farmdoc DAILY

Department of Agricultural and Consumer Economics, University of Illinois Urbana-Champaign

Weather and the 2020 Illinois Corn and Soybean Crops

Emerson Nafziger

Department of Crop Sciences
University of Illinois

August 6, 2020

***farmdoc daily* (10): 144**

Recommended citation format: Nafziger, E. "Weather and the 2020 Illinois Corn and Soybean Crops." *farmdoc daily* (10): 144, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, August 6, 2020.

Permalink: https://farmdocdaily.illinois.edu/2020/08/weather-and-the-2020-illinois-corn-and-soybean-crops.html

What a difference July rainfall makes. The U.S. Drought Map based on data through July 28 showed that only six percent of Illinois was rated as abnormally dry or with moderate drought, down from nearly 19 percent two weeks earlier. Above-normal rainfall over the past week in the southern half of Illinois will erase at least half that area, and with cooler weather this week, crop stress should be minimal during the first half of August, and probably longer than that in most places.

This change in fortunes related to weather showed up in the crop ratings for Illinois, which rebounded from around 60 percent good + excellent in mid-July for both corn and soybeans, to 76 percent for both crops on August 2. That's a big change, and ratings for both crops moved from below the national averages to a few percentage points above the national ratings.

Corn

The Illinois corn crop was planted close to normal time, with the exception of some late planting and replanting in areas that had heavy rains in May. Periods of dry weather in June helped the crop to establish its root system, but also caused some early stress. May temperatures were slightly below normal, but both June and July were warmer than normal. Growing degree-day (GDD) accumulations from May 1 through August 3 ranged from 1,840 (109 above normal) in northern Illinois to 1,923 (43 above normal) in central Illinois to 2,101 (32 above normal) in southern Illinois.

Warmer temperatures brought on rapid crop development, and the 50 percent silking date in 2020 was on July 14, three days later than the average of the previous five years. The weather was stressful in many areas during mid-July, raising concern about how successful pollination might be. See Dr. Bob Nielsen's recent article on pollination under stress for more on this topic. That concern hasn't gone away, and even though improved weather after pollination helped to limit kernel abortion, yields in some fields may be limited by having fewer kernels per acre than the crop would be able to fill. At 34,000 ears per acre and 80,000 kernels per bushel, it takes 471 kernels per ear (16 million kernels per acre) to end up with 200 bushels per acre. Under good filling conditions, fewer kernels per ear or per acre may get a little larger than normal. But filling more kernels is a more consistent path to high yield than having kernels get larger. Very high yields often come from fields with kernel counts of 20 million per acre or more.

Other than the lack of rain in many areas, the first weeks of July brought a lot of sunshine, and although both minimum and maximum temperatures averaged above normal, there weren't too many extreme temperatures. One week we'd like to "redo," though, was the week of July 4 to 11, where both minimum and maximum temperatures were 3 to 5 degrees above normal, there was little rain in most of Illinois, and on July 11, a large hailstorm over several counties in east central Illinois caused extensive crop damage. This storm also brought much-needed rainfall, though, and over the affected area, the liquid water helped more than the frozen water hurt. The weather pattern shifted in mid-July, and July rainfall ended up being near normal (3.85") in northern Illinois, about an inch above normal (5.10") in central Illinois, and about two inches above normal (6.38") in southern Illinois.

The return to wetter conditions, along with below-normal temperatures the first week of August, has had a dramatic effect on the corn crop. One very visible change is in crop canopy color, which has moved from sickly pale green in the drier areas to dark green in most fields now. Such deep green canopy color in early August is one of the best indicators we have that the crop is ready to go ahead to fill its kernels. Other than something that obliterates the leaf area—hail, hungry locusts, misplaced herbicide, or a fast-developing disease—there is little that can interrupt this process. Soil water supplies could still be an issue, but soils in many fields already have the 5 or so inches of water the crop needs to reach maturity. If temperatures return to normal, we can expect the crop to mature beginning in early September, on a normal schedule.

I've been using, with due caution, a weather model based on 38 years of Illinois crop and weather data, to get an indication of what Illinois corn yields might be. This model is developed in much the same way as the one for the U.S. that was discussed by Scott Irwin and Todd Hubbs in *farmdoc daily* last month. I ran the model during the second week of July, but decided not to talk about the numbers until we got through July. Using actual July weather, it predicts Illinois corn yields in 2020 to be slightly above trendline. Trendline yield for the entire state is 191 bushels per acre, ranging from 198 and 200 in northern and central Illinois, respectively, to 178 bushels per acre in southern Illinois. Models like this never perform perfectly, but even with some concern about how many kernels are filling, 2020 looks to be a good year for corn in Illinois.

Soybean

As I wrote in my July 9 article, the main effect of dry weather on soybeans before flowering was complete and podsetting began was short plants with canopies that weren't able to intercept all of the sunlight. While rainfall since then has improved canopy cover, plants in many fields are still shorter than normal. This might mean that they have fewer nodes than they would normally have by this time. Plants stop adding height and nodes during stage R5, when seeds develop and begin to fill. According to NASS, 52% of Illinois soybeans were setting pods by August 2. Except for early-planted and early-maturing soybeans, most plants setting pods now should be able to add another few nodes, pods at those nodes, and a little more leaf area. As much as humans are enjoying the cooler weather this week, higher temperatures would likely have been a little better for adding nodes and pods to soybean plants.

Soybean seed (pod) number per square foot or per acre is a critical factor in setting yield potential. The lowermost, and sometimes uppermost, nodes on the stems of normal-height soybeans typically have few pods, and shorter stems may have more pods on these nodes; that is, shorter stems do not always have fewer pods. Look at pod numbers on the upper few nodes: if there is a cluster of pods there, it means that the plant has partly compensated for lower pod numbers on nodes below that. The important number, at a given plant population, is number of pods (with seeds) per plant.

At 2,500 seeds per pound (150,000 seeds per bushel) and 3 plants per square foot (131,000 plants per acre), 1.15 seeds per plant is one bushel per acre. For a 65-bushel yield, that's about 75 seeds per plant, or, at 2.5 seeds per pod, 30 pods per plant. We can only get accurate pod numbers once there are no more new flowers at the top nodes, and new pods have elongated to an inch long or so. Pods can abort, but they typically don't do this very much once they have seeds starting to develop that can be felt through the pod wall.

The soybean canopy has benefitted greatly from the improved weather conditions. With the exception of hail-damaged or late-planted fields, we're starting to see the soybean canopy take on the "dark green blanket" look that we've come to associate with high yields. As is the case with corn, once soybean plants have set seed numbers, there is usually little threat to their ability to fill these seeds. The filling process

takes three weeks or so for individual seeds, but four to five weeks for a plant due to having a range of seed growth starting times on the plant. Defoliating insects and development of foliar diseases that inactivate leaf area are threats, but are not frequent occurrences. Fields still need to be scouted, though: soybean leaves will need to go “flat-out” to fill seeds over the next month, and loss of leaf area can have a direct effect on yield.

I don’t yet have a weather model for soybeans like the one mentioned above for corn. In a *farmdoc daily* article on July 23, Scott Irwin and Todd Hubbs showed two models that projected 2020 U.S. soybean yield to be above trendline. The crop condition ratings for soybean are slightly higher for Illinois than for the U.S., but that’s normal, and it’s not clear that this will translate to above-trendline yield for Illinois. The 2020 trendline yield for Illinois is 56.5 bushels per acre, and actual yield has been higher than that in three of the last five years. Even with the rocky start to the season, we hope for positive surprises in yields again in 2020.

This article first appeared in the UIUC Bulletin on August 5, 2020: https://farmdoc.illinois.edu/field-crop-production/weather-and-the-2020-illinois-corn-and-soybean-crops.html

References

Irwin, S. and T. Hubbs. "The Accuracy of Early Season Crop Weather Model Forecasts of the U.S. Average Soybean Yield." *farmdoc daily* (10):136, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, July 23, 2020.

Irwin, S. and T. Hubbs. "The Accuracy of Early Season Crop Weather Model Forecasts of the U.S. Average Corn Yield." *farmdoc daily* (10):131, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, July 16, 2020.

Nafziger, E. "Hoping for rain: crops at mid-season 2020." Department of Crop Sciences, University of Illinois at Urbana-Champaign, July 9, 2020.

Nielsen, R. L. “Kernel Set Scuttlebutt.” Corny News Network, Purdue University. August 2020. http://www.kingcorn.org/news/timeless/KernelSet.html