigation



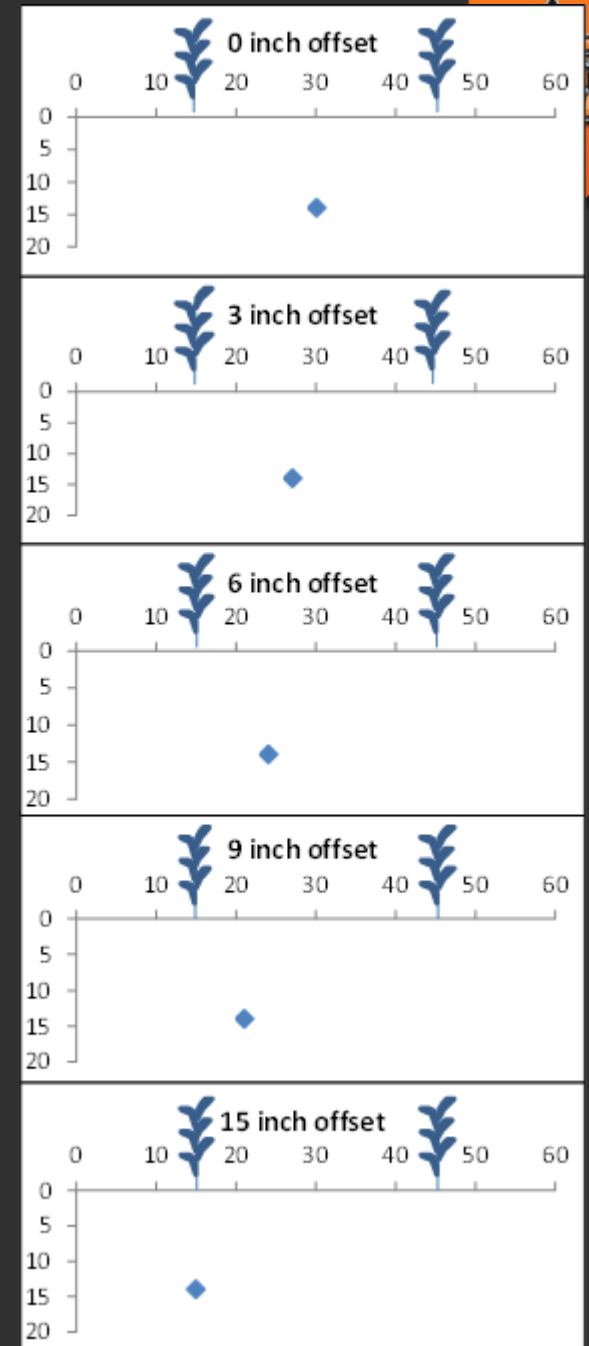
# OPREC Project



- **Evaluate the response of corn and sorghum to:**
  - ✓ **Crop row placement with respect to drip lines**
  - ✓ **Irrigation application rates (100%, 75%, and 50%)**
- **Investigate the performance of two irrigation management tools:**
  - ✓ **Soil moisture**
  - ✓ **Canopy temperature**

# Row placement

- Rows were offset using RTK Guidance
- Plots: 6 rows wide (15ft) and 30 ft long



# Germination and SDI



7/24/2014



8/12/2014



8/12/2014





# Water Application (in)



	Sorghum		Corn	
	2014	2015	2014	2015
<b>50% irrigation</b>	<b>7.6</b>	<b>6.7</b>	<b>9.4</b>	<b>10.5</b>
<b>75% irrigation</b>	<b>11.7</b>	<b>10.0</b>	<b>13.5</b>	<b>15.5</b>
<b>100% irrigation</b>	<b>15.1</b>	<b>13.2</b>	<b>16.5</b>	<b>20.6</b>
<b>Rainfall</b>	<b>10.6</b>	<b>11.7</b>	<b>14.0</b>	<b>19.8</b>

# Corn Grain Yield 2014



- Increasing the offset resulted in a decreased yield
  - ✓ Most prevalent at 50 and 75% Irrigation
- Decreasing irrigation amount resulted in a decreased yield

Offset	50%	75%	100%	Average
Inches	-----Bu acre <sup>-1</sup> -----			
0	132	178	206	172
3	140	177	212	177
6	131	172	208	170
9	119	151	204	158
15	120	163	206	163
Average	129	168	207	

# Corn Grain Yield 2015



- Increasing the offset did not result in a decreased yield
- Decreasing irrigation amount resulted in a decreased yield

Offset	50%	75%	100%	Average
Inches	-----Bu acre <sup>-1</sup> -----			
0	210	222	239	224
3	198	242	246	229
6	197	234	230	220
9	182	243	248	224
15	196	237	246	226
Average	197	236	242	

# Sorghum Grain Yield 2014



- Sorghum yields were not influenced by offset treatments
- Decreasing irrigation amount resulted in a decreased yield
  - ✓ 75% irrigation was sufficient

Offset	50%	75%	100%	Average
Inches	-----Bu acre <sup>-1</sup> -----			
0	120	150	152	141
3	127	164	149	147
6	128	154	152	145
9	133	146	152	144
15	126	151	154	144
Average	127	153	152	

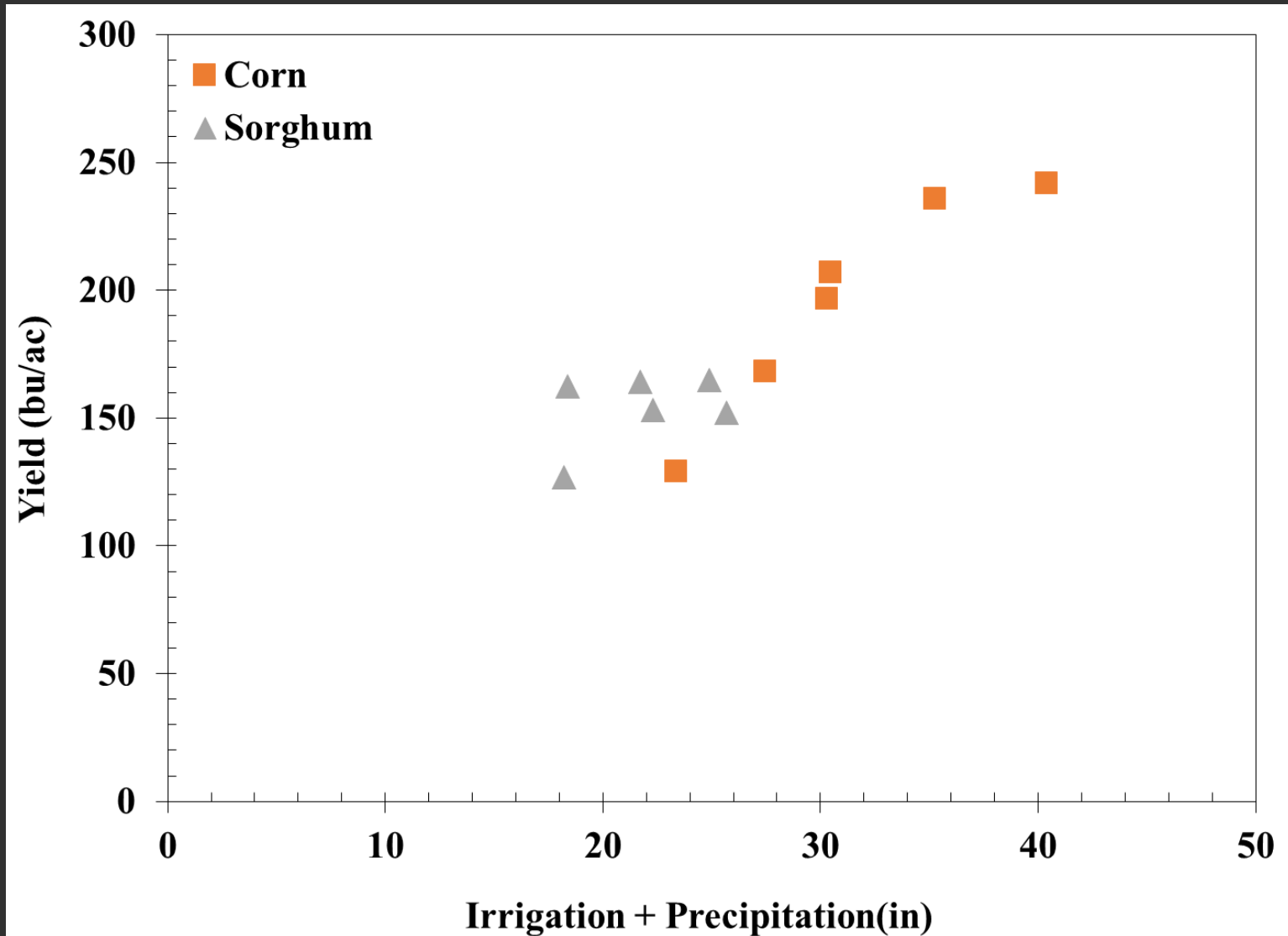
# Sorghum Grain Yield 2015



- Sorghum yields were not influenced by offset treatments
- Decreasing irrigation amount resulted in a small yield loss
  - ✓ 50% irrigation was sufficient

Offset	50%	75%	100%	Average
Inches	-----Bu acre <sup>-1</sup> -----			
0	164	163	164	164
3	162	164	164	163
6	158	169	168	165
9	165	165	162	164
15	163	160	166	163
Average	162	164	165	

# Water Productivity Function

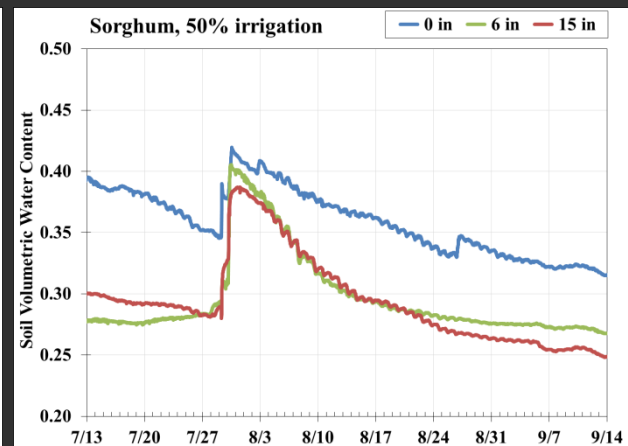
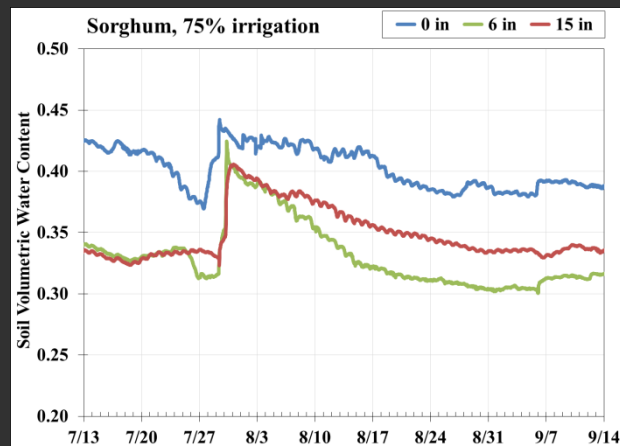
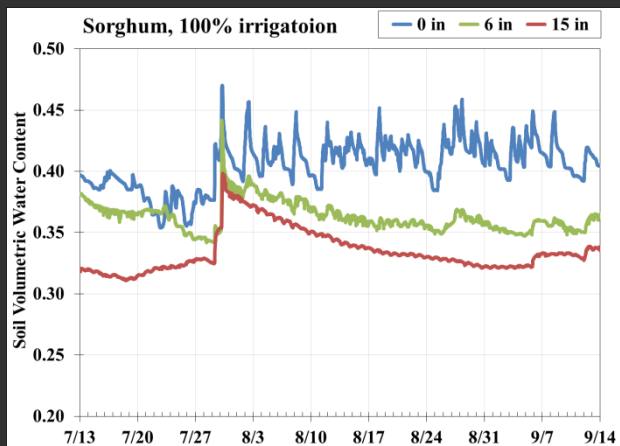
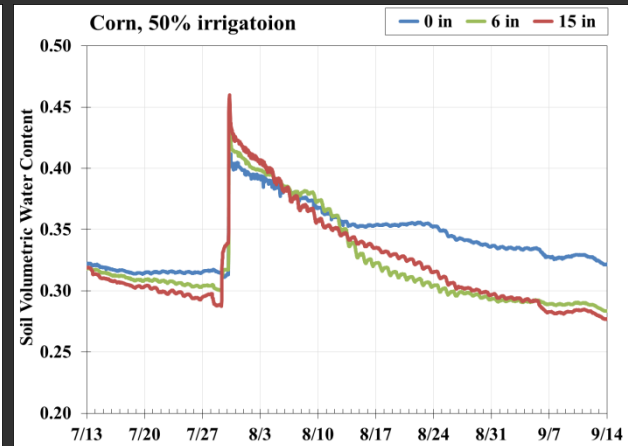
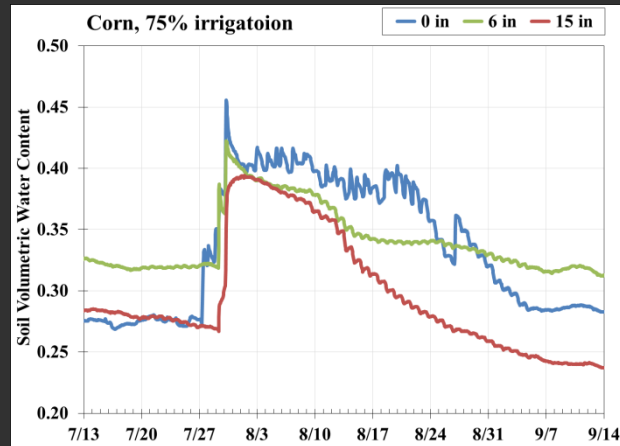
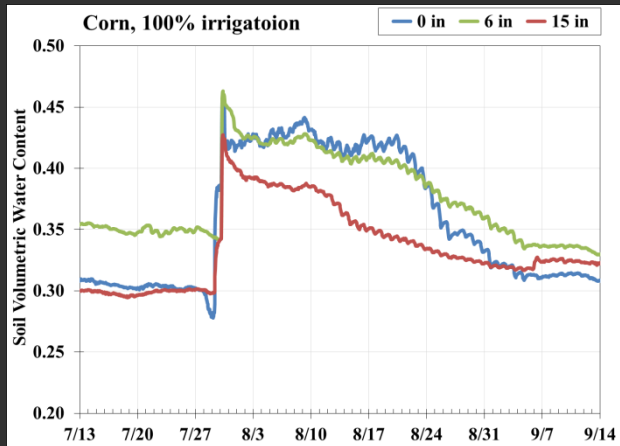


# Soil Moisture Sensors

- **Campbell Sci. 655**
- **Rod length: 4.7 in**
- **Sensing Volume: 220 in<sup>3</sup>**

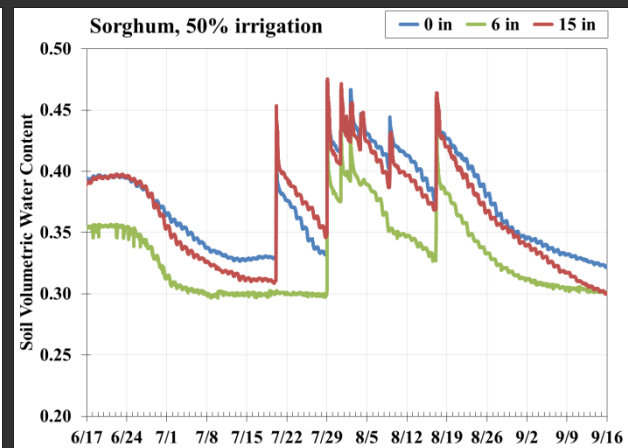
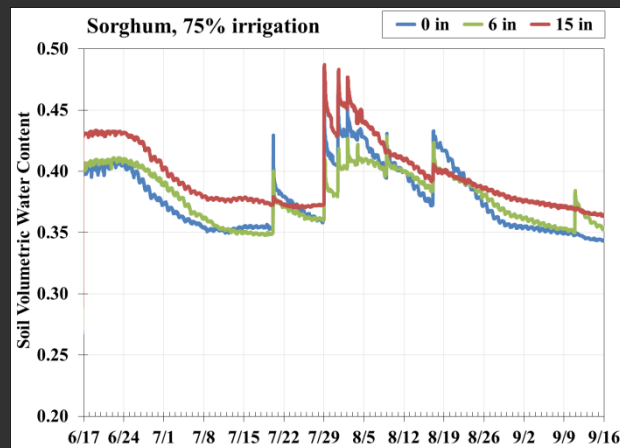
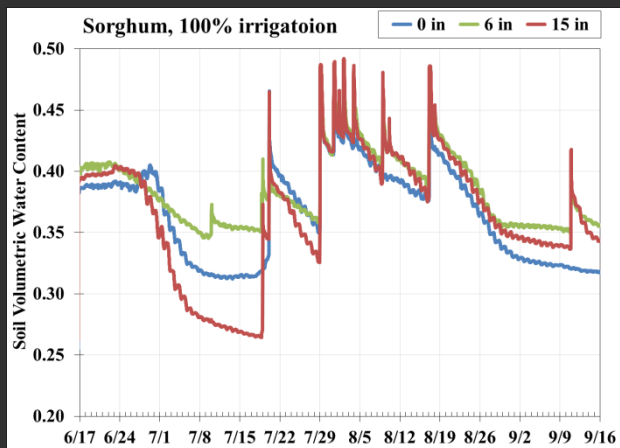
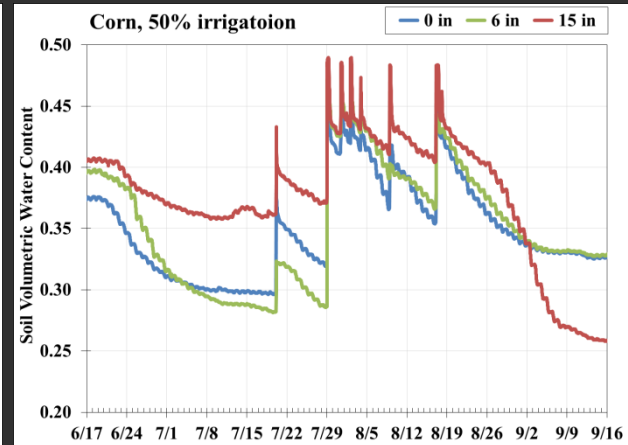
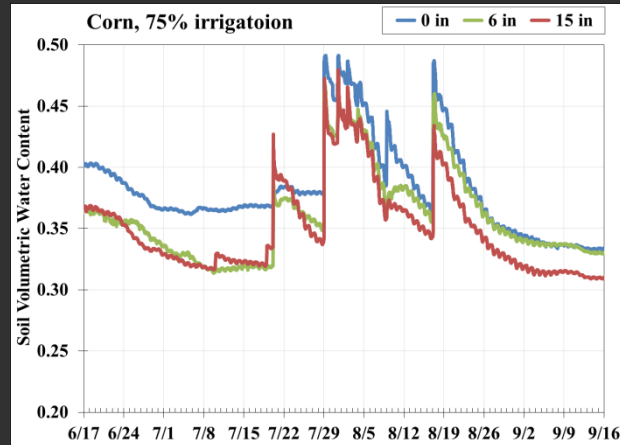
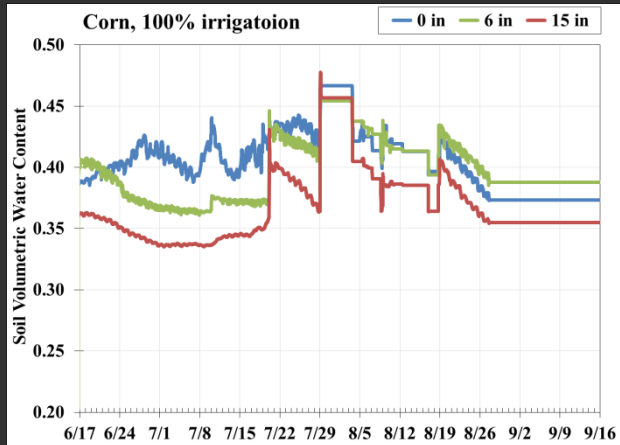


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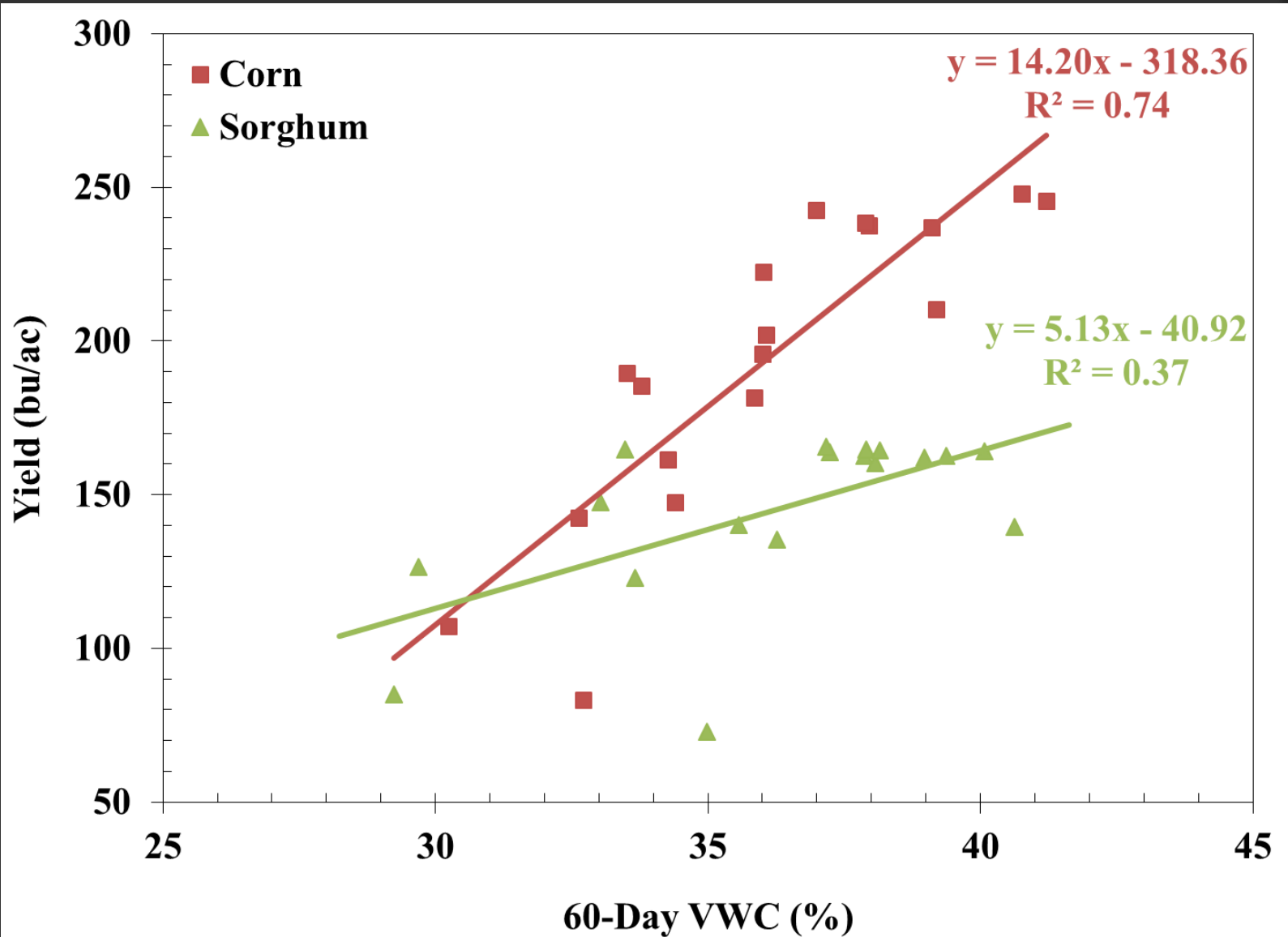




# Soil Moisture 2015



# Yield vs. Soil Moisture



# Questions

