THE LEADING EDGE

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A PUBLICATION DEDICATED TO MAXIMIZING YIELD POTENTIAL

Nitrogen Management: Increasingly Important, Increasingly Complex

"How much nitrogen do I need?" and "When do I apply it?" are questions that plague farmers throughout the growing season. Nitrogen management is becoming an increasingly complex task. Too much nitrogen introduces the potential for environmental harm and wastes money. Too little nitrogen means that by July, crops turn yellow, a sign that they did not have access to needed nutrients during key growth stages. Options for application and control are continuously emerging, and they can raise more questions than answers.

The list of factors that determine the amount of nitrogen appropriate for each field and each crop is long. According to the Iowa Soybean Association (ISA), while yield goals were once thought to be the key dynamic in determining nitrogen management, new information and technologies have altered the nitrogen management landscape so much that some states have dropped yield goals from their nitrogen recommendations. Timing of application is critical, and nitrogen loss potential and availability are two key factors that although once ignored, are now recognized as key.

Nitrogen Availability and Loss Potential

2984 Series High Residue Maverick™

Nitrogen availability both across fields and within fields varies considerably. The amount of nitrogen needed to maximize yield directly correlates to the amount of organic matter in the soil. Organic matter is biologically active and its presence in soil means higher yielding plants are produced with less added nitrogen.

However, soil residue requires organic matter to breakdown.

Therefore, fields with more residue have less nitrogen available for newly planted crops. A typical corn crop gets about half its nitrogen from the organic matter still available.

Soils high in pH show an increase in the rate of nitrification of applied anhydrous ammonia. This leaves nitrogen susceptible to loss earlier in the growing season.

To minimize volatilization, both granular urea and UAN should be incorporated into the soil. However, keep in mind that nitrogen from the nitrate share of UAN is more susceptible to leaching because it does not bind to the soil like the nitrogen from anhydrous ammonia. Excess water carries it below the root zone and puts it out of reach of roots that need it.

Timing

As previously stated, a typical corn crop gets about half its nitrogen from the organic matter. The other half of a crop's nitrogen supply comes from producer-applied fertilizer. Studies done by various groups have consistently indicated that application of nitrogen very close to or simultaneously with planting is beneficial. The amount varies for each set of circumstances. A producer's fertilizer dealer is a valuable resource when determining the amount of nitrogen to apply pre-plant and throughout the growing season.

Nitrogen applied up to the silking stage has the potential to improve yields. However, producers should be aware that nitrogen deficiencies prior to the 8-leaf stage can result in non-recoverable yield loss, according to the Plant Management Network.

Stress Detection through Late-Spring Nitrate Tests

The yellowing of plant leaves is a telltale sign of stress due to lack of nitrogen. However, by the time this symptom is observable, stress can be too severe to rectify with additional nitrogen application, and yield losses are inevitable. A late-spring nitrate test has the potential to catch deficiency at an earlier stage.

According to the Ontario Ministry of Agriculture, a pre-sidedress or late-spring nitrogen test taken when corn is 6 to 12 inches tall (late May of early June) is likely to reflect the amount of nitrate that has mineralized from organic sources and will more accurately indicate fertilizer nitrogen requirements.

3600 Series Fertilizer Toolbar in Canada.

Evidence shows that nitrogen recommendations based on later sampling are more accurate than those based on a planting-time sample, particularly true when there are organic sources of nitrogen such as manure or soybeans in the cropping system. From these later results, producers should be able to accurately determine the amount of nitrogen that will be available before corn plants enter critical uptake stages.

Samples for this test should be taken from random locations throughout the field at a depth of one foot. Plant testing labs can run these tests and return the results. The ISA reports that critical nitrate concentration is usually 21 to 25 parts-per-million (ppm). Therefore, a ppm rate of less than 21 indicates that a crop would respond to additional nitrogen with results significant enough to justify the cost.

Remote Aerial Imagery

Yield history, soil fertility, drainage, and late spring soil test data can be enhanced with remote sensing with aerial imagery. The yellow and green images that are provided to producers that use aerial imagery clearly reveal nitrogen-deficient areas. From the sky, these patterns are evident earlier in the season—while there is still opportunity to supply additional nutrients.

To locate an aerial imaging service, ask around at an area airport or farm supply cooperatives. Local precision agriculture specialists may also have connections. John Deere Agri Services also offers remote sensing aerial imagery.

Side-Dressing to Counteract Deficiency

The availability of larger toolbars with better flotation and coulters with parallel linkage to maintain depth make side-dressing additional nitrogen a viable option for many producers. Injecting or

incorporating liquid fertilizer into soil while sidedressing is more effective than dribbling. If producers are willing to side-dress most of their nitrogen, pre-plant rates can be cut by up to 50 pounds-per-acre, according to the ISA.

To accurately evaluate the effectiveness of side-dressing, it is advisable to leave at least three untreated strips the width of your combine head. These strips can be harvested separately and their yields compared to those of the treated areas of the field.

2995 Series coulters on side-dress toolbar

Variable Application Rates

Options for enhancing side-dress processes are available. Because of variations in the weather and soil composition throughout fields, applying the same amount of nitrogen throughout your operation may not be the most cost-effective or environmentally conscious option. Applicator-mounted optical sensing systems communicate with software that adjusts the amount of nitrogen applied during realtime application. Although it may not yet be affordable or predictable for all producers, the possibilities it introduces are exciting.

When implementing an optical sensing system, it is critical to include test strips. The sensors read light reflected from the crop to determine the amount of nitrogen necessary to bring the tested area up to the level of the lowest-rate strip sufficient in nitrogen. These uniform-rate check strips can be harvested as separate loads for comparison with a yield monitor or side-by-side comparison with a weigh wagon.

Post-Season Nitrogen Indication

An end-of-season stalk nitrate test may prove to be valuable to producers in planning for next year’s crop. The test looks at an 8-inch section of stalk cut from 6 inches above the ground after the plant has reached blacklayer maturity. Most soil and plant analytical labs provide this service, and producers should check with them for specific collection and submission procedures.

Results from the test will be reported in ppm. A nitrogen concentration of 700 to 2000 is considered optimal. A higher rate

indicates that more nitrogen than necessary was available; a rate lower than 250 ppm suggests more nitrogen would almost certainly have increased yield. If a concentration within the 250 to 700 ppm range is reported, the cost of nitrogen and the price of grain need to be considered to determine the profitability of additional nitrogen application.

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