WATER MATTERS

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Save Time and Increase Sustainability *continued from page 3*

on plant health, chlorophyll levels, and canopy coverage, which enables precise assessment of crop development. The daily images that are now captured by these satellites can detect early signs of stress from pests, disease, or drought well before we can detect them with our own eyes. This information helps ag producers to make proactive decisions as opposed to reactive.

Today, modern technology allows farmers to monitor and control pivot irrigation systems directly from their cellphones or tablets, making irrigation management smarter, faster, and more efficient. This is made possible through a combination of sensors, wireless connectivity (cellular or Wi-Fi), and specialized apps or web platforms developed by irrigation equipment manufacturers or other ag tech companies. Cellular-based pivot monitoring is transforming irrigation management, and giving farmers unprecedented control and insight into their irrigation operations. By reducing the need for manual checks and improving water-use efficiency, this technology not only saves time and resources but also supports more sustainable farming practices.

In addition to the advancements in pivot monitoring technology, soil moisture probes have also improved. No more having to go out to the probes in the middle of the field and connecting to them to get a reading. Real time telemetry meters send the data directly to a farmer's computer, cellphone, tablet, or other handheld digital device. This enables the producer to make real time data driven irrigation decisions, ensuring crops receive the right amount of water at the right time.

Since 2019, the Lower Loup NRD has offered cost-share to landowners to upgrade their center pivot systems to become Variable Rate Irrigation (VRI) capable. This upgrade will allow producers to control the speed of their pivots. The benefits include increased watering efficiency and water savings, a reduction in chemical and fertilizer use as well as the associated cost savings from needing to purchase less of those inputs, increased yield in low production areas, and reduced yield variation. The cost-share is limited to two applications per landowner per year and up to $2,000/application. The cost-share rate is $1.37/linear foot based on the length of the center pivot.

Beyond the VRI program, the LLNRD collaborates with the USDA's Natural Resources Conservation Service (NRCS) and University of Nebraska Extension through the Regional Conservation Partnership Program (RCPP). This partnership provides additional financial and technical assistance to producers for adopting conservation practices aimed at improving irrigation efficiency and nutrient management.

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In-season Nitrogen Application Promotes Economic and Environmental Sustainability

In-season nitrogen application has emerged as the best practice in modern corn production. Ongoing research and studies show that it is much more efficient and effective to do in-season applications opposed to front loading or fall application. We don't irrigate in November for the next spring's corn crop, so why apply nitrogen at that time?

Nitrogen is highly mobile in the soil and susceptible to loss through leaching, volatilization, and denitrification. The longer nitrogen is sitting in the soil and not being used by a crop, the higher the risk of loss of this input.

Waiting to apply nitrogen until the crop requires it allows ag producers to better match the application rate to the need and uptake of the crop. It also reduces the risk and unknowns of weather conditions that can have a large impact on the rate that nitrogen can leach through the soil profile. The 2024 growing season started off with above normal precipitation, and during our soil sampling activities we observed quick movement of nitrogen.

"Our early findings show that water and dissolved substances like nitrate move quickly through the silt loam soil under irrigated cornfields in our area," said Chris Hobza, Lead Hydrologist, P.G., with USGS. "While we're still early in our research, these initial findings indicate some nitrogen from fall-applied fertilizer moves past the root zone before crops can use it in the following growing season."

A corn plant has only taken up 10% of the total nitrogen it will need for the growing season at the V6 (6th leaf) growth stage. This is typically around the middle part of June within our area. This reiterates that in-season application is the best practice for applying nitrogen to corn. Chemigation is a great option for this. Producers will already be running pivots to irrigate, why not spoon feed the crop as well?

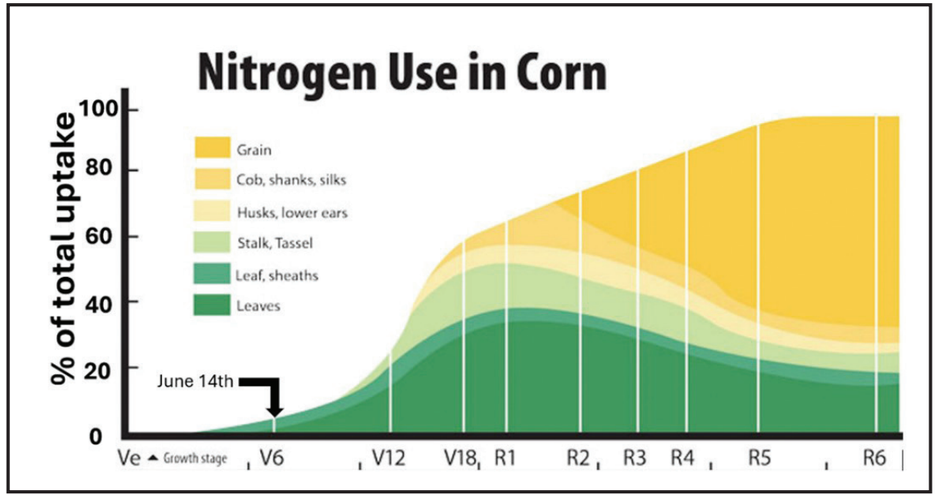

Figure shows nitrogen uptake by corn through the growing season. Corn planted April 24, 2024, was at growth stage V6 on June 14th.

Y-drop applicators are also an excellent option. Ultimately, in-season nitrogen application promotes both economic and environmental sustainability. By applying nitrogen more precisely and at the right time, farmers not only save on input costs but also reduce nitrogen runoff and groundwater contamination.

Inside this issue:

LLNRD Advanced Soil Sampling Program

The Lower Loup NRD's Advanced Soil Sampling Program is intended to promote the use of soil tests that include a soil health assessment component. These tests take in-field nutrient credits into account when making nutrient management recommendations with the intention of reducing overall nutrient inputs to lessen the impact of nutrient leaching/loss. The tests also provide available macronutrients, micronutrients, and cover crop recommendations for improving soil health. Every field should have the opportunity to have at least one advanced soil test taken to determine its overall nutrient availability as macro- and micronutrients are shown to be crucial to overall plant growth and development as well as aiding in improving yields and minimizing nutrient leaching/loss. A summary of the macro- and micronutrients and their functions is included with this article.

Many Nebraska labs, such as Ward Labs, Regen Ag Labs, Midwest Labs, and AgSource Labs, have a soil health assessment test available. Each lab has their own protocol as well as soil scientists to aid with the interpretation of their respective soil tests. Contact the lab of your choice to ensure that the soil samples are properly taken as per their protocol.

Through the Lower Loup NRD's program, each landowner can enroll up to 8 sample sets, each set consisting of one advanced soil health analysis test and one 3-foot-deep soil nitrate test (one sample set per 40 acres). The cost-share rate for the soil health analysis test is up to $55/test, and the rate for the deep soil nitrate test is up to $15/test. Once enrolled, the 8 sample sets are enrolled for 4 years. Payment will be received after submission of the samples sets each year.

LLNRD technician Shay Reilly packages a soil sample to be sent to a lab for testing.

Macronutrients

1. Nitrogen (N)

Nitrogen plays a key role in photosynthesis and protein production; too little nitrogen can limit plant productivity. Because nitrogen is mobile in the soil and within plants, this can lead to the leaching of nitrogen beyond the root zone, meaning that it is out of reach of the plant. This element demands a sound fertility management plan to prevent nitrogen loss and water contamination.

2. Phosphorus (P)

Phosphorus is a primary component of cell membranes and enzymes of plants; it also plays a crucial role in photosynthesis.

3. Potassium (K)

Essential for the translocation of sugars within the plant. This element plays a vital role in stomata formation, which regulates plant moisture loss and stress from heat and cold temperatures.

4. Calcium (Ca)

Calcium plays an important role in nutrient transport and plant membrane strength.

5. Magnesium (Mg)

Significant for enzyme production, chlorophyll structure, and photosynthesis.

6. Sulfur (S)

Sulfur helps plants take up other nutrients.

Sulfur is also essential to amino acid and protein synthesis.

Micronutrients

1. Zinc (Zn)

It is important for protein, enzyme formation, and cell wall integrity of plants.

2. Iron (Fe)

It plays a vital role in photosynthesis and plant respiration and is also needed for nitrogen fixation in soybeans.

3. Manganese (Mn)

The primary function of manganese is to serve as an activator of plant growth enzymes. Also helps with chlorophyll formation.

4. Boron (B)

Boron helps with cell wall formation and regulates plant metabolism.

5. Chlorine (Cl)

Chlorine regulates osmosis and charges compensation (the movement of cations, atoms, and small molecules in and out of plant cells as part of normal cell activity).

6. Copper (Cu)

It assists plants in protein and enzyme production.

7. Molybdenum (Mo)

Molybdenum is required by plants to help control the metal component of enzyme formation. It also enables plants to use nitrogen efficiently.

Soil pH

Soil pH, a measure of how acidic or alkaline the soil is, is the most important soil characteristic that controls nutrient availability, plant growth, and microbial health. A pH of 7.0 is neutral on the pH scale of 0 to 14. Most row crops require the pH between 6.3 and 7.2 for maximum yield potential. These pH levels are where the mineral elements are most available to the plants. Micronutrients tend to be more available when the pH is 7 to 7.5, which is slightly alkaline, while macronutrients prefer a pH between 6.2 to 7.0, which is slightly acidic. In Nebraska, most field crops perform best at a soil pH between 6.0 and 7.0. This pH range provides the best balance of available nutrients. When soil pH is below this range, some nutrients become less available. Many soils in Nebraska are moderately acidic – around 5.5 pH – which can limit the availability of both macro- and micronutrients while limiting plant growth and development.

Cation Exchange Capacity (CEC)

Soil Cation Exchange Capacity (CEC) refers to the negative charges of a particular soil to absorb and exchange positively charged chemical ions such as Calcium (Ca2+), Magnesium (Mg2+), Sodium (Na+), Hydrogen (H+) and Potassium (K+). These negative charges are provided by clay and humus (most decomposed form of organic matter) particles, so as soil clay and organic matter contents increase, CEC will also increase. CEC is a very important chemical property that not only reflects soil functions such as the ability of a soil to retain and exchange essential plant nutrients but also helps calculate rates of soil amendments to remediate sodicity.

Save Time and Increase Sustainability

With the ongoing drought pattern that we are in and the ever-slimming economic margins that producers are operating on, utilizing the best farming practices is more important than ever. This includes being as efficient in nutrient management and irrigation management as possible. There have been many advancements in sensing technology for both management practices.

Satellite imaging has been around for many years, but recent improvements have greatly increased the accuracy and quality of this technology. The multispectral cameras on the satellites capture data

Photo courtesy of the University of Nebraska-Lincoln