

10-23-2000

## Management of phosphorus for crop production

Antonio P. Mallarino

*Iowa State University*, [apmallar@iastate.edu](mailto:apmallar@iastate.edu)

John E. Sawyer

*Iowa State University*, [jsawyer@iastate.edu](mailto:jsawyer@iastate.edu)

John Creswell

*Iowa State University*, [creswell@iastate.edu](mailto:creswell@iastate.edu)

Michael J. Tidman

*Iowa State University*

Follow this and additional works at: <http://lib.dr.iastate.edu/cropnews>

 Part of the [Agricultural Science Commons](#), [Agriculture Commons](#), and the [Agronomy and Crop Sciences Commons](#)

---

### Recommended Citation

Mallarino, Antonio P.; Sawyer, John E.; Creswell, John; and Tidman, Michael J., "Management of phosphorus for crop production" (2000). *Integrated Crop Management News*. 2083.

<http://lib.dr.iastate.edu/cropnews/2083>

**The Iowa State University Digital Repository provides access to Integrated Crop Management News for historical purposes only. Users are hereby notified that the content may be inaccurate, out of date, incomplete and/or may not meet the needs and requirements of the user. Users should make their own assessment of the information and whether it is suitable for their intended purpose. For current information on integrated crop management from Iowa State University Extension and Outreach, please visit <https://crops.extension.iastate.edu/>.**

---

# Management of phosphorus for crop production

## **Abstract**

This article continues a series that provides producers with information that will aid in phosphorus (P) management and in understanding environmental issues related to P management. It focuses on P management for crop production with attention to fertilization strategies, application methods, related soil management aspects, and environmental issues.

## **Keywords**

Agronomy

## **Disciplines**

Agricultural Science | Agriculture | Agronomy and Crop Sciences



## Management of phosphorus for crop production

This article continues a series that provides producers with information that will aid in phosphorus (P) management and in understanding environmental issues related to P management. It focuses on P management for crop production with attention to fertilization strategies, application methods, related soil management aspects, and environmental issues.

### Fertilizer and manure application for crop production

A previous ICM newsletter article ([Soil testing and available phosphorus](#) [1], September 18, 2000, pages 164-166) discussed how soil testing is used to arrive at optimal P application rates. Producers have to make additional decisions concerning the method and timing of application, with consideration given to P removal in harvested crops, the overall P needs of a crop rotation, costs of products, application charges, crop prices, and potential impacts on water quality.

At any one application producers may apply P fertilizer (or manure P) needed for one or more crops in a rotation. Decisions regarding the frequency of application should consider fertilizer and manure P reactions in soils, P needs of crops, application costs, and cash availability. The properties of most Iowa soils allow for a single fertilizer or manure application to be successful for up to two crops in a rotation. Most Iowa farmers apply the P needed for the corn-soybean rotation once. The efficiency of applied P with this practice is similar to that of annual applications if the needs of the two crops are considered and the application method is such that P losses with erosion or water runoff are minimized. This practice also reduces application costs. Producers should use proven yields for the crops involved, especially when only maintenance fertilization is needed. The 2-year application also adapts well to a 2- or 4-year soil testing program. Most soil testing laboratories provide 1- or 2-year fertilization recommendations.

### Fertilizer and manure application methods

Broadcasting is a popular and low-cost method for applying P fertilizers and manure. A subsurface band application theoretically could further increase yield of row crops (specifically corn) or reduce the optimum P rate under some conditions. Concentrating P in bands could increase plant uptake in soils with unusually high capacity to fix P and when root growth is restricted by unfavorable weather or soil conditions. Particularly with no-till or ridge-till management, deep banding also could enhance P uptake and yield compared with broadcast or shallow banding with the planter when the soil surface layer becomes drier (because broadcast P tends to accumulate near the soil surface).

Iowa research has shown, however, that in most situations any yield advantage from P banding does not offset increased application costs. Banded P often results in accelerated early growth and development, but yield levels remain comparable with the broadcast method. An update of recent deep-band and planter-band research was published in the September 18, 2000, ICM newsletter article *Corn and soybean responses to deep-band phosphorus and potassium*, pages 166-168. This result is explained by a moderate or low P-fixing capacity of most Iowa soils, favorable moisture and physical soil conditions for root growth in Iowa compared with other regions of the country, and few low-testing soils.

Still, Iowa producers could consider banding all or part of the P in some situations. For example, in fields with extremely deficient soil P (Bray-1 soil P less than approximately 5 ppm), a combination of broadcast and band fertilization should be more cost-effective. Also, the producers' cash availability may not allow for application of the recommended optimum rate, and banding can be more effective when suboptimal P rates are used. Also consider banding for no-till or ridge-till corn (banded preplant or as part of a starter mixture) in low-testing soils and when suboptimal preplant P rates are used, or when there is very high residue cover and in unusually cold and wet soils. Finally, producers may consider deep-banding or injecting P fertilizer or manure for other specific soil, crop, and nutrient management practices.

## **Phosphorus deep placement in relation to tillage and the environment**

Producers should consider deep placement of P fertilizers or manure in two situations. The first situation relates to fertilizer placement for reduced tillage systems. Although research shows no major crop yield advantage of deep P placement over the less costly broadcast P placement, no-till and ridge-till corn and soybean may benefit from deep potassium placement. Moreover, no-till corn may benefit from fall strip tillage in some situations, as was discussed in the September 18, 2000, and August 21, 2000, ICM newsletter articles. Producers may save in application costs by deep banding or injecting P and K together and, occasionally, an increase in corn early growth due to banded P may translate into higher grain yields and other benefits such as faster soil coverage and enhanced weed control.

The second situation relates to environmental considerations. The risk of P and nitrogen (N) losses from fields to surface waters with soil erosion and water runoff is markedly reduced when fertilizers or manure are incorporated or injected into the soil. Also, incorporation or injection reduces N losses through ammonia volatilization. Thus (especially with manure and in no-till fields), producers may help protect water quality and may increase nutrient use efficiency by deep-banding or injecting fertilizers and manure.

## **Summary**

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

This article originally appeared on pages 182-183 of the IC-484(23) -- October 23, 2000 issue.

---

### **Source URL:**

<http://www.ipm.iastate.edu/ipm/icm//ipm/icm/2000/10-23-2000/pmanagement.html>

**Links:**

[1] <http://www.ipm.iastate.edu/ipm/icm/2000/9-18-2000/availablep.html>

IOWA STATE UNIVERSITY  
University Extension