It’s June 15. A big weather system has just swept through Missouri last night and this morning, dropping between one and three inches of rain.

Much of the Missouri corn crop had to be re-planted due to cool and wet early-season conditions. The cool is gone, but the wet has remained. With warm soils, potential for nitrogen loss is considerably higher than it was in April, particularly on soils that don’t drain well.

My rule of thumb is that corn fields that receive a foot or more of precipitation in May and June are likely to experience yield loss due to N deficiency. Over the last 60 days, most of Missouri has received 10 or more inches. That puts nearly everyone in the ‘danger’ category. Barton, Vernon, Bates, Nodaway, Clark, Lewis, Marion, Ralls, Cooper, New Madrid, Pemiscot, and Dunklin are counties with the highest risk levels based on rainfall totals and row crop acreage. Although I will focus on corn, milo and cotton crops are also vulnerable to yield loss when N is lost.

Level of risk depends on nitrogen fertilizer management and soil properties as well as rainfall. The last two years, I’ve written a newsletter article with a Nitrogen Loss Scoresheet that gives some guidance as to risk levels associated with different N sources, timings, and soil textures. Here’s a link to last year’s version, which should still be useful this year:


Last year, nitrogen deficiency cost corn producers in Missouri and across the Midwest a pile of money. Based on aerial photos and windshield surveys in August, I estimated about 70 million bushels of potential corn production lost in Missouri, and about 460 million bushels across the corn belt. Here’s a pdf file (warning, 5 Mb) about nitrogen loss and yield loss across the Midwest last year: http://plantsci.missouri.edu/nutrientmanagement/nitrogen/scharf%20N%20loss%202008.pdf

This yield loss could have been prevented using rescue applications of nitrogen fertilizer. The acreage needing rescue N last year was so great that logistics of application equipment and fertilizer delivery would have created bottlenecks. However, the biggest limitation was the mindset of producers: Being unsure about the need for additional N and the potential for yield response.

My experience with N timing experiments and rescue N applications to production fields is that full or nearly full yield can be achieved if rescue N is applied by the time the corn tassels. Limited information suggests that

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By Peter Scharf

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else is based off of this yardstick. In a wet year, even this area can lose so much N that it is no longer fully green at the time of sidedressing. We have not seen that so far this year, but have seen some reference areas with severe stand loss. In past years, when we’ve had poor reference areas (applied too late, not marked, leaf burn, atypical area of field) we’ve lost money with the sensors. When we’ve had good reference areas, we’ve made money.

One problem that we ran into in a booth demo several years ago resulted from starting the field in the evening and finishing in the morning. The value for the high-N reference was not re-checked. When we made the application rate map, there was a sharp line where N rate dropped off from evening to morning. There was a heavy dew that morning which apparently changed the sensor readings. We later confirmed this in experiments where we measured the change in sensor values as dew dried off the leaves, or as we sprayed water on the leaves. Re-checking the reading of the high-N reference area before starting to apply in the morning almost certainly would have solved this problem.

Followup research has showed that sensor readings change even when leaf wetness does not change. We are not sure why. Our current recommendation is that a high-N reference area should be measured at least every two hours while sidedressing. The Greenseeker brand of sensors, which is currently the most widely available sensor for sidedressing N, is especially changeable, possibly due to temperature sensitivity. With this sensor, we recommend checking the high-N area hourly if possible.

One approach we’ve come up with for re-checking the appearance of high-N corn is to apply a high rate of N crosswise to the corn rows. Then we cross this high-N strip every time we drive the length of the field. We program in its location, and our system automatically checks it every time we drive across. This will take care of any drift in sensor readings due to a rain shower, dew drying, leaf rolling or wilting, temperature effects, and so on.

Greenseeker sensors can be purchased in sets of 4 (about $18,500) or 6 (about $22,500). The 4-sensor setup is intended for applicators with narrower swaths. I’m not convinced that even four sensors are needed, much less six. The research that I’ve seen suggests to me that three sensors is probably the point of diminishing return, and we use three in all of our field demos. Greenseeker has recently been acquired by Trimble, which should give them some stability and product synergy. Sidedressing is a lot less work with autosteer, although my experience this year is that autosteer is not always good enough to keep the sensors directly over the corn rows.

Ag Leader is beta-testing sensors this year that were designed by Holland Scientific and plans a full release for 2010 if all goes well. They are re-designing their InSight field monitor to add the capability to receive sensor inputs and calculate N rates. This is a brand-new sensor design and in my opinion they need a better understanding of how it reacts when it moves from N-sufficient to N-stressed corn before their rate recommendations can be considered reliable. Nonetheless, my previous experience with Holland Scientific sensors is that they work well and are stable. I think the odds are good that the Ag Leader sensors will develop into an excellent product. I haven’t heard anything about their pricing plans, but individual sensors of an earlier model sell for about $2500 each (including cables etc.) from Holland Scientific.

AGCO is also looking to enter the North American N sensor market with a European sensor that has been re-engineered by Toshiba. I do not know what launch timing, pricing, or bundling are planned for this product.

Interest in sensor-controlled sidedressing is growing among both producers and companies. The sidedressing aspect is an obstacle to many corn producers, but if we get more years with massive N loss like 2008, they will start to find ways to make it work. And the opportunity to diagnose and apply the correct rate is appealing to them.

Links to Powerpoint presentations about our on-farm demonstrations of sensor-based sidedressing for corn and cotton can be found at the bottom of this web page: http://plantsci.missouri.edu/nutrientmanagement/nitrogen/rate.htm

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even up to two weeks after tasseling, N-stressed corn will give a profitable yield response.

The question of whether more N is needed is tougher. My opinion is that aerial photos are the quickest and most accurate way to pinpoint where additional N is needed. We will be working with Agrivision to deliver a service called NVision to producers this year to acquire aerial photos and turn them into maps of estimated yield loss due to N deficiency. In fields where estimated yield loss justifies a rescue treatment, we will also provide variable-rate N application maps to correct the deficiencies. Nitrogen loss is nearly always patchy in a field, depending on where water runs and sits, and variable-rate applications handle this much better than putting the same rate over the whole field. For more information on this service, call David Hughes at (573) 682-7194 or Aubrey Martin at (660) 259-2020.

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