

## Maximize fertilizer use efficiency for peak fertilizer prices of 2022

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Record high fertilizer prices this winter have driven a lot of creative thinking about cost-cutting strategies for 2022. Dairy farmers are at an advantage as manure is a tremendous source of all essential nutrients, and typical rotations of corn and alfalfa/grass result in nutrient and other benefits for corn following sod. But how do we know where cuts in fertilizer are appropriate and where they are not?

### HERE ARE SOME STRATEGIES TO CONSIDER

- Begin your farm-wide fertility plan with an assessment of all on-farm nutrient resources.
- Look at past yields to plan using realistic yield goals for your farm and fields - and fertilize accordingly.
- Tune-up equipment so you can apply accurate and appropriate rates on your fields. Spending shop time this winter calibrating lime, manure and fertilizer spreaders ensures accurate applications and can save real dollars.
- Compile recent soil and manure tests. Soil tests (Figure 1) from the past three years are generally considered 'recent' and are critical to identify amounts and types of lime and fertilizer needed for any planned crop. If soil or manure analyses are needed, sample as soon as conditions permit and submit them for appropriate analyses immediately. The cost of collecting and analyzing soil and manure samples is lower than the price you pay when over- or under-estimating lime and fertilizer needs.
- With soil test results as a guide, correcting soil pH to recommended crop-specific levels is the top priority, using ag lime sources that are also tested and reliable. Periodic application of ag lime is needed on most Northeastern soils, but not all, to maintain optimum pH and optimal nutrient availability to growing crops. Strive for a minimum pH of 7.0 if you have alfalfa or soybeans in your rotation. For corn and grass rotations, strive for a minimum pH of 6.0-6.2, but using 6.5 as a target for fields with both corn and alfalfa rotation is a good management strategy.
- An appropriate soil test will also report levels of phosphorus (P) and potassium (K) equivalents ( $P_2O_5$  and  $K_2O$ ), calcium, magnesium, and some micronutrient levels for comparison to crop-specific university research-based fertility recommendations. Be sure to request the soil test that is used to derive recommendations by the land grant university of your state. Soil test

conversions from one soil analysis to another can sometimes be done, but any conversion adds uncertainty to the recommendation. Fields with soil test results for P or K in the adequate or high ranges do not need any supplemental P or K beyond a small amount in starter fertilizer. Starter fertilizer should be banded and should contain all the P needed for the season, with small amounts of nitrogen (N) and K, if needed while heeding salt injury and ammonia burn guidance.

- The top expense in most farm fertilizer budgets is N. To minimize the need for fertilizer N, maximize its use efficiency by crediting N from all sources. Fertilizer N use efficiency is subject to management, crop rotation, manure use, soil type, and the weather. Consider realistic yield potential of each field. Soil organic matter, manure applied in the current and previous seasons, sods and crop residues can contribute significantly to plant-available N, as those materials decompose during the growing season. They simultaneously provide organic carbon and other macro- and micronutrients. Northeast soils can typically supply 30 to 80 pounds of plant-available N per acre

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annually depending on soil type and field conditions. Sods may contribute 50 to 90 lbs N per acre, depending on stand vigor and legume content. Plant-available N from manure ranges widely, depending on animal source, manure type, application rate and timing. See accompanying article on the Value of Manure on page 12. In fields where rotation credits are expected and manure has been applied, the Pre-Sidedress Nitrate Test (PSNT) can be used to identify fields where sidedressing of additional N is not needed, which is another money-saving strategy. This can only be done when starter and at-planting N fertilizer application rates are limited to no more than 30 lbs N per acre.

- Timing of N application is a large factor in its use efficiency. In humid climates, N applications outside the growing season are not recommended due to the high risk of inorganic N loss to the environment and minimized availability for its uptake by a subsequent crop. For corn, applying a small amount of N in the starter (30 lbs N/acre or less) combined with sidedressing at V4-V6 can help reduce fertilizer loss before the plants can take up the nutrients. When additional sidedress N is needed beyond starter, and when applications are delayed due to weather conditions, a late sidedress application will still lead to a yield response, but it will be lower than with an on-time sidedress application as shortage of N earlier in the season will impact final season yield. Consider nitrification and/or urease inhibitors when N is needed but incorporation is not possible (urease inhibitors) or when you want to apply all N at planting rather than sidedress and leaching or denitrification losses early in the season are likely (nitrification inhibitors). Controlled-release fertilizer could also be considered. If weather and soil conditions are not conducive to N

losses, or if N fertility is excessive, there is no benefit from either inhibitor.

- Plan in the longer term to develop guidance for your fields by implementing N rich or control strips or plots in fields, by measuring yield and calculating N supply for some or all fields. When you use crop yield and N supply data to determine N balances for each field, you may also rank fields and identify where N was limiting and where changes can be made in future seasons. See the March 2021 Progressive Dairy article “In pursuit of improved nitrogen management for corn silage: Tracking

field nitrogen balances” on this topic (Berlinger et al., March 2021). ■

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Soil sampling is key to identifying where additional fertility is needed and where not.