

Irrigation Management Strategies in MS



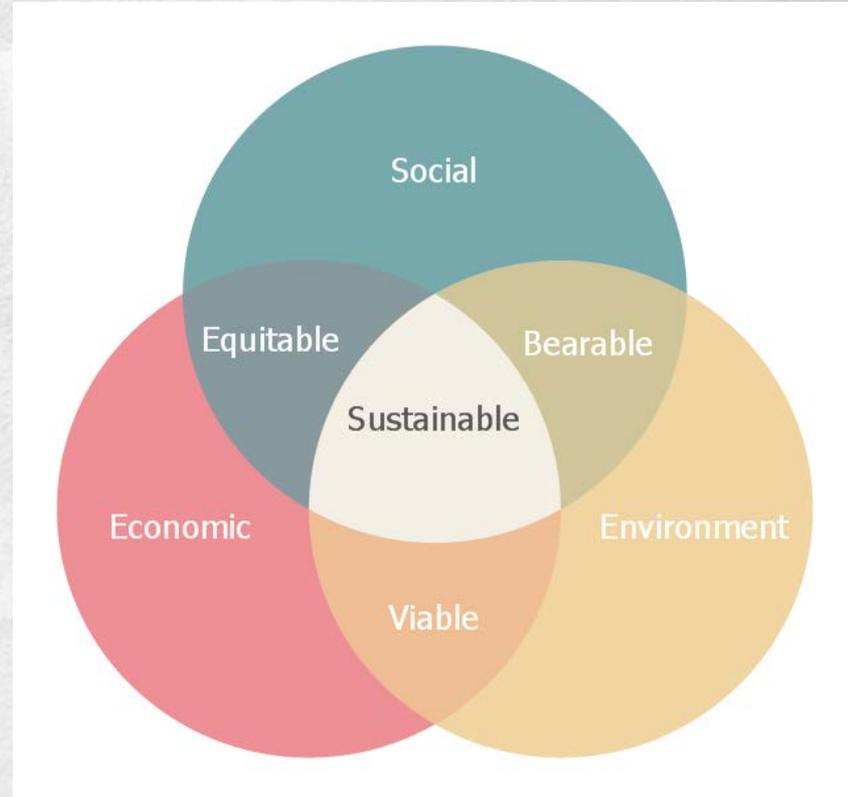
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MISSISSIPPI STATE
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Sustainable Agriculture



- Economically Viable: If its not profitable, its not sustainable
- Socially Supportive: The quality of life of farmers, farm families and farm communities
- Ecologically Sound: We must preserve the resource base that sustains us all

On-Farm Evaluations: Corn



	Yield	Water Use	WUE	Profitability
	---Bu/acre---	---Acre-in---	--Bu/acre-in-	----\$----
Producer	220	9.4	28.8	682
RISER	227	5.5	44.7	709
P-value	0.0926	0.0011	0.0100	0.0560

N = 16 farms
 7% population exceeded permitted value, 18 acre-in/year
 86% population applied more water than RISER
 14% population applied less water than RISER



On-Farm Evaluations: Soybean



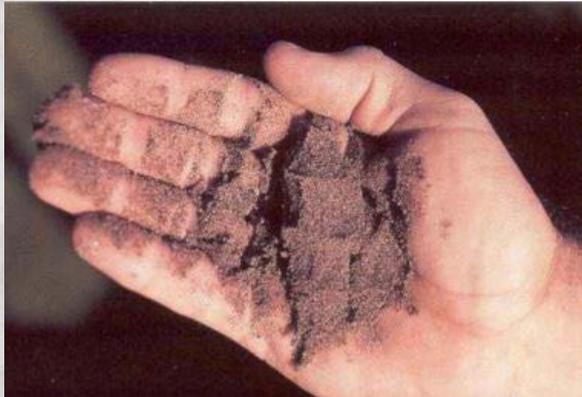
	Yield	Water Use	WUE	Return
	---Bu/acre---	---Acre-in---	--Bu/acre-in-	-----\$-----
Producer	69.3	11.5	7.2	543
Riser	68.6	9.1	9.8	556
P-value	0.6703	0.0198	0.0194	0.5376

N = 20 farms Mississippi and Arkansas
 7% of the population exceeded permitted value, 18 acre-in/yr
 79% population applied more irrigation water than RISER
 21% population applied less water than RISER



Common Irrigation Scheduling Methods

Feel & Appearance



Calendar

June 2020

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

www.calendaroptions.com

The Neighbor

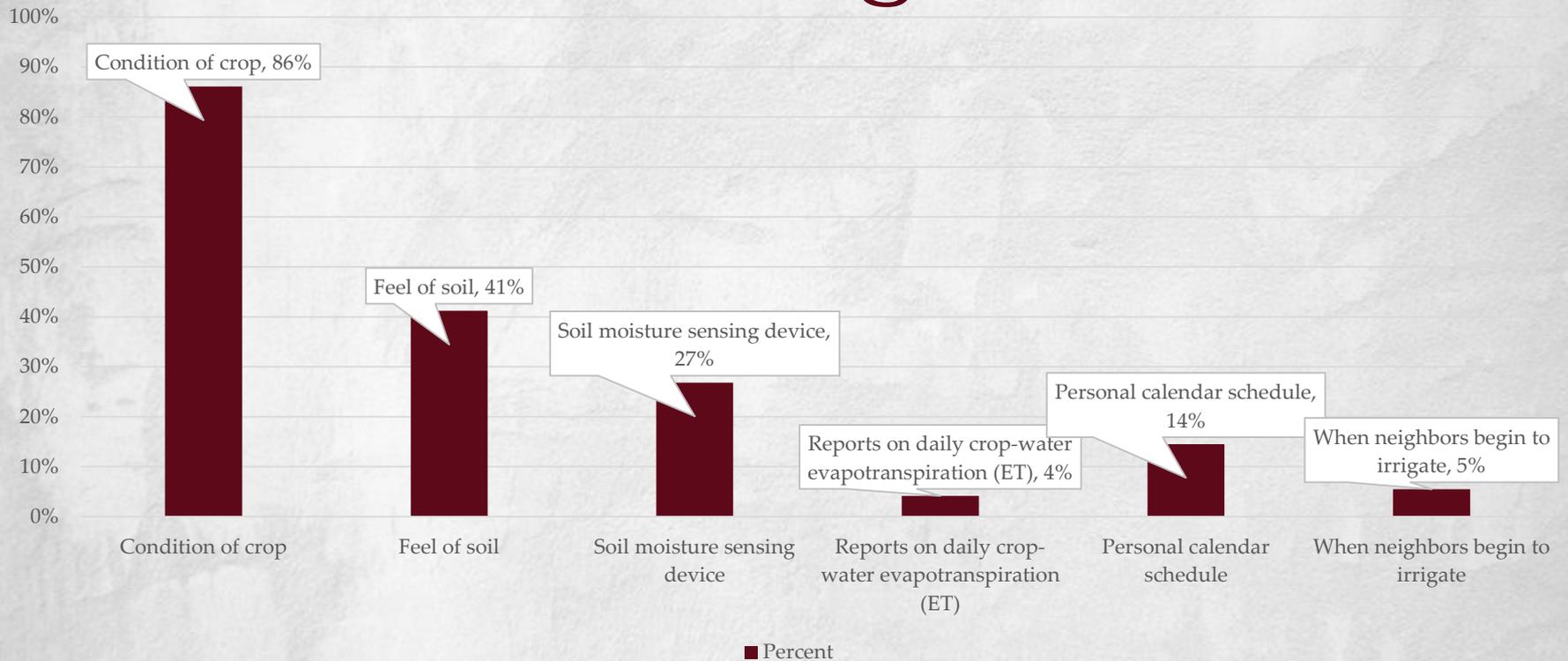


Irrigation Scheduling

- Understanding soil moisture sensors
- Interpreting soil moisture sensor data
- Making irrigation decision off of soil moisture sensors

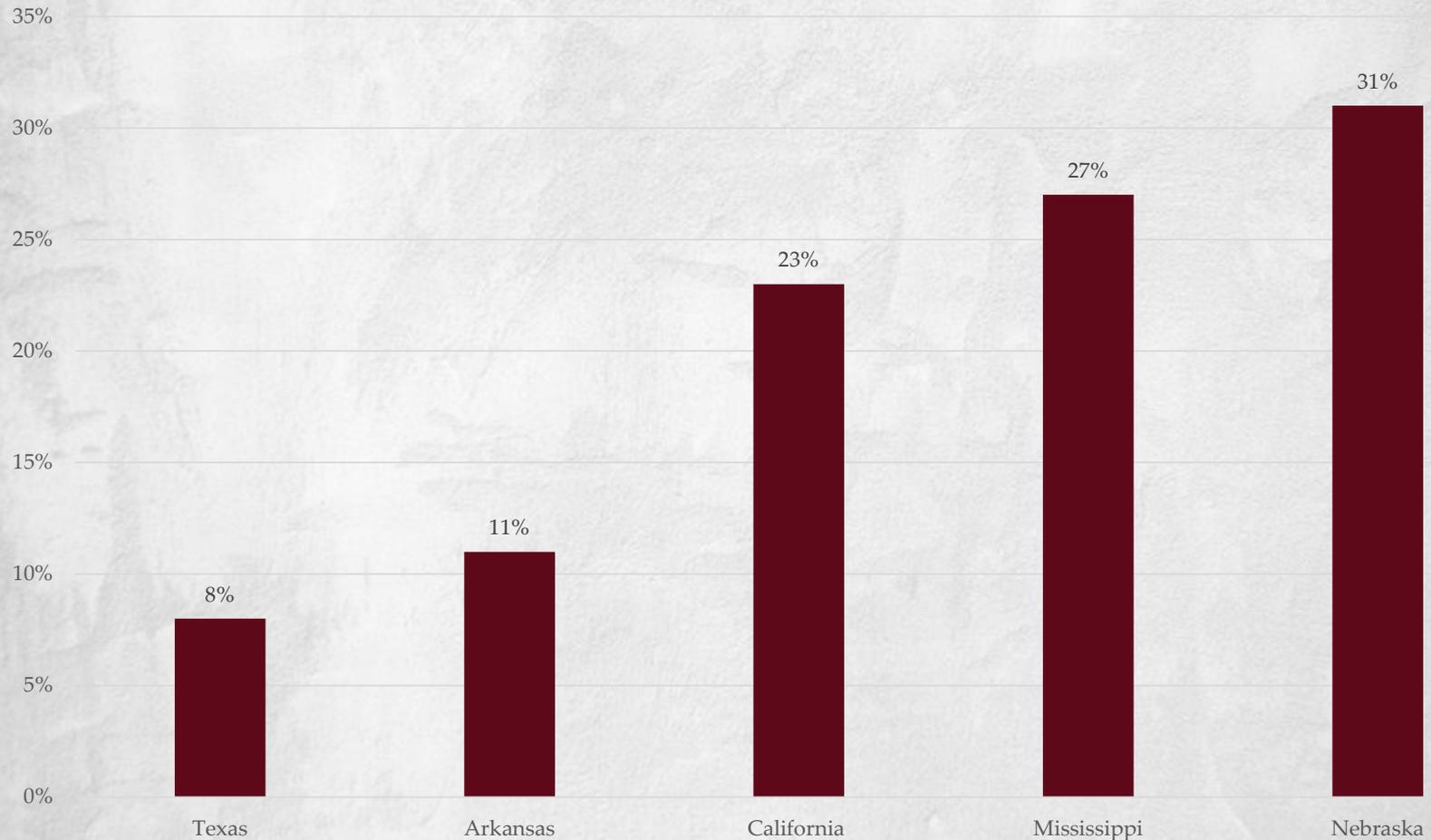


Methods of Irrigation Scheduling in MS



National use of SMS

SMS by state



Common Barriers with SMS

- Interpretation of sensor data
 - Setting the correct thresholds for each crop
 - Setting triggers for your fields
 - Properly weighting sensor depths correctly
- Acquisition of data
 - Manual (infrequent)
 - Telemetry (usually high cost)

Answering questions

- When to start irrigation
- Has enough water infiltrated?
- Are we applying enough, insufficient, or excessive water?
- Is there sufficient deep soil water reserve for crop water uptake?

Developed Irrigation Instruments/Devices

Tensiometer



Watermark Sensor



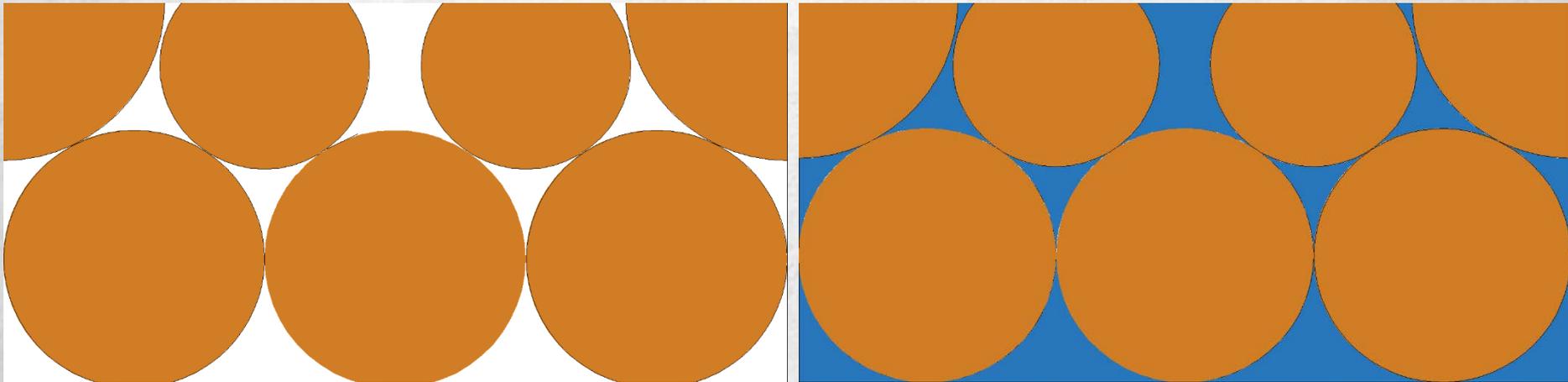
Soil Capacitance Probe



Suction/Tension in Soil

Dry Soil = High Suction

Wet Soil = Low Suction

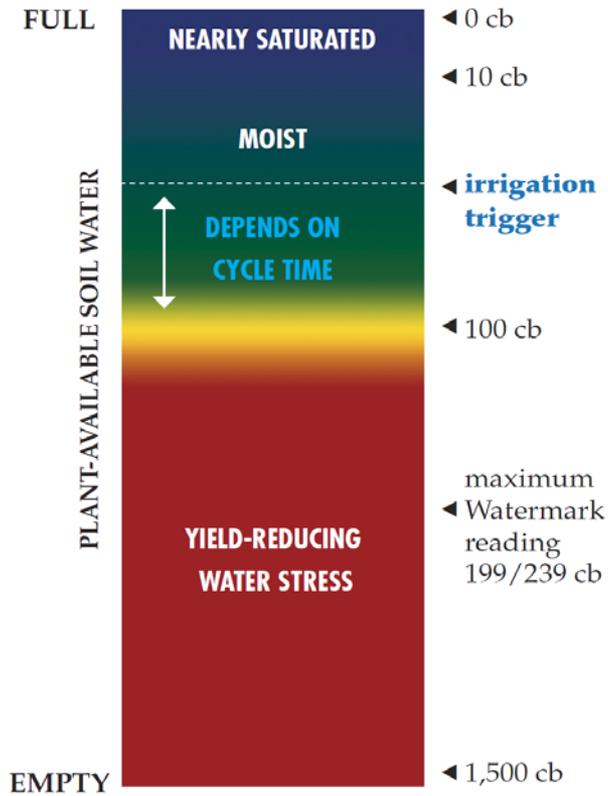




Cutaway
View

Irrigation Triggers

Depends on cycle time
How to find your trigger



Sensor depth	Date A (two sensors)	Date B (three sensors)	Date C (four sensors)
6"	$0.5 \times 62 \text{ cb} =$ 31 cb	$0.25 \times 104 \text{ cb} =$ 26 cb	$0.17 \times 72 \text{ cb} =$ 12 cb
12"	$0.5 \times 52 \text{ cb} =$ 26 cb	$0.25 \times 108 \text{ cb} =$ 27 cb	$0.17 \times 60 \text{ cb} =$ 10 cb
24"		$0.50 \times 54 \text{ cb} =$ 27 cb	$0.33 \times 51 \text{ cb} =$ 17 cb
36"			$0.33 \times 30 \text{ cb} =$ 10 cb
Weighted average	$31 \text{ cb} + 26 \text{ cb} =$ 57 cb	$26 \text{ cb} + 27 \text{ cb} +$ $27 \text{ cb} =$ 80 cb	$12 \text{ cb} + 10 \text{ cb} +$ $17 \text{ cb} + 10 \text{ cb} =$ 49 cb





6" Sensor reading = 85 cb

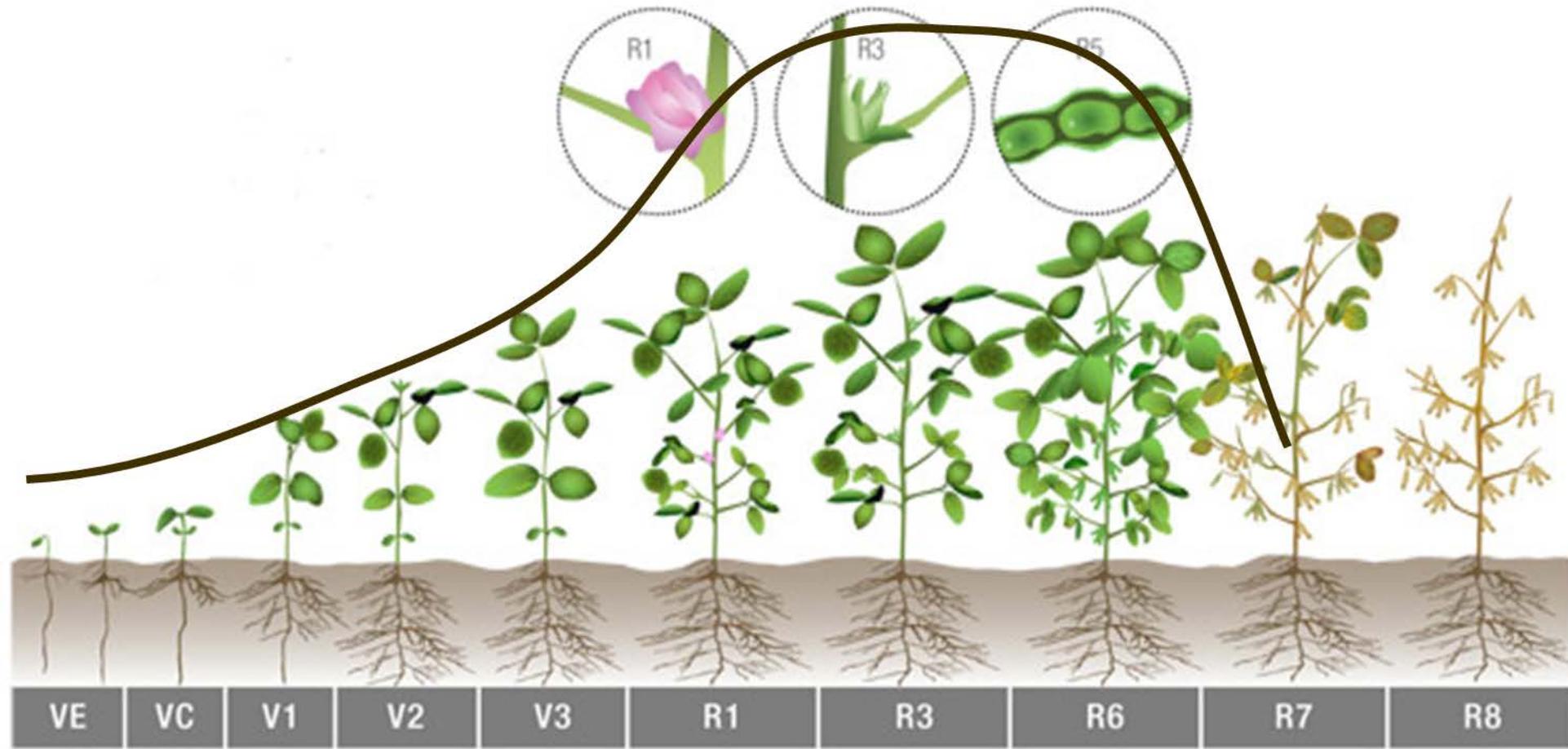
12" Sensor reading = 65 cb
Average = $.5 \times 85 + .5 \times 34 = 75$ cb

24" Sensor reading = 30 cb
Average = $.25 \times 85 + .25 \times 65 + .5 \times 15 = 53$ cb

How to use the data?

- Determine irrigation trigger levels
- Schedule Irrigation
- Monitor responses to irrigation and rainfall

Crop Water Needs

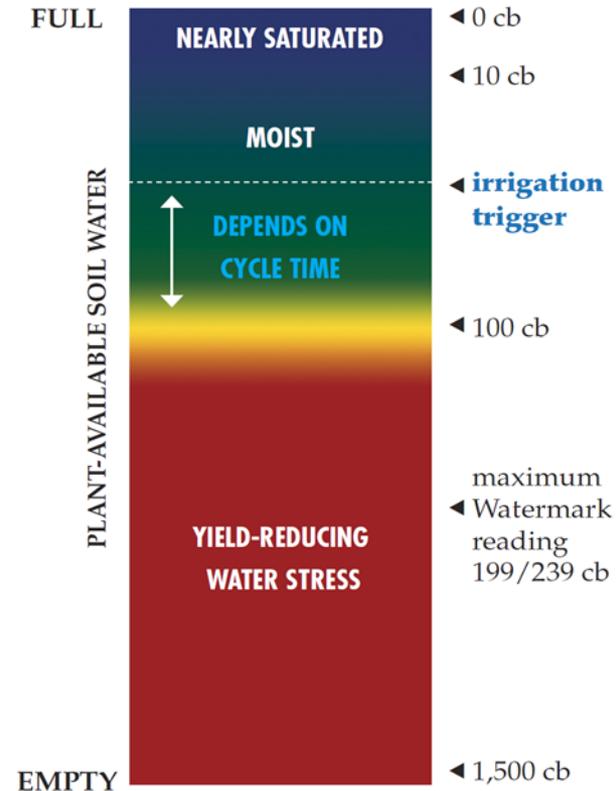


Irrigation Guide for Soybeans

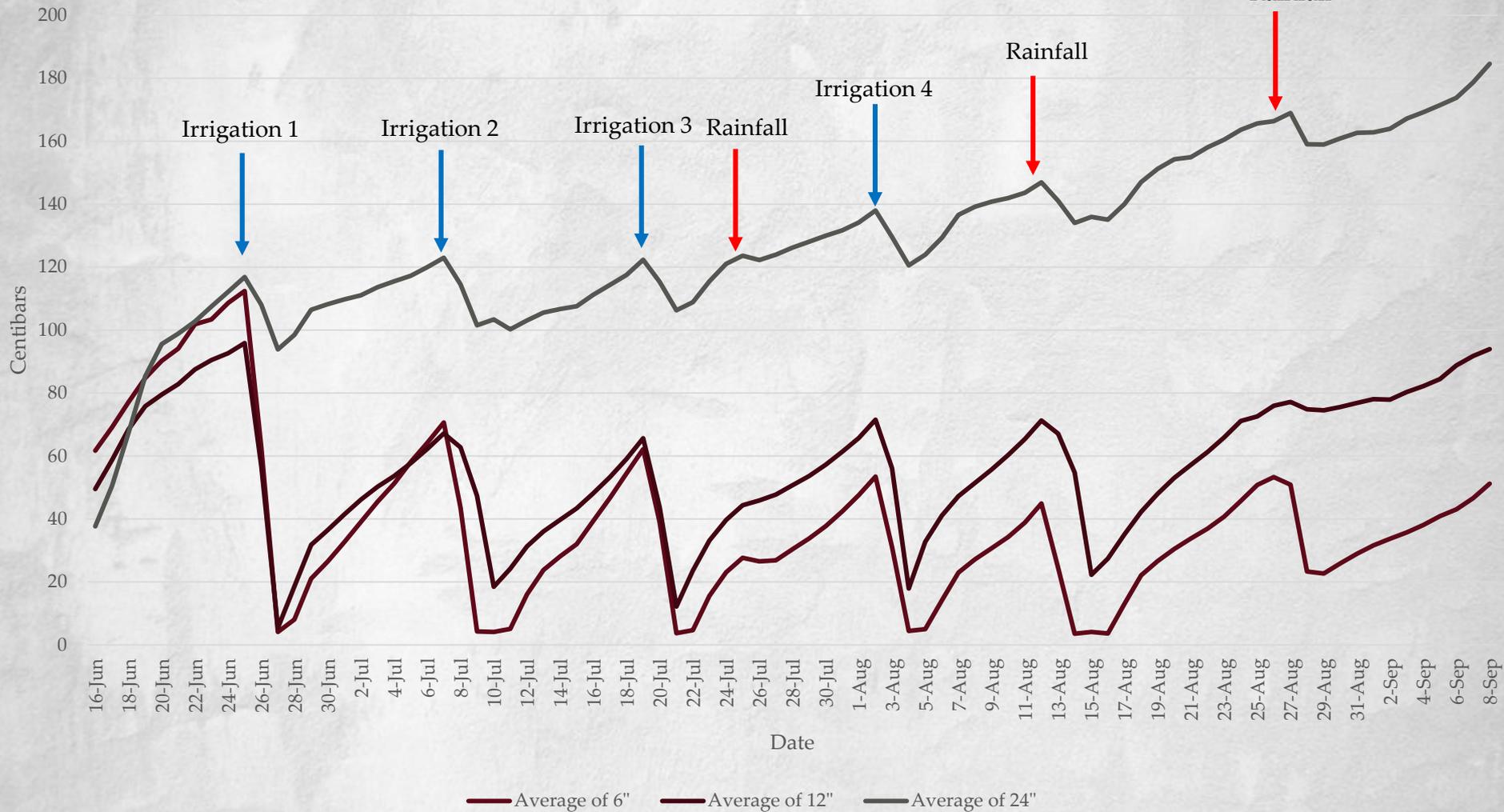
Growth Stage	Active Rooting Depth	Average Sensor Readings in Centibar
V1-R3		80-90
R3-R6		75
R6	Irrigate if needed to supply needs to R6.5	
R6.5	Terminate Irrigation	

Irrigation Guide for Corn

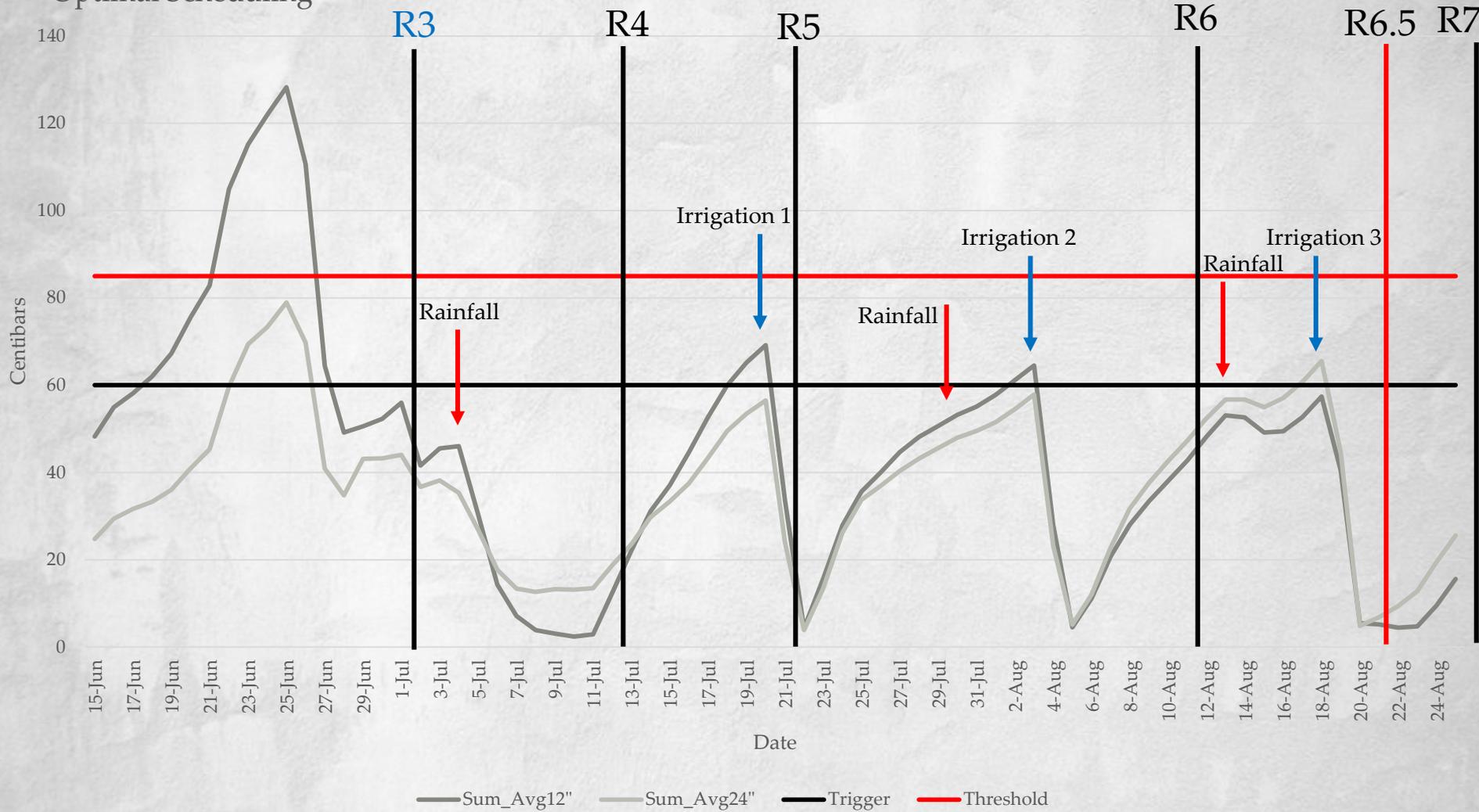
Growth Stage	Active Rooting Depth	Average Sensor Readings in Centibar
Emergence to V-14		90-100
V-15 to Tasseling (wet at tasseling)		80
Dent to Black Layer		90



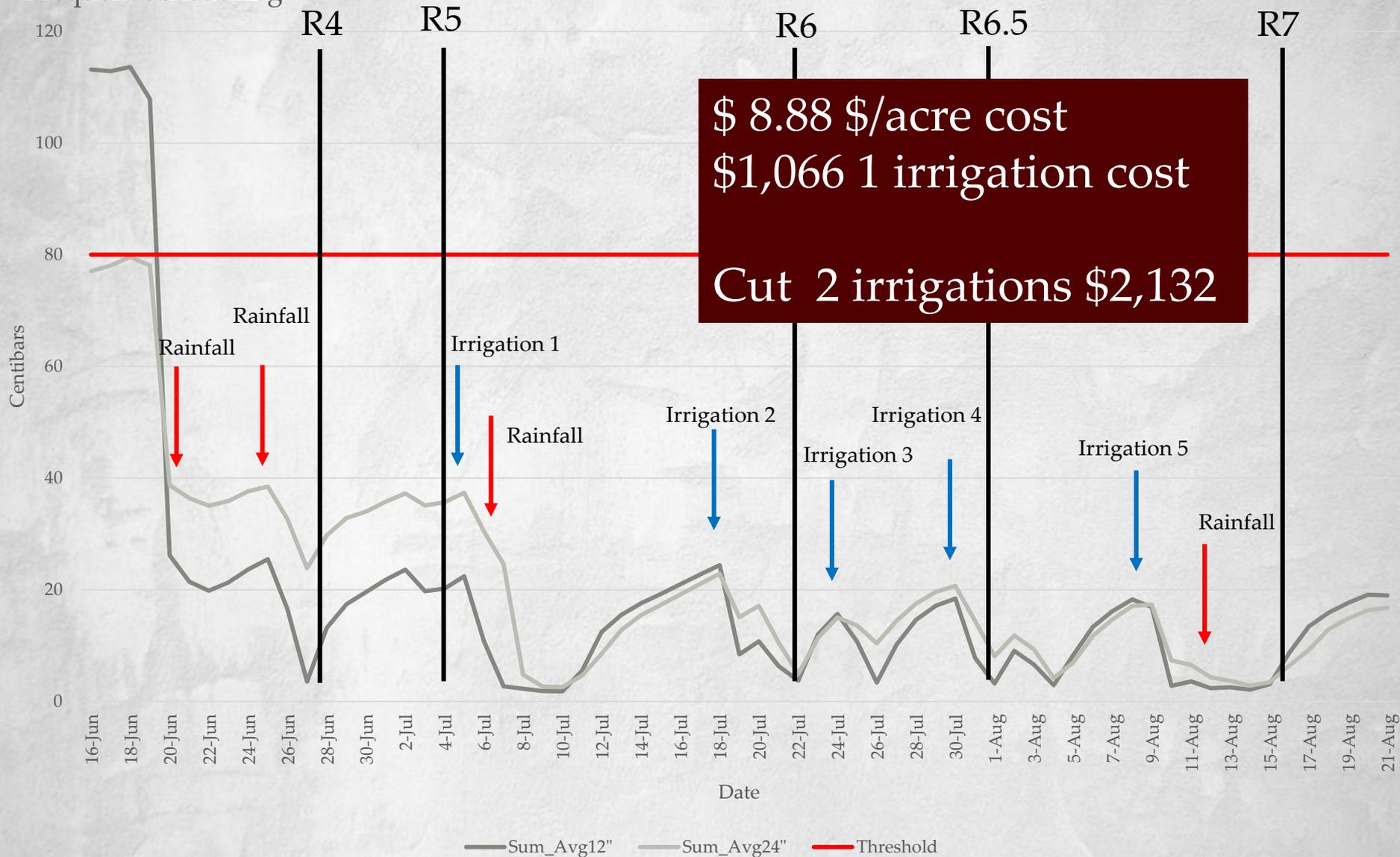
Loamy Soil



Optimal Scheduling



Frequent Scheduling





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Watermark Fundamentals & Application

1. Scientific Background
2. Measurement Devices
3. Sensor Construction
4. Sensor Location
5. Sensor Installation
6. Irrigation Triggers

MISSISSIPPI STATE UNIVERSITY EXTENSION
IRRROMETER WATERMARK SERIES: Irrigation Triggers

This publication series provide a granular matrix sensor cover other types of soil moisture sensor

Introduction
 An irrigation trigger is the point at which starting too wet wastes water and too dry reduces yield. In this publication, we provide information on how to select an appropriate trigger and how to schedule irrigation using watermark data.

Interpreting Watermark Data
 Watermark data can serve as a "gas tank" of the crop. Figure 1 illustrates weighted average centibars (cb) of centibars are low when wet and high when dry.

IRRROMETER WATERMARK SERIES: Construction Guide

This publication series provides information on a granular matrix sensor commonly used in other types of soil moisture sensors. Users should choose tools that best fit their needs.

Introduction
 This publication provides a step-by-step guide to Watermark sensor construction. Following the instructions, the sensor is easy to install at the intended depth and remove at the end of the season.

Preparation
 The tools and supplies pictured below will be necessary. Sensor wires are usually convenient.

IRRROMETER WATERMARK SERIES: Location Selection

This publication series provides information and recommendations pertaining to the Irrrometer Watermark 2005S, a granular matrix sensor commonly used in Mississippi for scheduling irrigation. Future publications will discuss other types of soil moisture sensors. Users should choose tools that best fit their needs.

Introduction
 Where sensors are installed affects the likelihood that the readings are suitable for irrigation scheduling. This publication provides a step-by-step guide to selecting an appropriate sensor location for a field.

Representative Area
 The first step is choosing a representative area within the field. Such an area can be identified based on past experience and observations, along with soil, yield, and aerial maps. The table below suggests criteria for consideration and the associated reasons.

Recommendation	Reason
Place sensors in an area with the major soil type, typical terrain, and average yield.	Avoid making irrigation decisions based on abnormal areas.
Place sensors 1/3 to 1/2 of the way down the furrow.	Avoid over-irrigated areas near the open end and the tail end of the field.
Place sensors at least two furrows (passes) inward from the field edge.	Avoid edge effects (e.g., tree lines, pesticide drift).

Ideal Crop Rows
 The second step is choosing a crop row that is least disturbed by field operations. Installing in a swing row minimizes the risk of sensor damage by tractors and implements. Also, wheel traffic produces compacted, "hard" furrows, which infiltrate less water than uncompacted, "soft" furrows.

For example, if a field is typically farmed using a tractor with dual rear wheels and 8-row implements, the ideal crop rows for sensor installation would be the first and last rows of each 8-row pass.

Figure 1
 A vertical color scale diagram showing soil moisture levels. From top to bottom: FULL (blue), NEARLY SATURATED (green), MOST (yellow), PLANT-AVAILABLE SOIL WATER (orange), YIELD-REDUCING WATER STRESS (red). A vertical arrow indicates that soil moisture 'EXPANDS ON CYCLE TIME'.

Figure 2
 A diagram showing furrow length down a field. It labels 'Crown of Field', 'Minor Soil Type', and 'Major Soil Type'. It indicates '1 to 3 of furrow length down' and 'At least two planter passes in'. A 'Tailwater Ditch' is shown at the end of the furrow.

Figure 3
 A photograph of a sensor kit including: ARS PVC Cement, PVC Primer, PVC Cap, PVC Pipe (1/2" x 3/8" x 3.0'), Three-Measure-In-Furrow Colored Electrical Tape, and a sensor wire.

Figure 4
 A photograph of a set of three sensors: one 6-inch, one 12-inch, one 24-inch, and one 36-inch long.

[Extension Publications](#)

Soil Moisture Monitoring Showcase

[Web Tools](#)

Soil Moisture Monitoring Showcase



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[CropX Soil Sensor](#)

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Showcase Demo

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