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Fall fertilizer considerations in 2019

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The high number of prevented-planting fields in some areas, the late start to harvest, and the inability to apply P and K fertilizer as planned last fall or this past spring combine to raise a number of questions about fall application of P, K, and lime over the next few months.

Prevented-planting Fields

If P and K fertilizers were applied last fall or this past spring but no crop could be planted, there's no reason not to count all of the applied P and K as available for the 2020 crop. The same goes for any lime applied over the past 12 months. Any nitrogen (N) that was applied with MAP or DAP is likely no longer available, and shouldn't be counted in the 2020 supply.

If the plan was to sample soil last fall or this spring to determine how much P, K, and lime to apply but that didn't get done, these fields can be sampled now in preparation for fall or spring application. If the plan was to sample after the 2020 crop, there's no reason to move that up to this fall; these nutrients didn't (and won't) go anywhere. By the same token, there's no reason not to apply after two years based on estimated removal using the same P and K rates set to be applied a year ago. Unless a cover crop has been or will be harvested from a prevented-planting field this fall, removal will be zero.

Our most recent numbers to use for estimating P and K removal (see the Bulletin article with details) are 0.37 lb P_2O_5 and 0.24 lb K_2O per bushel of corn and 0.75 lb P_2O_5 and 1.17 lb K_2O per bushel of soybean.

We mentioned last spring the concern about the "fallow syndrome" that's been associated with having no crop in a field for an entire growing season. This problem, which appears as a phosphorus deficiency, has been more commonly seen in fields or parts of fields where water has stood for much of the season; it was reported in the Mississippi River bottomlands in 1994 following the flood of 1993, when water stood on parts of fields through much of the summer. If weeds or cover crops grew on prevented-planting fields for most of this summer, especially in August and September, the crop-friendly fungi (VA mycorrhizae, or VAM) that prevent this problem likely are still present, and there's no cause for concern.

In low-lying spots where water stood into mid-summer, and in fields kept weed-free through the summer by tillage or herbicide, we can't rule out a possible problem due to loss of VAM. There are commercial preparations of VAM that can be applied in-furrow to inoculate corn next spring. In most cases, it will be

enough to make sure there's adequate P close the seed so the crop can take it up as growth begin, after which VAM will start to regrow in the roots of the new crop. Growing a cover crop this fall will restart VAM growth this fall, and should rule out the need for any additional steps next spring.

A year without a crop is used deliberately in some dry regions to store water for the next crop, but is a novelty for most Illinois fields. So we don't have much research to help predict what this might mean for the next crop: is "fallow" in 2019 more like soybean or more like corn in its effect on the 2020 crop? We think the answer is "neither" – that 2019 will instead be an "amnesty" year, in which any effects of the 2018 crop got canceled or at least minimized, leaving open the choice of crop in 2020. Wheat planted this fall can be expected to do well on fields where neither corn nor soybean grew in 2019, as long as we get rid of plants that can serve as a reservoir of insect-vectored diseases (see the Bulletin article on this), take care not to plant too early, and provide enough P for the crop.

The extent to which weeds or cover crops grew and matured might influence how having no crop this year might affect next year's crop. Any addition to the weed seed supply could complicate weed control going forward. Large quantities of mature (high-carbon, low nitrogen) residue produced this year may act much like corn crop residue, increasing the N requirement for a 2020 corn crop. Because weed or cover crop growth requires soil water, there may be a little less stored soil water next spring in fields where there was a lot of growth this year. But most fields that didn't grow a crop this year are likely to have more water stored in the soil now, and should also have more mineralized N, both because less N was taken up by a crop, and because there is less residue whose breakdown ties up N. These increases may well diminish by next spring, but they still might be helpful to next year's crop, whether that's corn or soybean. In using the N rate calculator to set corn N rates in fields with no crop and minimal weed or cover crop growth this year, I suggest choosing soybean as the previous crop; in fact, with no removal of mineralized N from the soil by soybean this year, it might be appropriate to also set N rates for next year's corn crop a little lower (within the MRTN range) than usual. In fields with a lot of residue present now, it might be more appropriate to select "corn" as the previous crop when using the calculator.

Fields with a Crop in 2019

If neither soil sampling nor P and K application could be done as planned for the 2019 crop, the yield-based estimate of nutrient removal by this year's crop can be added to the estimate of removal by crops grown since the last application. The urgency of the need to apply "catch-up" P and K depends on soil test levels the last time the field was sampled: if P and K levels are already high, there's less concern about yield loss even if 2019 ends up being a "skipped" year of replacement. Yields in some fields will also not be as high in 2019 as they were in 2018, meaning less nutrient removal. But any of the immobile nutrients like P and K that were removed with harvest of any crop will need to be replaced at some point if soil test levels are to be maintained.

Other than less nutrient uptake in fields where yields are lower than expected this season, soil sampling and nutrient management can continue as usual in fields where a crop was grown this year. In the drier parts of Illinois, late-planted crops took up water (and matured or will mature) later than normal, although the total amount of water taken up is less where yields are lower. Where it's dry enough to make it difficult to get a soil probe to the proper depth, we can expect soil samples to show more variability than usual, especially in K test levels. This is due both to variable depth of samples and to the effect of dry soils on K extractability. Samples taken from dry soils often show lower than expect soil test K levels because K cations get trapped in clay lattices. Test levels of pH and P are less affected than the K test by soil moisture before and during sampling. Dry soils are rare in the spring, and so soil test levels, especially of K, are more consistent when measured on samples taken in the spring.

Fertilizer Application

Soils are currently dry enough to allow application of dry fertilizer materials over much of Illinois, but slow harvest progress so far—13% of corn and 11% of soybeans were harvested in Illinois by October 6—will slow the start to application of phosphorus and potassium fertilizers, and lime. The development of wet conditions could slow both harvest and fertilizer application that follows harvest, but soils in the drier parts of Illinois can take in an inch or two of rainfall without turning muddy or forcing much delay. Most people are anxious to start applying fertilizer after the delays and frustration in getting this done over the past year.

There has been a considerable amount of discussion about whether or not placing P fertilizer beneath the soil surface is a sound practice. The main reason for doing this is to keep the P in MAP or DAP, which is highly soluble, from dissolving and running down slopes and into streams in the event of heavy rain. How much of this might occur is affected by slope, permeability of the surface soil, how dry the soil is, how much crop residue is present, and the intensity of rainfall. Soils following soybean harvest are generally more permeable than following corn harvest, but corn leaves more residue. Tillage increases surface permeability, but also loosens soil to make it move more readily with runoff water. Drier soils can take in more water before runoff begins than can wet soils.

October and November are drier months, on average, than spring months; crops growing into the fall extract a significant amount of water from the soil thus leaving it drier; and high-intensity rainfall events are less likely in the fall. So overall, chances of getting high-loss conditions are lower in the fall than in the spring, but they aren't zero. Surface-applied P will move into the soil under normal weather conditions, and will end up safe from direct loss (it can still move if soil runs off the field) by December. Most research has shown no yield benefit to subsurface placement of P and K in the fall compared to broadcast, and the added cost of subsurface placement will mean little or no return from this practice in most years and on most fields. In strip-till systems, however, where subsurface placement doesn't add to the amount of surface soil disturbance, applying P and K beneath the strip while strip-tilling in the fall may be a cost-effective way to apply these nutrients.

Although we've found that the N in DAP tends to be available to the next year's crop if DAP is applied after soils cool down to 50 degrees, applying MAP or DAP when soils are warm will allow much of the ammonium from these materials to convert to nitrate in the fall; once it's nitrate it can move down with water into and through the soil, including to tile lines if there's a lot of rainfall. Even if the N doesn't move too far down in the soil in the fall before the soil freezes, it will have a head start when water begins to move through the soil in the spring. There can also be direct movement of ammonium (along with P) in surface runoff during heavy rainfall before the MAP or DAP has had a chance to dissolve and move into the soil.

While it may not be practical to hold off on applying MAP or DAP until soil temperatures fall to below 50 degrees, we should recognize that even though the amount of N in these fertilizers is relatively small, it can add appreciably to the N that moves to surface waters through drainage tile. One solution that has been suggested is to switch from using MAP/DAP as the P source to using triple-super-phosphate (TSP, 0-46-0) which contains no N. If TSP is available at about the same cost per pound of P as MAP or DAP, it would be a good source to use, especially for applications made before mid-October. The "free" N that comes with MAP or DAP is more likely to reach tile lines than the roots of next year's corn crop if it's applied when soils are warm in the fall. If application is made after soil temperatures reach 50 degrees or is delayed until next spring, the N in MAP or DAP will contribute to the N supply for next year's crop.

This article is modified slightly from the version that first appeared in the U of I Bulletin on September 27, 2019: http://bulletin.ipm.illinois.edu/?p=4890.

References

Corn Nitrogen Rate Calculator. Iowa State University Agronomy Extension and Outreach. http://cnrc.agron.iastate.edu/

Kleczewski, N. "Tips for small grain planting in an odd 2019 field season." *Bulletin*, Integrated Pest Management, Department of Crop Sciences, University of Illinois, September 14, 2019. http://bulletin.ipm.illinois.edu/?p=4887