
The objective of this document is to provide you with current and helpful information regarding water protection, and the Michigan Agriculture Environmental Assurance Program (MAEAP).

Nitrogen presents unique challenges, but new technology can help farmers

Nitrogen is one of the most challenging areas of production agriculture systems due to its complex cycle in the soil, potential mobility, numerous loss mechanisms, and relatively late season demand by the corn crop. Application rate, timing and placement are highly interconnected, adding to the complexity. However, new technologies have played an important role in dramatically increasing nitrogen (N) use efficiency in recent years.

The N cycle is more complex than that of other nutrients. Numerous forms of N can exist in the soil depending on conditions, though plants only take up N in the ammonium and nitrate forms. Many inorganic forms of N that are widely applied to crops are also subject to losses into the atmosphere or below the root zone in the soil profile. Ensuring N is available for plant uptake – while not being lost through other routes – is a major challenge in fertility programs.

In addition, considerable amounts of N already exist in the soil in organic forms. Much of this N cycles into plant available forms during the growing season, but are regulated by microbial processes. Availability of these sources can be inconsistent though the growing season and prediction is difficult.

A number of technologies have been developed to overcome these challenges. Corn requires more than 80% of its total N needs after the V8 growth stage with peak demand coming during early reproductive phases. The height of corn has limited field operations in the past, but new equipment today allows for later applications of N with accurate placement for improved plant uptake. By shifting applications from before planting to during the season, information such as weather and crop condition can influence application rates, increasing nitrogen use efficiency.

Delayed-release N or N stabilizer products have been developed that control N availability or conservation processes in the soil, with the intention of better matching plant demand. These products leverage our understanding of the complex chemical processes in the soil to increase total N use efficiency. While these products tend to cost more than conventional N sources, greater flexibility in application can be possible and total application rates reduced.

Computer models to determine optimum N application rates can also help by combining weather data, digitized soil maps, and crop health measurements to estimate N needs for the remainder of the growing season.

New technologies in nutrient management can improve rate, timing and delivery decisions and improve nutrient use efficiency. Utilizing these tools is an important part of modern agricultural management and especially important when managing the complexity of Nitrogen.



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