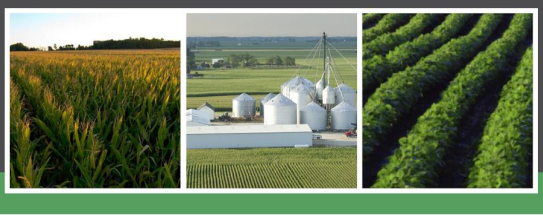

Agronomic Spotlight

Corn and Soybean Water Use

- Water use rates of corn and soybean peak during the reproductive stages.
- When crops do not receive enough water to meet evapotranspiration demands during the reproductive growth stages, significant reductions in yield can occur.
- Understanding corn and soybean water use and agronomic practices that can help to improve water use efficiency may help improve yield potential.

Evapotranspiration (ET)

The terms crop water use and evapotranspiration (ET) are used synonymously to describe the movement of water through evaporation (E) from the soil and plant surfaces and transpiration (T) through the plant. Transpiration is the movement of water from the soil into plant roots, through plant stems and leaves, and back out into the atmosphere. Transpiration is an important concept because yield is related to the amount of water a plant transpires. Understanding corn and soybean water use and agronomic practices that can help to improve water use efficiency may help improve yield potential.

Factors that Influence ET

Crop growth stage. Crop water requirements change throughout the season. The water demands of corn and soybean are relatively low during the early vegetative stages, peak during the reproductive stages, and begin to decline once plants reach their mature size. Corn water use rates peak during the early reproductive growth stages, while soybean water use peaks during the mid- to late reproductive stages. As plants reach their mature size and the grain/seeds are being filled, water use begins to decline due to a lower evaporative demand (shorter days, lower temperatures, lower solar radiation), a loss of transpiring leaf area as leaves begin to die, and changes in plant physiology. Water at this stage is used primarily to produce the grain/seed as opposed to vegetative growth.

Weather / climate. The ability of the atmosphere to evaporate water is the driving force for soil water evaporation and transpiration. Daily ET is influenced by solar radiation, air temperature, relative humidity, and wind. High air temperatures, low humidity, clear skies, and high winds cause a large evaporative demand.

Relative maturity. A full-season product will use more water over the course of the season compared to a shorter-season product grown in the same location. While longer-season products use more water, they may also have a higher yield potential if heat units and adequate water are available.

Soil water holding capacity and soil water content. Soil type dictates the maximum amount of water a soil can hold and how much of that water will be available to plants. Fine textured soils can hold more water than coarse textured soils. When the soil water profile is full (field capacity), plants use water at the maximum rate. As the water content of the soil drops, plants are less able to extract the water.

Tillage and soil / residue management. The soil water evaporation component of ET can be reduced with conservation tillage and increased surface crop residue. Tillage increases soil water evaporation and runoff and destroys crop residue that can catch rain and snow. Surface residue helps reduce runoff by creating obstructions that limit water movement and allow more time for water to infiltrate into the soil profile. Compaction and restrictive layers in the soil can limit root growth making plants more susceptible to water stress during hot, dry weather because plants can not reach the moisture deeper in the soil.

Drought Stress

The effect that water stress can have on yield will vary depending on the growth stage. For corn, the growth stages that are the most sensitive to water stress are tasseling, silking, and pollination. Water stress during silking can have the greatest impact on yield potential due to desiccation of the silks and pollen grains, which will result in poor pollination.[1] For soybean, the most critical time to avoid water stress is during pod development through seed fill. Water stress during these growth stages can result in a reduced number of seeds per pod and reduced seed size.[2] Both corn and soybean require adequate water through the reproductive stages in order for seeds to achieve their maximum weight.

Excess Water

Excess rain or irrigation and poor drainage can negatively impact crop growth and yield potential as well as increase soil loss due to runoff and increase the leaching of nitrogen. Soils that remain saturated for long periods can have reduced oxygen in the root zone, and crops grown in these soils can have an increase in the occurrence of soil-born diseases and restricted root growth due to lower soil temperatures.

Sources

[1] Kranz, W.L., Irmak, S., van Donk, S.J., Yonts, C.D., and Martin, D.L. 2008. Irrigation management for corn. NebGuide G1850. University of Nebraska-Lincoln Extension.

[2] Helsel, D.G. and Helsel, Z.R. 1993. Irrigating soybeans. Publication G4420. University of Missouri Extension. 140504060312

For additional agronomic information, please contact your local seed representative. **Individual results may vary,** and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. 140504060312 050916CAM