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Can I skip P Fertilizer? Greg LaBarge

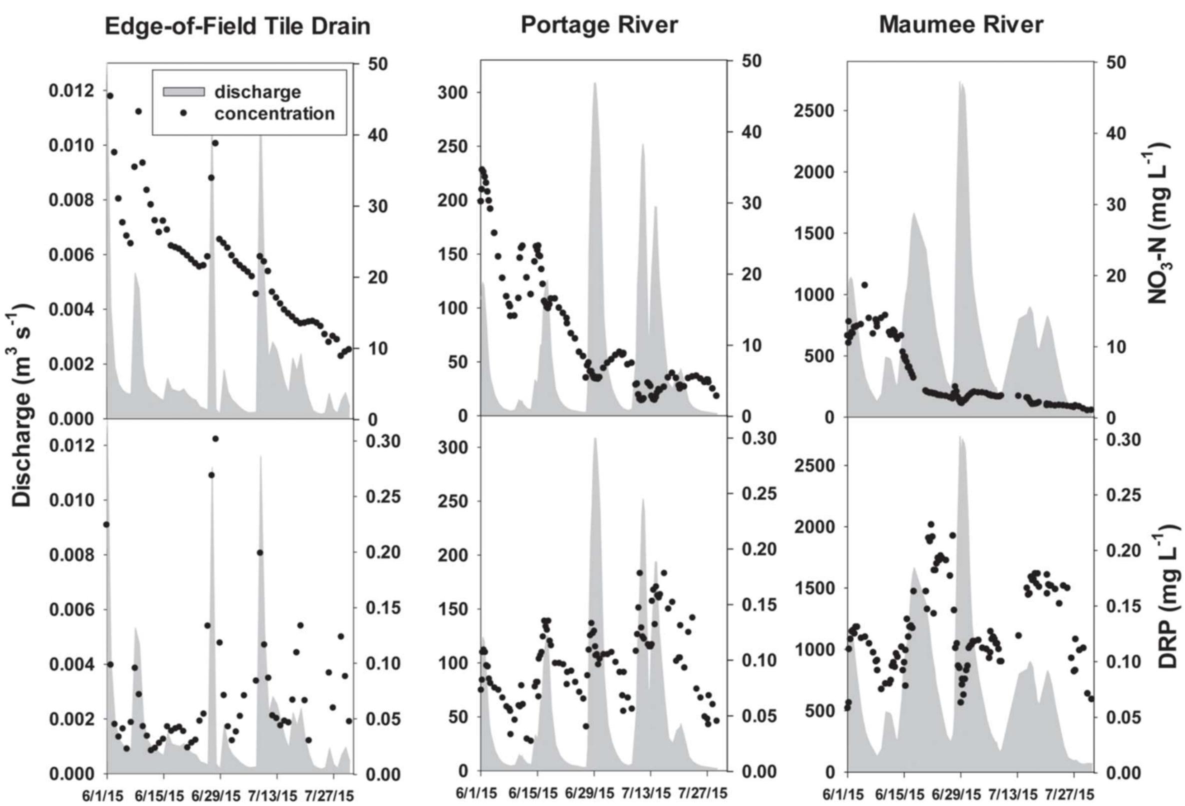
A spike in phosphorus fertilizer prices, along with lower corn prices, has resulted in a P: Corn price ratio at a historic high. If you use the build-maintain-fertilization strategy, this should be a year to use the past buildup rather than a new application. I hear two common concerns about not applying fertilizer. One question is, "If I do not apply fertilizer, will the crop run short?" The other question is, "How fast will my soil test drop?" Here is some information in response to these two questions.

Let's start with "If I do not apply fertilizer, will the crop run short?" A key principle to know is that soil stores phosphorus (P), and this stored source becomes plant-available at a steady pace throughout the growing season. The soil's capacity to release P is what we measure in a soil test. Water quality, plant tissue tests, and P fertilizer response data indicate that soil-stored P is released into solution and is capable of supplying P in the absence of applied fertilizer.

In water quality tracking, the soluble P measured in tile leaves the field at a similar concentration with each new drainage event. The soluble P found in the tile is the same P that is present in the soil and is used by the crop. The drainage is just moving the soil-soluble P out of the tile. The observation that soluble P recovers in each drainage event also means that it was initially in the soil to feed the crop before excess moisture was drained from the field.

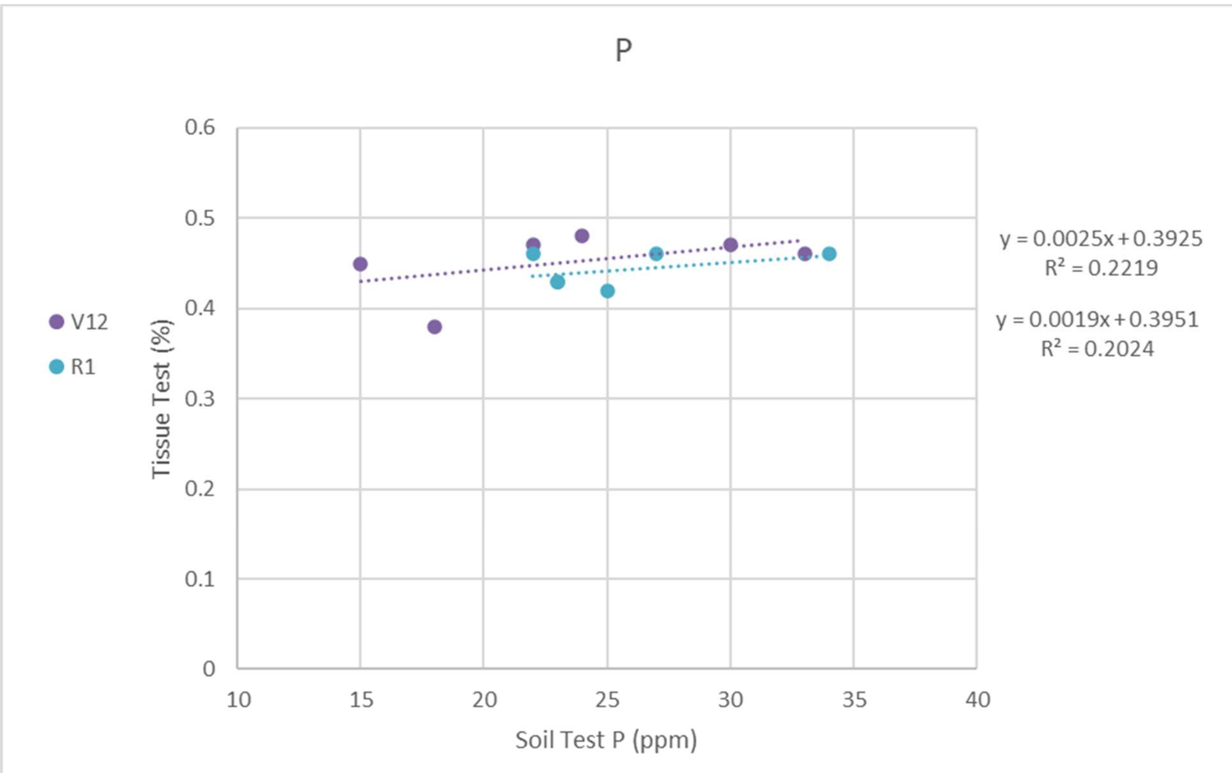
N and P loss from tile water on a 45-acre field to two watersheds, the Portage (272,000 acres) and Maumee (3,953,686 acres) for the period June and July of 2015. The last P application was made to the 80-acre field in the fall of 2014. Data shown in Figure 1.

Figure 1. Daily water discharge and nutrient concentration for (nitrate [NO3–N] and dissolved reactive phosphorus [DRP]) concentrations across three spatial scales for the period 1 June to 31 July 2015. (Source: J. Environ. Qual. 46:466–469 (2017) doi:10.2134/jeq2016.11.0434)



Tissue test results help us see plant uptake. In 2025, at the Molly Caren Agricultural Research Center in London, OH, we had several fields where no P was applied. We identified field areas with STP of 15, 18, 22, 22, 22, 24, 30, and 33. At corn growth stage R1, ear leaf samples were collected from these different STP soil test areas. The sufficiency range for P is 0.3% to 0.5%. The lowest result was 0.38% from the 15 PPM area, well within the sufficiency range. All the soil test levels provided adequate phosphorus (P) to meet the crop needs, as indicated by the tissue test. Data for V12 and R 1 shown in Figure 2.

Figure 2. Tissue test results from field sites with different Soil Test P levels at corn growth stages V12 and R1 for 2025 at Molly Carne Agricultural Center.



Ultimately, the yield response to fertilizer application pays the fertilizer bill. Table 1 shows P fertilizer response trials conducted in the state at on-farm and research station sites. When the soil test P level is greater than the Tri-State Fertilizer Recommendation "Critical Level" of 20 PPM, 13% or 32 of 245 trials showed a response to P fertilizer. For the 13% responsive trials, the relative yield increase was 2%. The lack of yield response to fertilizer application indicates that soil-stored P can meet crop needs by maintaining plant-available P throughout the growing season.

The other STP levels shown in Table 1 are below the Tri-State "Critical Level". As STP continues to decrease, the percentage of responsive trials increases, along with the percentage of yield added.

Table 1. Summary of P fertilizer trials on Ohio corn, soybean, and wheat. (Source: https://ohioline.osu.edu/factsheet/anr-0146)

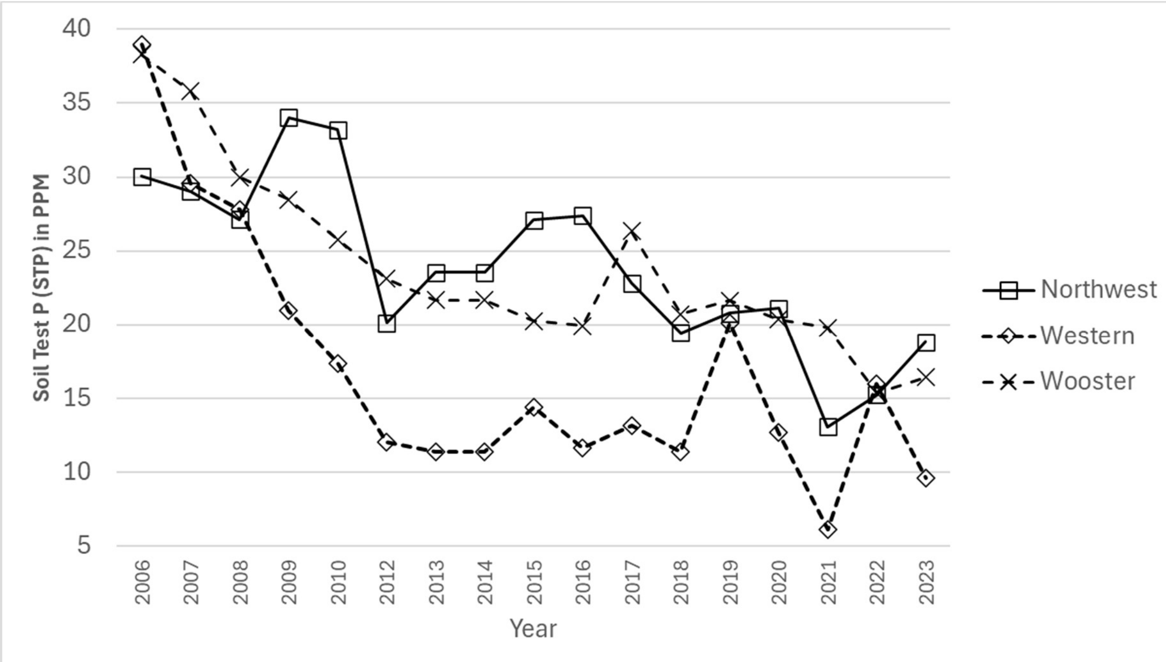
Mehlich 3 Soil Test Range	# Trials	% of trials that responded to added P Fertilizer	Change in Median Relative Yield
>20	245	13	+2 %
10–20	164	34	+7 %
<10	30	67	+13 %

Another concern I hear is that without fertilizer, my soil test will drop. There is no doubt that soil test P will drop as we continue to harvest grain and forage. More P is pulled out of the soil, and the soil test will decline. But that decline does not happen quickly. The rate of decline is influenced by soil type.

We have a long-term P & K study where no P has been applied since 2005 at our three research stations. The stations are Northwest (near Bowling Green), Western (near Springfield), and Wooster (near Wooster).

Our experience at those three sites shows that soil tests starting at an average STP of 36 ppm declined to the critical 20 ppm level at different rates. The fastest decline was at Springfield, where, after five crop harvests, the STP dropped to 17 ppm, dropping at a rate of 4 ppm/year. Both Bowling Green and Wooster took 16-17 crop years to drop below 20 ppm, with a one ppm decrease in STP per year.

Figure 3. Change in Soil Test P levels at three Ohio sites with no fertilizer additions from 2005 to 2023.



Your soil test results, along with the information in this article, can help answer our two common questions about fertilizer needs and changes in STP for your farm. If you want more details on the information, use https://go.osu.edu/presponse