Variable Rate Fertilizer Application

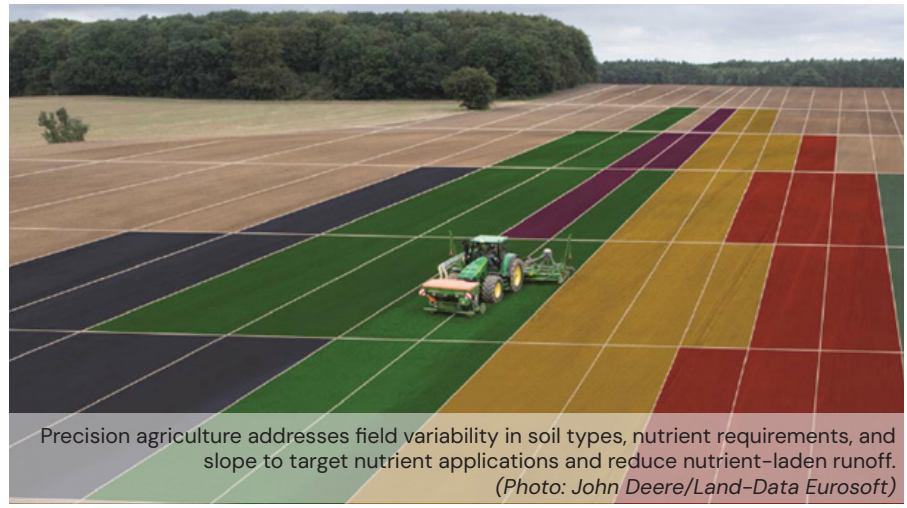
Nutrient Uptake Varies Across Every Field

Many fertilizer application methods treat an entire field uniformly. However, fields are inherently variable, and **nutrient uptake is influenced by factors such as slope, soil type, drainage, and organic matter content.** Using a single fertilizer rate can be inefficient, some areas end up under-fertilized while others receive more than they need.

What is Variable Rate Fertilizer Application?

Variable rate fertilizer (VRF) application is a precision agriculture technology that considers the diverse requirements within a field allowing for better placement of nutrients and consequently, improved nutrient uptake. **VRF application results in:**

- Input cost saving from less wasted fertilizer.
- Reduced nutrient loading to ground and surface water.



Precision agriculture addresses field variability in soil types, nutrient requirements, and slope to target nutrient applications and reduce nutrient-laden runoff. *(Photo: John Deere/Land-Data Eurosoft)*

Working within Management Zones

VRF application enables greater in-field precision through the use of management zones. These zones are determined based on variables such as yield maps, soil maps, topography, and soil test results. Once created and uploaded to the GPS/RTS system, optimal fertilizer rates are prescribed by the farmer or an advisor. Application rates can be controlled manually or through rate control technology, which instructs the equipment to apply fertilizer at predetermined rates for each management zone.

Soil Testing

Soil testing is a key component of any variable rate system. The sampling technique used depends on the resolution of your management zones. The more samples collected in a field, the more accurate the management zone.

1. **Bulk soil sampling**
   Typically consists of one soil test per 25 acres.
2. **Grid sampling**
   One sample per grid unit. Grids can be set at various sizes but remain constant across a field.
3. **Zone sampling**
   Uses predetermined zones based off various data sets, which may include yield data, satellite imagery and topography. At least one soil test should be done in each zone.

*Graphic used with permission from Veritas

In Partnership with:

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Strip-till systems can increase nutrient management through the application and incorporation of nutrients directly into the root zone. Direct placement of fertilizer can improve nutrient uptake and reduce nutrient losses through soil and water erosion. *(Photo: G. Smyth)*

Case Study:

THE VAN ARKEL PROJECT

CONCERN:

Soil test results revealed inconsistent nutrient levels across the Van Arkel fields. When they compared their soil test maps to their yield maps, they observed the lowest yields in the areas with the highest phosphorus (P) levels.

Realizing that in these areas, P was not limiting their yields, the Van Arkels wanted to apply less fertilizer in these zones to improve input efficiency, save costs, and reduce nutrient loss.

Dry fertilizer being applied in the strip. *(Photo: G. Smyth)*

The Van Arkel equipment modifications were completed with support from SCRCA and OMAFA.

DIG DEEPER

More Soil Resources can be found at the Soils at Guelph Website

GOAL:

Change fertilizer application rates based on the needs of the crop in various areas of the field. Specifically, the Van Arkels wanted to apply less fertilizer in the areas that tested high for P and apply more fertilizer in areas that tested low for P.

SOLUTION:

The Van Arkels installed a dry fertilizer rate controller onto their strip-till equipment. The rate controller can change the fertilizer application rate based off the needs of the field's predetermined management zones.

Variable Rate Fertilizer Controller. *(Photo: Crop Life)*

BENEFITS:

The combination of a dry fertilizer rate controller and a strip-till system improves nutrient management by applying and incorporating fertilizers directly into the root zone. This placement enhances nutrient uptake and reduces losses.

1. Fertilizer is applied efficiently at rates based on the needs of the management zones within the field. This efficiency saves input costs and reduces nutrient losses.
2. Minimize fertilizer application near sensitive areas such as watercourses and drainage ditches, reducing the risk of phosphorus loading.