

Irrigation Scheduling with Soil Moisture Sensors

Soybeans

*Not for use with portable dielectric type sensors



Recommendations:

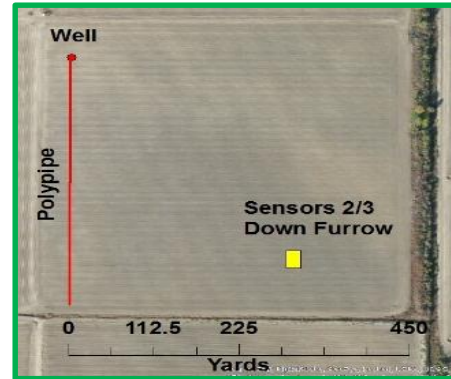
- Computerized Hole Selection Irrigation (PHAUCET, Pipeplanner) is recommended for all furrow-irrigated fields to achieve the best results when utilizing soil moisture sensors to schedule irrigations. SURGE Valves may also be necessary to adequately saturate the rooting zone.

Sensor Placement:

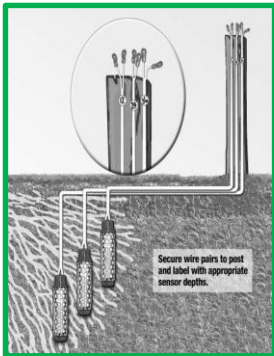
- Use a minimum of one (1) sensor set per 40-80 acres.
- Place sensor approximately 2/3 down row in a representative area of the field.
- Determine representative area based on yield maps, soil maps, etc.
- If putting multiple sensors in an irrigation set, the first and last field in a rotation may be the most optimal for monitoring start time to complete spin while maintaining the threshold of the last field.

Applicable Soils:

- Understand your soil. These general rules apply to heavy clay soils to fine loam soils, variance may apply to sandy soils.



Typical Sensor Depth:



6"
12"
24"
36"

Irrigation Guidelines*: Initiate irrigation within the listed centibar reading

Growth Stage	Centibar Threshold Reading
V1-R3	80-90
R3-R6.5	60-70
R6.5	Terminate Irrigation
R6	Can apply last irrigation to maintain moisture to R6.5

- *These recommendations are strictly guidelines based on available data. Plants can tolerate stress up to R3 but are less tolerant from R3-R6.
- *Reference growth stages information on back
- *Base reading off weighted average within the active rooting zone
- *Based on research and methods performed by Jason Krutz (MSU)

Determining Centibar Weighted Average within Active Rooting Zone

Sensor	Sensor Depth	Sensor Reading	%Rooting Zone	Weighted Reading
1	6"	100 cB	X .25	= 25 cB
2	12"	60 cB	X .25	= 15 cB
3	24"	32 cB	X .50	= 16 cB
4	36"	<5 cB		

Weighted Average = 56 cB

Sensor	Sensor Depth	Sensor Reading	%Rooting Zone	Weighted Reading
1	6"	100 cB	X .17	= 17.0 cB
2	12"	75 cB	X .17	= 12.8 cB
3	24"	50 cB	X .33	= 16.5 cB
4	36"	35 cB	X .33	= 11.6 cB

Weighted Average = 57.9 cB

Example 1:

- **Sensors 1-3** show reduction in soil moisture indicating presence of root activity at 0"-24"
- **Sensor 4** shows no reduction in moisture indicating no root activity at 36"
- Active Root Zone 0-24"
- 100% of Root Zone = 24"
- 50% of Root Zone = 12"
- 25% of Root Zone = 6"

Example 2:

- **Sensors 1-4** show reduction in soil moisture indicating presence of root activity at 0"-36"
- Active Root Zone 0-36"
- 100% of Root Zone = 36"
- 33% of Root Zone = 12"
- 17% of Root Zone = 6"

Internet Information:

Hansen AM400

<http://www.mkhansen.com/documents/install.pdf>

Watermark 200SS Sensors and Data Logger

<http://www.irrometer.com>

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R1: First flower anywhere on the plant.



R2: Flower in the upper (youngest) two nodes.



R3: 3/16-inch-long pod in upper four nodes.



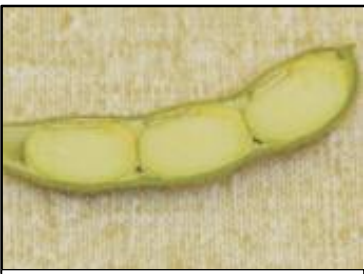
R4: 3/4-inch-long pod in upper four nodes



R5: Visible seed in pod of upper four nodes.



R6: Beans touching inside pods of upper four nodes.

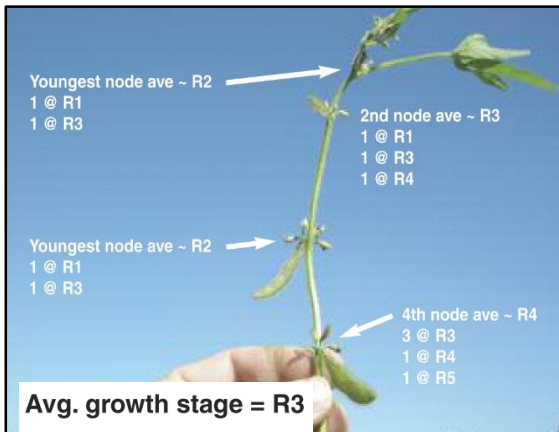


R6.5: Pod and pod wall beginning to turn mature



R7: Pod mature in color anywhere on plant.

*Source: Mississippi Extension Publication 2588 (Guide to Soybean Growth Stages)



How to Determine Soybean Growth Stage:

Concentrate on the youngest (upper) four nodes to determine soybean growth stage. Estimate the average growth stage for the reproductive growth (flowers and pods) on the youngest four nodes. Begin with the youngest fully expanded leaf and estimate growth stage down the next three nodes,

*Source: Mississippi Extension Publication 2588 (Guide to Soybean Growth Stages)

MG	Planting period	Date range of stage occurrence		
		R 1	R 3	R 6
4	Early April	May 15-19	June 2-5	July 23-26
	Mid-April	May 20-24	June 11-14	July 29-Aug. 1
	Late April	June 1-5	June 20-23	Aug. 8-11
	Early May	June 10-14	July 2-5	Aug. 13-16
	Mid-May	June 20-24	July 12-15	Aug. 21-24
	Late May	July 1-5	July 20-23	Aug. 30-Sept. 2
5	Early June	July 10-14	July 27-30	Sept. 1-4
	Early April	June 1-5	June 24-27	Aug. 16-19
	Mid-April	June 7-11	July 1-4	Aug. 21-24
	Late April	June 15-19	July 9-12	Aug. 27-30
	Early May	June 26-30	July 18-21	Sept. 1-4
	Mid-May	July 4-8	July 25-28	Sept. 5-8
6	Late May	July 12-16	July 30-Aug. 2	Sept. 10-13
	Early June	July 20-24	Aug. 3-6	Sept. 12-15
	Early May	July 5-9	Aug. 4-7	Sept. 14-17
	Mid-May	July 14-18	Aug. 11-14	Sept. 19-22
	Late May	July 20-24	Aug. 15-18	Sept. 20-23
	Early June	July 30-Aug.	Aug. 20-23	Sept. 23-26

*Source: University of Arkansas Coop Extension Service (Soybean Irrigation Guide for the Southern US)

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Recommendations:

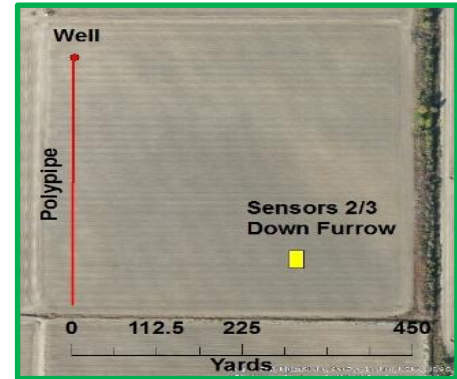
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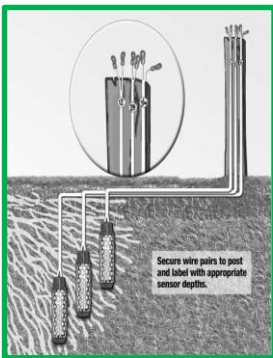
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Irrigation Guidelines*: Initiate irrigation within the following centibar readings

Growth Stage	Centibar Threshold Reading
Emergence-Tasseling	80-90
Tasseling-Dent	60-70
Dent-Black Layer	90

*These recommendations are strictly guidelines based on available data.

Corn plants are less tolerant to stress from tasseling to dent

*Reference growth stages information on back

*Base reading off weighted average within the active rooting zone

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Stage	Stage Title	Days	Description
V2		5	Two fully developed leaves with collars
V4			Four fully developed leaves with collars
V5-V16			V12-V16, new leaves appear every 2-3 days until VT
VT	Tasseling		Lowest branch of tassel visible. Silks may be visible on husk
R1	Silking	65	Silks have emerged from tip of ear on most plants
R2	Blister		Milk turns thick and pasty. Kernel visible
R3	Milking		20 days after silking, kernel turns yellow. Silks are brown
R4	Dough		26 days after silking, kernel has a dough/paste like substance
R5	Beginning Dent	90	Dent on top of kernels, starch line progressing from top of kernel towards tip
R5	Full Dent		Dent on kernels, starch line fully across
R6	Black Layer/Mature	125	Kernels have reached maximum dry weight

*Source: University of Arkansas Research and Extension



V2



VT



R1



R2



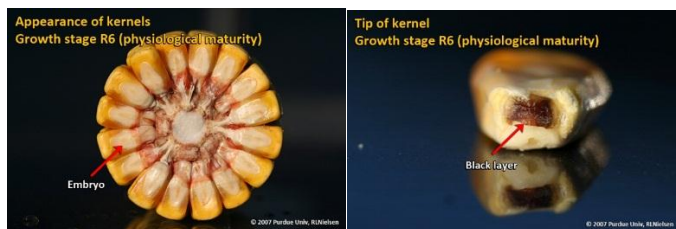
R3



R4

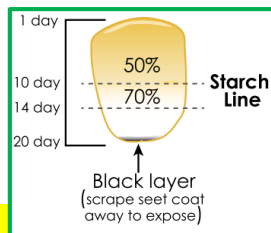
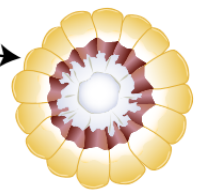


R5



R6

At beginning dent or about 90 days, check starch line. Break an ear of corn in half. Inspect the top half of the ear. Terminate irrigation when starch line reaches 50% for furrow irrigation and 70% for sprinkler systems from top of kernel and good soil moisture.



- Source: University of Arkansas Research and Extension

Effective Dates: May 2014 – September 2014

