Phil Needham

Value of Fluid Flexibility In Intensive Wheat Management

Nitrogen is a key component to yield and accurate timing of the appropriate form of the nutrient can reap huge rewards.

Summary: *Intensive cereal management began in England, France, and Germany in the 1970s. These systems have since spread east across Eastern Europe to Russia and west to the progressive areas of the U.S. As part of the process, many yield limiting factors had to be isolated and corrected to achieve success, but yields doubled in many of these regions in the span of little over a decade. In Kentucky, for example, the Opti-Crop management system was introduced and helped propel the state winter wheat yield average from 33 bu/A in the late 1980s to over 65 bu/A by the end of the 1990s. Growers there were able to significantly increase their profi ts and expand their farming operations as a result of the new management technology. Many factors have contributed to our growth in this region, but paying close attention to details, regular field inspections, accurate chemical and fertilizer applications, and constant follow-up with growers are the main ones. Another key aspect that we concentrate on is timing of product applications, especially nitrogen (N). N is a key component to yield and accurate timing of the appropriate form of the nutrient can reap huge rewards. Today about 90,000 acres of spring wheat have been brought under the Opti-Crop management system in the northern plains of the U.S., together with an established 100,000 acres of soft red winter wheat within the Ohio Valley, and yields continue to increase.*

Nitrogen (N) is one of the most cost-effective inputs applied to a cereal crop. For every unit of N applied, there is an incremental increase in yield up until the point at which maximum yield is obtained.

Our ability to predict the N requirement of a wheat crop has improved in recent years, but it is still only approximate. The wide range of soil types, mineralization values, rainfall amounts, and differences between varieties and their respective planting dates ensure that precision beyond the nearest 20-lb increment is difficult to achieve, even for a well-trained agronomist. Current efforts with regards to computer modeling and electronic plant sensing will enable us to match plant requirements with N recommendations more precisely in the future.

Real-time plant sensing technology will continue to develop and as units are sold in increasing quantities, the price will become more affordable. Environmentally and economically, this is definitely the way forward and we should look at such technology closely.

UAN the choice

While consulting with wheat growers it became apparent that uniformity of nutrient applications and the actual timing of N products were limiting factors that were holding back wheat and other crop yields. Initially, many producers were using urea or anhydrous ammonia at or prior to seeding as their N sources. But, because of the differences in product quality, the general lack of equipment to uniformly apply the products evenly across fields and, most importantly, the inability to manage the spring crop canopy with fall-applied applications of N, the decision was made to convert growers to the use of liquid urea ammonium nitrate (UAN). UAN can be sourced in 28, 30 or 32 percent liquid N forms and is a combination of both ammonium nitrate and urea dissolved in water. The vast majority of Opti-Crop growers between Tennessee and North Dakota uses a liquid-based N program.

The switch was quick, painless and well received. Most of our customers already had access to large trailed or self-propelled sprayers that could be equipped with streamer bars to deliver UAN postemergence to wheat without signifi cant problems with leaf scorch. The specifi c application of N depended on the number of plants per square yard, plant size, residual N levels, overall plant health, and expected yield. In general, N rates ranged from 20 to 40 gallons/A of UAN.

Achieving precision

To make precise N recommendations, three factors must be understood:

- Crop demand
- Soil N supply
- Efficiency of fertilizer uptake.

Application uniformity is more critical than actual form of N used in the spring. For example, urea is a good product, but if it is streaked with a spinner truck, then the value of the application may be significantly reduced.

Because large air trucks damage wheat after green-up in the spring, we

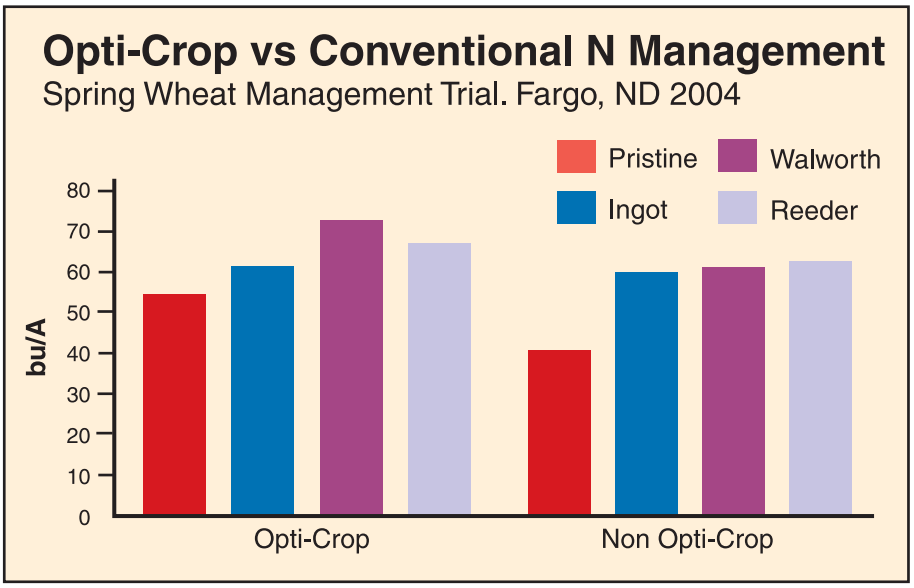

Figure 1. Comparison trial on intensive spring wheat N management, applying UAN on field in Fargo, North Dakota, 2004.

encourage growers to use row crop application equipment in harmony with tramlines. This procedure is being used on many acres across the U.S. and around the world, and has helped the Opti-Crop team increase yields by offering a higher standard of application accuracy than was previously used. If row crop equipment is available, then UAN forms of N can be dribbled on using stream bars. Stream bars virtually eliminate leaf scorch that is generally associated with N sprayed onto wheat through flat fan nozzles.

One of the main obstacles centers on being able to reliably predict how much N will be available to the plant from the soil over the course of the growing season. One sensible approach is to measure total soil nitrate N (preferably measuring ammonium nitrogen also) on deep soils down to 3 feet. This deep sampling technique offers a good snapshot in time, but it is highly rainfall, temperature, and soil type specific, so it should be backed up with sound agronomic experience.

Winter wheat

Fall N applications. Depending on planting date, we strongly discourage growers from applying more than 20 to 30 lbs/A of actual N at that time. Higher rates of fallapplied N may lead to too much early fall growth. That can trigger excessive moisture use, which can be a major yield limiting factor in low rainfall areas. An application of 30 lbs/A of N would be appropriate for later planted fields or fields no-tilled into high residue crops such as wheat after wheat or wheat after corn. The 20-lb/A rate would be more suitable for wheat crops following soybeans that yielded 30 bu/A or more, or legumes such as alfalfa. In fact, most growers seeding wheat after good yielding soybeans or alfalfa could probably get by without using any fallapplied N.

Spring N applications. Total amount of N applied in the spring to a winter wheat crop must be primarily dictated by its yield potential. Historic yield records and local varietal performance can be used together with moisture status close to N application timing to help streamline more accurate recommendations. Secondly, the 3-foot deep soil N test should provide insight regarding soil N reserves. Another important piece of information to consider is the ability of the soil to either release or tie up N during the season. A good wheat crop with 14 percent protein will require on the order of 2 lbs/bu of actual N. That means a 100-bu/A crop would require around 200 lbs/A of N. However, this does not mean 200 lbs/A needs to be applied in the form of fertilizer, as soil reserves and N mineralization from organic matter may make up for 40 to 60 percent of this total amount.

Spring N timing. Application timing is critical for high yields, both from the standpoint of canopy manipulation (adjusting tiller numbers up or down to achieve the desired head population per square yard) and with respect to crop moisture use. Applying N too early can result in a crop canopy that gets too big too soon, which usually offers no yield advantage (many times in a dry environment it may result in a negative yield impact). On the other hand, putting spring N down too late may lower the number of tillers and primordial grain sites at harvest time. Therefore, an experienced agronomist will need to weigh all these factors carefully— in conjunction with rainfall forecasts—to make sound decisions about application timing. Design of the plot in Figure 1 was randomly replicated four times. We have found that yields can be increased on the listed varieties of spring wheat by post-applying the majority of the N, compared to the standard practice of applying it all at or prior to planting. We encourage growers to add 20 to 30 lbs/A of N and 30 to 40 lbs/A of P_2O_5 to help with earlyseason establishment, then apply the balance as a topdress application around Feekes growth stage 4 to 6, depending on plant health. The reason for increased yield on these varieties (Figure 1) is that tiller density is controlled when the majority of N is post-applied, rather than encouraging excessive tiller when N is applied preplant.

More information on spring and winter wheat management can be found on the Opti-Crop website at www.opticrop.com

---

Needham is Opti-Crop manager from Owensboro, Kentucky. ❑