



Department of Plant  
and Soil Sciences

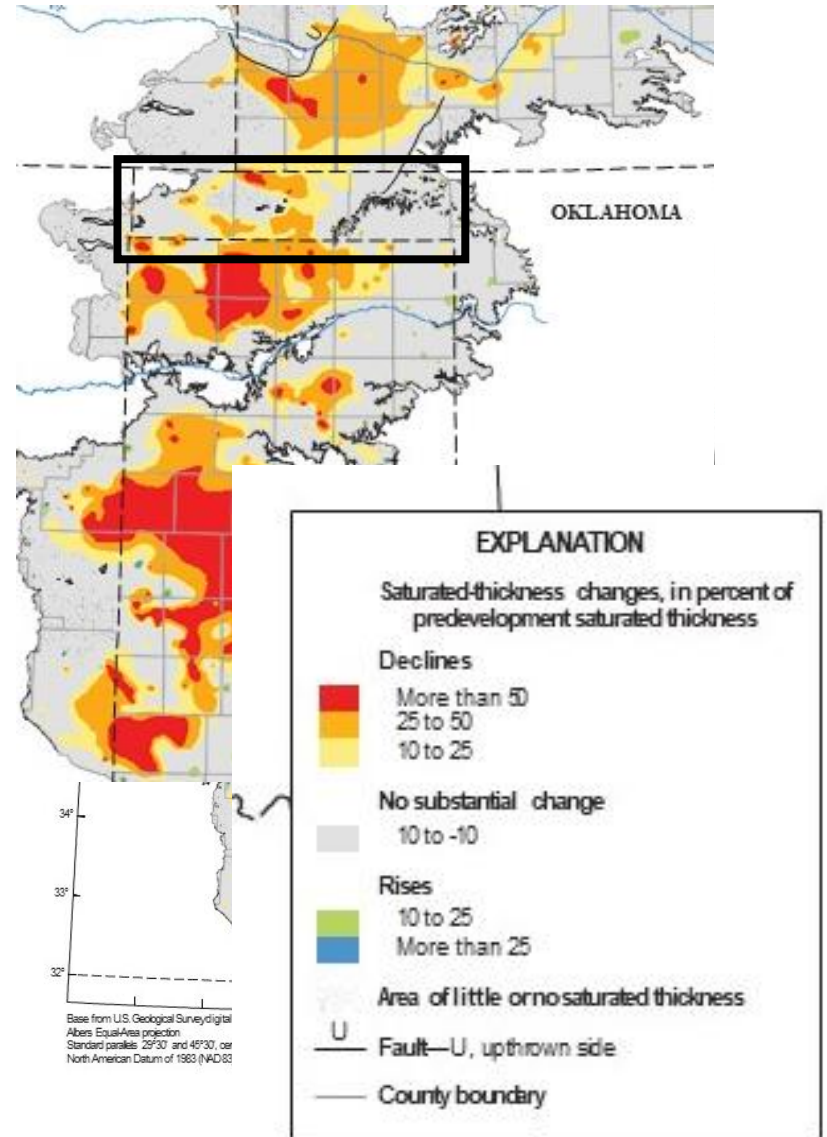
# Subsurface Drip Irrigation: Impact of Management and Crop Selection on Soil Water Dynamics

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# Background

- Oklahoma Panhandle
- Agriculture depends on the Ogallala Aquifer
- Well monitoring started in 1937 (USGS, 1976)
- Saturated thickness declined 25-50% (USGS, 2013)
- Resulting in declining well capacities





# Introduction

- 86% of water extracted is used for irrigation
- Corn: Major consumer of irrigation water
- Main source of grain for local feedyards
- Declining Water Capacities will impact:
  - Crop production
  - Economy
- Options:
  - Combine Wells: long term impacts
  - Reduce irrigation Acreage: reduce production





# Alternatives

- Management of irrigation: Subsurface drip irrigation
- Alternative crop: Grain Sorghum
  - Accepted by feedyards
  - Price is comparable to corn
  - Published evidence of lower water demand and high water use efficiency (compared to corn)
- However, no irrigation management strategies data based on well capacities is available



# Objective

**Objective** of this study was to evaluate the impact of different irrigation distribution strategies on soil water extraction by corn and grain sorghum and its influence on yields.

**Hypothesis:** Our hypothesis is that less frequent but larger irrigation events would increase the depth of soil water extraction.



# Method

- Study was conducted at Oklahoma Panhandle Research and Extension Center, Goodwell, OK.
- Subsurface drip system installed at the station was used in this study.
- Drip tape was buried 12 in. deep and 60 in. wide.
- Each drip tape waters two crop rows planted at 30 in.

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Date	Management	
	Corn	Sorghum
Planting	April 20 2017	June 6 2017
Population	32500/acre	65000/acre
Fertilizer (UAN)	279 lb N	180 lb N
Harvest	October 12 2017	To be harvested

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# Method

Irrigation Treatment	Corn	Irrigation Treatment	Sorghum
1	0.35 in/day*	6	0.35 in/day*
2	1.05 in/3 day*	7	Extra from trt1
3	1.05 in/4 day	8	0.35 in/4 day
4	0.79 in/4 days	9	1.05 in/3 day*
5	0.27 in/day	10	0.27 in/4 day

\*full water

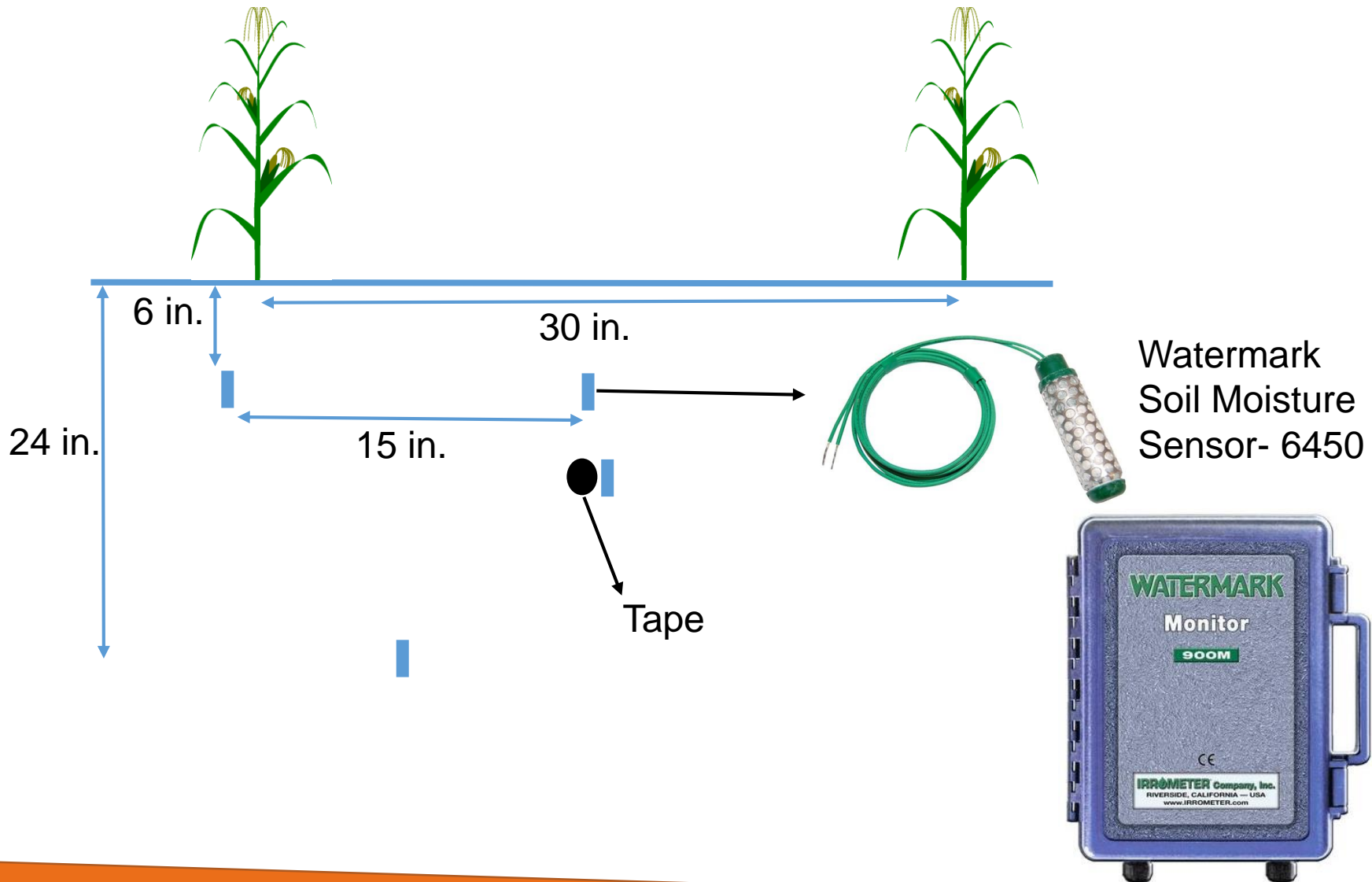
Highlighted treatments represent simulations of split pivots where water is shared.

Trt 1 and 2 are full water on corn, independent of milo

Trt 6 and 9 are full water on milo they are not dependent on corn irrigation, assuming milo irrigated independently of corn



# Method





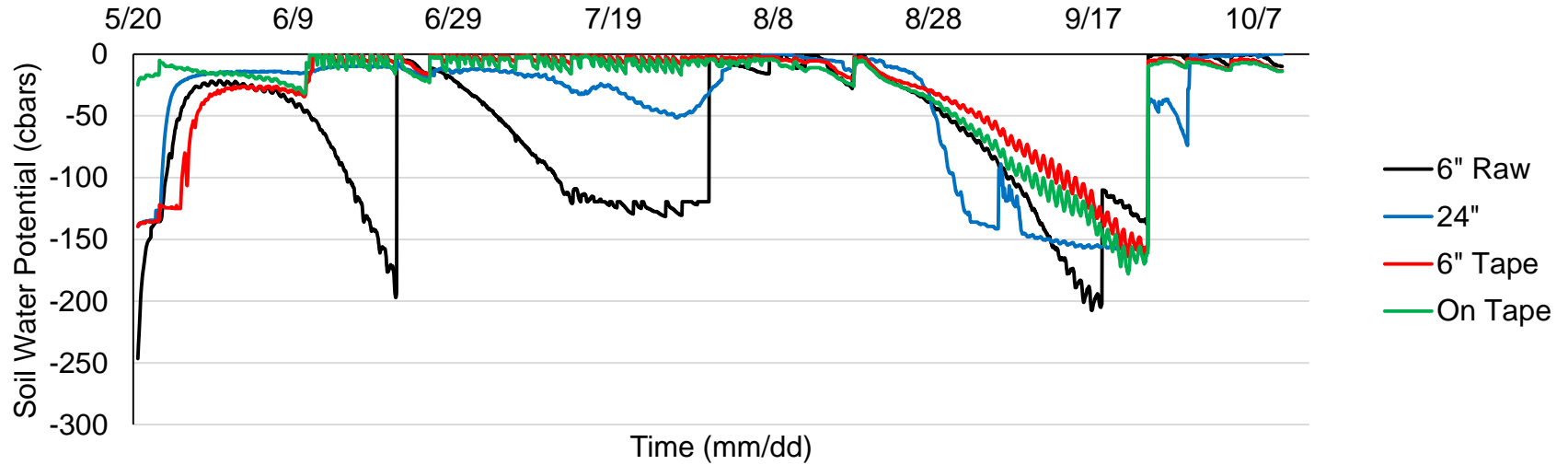


# Results

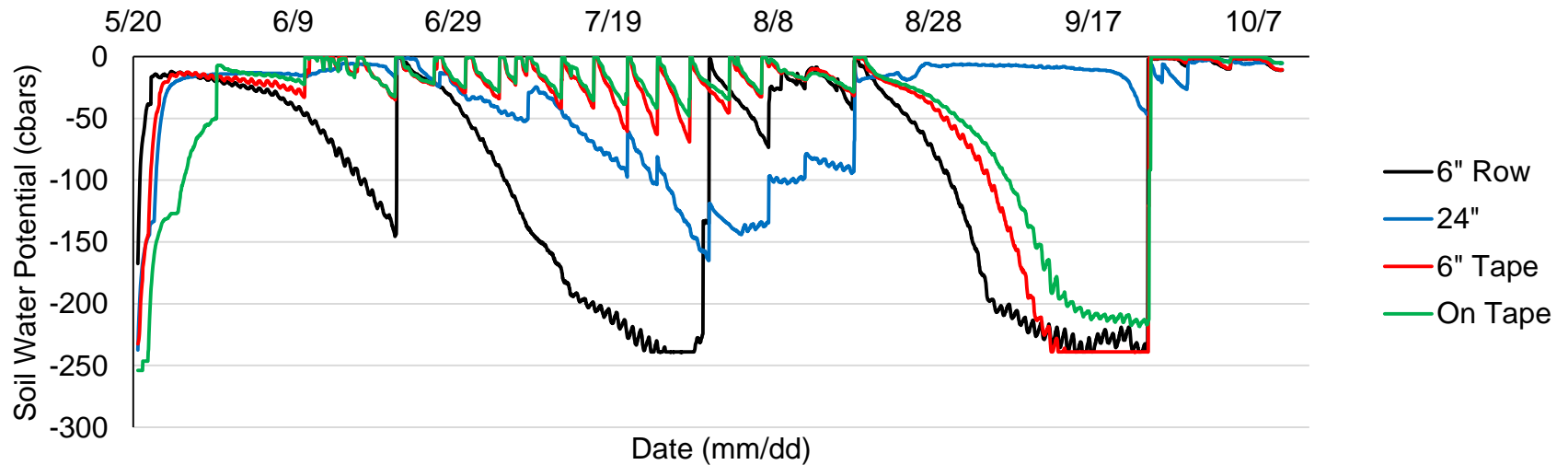


# Soil Moisture (Corn)

### Treatment 5 (0.27 in/day)



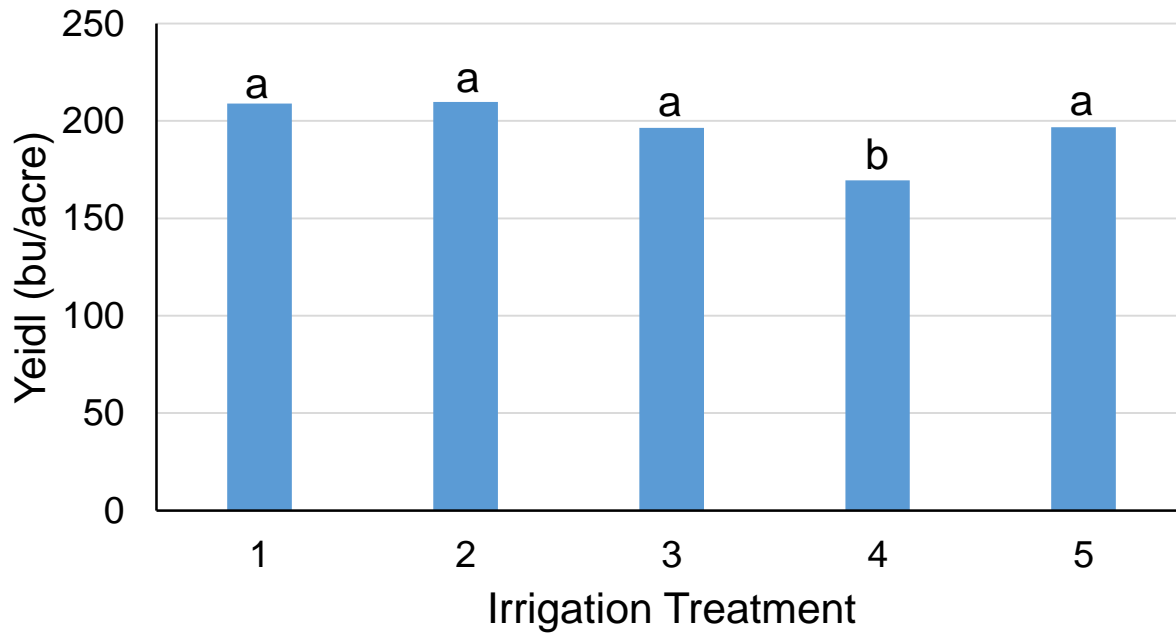
### Treatment 4 (0.79 in/4<sup>th</sup> day)





# Results (Corn)

Average Corn Yield

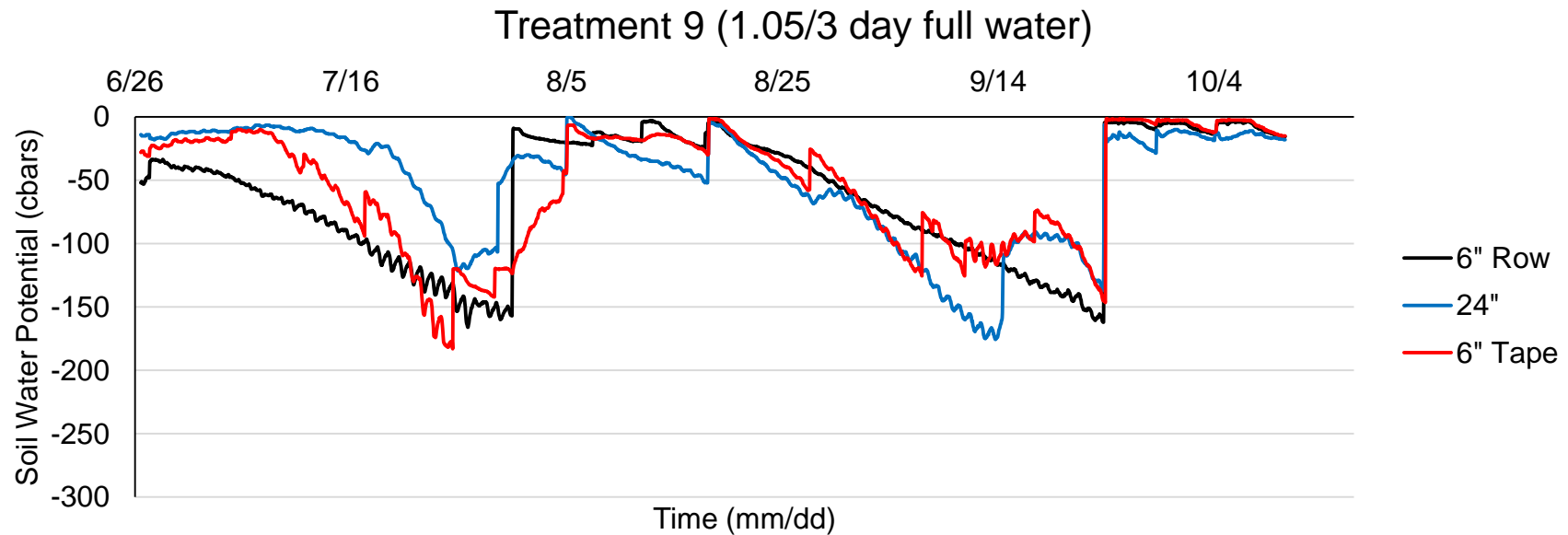
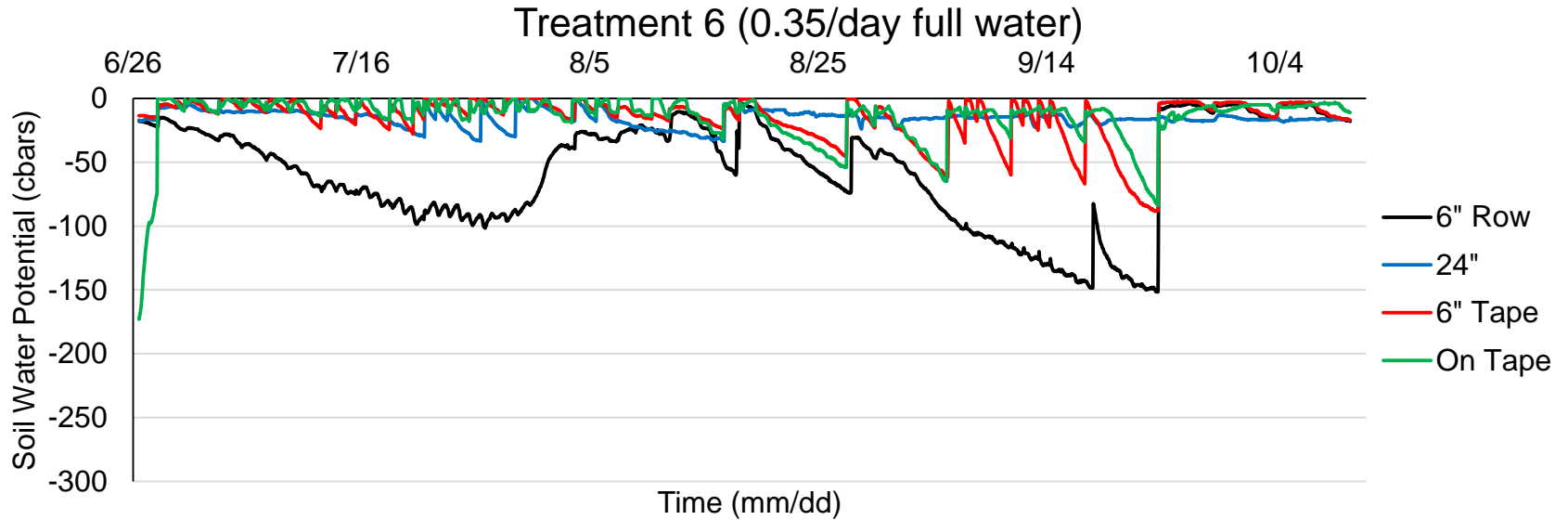


Similar lowercase alphabets above bars represent no significant difference at  $p < 0.05$  and vice-versa.

Treatment	Total
1 = 0.35 in/day	19.1
2 = 1.05 in/3 day	17.7
3 = 1.05 in/4 day	14.8
4 = 0.79 in/4 day	11.3
5 = 0.27 in/day	15.2



# Soil Moisture (Sorghum)





# Summary

- An experiment was conducted to understand the soil water extraction behavior of corn and grain sorghum under different irrigation distribution regimes in Oklahoma Panhandle region.
- Our results (preliminary) indicate that depth of water extraction was inversely proportional to irrigation applied.
- Moisture sensors did detect temporal differences in soil moisture
- Corn yields were proportional to total irrigation applied.



# Questions

**Thank You**