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LIMITING NUTRIENT LEAKS

Natural ecosystems are often nutrient-limited. They support flora and fauna adapted to specific nutrient limitations. With a diversity of species competing for a limited supply of nutrients, little leaks out of the system.

Cropping systems are different. Agricultural management adds nutrients to boost productivity. While the higher yields save land for nature, nutrient leaks can perturb the natural balance .

Nitrogen is a nutrient that leaks in many ways. It can leach away as nitrate, causing issues for water immediately below the field and as far away as the ocean. It can leak to the air in the form of nitrous oxide, depleting the ozone layer in the stratosphere and warming the climate through the greenhouse effect. Or it can leak to the air as ammonia, possibly affecting air quality and smog, and potentially disturbing nearby natural ecosystems.

The nutrient P leaks in small amounts. But even the small concentrations in surface runoff or tile drain water can stimulate blooms of algae in rivers and lakes.

Best management practices limit the leaks. Applying the right source at the right rate, time and place—to the extent that is practical—ensures that crops take up the largest possible portion, limiting the amount available to be leaked.

Best management practices are specific to the soil and cropping system. They often include:

- Soil and plant analysis.
- Placement for maximum plant availability.
- Nutrient budgeting to match crop removal.
- Mapping and managing soil variability among and within fields.
- Timing applications and controlling release to synchronize with plant demand.
- Selecting genetics and managing for higher yield and nutrient uptake.
- Maintaining a buffer zone between the fertilized field and watercourses.
- Growing cover crops to retain nutrients for the next growing season.
- Conservation tillage to minimize runoff and erosion.

Even with best management, some leakage continues. Going further in limiting leaks requires further research and technology. Current technologies include inhibitors and coatings that control nutrient release from fertilizers. Future technologies may include nutrient-need forecasts related to weather. All technologies require on-farm testing to validate their effectiveness.

Are some crops leakier than others? Some consider corn to be particularly so, and worry that the biofuel-demand-driven increase in corn production will lead to larger leaks. However, nutrient leaks can occur before, during and after the growth period of any particular crop. It is important to consider the management of the full crop rotation. Extensive research in the Chesapeake Bay watershed has shown that cover crops following corn reduce nitrate leaks.

Increasing global demand for food, fiber, and fuel increases expectations for crop productivity. Best management of both cropping systems and nutrients gives the best chance of preserving natural ecosystems and limiting the nutrient leaks that might affect them.

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Abbreviations in this article: N = nitrogen; P = phosphorus.

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