INCREASING SOYBEAN

IRRIGATION EFFICIENCY

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THE DEFINITIVE GUIDE TO HELP YOU MAXIMIZE YIELD POTENTIAL WHILE SAVING WATER, LABOR AND ENERGY COSTS DURING IRRIGATION.

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IRRIGATION IN SOYBEANS

Soybean plants have the ability to withstand a certain amount of stress, whether it be from diseases, insects or drought. However, plants can only withstand these pressures for so long before losing yield. Drought stress is no exception. For this reason, an increasing number of Mississippi soybean farmers irrigate their acres. Irrigation can substantially increase yield, but the practice does not come without additional costs and labor. Nevertheless, certain practices and tools can make irrigation more efficient and farmers more profitable.

SOYBEAN IRRIGATION INITIATION

Drought affects soybeans most during the reproductive stages, when plants begin to flower and produce pods and seeds. During these stages, a soybean plant can use 0.25 inch of water per day. A plant's supplemental water needs from irrigation are greatest during these times. According to Mississippi State Irrigation Specialist Jason Krutz, farmers should begin irrigation at threshold, regardless of growth stage. He adds that soil moisture sensor irrigation thresholds can be used to ensure you don't lose yield associated with drought stress during the critical R3 through R6 growing stage.

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 on weighted average within the active rooting zone

*Based on research and methods performed by Jason Krutz (MSU)

PHAUCET/PIPEPLANNER

Increase furrow irrigation efficiency through the use of the PHAUCET or PipePlanner computer programs. These programs help farmers determine the best hole sizes to punch along the length of a polypipe irrigation set. The tool calculates these hole sizes based on pressure changes along the tubing, pipe diameter, different row lengths and the elevation changes along the pad where the polytubing is located.

- PHAUCET/PipePlanner is a free, Web-based computer application provided by Delta Plastics.
- There is no rule of thumb on how long it takes to set these tools up. But, once you are familiar with designing an irrigation set with these tools, several hundred acres can be evaluated in an hour.
- Delta Plastics' estimates put the water savings between 25 and 50 percent, and an average of 25 percent reduction in energy costs.
- Krutz states that the average field needs 15 to 18 inches of irrigation water to reach yield potential. At $3 per acre inch, a cost saving of $12 to $14 per acre can be expected.

- For questions, please visit ***www.pipeplanner.com*** or contact your local extension agent.

The program offers the potential for reducing water runoff from irrigation by providing the following:

1. Design of hole sizes to punch in irrigation tubing
2. Calculation of pressure (head) changes along the tubing
3. Adjustment of hole sizes for different row lengths in the same irrigation set
4. Ability to evaluate different layout options for the field and irrigation tubing
5. More uniform watering of the field in shorter time period

The following is the field information needed to run the program:

1. Field size and dimensions
2. Accurate measurement of flow rate from well
3. Maximum number of hours that can pump in one set without causing problems
4. Row lengths in the field, not each row length but long and short rows in a set
5. Length and slope of turnrow for irrigation tubing
6. Row spacing and preference on irrigating every furrow or every other furrow

SURGE VALVES

Improve the water infiltration in fields through the use of surge valves. The valves divide a standard irrigation run into two sides, alternating irrigation between the two sides. Water flow oscillates between the two sides of the valve for predetermined periods until the water reaches the tail ditch. The system then moves to a soaking cycle and sends a pulse of water out until it reaches the tail ditch on one side and then alternates to the other. This allows farmers to have better control over how much water is actually needed to infiltrate the soil profile.

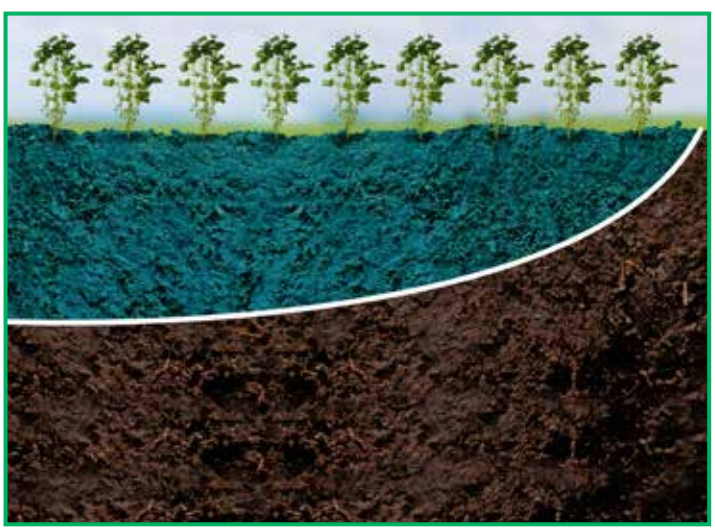
Surge Valve Setup for Silt Loam or Sandy Soil with Tendencies to Seal:

1. Determine the *Out Time* from past experience.
2. Set the *Advance Cycle* to half of the *Out Time* and add one hour.
3. Record time required for water to reach the tail ditch. Any adjustments to the *Advance Cycle* of the surge valve needs to be made before the *Soaking Cycle* begins. If timing is not recorded, adjustments can only be made after the completion of the *Soaking Cycle*.
4. The *Soaking Time* or completion time can be found on a PHAUCET/PipePlanner printout. If PHAUCET/PipePlanner requires 20 hours to apply three acre inches on each set, then the total system run-time is 40 hours before the system and well can be shut off. It is equally important to adjust the *Soaking Time*. If the single pulse is falling short of the tail ditch, time should be added. If the single pulse is putting water in the ditch, time should be subtracted.

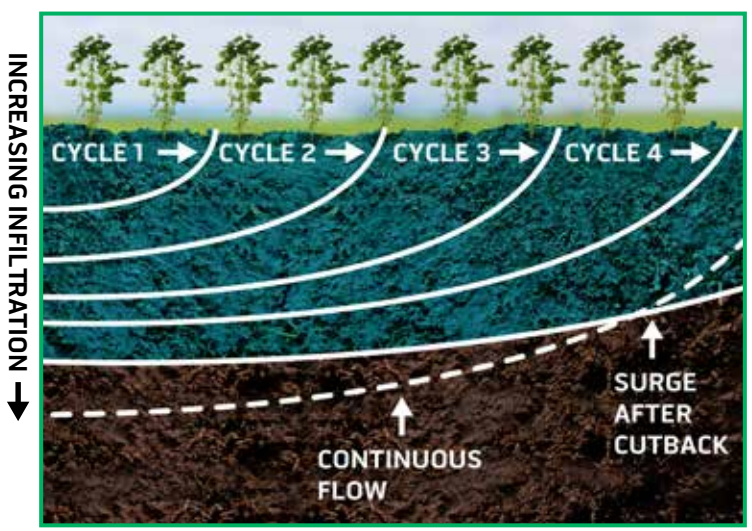
Surge Valve Setup for Cracking, Clay Soil:

1. Refer to PHAUCET/PipePlanner printout for the time required to apply three acre inches.

2. Set the *Advance Cycle* to the recommended time on the PHAUCET/PipePlanner printout.
3. Record the time required for water to reach the tail ditch. Any adjustments to the *Advance Cycle* of the surge valve needs to be made before the *Soaking Cycle* begins. If timing is not recorded, adjustments can only be made after the completion of the *Soaking Cycle*.
4. Shut the well and system off at the recommended time.



Soak cycle sends a single pulse down the field until the tail ditch is reached.



Advance cycle sends multiple pulses down the field until the tail ditch is reached.

PHASES OF FURROW IRRIGATION WHEN USING A SURGE VALVE

Advanced Cycle: The phase in which the dry furrow is wetted. This cycle creates multiple pulses down the field.

Out Time: The time required for water to reach the end of the furrow.

Soaking Cycle: The phase in which the required application depth is infiltrated. This is a single pulse, with each pulse reaching the tail ditch.

Soaking Time: The time it takes the required application depth to infiltrate.

SOIL-MOISTURE SENSOR

Soil-moisture sensors take the guesswork out of scheduling irrigations. Using these sensors may eliminate one or more irrigations per field without reducing yields. Soil moisture sensors should be placed at 6, 12 and 24 inches deep for production soybeans. These take the guesswork out of determining how much moisture the soil has available to plants. Portable soil moisture meters allow a producer to spot check a field at will, confirming the data being received from the soil moisture sensors installed in the field.

SOYBEAN IRRIGATION TERMINATION

Terminating irrigation too soon can result in decreased seed size, which ultimately will mean that maximum yield potential may not be reached. The decision for terminating soybean irrigation will likely depend on the field in question. Factors such as irrigation method, soil texture, soybean maturity group and environmental conditions at the time should all be considered. Generally speaking, if the crop has reached the R6.5 growth stage and adequate soil moisture is present, irrigation can likely be terminated at this point.

If the crop has reached the R6.5 growth stage, when the soybeans have begun to recede from the pod membrane, and adequate soil moisture is present, irrigation can likely be terminated at this point. R6.5 growth stage is when the pod and pod wall begin to change color and soybeans inside the pod are separating from the protective membrane within the pod.

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Technical editing for this fact sheet was led by Jason Krutz, Ph.D., Mississippi State University.