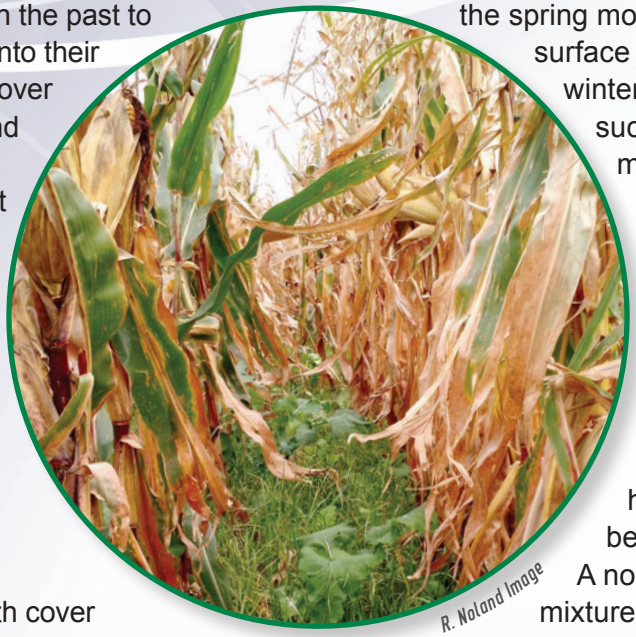
PLANT NUTRITION TODAY

2018 ISSUE 4, NO. 5

# NUTRIENT MANAGEMENT FOR SUCCESSFUL COVER CROPS

**Dr. Heidi Peterson**
Director, Phosphorus Program
**hpeterson@ipni.net**

Cover crop implementation has been promoted for several decades as a method to improve soil and water quality. Although producers have been reluctant in the past to integrate them into their management, cover crops have found their way back into more recent discussions as a strategy for meeting nutrient loss reduction goals. To overcome some of the past agronomic obstacles encountered with cover crop implementation, it is important to first consider crop nutrition.



R. Noland Image

Cover crops can improve the soil's biological, chemical, and physical properties. Many of these properties also impact crop nutrient management; therefore, cover crop adoption decisions must be integrated into conversations with your nutrient adviser.

### *What cover crop species do I use?*

Cover crops can improve soil infiltration, aggregation, porosity, and water-holding capacity. Improved soil structure and porosity supports proper root growth and development, which affects the plant's ability to access nutrients in the soil profile, especially those with low mobility, such as phosphorus (P). Your cover crop selection should depend on the benefit you want to achieve. For example, if the goal is to reduce the risk for nitrogen (N) and P runoff during the spring months when the surface soils are bare, a winter-hardy species, such as winter rye, may be the best option (Noland et al., 2018). If biological N fixation to reduce N inputs is desired, then a legume crop like red clover or hairy vetch may be the better choice. A non-winter hardy mixture selected for weed or pest suppression may include a brassica like tillage radish, mustard, or forage turnips, together with field peas and oats. Although this mixture or similar may require less termination effort and fewer field passes when planted in cooler climates, these varieties are not the best at assimilating and retaining the N since they begin to decompose in the winter months, releasing the recovered nutrients.

*The northern portion of the Corn Belt region experiences shorter planting and harvesting windows, which limits successful cover crop establishment opportunities in traditional corn grain systems.*

**PLANT NUTRITION TODAY** is a monthly publication of compiled scientific information developed by the International Plant Nutrition Institute (IPNI). Website: http://www.ipni.net/pnt

*“Cover crop adoption decisions must be integrated into conversations with your nutrient adviser.”*

### *How do cover crops affect soil fertility?*

Nutrient availability and timing from residue decomposition will depend on cover crop species, establishment success, termination timing, tillage, and weather. As the organic matter and residues are decomposed by soil microbial activity, chelation can occur, which can increase the solubility and plant uptake of some metal micronutrients such as iron, manganese, and zinc. The presence of chelated forms changes the relative availabilities among both macro and micro nutrients, and thus has an impact on balanced nutrition.

There has been successful research exploring the potential for cover crops to increase P solubility in tropical soils with low P availability. Soil microbes increase nutrient cycling by breaking down the residues to produce organic P compounds that mineralize to supply solution P; however, longer-term research is still needed to gather more conclusive results (Teles et al., 2017). When non-winter hardy cover crops are implemented in northern climates, it will be important to consider the potential fate of soluble P released as the plants decompose, and whether it poses a risk of P loss in surface runoff.

Sub-surface fertilizer placement may be an effective strategy to reduce dissolved nutrient losses where cover crops have not been effective in reducing surface runoff, especially during intense precipitation or rapid snowmelt events. Sub-surface placement may also minimize the potential for nutrient stratification in no-till, cover crop systems.

Non-legume cover crops will scavenge the available N, but it is important to consider the timing of its release during decomposition and when it is made available to the annual crop. Crops with a high C:N ratio may immobilize soil N, increasing the amount of fertilizer required to maintain the productivity of subsequent crops; whereas, early spring or winter termination may result in a lower C:N ratio and faster release of the N assimilated by the cover crop. Terminating cover crops when they are in their vegetative stage will generally increase plant available N within a month of termination. When incorporated, N mineralization and release will occur more rapidly.

When winter-hardy cover crops are implemented, properly timing the spring termination can improve N recovery and use efficiency. For example, if a N-fixing legume is terminated too early in the spring, the N-fixing benefit is not achieved. Interseeding legumes into standing cash crops at the V5 to V7 development stage, which can be coordinated with N-sidedressing, will allow the cover crop an early start to N-fixation prior to the winter months.

Since nutrient availability may be influenced by the adoption of cover crops, it is important to use adequate methods to assess the soil nutrient supply. For example, if a cover crop is to be used as a grazed forage, a supplemental N source may need to be applied at seeding. When properly integrated into your cropping system management approach, cover crops have the potential to reduce nutrient leaching and runoff losses, increase nutrient availability, and improve soil health. Successful cover crop adoption to maintain productivity within an existing cropping system will require patience, flexibility and the willingness to adjust your overall soil and nutrient management.

## References


Noland, R.L. et al. 2018. Crop Sci. 58: 1-11. doi: 10.2135/cropsci2017.06.0375

Teles, A.P.B. et al., 2017. Soil Use and Management. 33(1): 34-44. doi:10.1111/sum.12327



IPNI International Plant Nutrition Institute

5550 Triangle Parkway, Suite 300, Peachtree Corners, GA 30092-6515 U.S.
Phone: 770-447-0335 | Fax: 770-448-0439 | www.ipni.net