Corn and Sorghum Response to Different Irrigation Management Practices

17th Annual Crop Clinic
March 29th, 2016; Goodwell, OK

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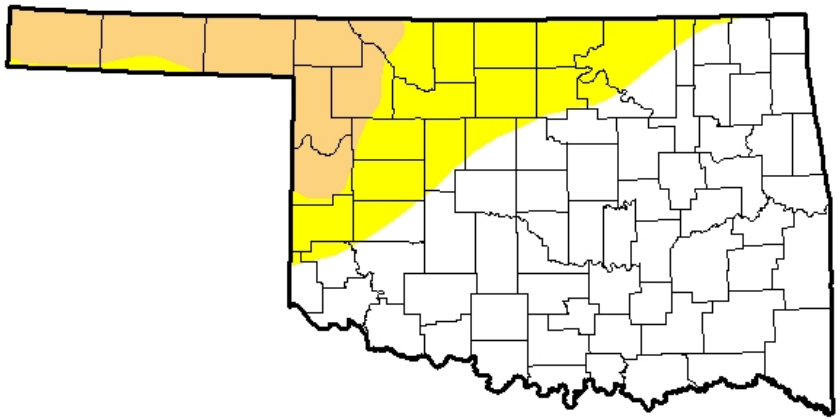
Drought Map

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
Current	65.15	20.59	14.26	0.00	0.00	0.00
Last Week 3/15/2016	65.59	26.01	8.39	0.00	0.00	0.00
3 Months Ago 12/22/2015	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 12/29/2015	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 9/29/2015	52.60	30.61	10.42	5.40	0.97	0.00
One Year Ago 3/24/2015	14.36	15.23	19.44	15.22	27.33	8.41

Intensity:

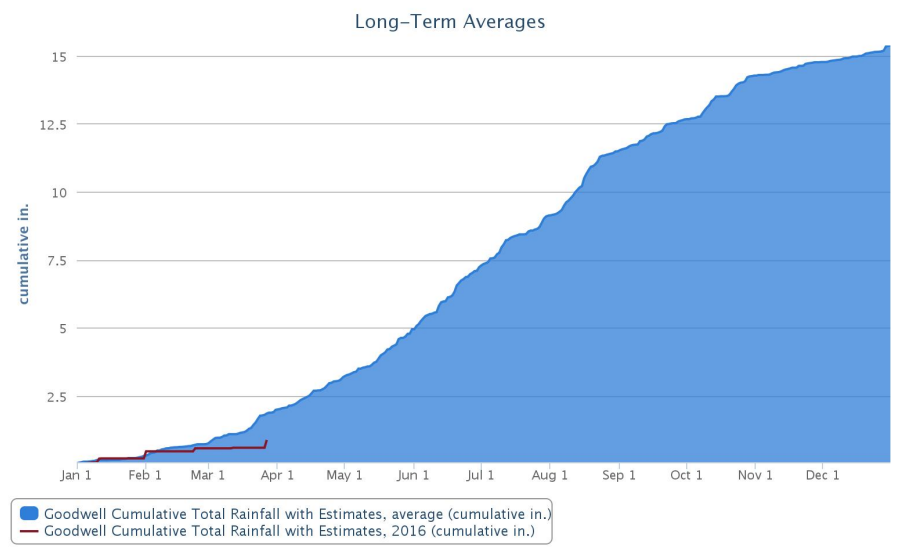
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

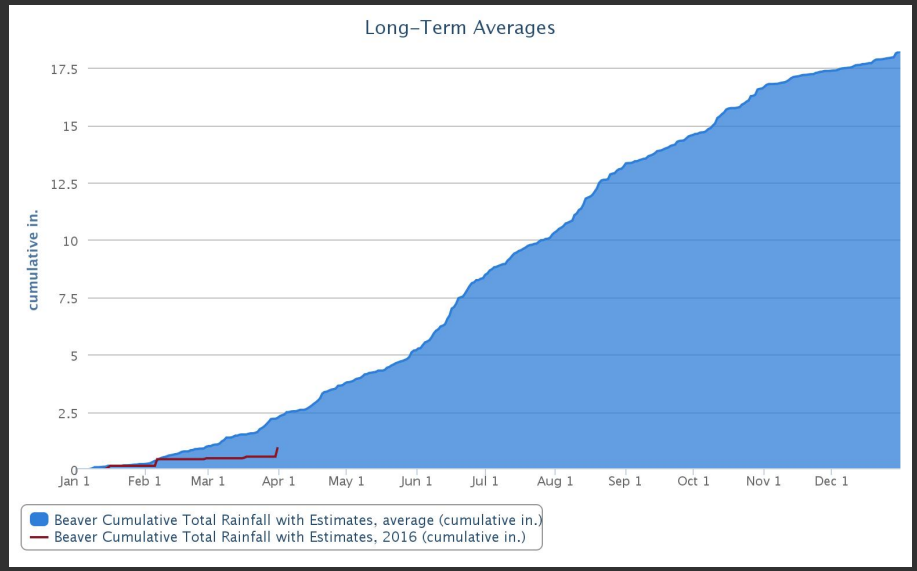
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

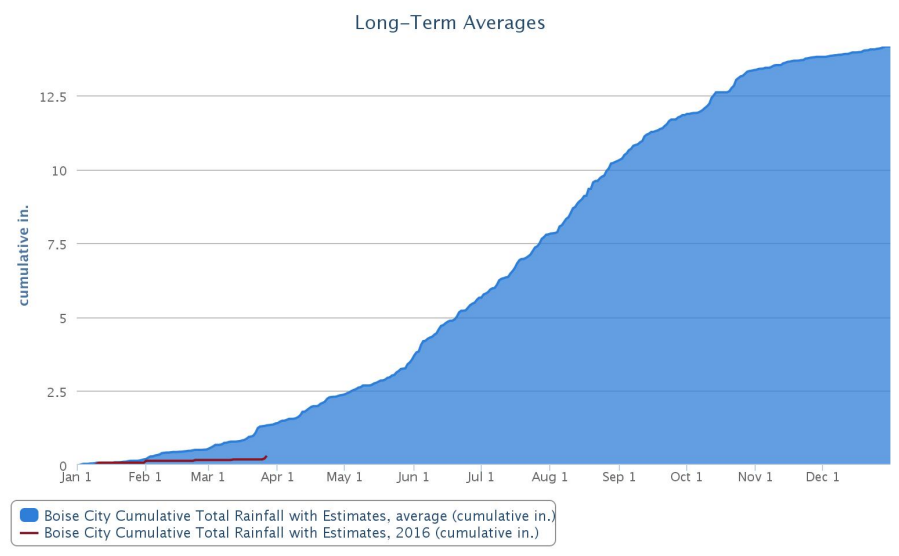
Author:
Brad Rippey
U.S. Department of Agriculture

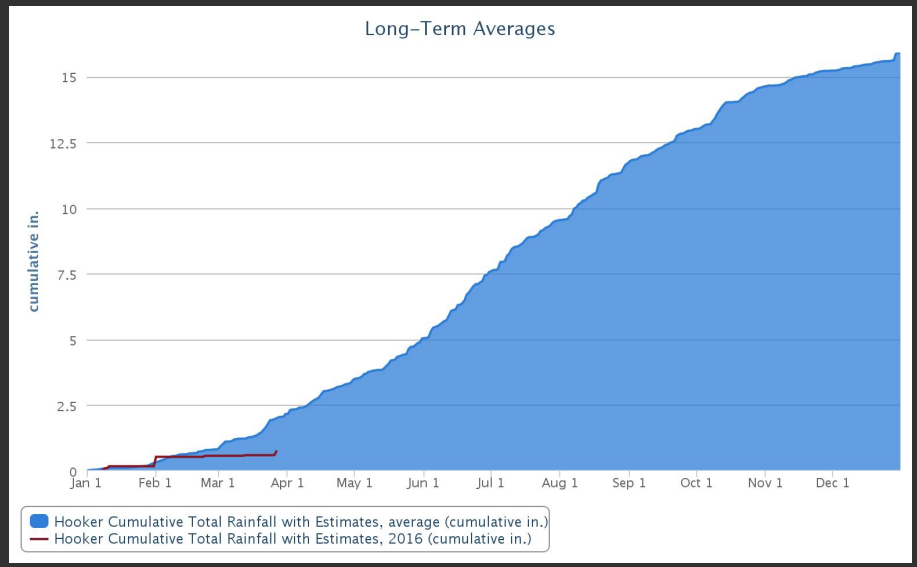
http://droughtmonitor.unl.edu/

2016 Rainfall

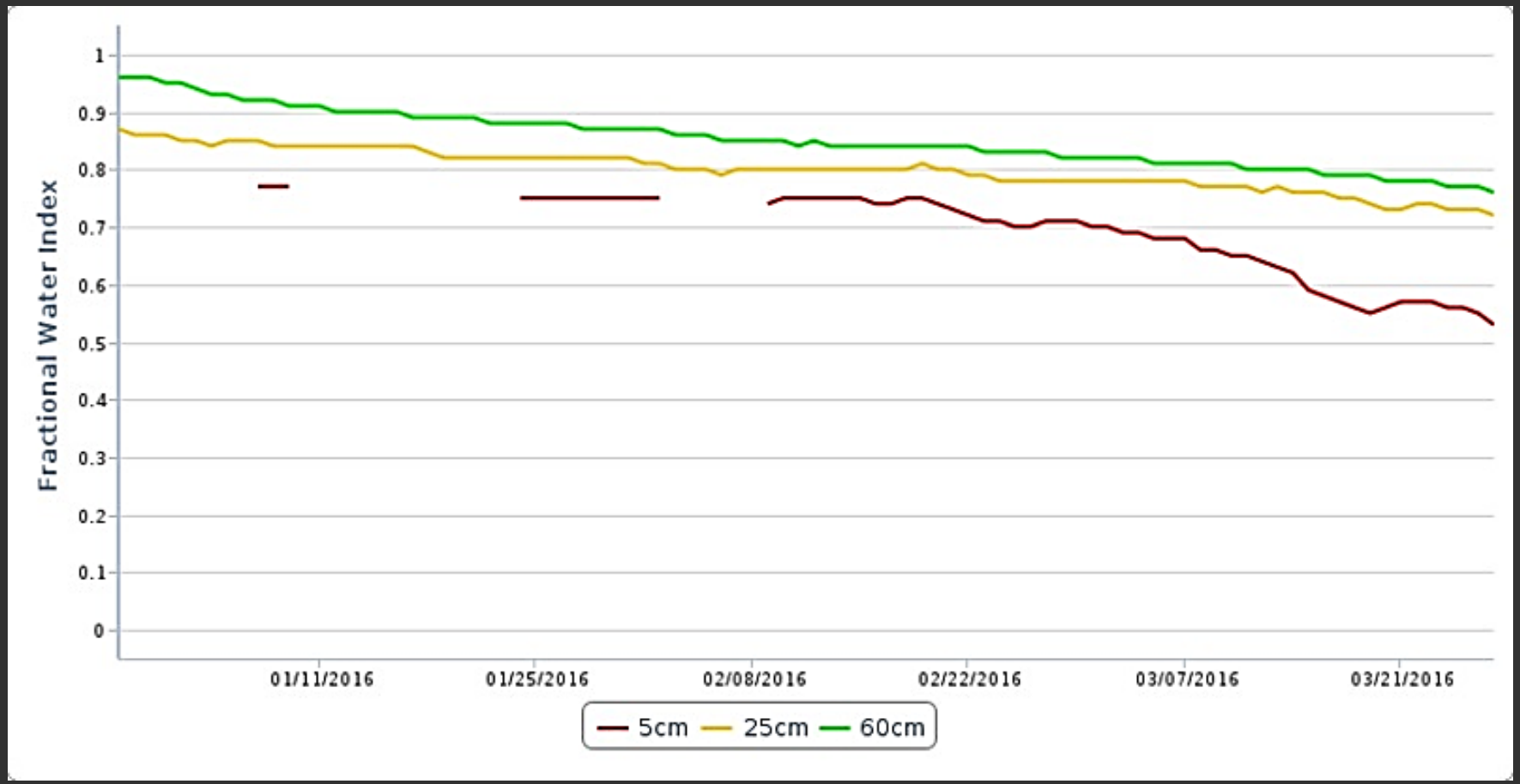




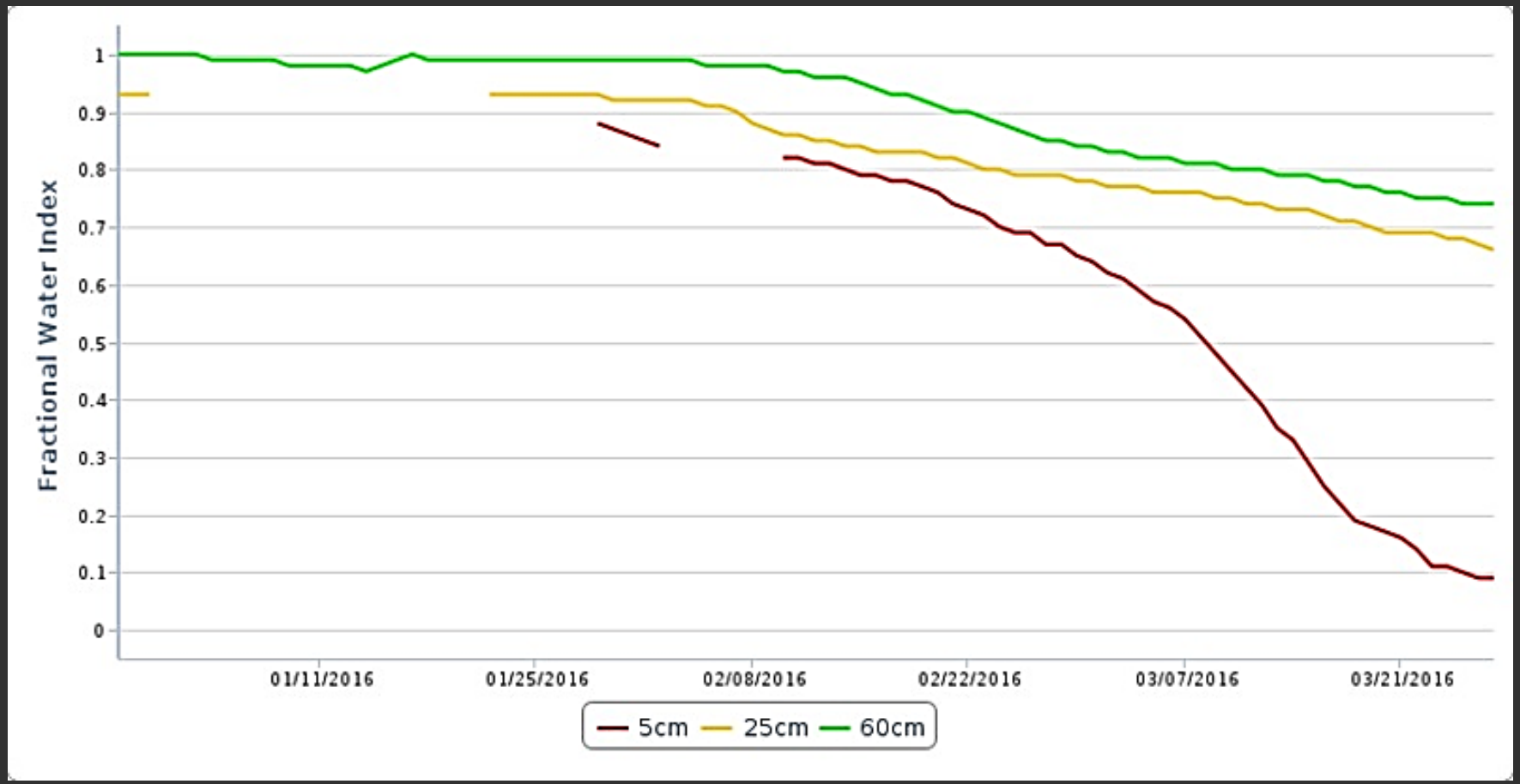




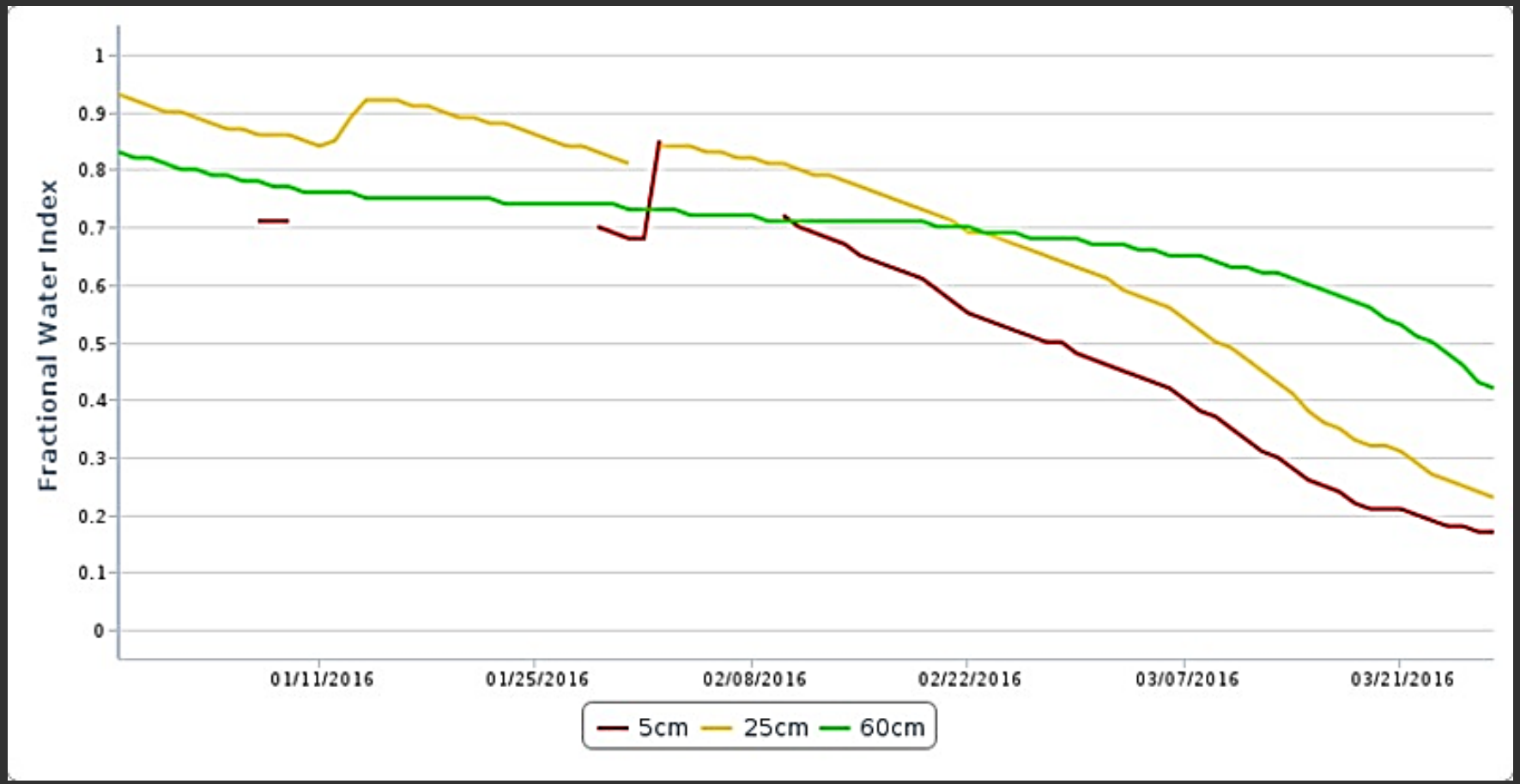
Soil Moisture: Goodwell (Beaver)



Soil Moisture: Boise City



Soil Moisture: Hooker



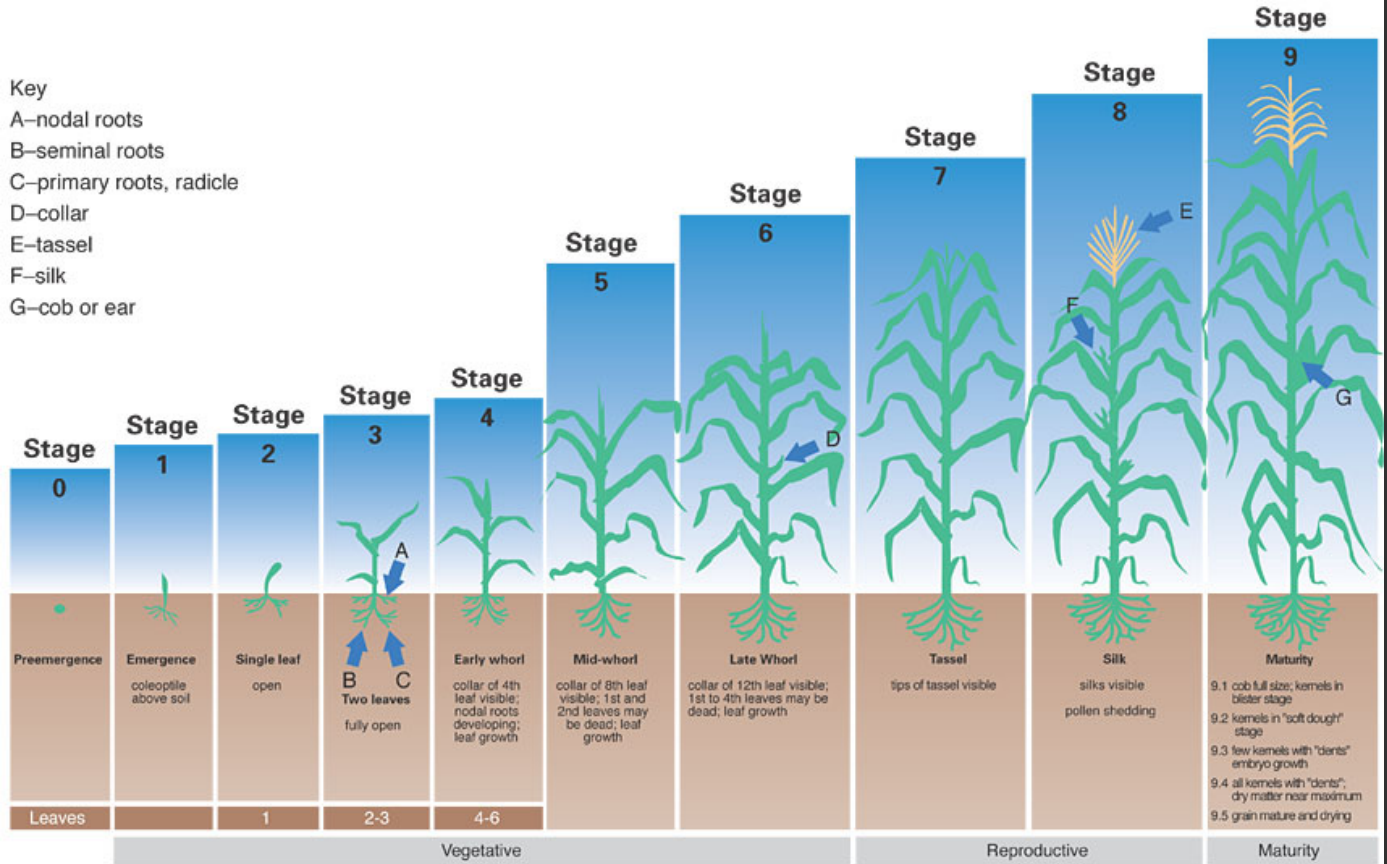
Solutions

Pre-planting irrigation

- Root development
- Rainfall utilization

Root Development

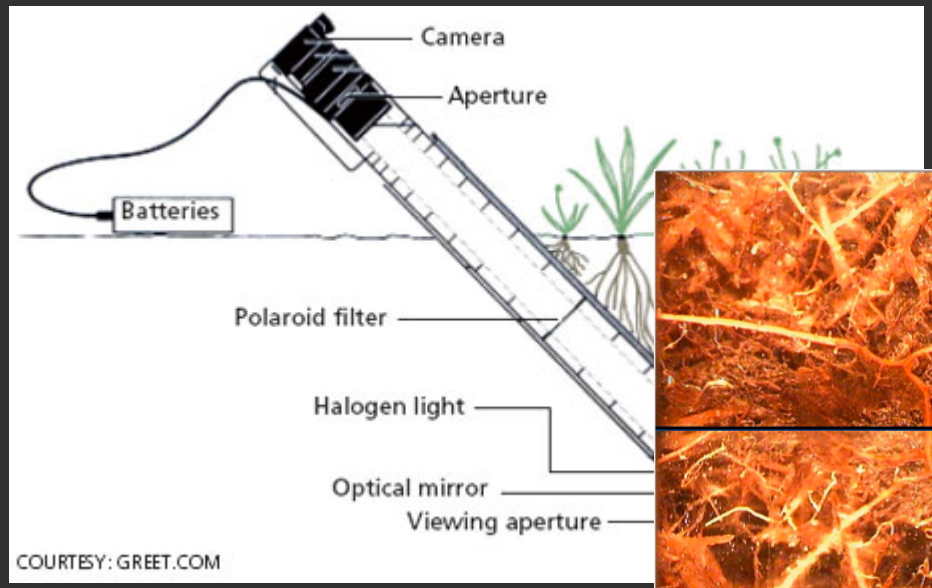
Trt 1: 100-100-100 **Trt 2: 100-100-50** **Trt 3: 80-100-80**
Trt 6: 80-100-40 **Trt 10: 65-100-40** **Trt 12: 40-100-40**

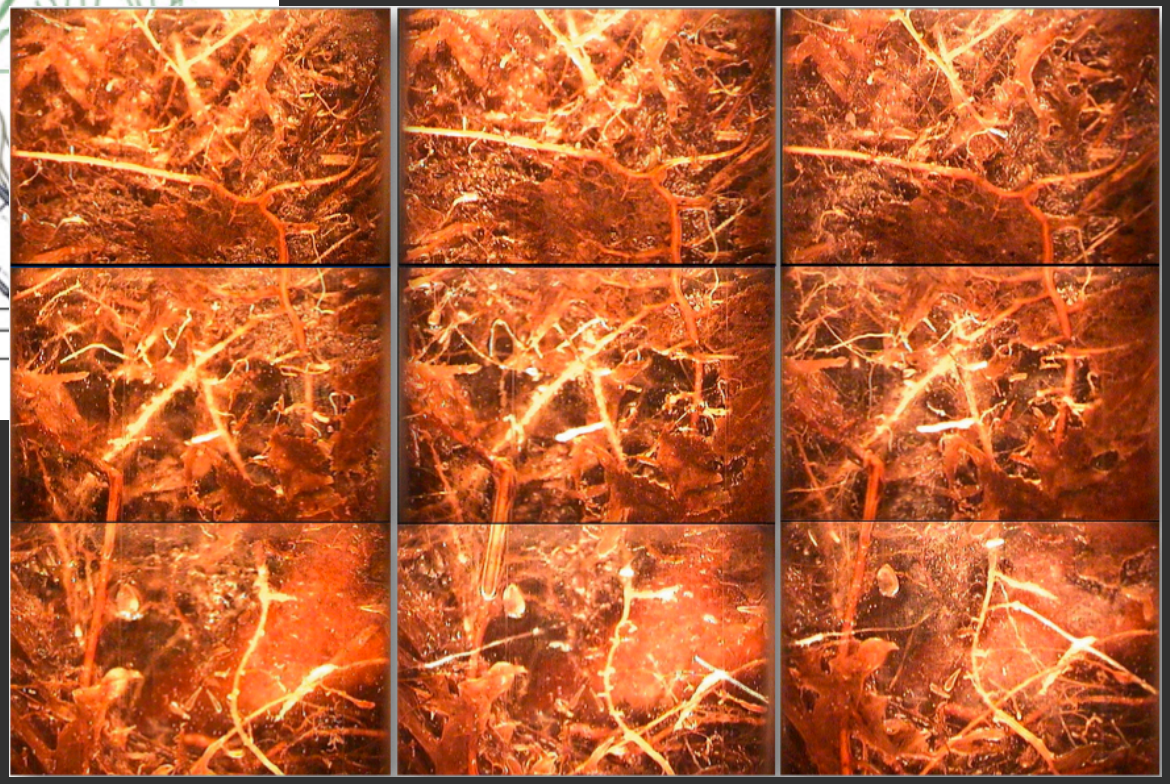


Source: *U.S. Department of Agriculture Technical Bulletin 976* and Honway, J. J., *1966 Special Report 48*, Iowa State University

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

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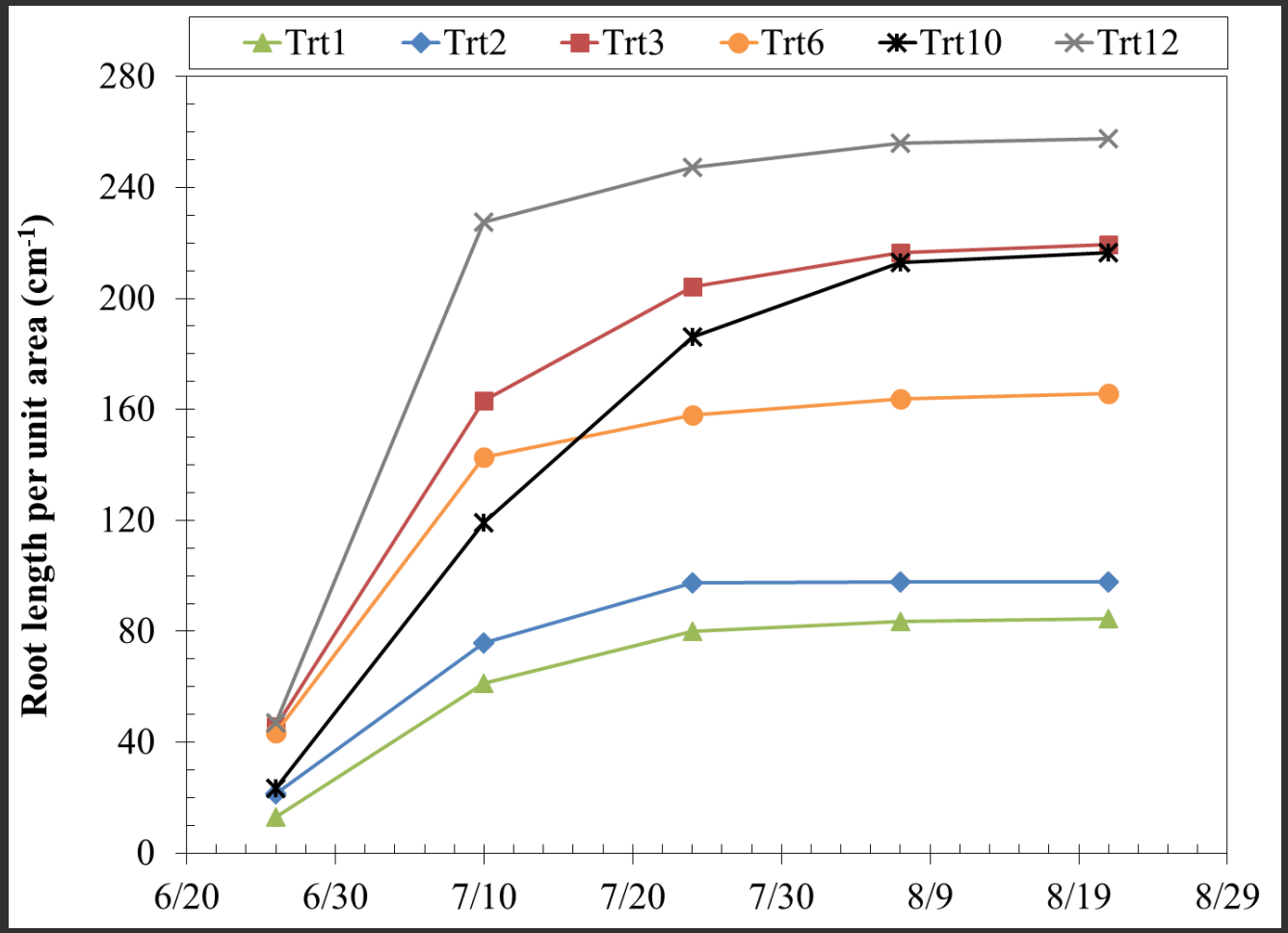
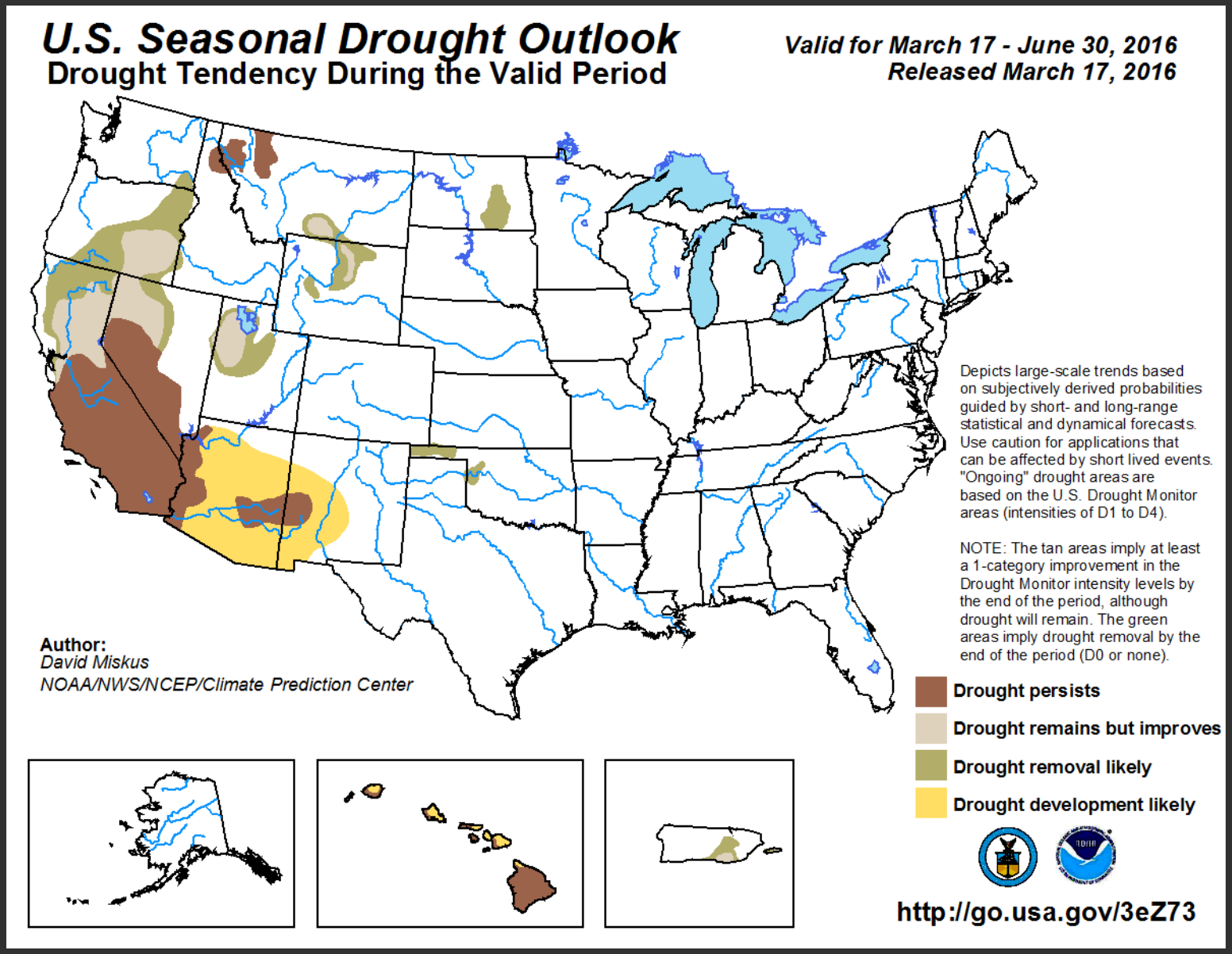
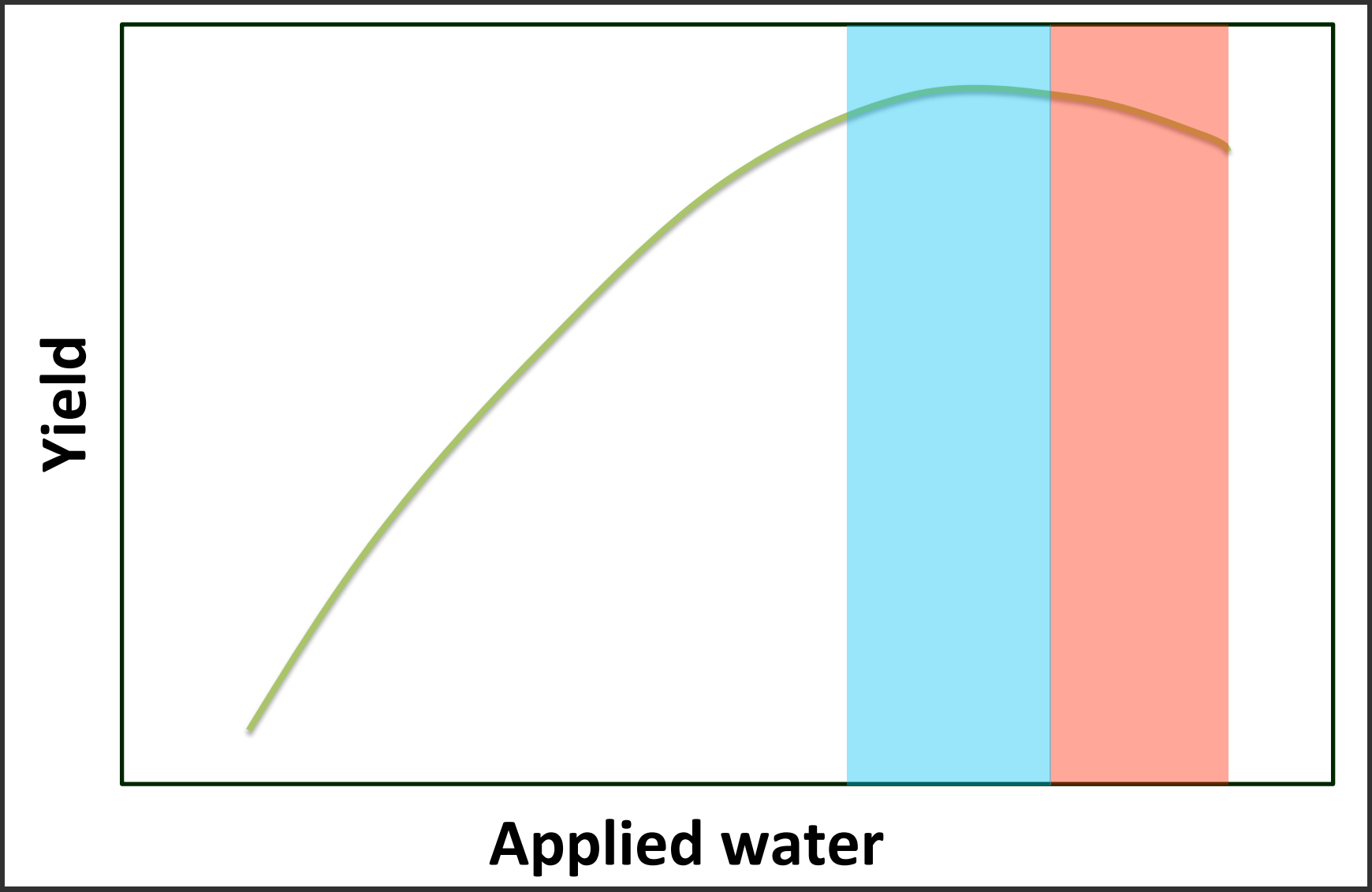


Rainfall Utilization



Crop Response to Irrigation



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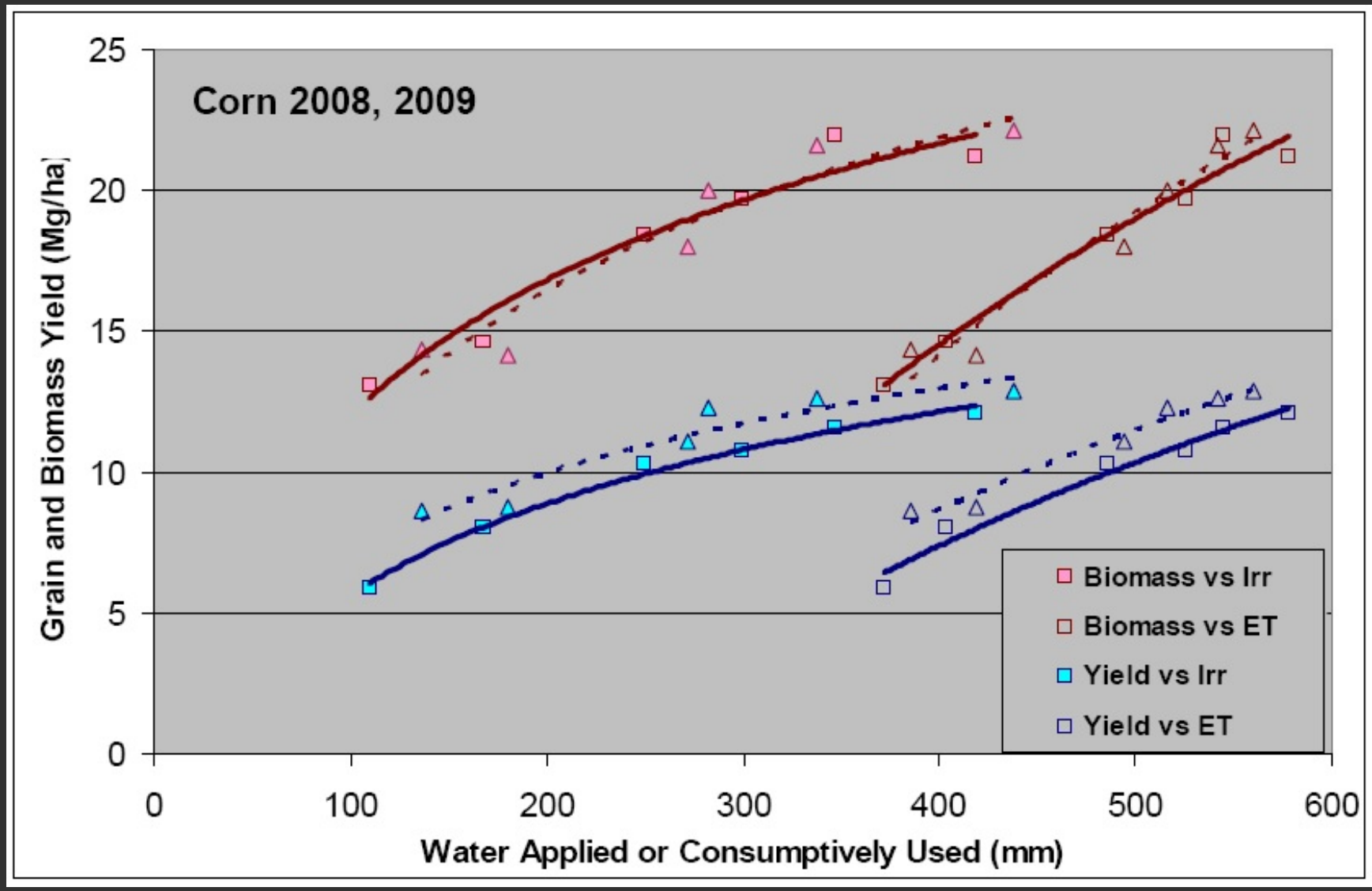
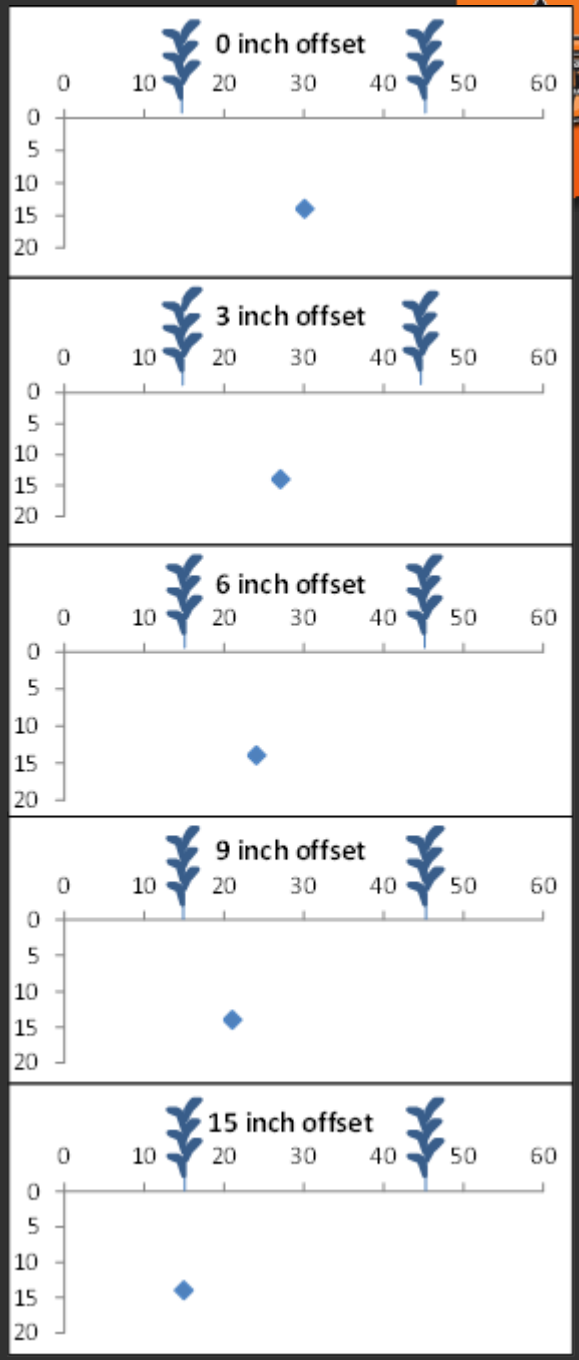


OPREC Project

- 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
50% irrigation	7.6	6.7	9.4	10.5
75% irrigation	11.7	10.0	13.5	15.5
100% irrigation	15.1	13.2	16.5	20.6
Rainfall	10.6	11.7	14.0	19.8

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^{-1}----------			
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^{-1}----------			
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

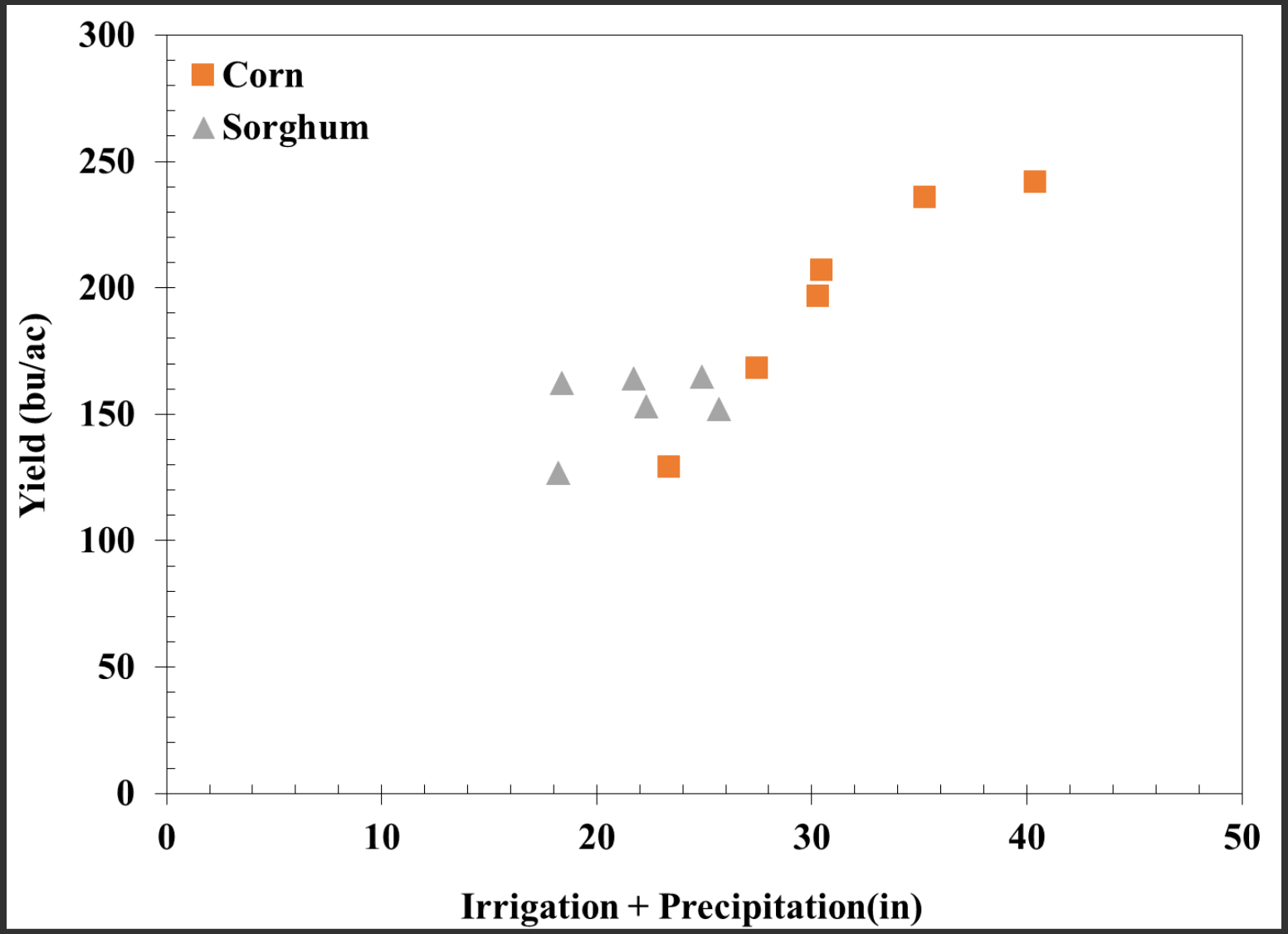
Offset	50%	75%	100%	Average
Inches	----------Bu acre^{-1}----------			
0	120	150	152	141
3	127	164	149	147
6	128	154	152	145
9	133	146	152	144
15	126	151	154	144
Average	**127**	**153**	**152**	

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^{-1}----------			
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**	

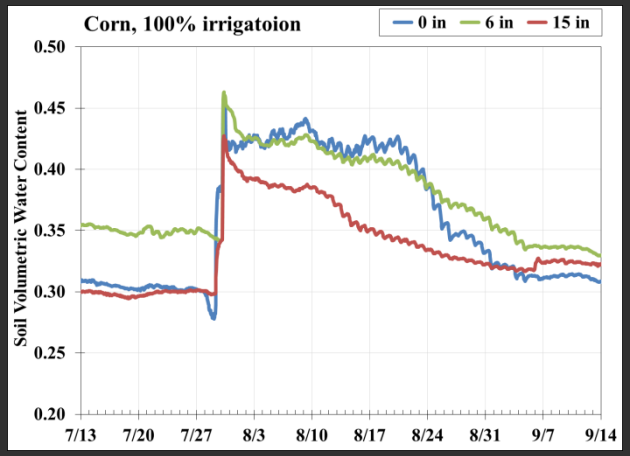
Water Productivity Function

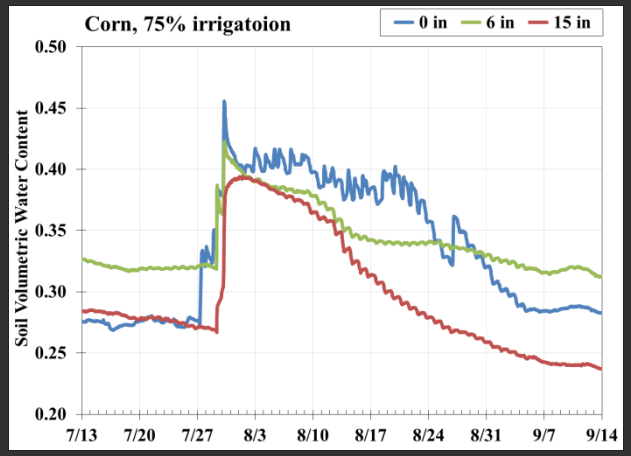


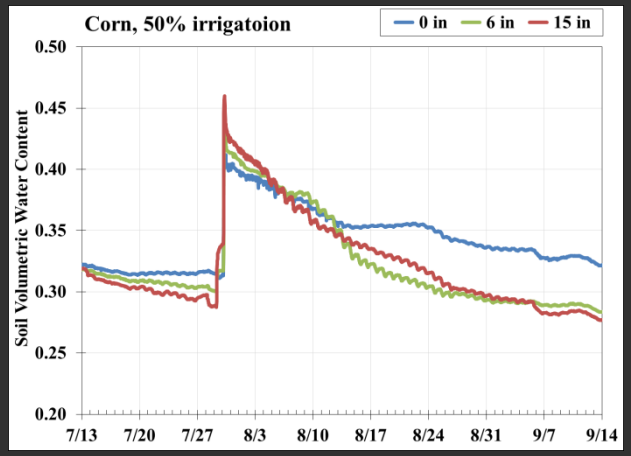
Soil Moisture Sensors

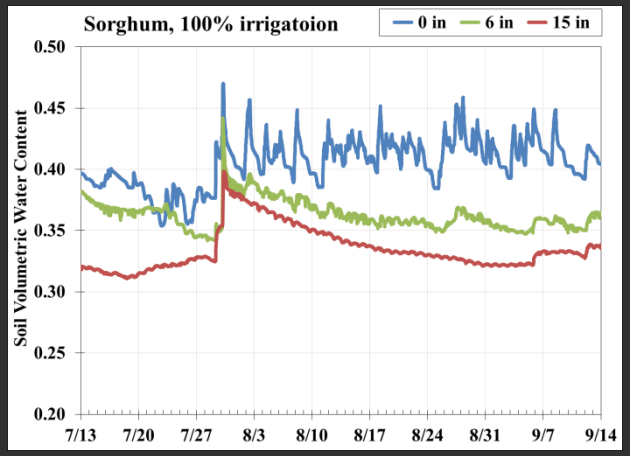
- Campbell Sci. 655
- Rod length: 4.7 in
- Sensing Volume: 220 in^3

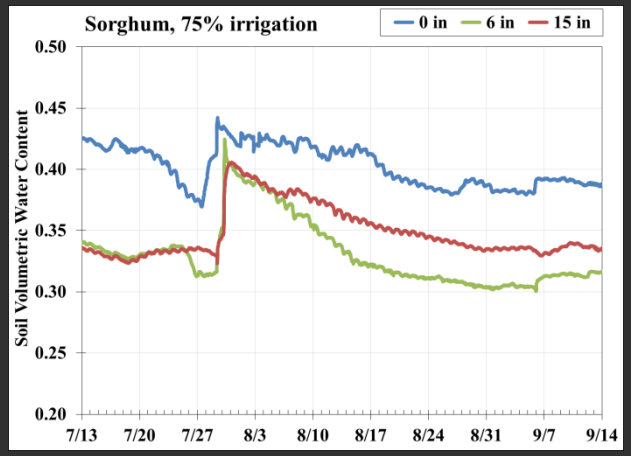
Soil Moisture 2014

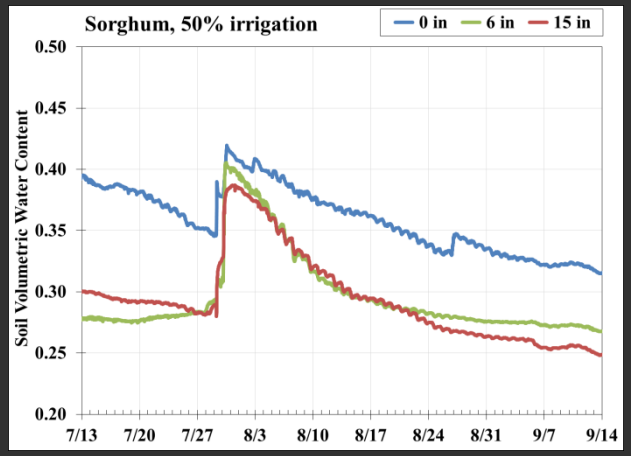




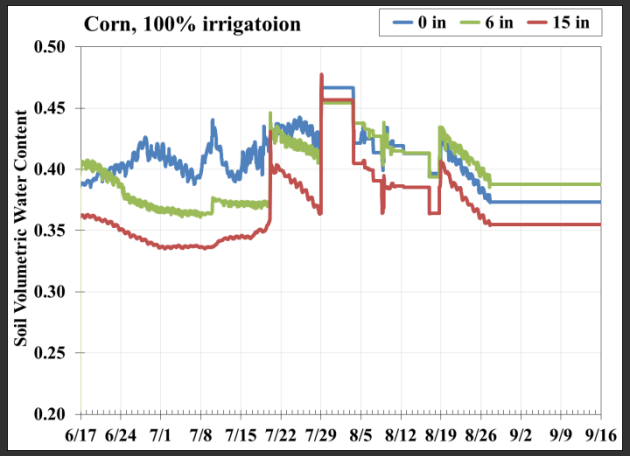


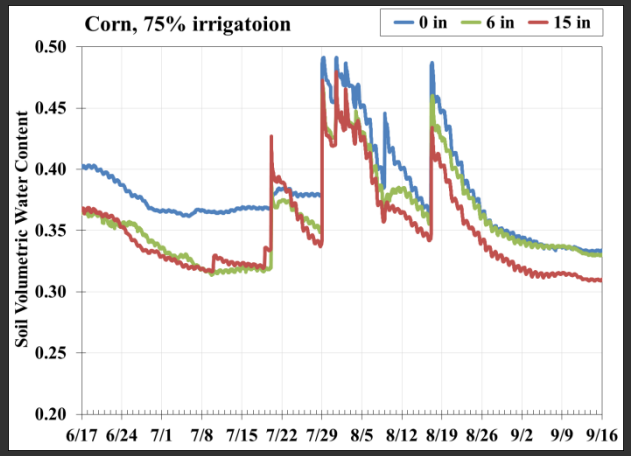


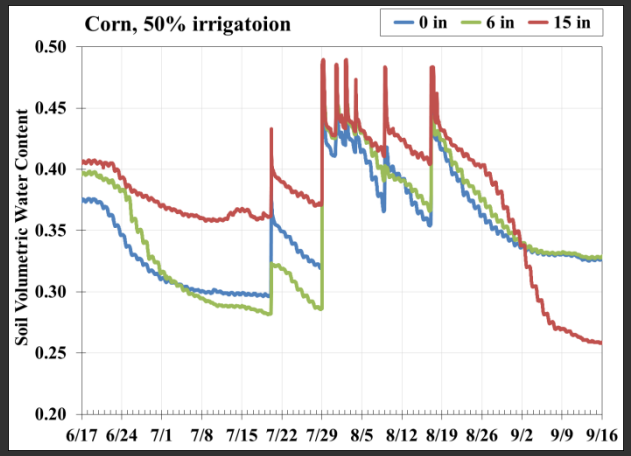


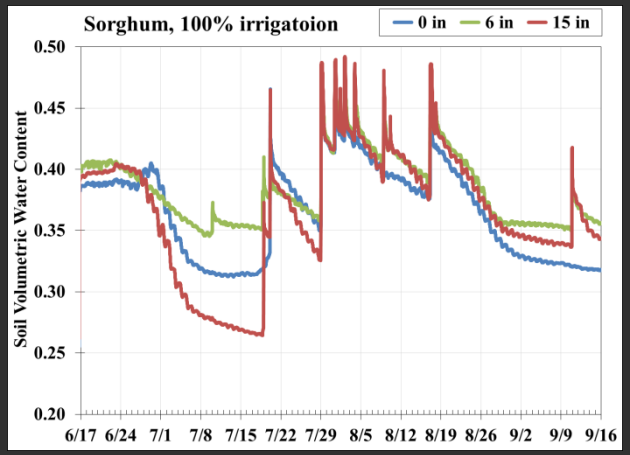


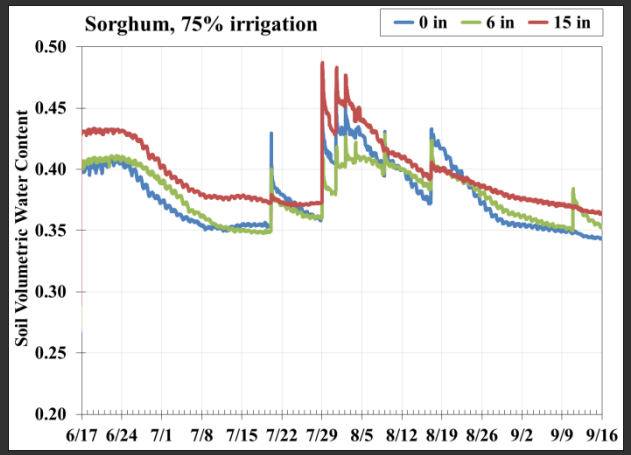
Soil Moisture 2015

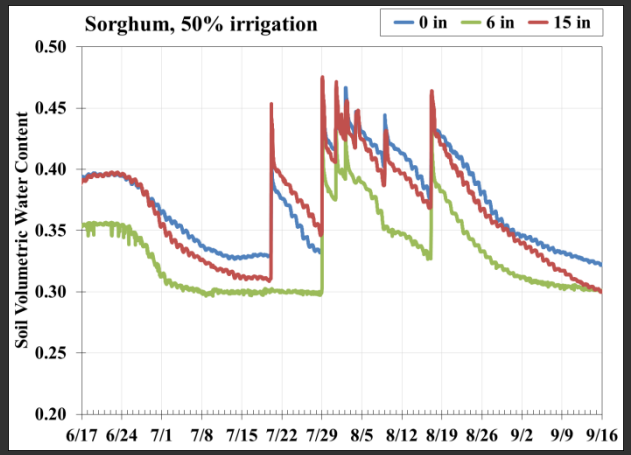




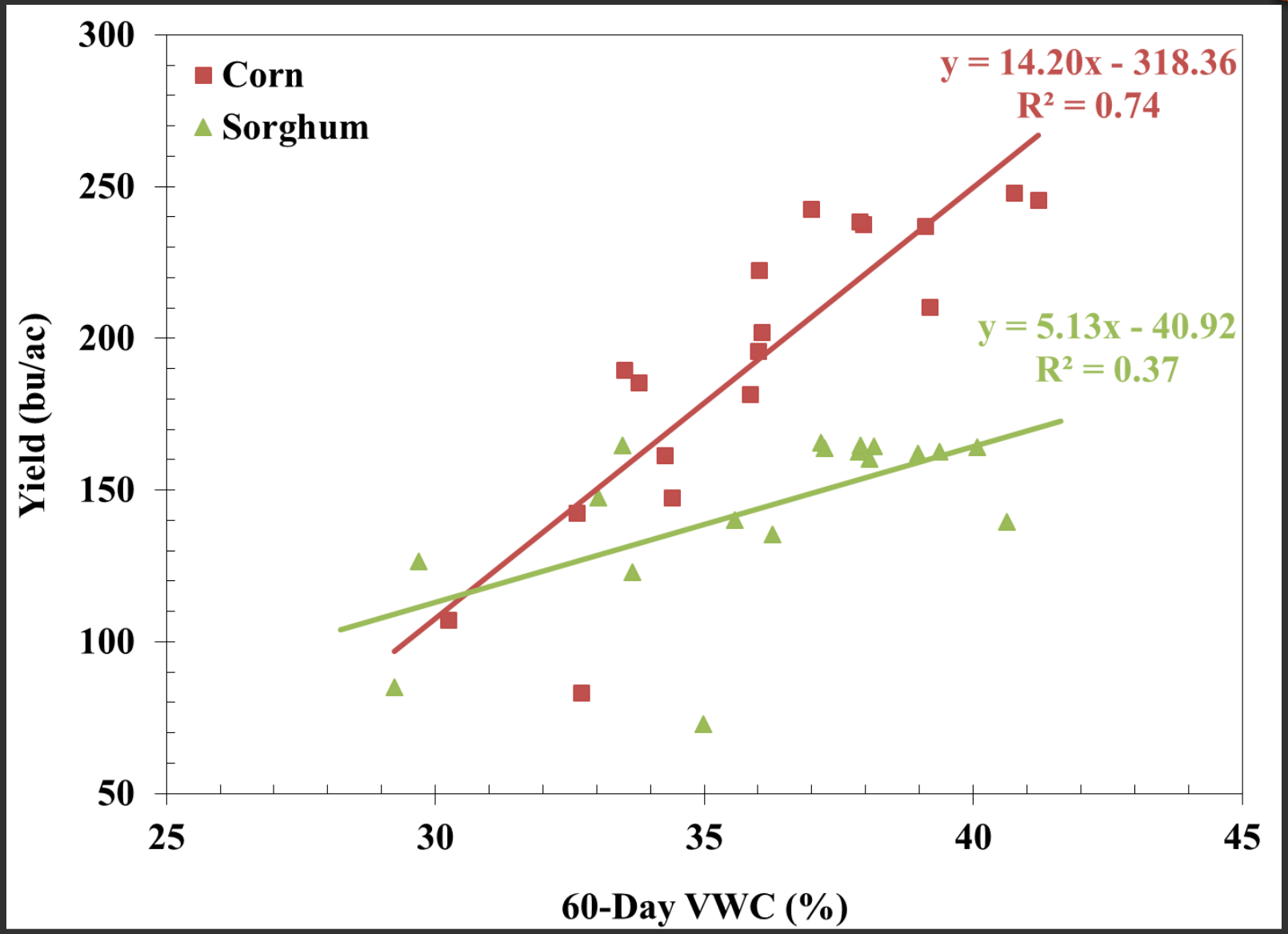








Yield vs. Soil Moisture



Questions