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Hoping for Rain: Crops at Mid-Season 2020

Emerson Nafziger

Department of Crop Sciences
University of Illinois

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While the record will show that planting progress for both corn and soybean crops in Illinois was close to normal in 2020, heavy rainfall in May and again in early June in some places this year led to some replanting, and some ponded areas don't have a stand. Stands are mostly good otherwise, but crop condition ratings in Illinois have been mediocre so far, with percent good + excellent percentage in the low 60s for both crops in early July. Conditions in states to the east of Illinois are no better, while crop conditions in states west and northwest of Illinois are mostly very good.

After wet soils earlier, the dry weather in June helped crops to establish and develop root systems. But in the parts of the state missed by rain in recent weeks, some fields are showing signs of lack of water as soils continue to dry out. The US drought map released on July 9 shows 20 percent of Illinois to be "abnormally dry," mostly centered around Peoria and with an area in southeastern Illinois. A small area of "moderate drought" now appears east of Peoria. Much of the rain that has fallen in recent weeks is from "popup" thunderstorms, which means that most places get none and a few small areas get a lot. While watching weather radar can help pass the time, watching as storms "just miss" may not be great for blood pressure or state of mind. As an example, three of the 17 WARM stations in Illinois reported rainfall on July 8, with amounts of 0.01, 0.02, and 0.04 inches.

Roots need to grow out into the soil to gain full access to the water in the soil, and late planting and soil compaction both decrease root growth. This can limit the amount of water taken up, even as leaf area increases along with the need for water. So we're seeing corn leaves curling in the afternoon in spots where soils are more compacted. Soybean leaves don't curl but they tend to wilt and take on a grayish cast when there's not enough water. We've had some reports of potassium deficiency in both crops, caused by restricted root growth.

Water loss by evaporation slows as the surface soil dries and also as the crop canopy develops to shade the soil and lower wind velocity at the surface. Once there's a canopy, water taken up by roots moves through the stem and out through the leaves as water vapor by the process of transpiration. The driving force for transpiration is "thirsty air" that acts to pull water vapor out of the leaves during the day though tiny openings called stomata. This helps to cool the leaves, and it allows carbon dioxide to move into the leaf to provide the starting material for photosynthesis. Water loss is the price the plant pays for taking in

carbon dioxide needed to form sugars using sunlight energy. As the crop reaches full canopy during late vegetative growth, the rate of water use by the crop reaches a maximum.

Water movement through the leaves increases as the canopy develops, and once corn is approaching tasseling, it can move as much water through the leaves as would evaporate from an open surface. So corn planted before mid-May that is now at or approaching pollination is moving as much as a quarter inch of water every day from the soil to the air. Water use rates increase as temperature, sunlight intensity, and wind speed increase: even with low wind speeds, use rates have been high in recent weeks. Low relative humidity increases water use rates as well, but on a warm, humid afternoon with RH numbers of 50 to 60%, water loss rates are still high, especially if it's breezy.

Many Illinois soils can hold 8 to 12 inches of plant-available water for the crop, as long as the crop has a good root system to take water up. But as water loss continues and soils dry, it gets increasingly difficult for the plant to take up water as fast as the crop uses it during the heat of the day. Stomata close at night, giving plants the chance to rehydrate. But as the water near the roots is taken up and as temperatures rise during the day, water uptake starts to lag behind crop demand for water, and we start to see stress symptoms develop. As water deeper in the soil begins to deplete, soil cracks will appear, caused by shrinkage of clay as the soil dries.

Predicting the effect of inadequate water on crop yields is not easy, especially as genetic selection in recent years has improved the ability of both corn and soybean to set good numbers of seeds even under stress. Many fields even in dry areas have good canopy color and look good in the morning, before transpiration starts to exceed the ability of the crop to take up enough water. Except perhaps in the driest areas, plants now at or approaching pollination should be able set good kernel numbers, thereby setting up good yield potential. Later-planted corn is likely to have more difficulty keeping photosynthetic rates high enough to maximize kernel set unless rain falls.

Soybeans are having difficulty in producing good canopy cover and good growth in dry areas. Plants in many fields are staying short, with leaves not expanding very fast. These fields haven't used as much soil water up to now as early-planted corn, so there's still soil water available, but root systems of stressed plants may not be able to reach this water very well. Warm days and nights have brought on flowering in many fields, but with limited node numbers now, flower numbers may not increase as quickly as they normally would.

Soybean plants need enough water to make good growth over the coming weeks in order to produce and retain enough pods to set up high yield potential. The podsetting process gets underway 15 to 20 days after flowers appear, and it lasts for several weeks. This means that that any improvement in conditions—lower temperatures and more rainfall—that takes place over the next few weeks can help to increase soybean yield potential. Soybean varieties bred for high yield tend to set pods aggressively, but if stress due to inadequate water last for several more weeks, more flowers will abort and fewer pods form than we need to produce yields like those in recent years.

High summertime temperatures—both daytime highs and nighttime lows—have a negative effect on corn yield in Illinois, while July rainfall is very beneficial. None of those factors is pointed in a positive direction at the moment, and if that continues, we can probably expect below-trendline yields. Illinois trendline corn yield for 2020 is about 190 bushels per acre, so yields can still be good, but it will take more rain to get us there, and sooner will be better than later. The extended period of pod formation during which soybean yield potential gets established means that the "day of reckoning" comes a little later for soybean than for corn.

Other than having crop insurance in place and running irrigation systems if that's an option, there is little we can do in terms of management to mitigate yield losses from dry weather. Check fields for mites and insects including corn aphids, and check for SCN damage in soybeans, even though there isn't much to do other than to note this for next time.

In recent years some have promoted foliar fungicide as a way to lower stress effects in both corn and soybean. While strobilurin fungicides can decrease respiration and increase net photosynthesis for a week or two after application, they don't increase yield consistently. They certainly won't counteract severe lack of water, and there's little evidence that they will pay their cost under moderate stress. They should be used for managing diseases, not stress. Some plant growth regulators and other products are

also sold as ways to counter stress. There is little evidence that any of these work, at least consistently, to do that.

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