Variable Rate Fertilizer Application

Uniform Rate or Variable Rate?

Conventional methods of fertilizer application treat all areas of a field uniformly. Fields, however, are not uniform and nutrient uptake is impacted by a multitude of factors that may vary across a field including slope, soil type, drainage, and organic matter content. A single application rate can result in the inefficient use of fertilizer as some parts of the field will receive sub-optimal nutrient inputs and others will receive more inputs than needed.

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, and reduced nutrient loading to ground and surface water.

Working within Management Zones

VRF application allows greater in field precision management through the use of management zones. Management zones are determined based on variables such as yield maps, soil maps, topography, and soil test results. Once management zones are established and added to the GPS/RTX database the optimal fertilizer requirements are prescribed either by the farmer or an advisor. Rates can be controlled manually or through rate control technology, which instructs the equipment to apply fertilizer at predetermined rates throughout the various management zones.

Colour-coded management zones within a field
Photo: John Deere/Land-Data Eurosoft

Soil Testing

Soil testing is central to any variable rate system. Based on the resolution of your management zones different soil sampling techniques can be used. The more samples collected in a field, the more accurate the management zone. Bulk soil sampling typically consists of one soil test per 25 acres. Grid sampling consists of one sample per grid unit. Grids can be set at various sizes but remain constant across a field. 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. Soil test results can be used to evaluate management zones and to prescribe fertilizer application rates. *Graphic used with permission from Veritas*

Case Study: The Van Arkel Project

Concern

Soil test results revealed inconsistent nutrient levels across the Van Arkels 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.

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.

Rate Controller
Photo: Crop Life

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 of the needs of the field's predetermined management zones.

Benefits

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

The Van Arkel equipment modification was completed with support from SCRCA and OMAFRA. If you are interested in modifying your equipment to improve soil health and reduce nutrient losses, please contact SCRCA.

Strip-till systems can allows for increased 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 courtesy of No-till Farmer

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