Phosphorus Application

Management tools that help in creating a phosphorus management plan.

Interpretation of soil tests and phosphorus (P) values.

Soil testing is the best tool producers have to ensure the profitability of their P fertilization program. Producers should apply P to maximize profit, not yield.

Soil test data can be used to manage P application rates and profitability. Soil testing can also help producers control the negative impacts of P on water quality.

Several soil P tests (Bray P_1, Mehlich-3, or Olsen) are recommended in Iowa. These tests estimate plant-available P, which is influenced by soil characteristics such as the type of minerals, soil pH, conditions for root growth, and water holding capacity.

Since most P applied to undisturbed soil remains within about two inches from the application point, managing P for crop availability requires understanding and implementing practices such as soil sampling depth, fertilizer placement, and time of application.

Soil test values are an index and indicate the relative P availability to crops during a growing season.

One of the most useful soil test values is the critical concentration of P—that value above which there is a low probability of response to fertilization and below which the crops likely will respond to fertilization.

The goal of soil test interpretation should be to maintain plant available nutrients at a level where yield is not limited by shortage of nutrients. But, apply P to maximize profits rather than yield.

Key Points

- Interpretation of soil tests and phosphorus (P) values.
- Using P fertilizers—a question of economics and environmental stewardship.
- Determine what sound P practices to use in your operation.
- There is no economic gain for P application over 20 ppm—use a P strategy that optimizes your inputs.

All soil tests are constantly calibrated against crop responses to nutrient applications. Soil test P interpretations are constantly evaluated for accuracy, and fertilizer recommendations are adjusted to reflect current data.

The amount of P extracted changes between methods, and a soil test value is meaningless without a correlation with crop response.

Also, the meaning of soil test values may change with the introduction of new crops, new hybrids and varieties, or new management practices.

Using P fertilizers—a question of economics and environmental stewardship.

Many soils have soil P levels built-up to optimum levels for crop production, with some that are built-up to levels much higher than optimum. All research indicates that increasing soil P to very high levels increases the risk of P loss to water resources. The way in which P is managed now has the potential to change the way producers manage P in their soil in the future.

Other factors influence P loss to water bodies, including soil texture and pH, erosion, timing and rate of P application, tillage, and crop residue on the soil surface.

Determine what sound P practices to use in your operation.

To limit P losses, consider injection or banding fertilizer P and manure into the soil, avoid excessively high P application rates, use crop residue management practices that reduce sediment losses and increase water infiltration into the soil.

Most Iowa producers apply P fertilizer (or manure P) for their corn-soybean rotation once every two years. The properties of most Iowa soils allow producers to apply P in one application for up to two crops in a rotation without limiting effectiveness.

When managing P application, producers should weigh several factors: fertilizer and manure P reactions in soils, the P needs of the crops, application costs, and cash availability. Use reasonable yield potential estimates.

Also, compare the advantages of broadcasting (a popular, low-cost P application method) to the advantages of subsurface band application in your operation.

Subsurface band application could offer some advantage to no-till or ridge-till operators and may increase yields, reduce the optimum P rate under some conditions, increase plant uptake in soils with unusually high capacity to fix P or when root growth is restricted by unfavorable weather or soil conditions.

There is no economic gain for P application over 20 parts per million (ppm)—use a P strategy that optimizes your inputs.

Research shows that there is infrequent yield response to P values over 20 ppm. If soil test values for P are 20 ppm (or above) consider maintenance strategies or a no-application approach to P fertilization.

Summary

Producers who want to carefully manage P in their operations have many tools available to them. By learning more about application methods, soil management, and the potential impact of P management on water quality, producers can improve their bottom line by fully utilizing P resources and limiting P loss to surface water.

Best Management Practices, or BMPs, utilize the most effective and practical means available to reduce or prevent water pollution from farm operations. BMPs are selected based on assessment, analysis of the impact of alternative practices and their economic considerations. They are implemented using current available technologies, management skills and available resources. BMP information sheets available from ISU Extension include:

NMEP 1, *Soil Testing*
NMEP 2, *Phosphorus Application*
NMEP 3, *Manure Resources*
NMEP 4, *Residue Management*
NMEP 5, *Crop Rotation*
NMEP 6, *Crop Yields*

NMEP 7, *Nitrogen Application*
NMEP 8, *Nutrient Management Plan*
NMEP 9, *Equipment Calibration*
NMEP 10, *Conservation Reserve Program*
NMEP 11, *Conservation Practices*

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