

# MEASURE AND MANAGE

## Proper Nitrate Nitrogen Soil Sampling Procedures for Cash Crop Corn

By Dale Cowan  
[dcowan@agtest.com](mailto:dcowan@agtest.com)  
Agri-Food Laboratories CCA.On

---

- Sampling can be either preplant or at pre-sidedress.
- Sample at a 1 foot (30cm) depth.
- Collect at least 1 core per every 2 –5 acres.
- Pay attention to field slopes, sample low ground separate from high ground.
- Represent no more than 15-20 acres per sample.
- Package in normal soil boxes and submit asap to Agri-Food Laboratories.
- Allow 3 days for results and recommendations.

For Site Specific Nitrogen Management resulting in Variable Rate Application Maps. Order through our Dispatch or Mapping Center, requires planning and a 5 day lead time.

- In order to increase **Nitrogen Use Efficiency** the **Nitrate Nitrogen Soil Test** is required. On average, our database shows that our current use efficiency of Nitrogen in corn production is around 33-40%. This is determined by using Yield Maps and calculating the N taken up in the grain and divided by the N application rate combined with the results of a Spring Nitrate Soil Test to determine the total N available.
- Obviously Precision Agriculture management provides a greater level of insight into better N management. However, better use of N can be accomplished with a good sampling protocol on any corn field without Precision Management.
- Understanding the Nitrogen Cycle and the dynamics involved in Nitrate release leads one to the conclusion that more than one sample is required to properly characterize the Nitrate level across the landscape of any field.

**The 3 principle components of Nitrate nitrogen release in the soil are: Organic Matter, Available Moisture, and Soil Tilth.**

- When all 3 of these are optimized significant amounts of nitrate are released to crops. These components have a strong correlation to slope and topographic features in a field. Low slope positions generally have deep topsoil profiles, greater organic matter and moisture and higher levels of nitrate nitrogen. Contrast this with upper slopes with shallow profiles, lower organic matter and less moisture resulting in less nitrate release. Any combination of the 3 results in different release rates in the field.
- When sampling a field of rolling terrain composite samples should be taken of the low slope, mid slope and upper slope positions and all 3 samples submitted to the lab for analysis. If the field is sampled in a site specific manner (GPS) with georeferenced sample sites and mapped, then other options for N applications are possible. A better determination of the best single rate can be calculated or a decision to apply on a variable rate basis can be determined using appropriate equipment.
- Currently we make recommendations for corn only. Although, by applying a little art with the science we could interpret N requirements for other crops.
- Timing of most Nitrate samples are at sidedress time when there is more time to do them rather than at preplant time. Proper sampling depth is also critical. A minimum depth of 1 foot is required to adequately account for as much Nitrate in the root zone as possible. Samples should be submitted to the laboratory for analysis as soon as possible ( 24 Hours) or refrigerated until shipment can be arranged. Our laboratory requires 2 days to analyze and report results and recommendations.

## Manure Management and The Nitrate Nitrogen Soil Test

- Livestock operations need to handle the Nitrate Soil Test as a sidedress management tool. Most of the nitrogen in manure is organic and must be mineralized in the Nitrogen Cycle to plant available Nitrate. This conversion requires time and may not be fully completed by the time of planting and the test would underestimate the nitrate release from manure. By late May or early June this cycle may be more complete and a better estimate can be determined by the test at this time.
- However, a total management approach is needed to effectively manage manure N and maximize crop performance. N from manure should be applied to meet 70% of the N removal of the corn crop and the balance applied from commercial sources when P fertility is needed. If P is not needed then the manure should be applied to meet the crop removal of P and the N contribution determined and the balance of N applied from commercial sources. The use of commercial N helps to compensate for uneven nutrient content in manure and any application miscues that may occur unintentionally.
- The nitrate soil test taken at sidedress time may indicate that additional N may not be needed especially on spring applied manure. It is not unusual to have sufficient N available from manure to meet the N requirements of the corn crop. ( Assuming uniform application and landscape.)
- To manage manure properly requires a Manure Test to determine nutrients available per 1000 gallons. An assessment of yield potential to determine target rates. Soil Test to determine nutrients in most need on a farm wide basis. Choose the fields that need P and K as they are most likely to use nutrients effectively.
- For Site Specific Management use yield maps to determine crop removal rates and use those resulting **zones** to apply manure on a Variable Rate Basis. We have other technologies for establishing zones as well, Topography Maps, and Remote Sensing Imagery Interpretation.