The Oklahoma Cooperative Extension Service
Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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Methods for Applying Topdress Nitrogen to Wheat

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http://osufacts.okstate.edu

Benefits of Topdress N

There are many ways of supplying a winter wheat crop with the nitrogen (N) it needs. Each method has advantages and disadvantages. The entire crop N requirement, for example, can be applied prior to planting using a less-expensive form of N fertilizer, such as anhydrous ammonia. This method can be effective, but has some inherent disadvantages such as the inability to accurately gauge crop yield potential at the time of application and the potential of N loss. For this and other reasons, many producers choose to split-apply N.

In the southern Great Plains, a split-application of N generally refers to one pre-plant application of N, followed by a second application of N at greenup (topdress) in late winter. Split-applications of N are frequently more efficient than single applications. Greater efficiency is a tremendous benefit to wheat farmers, as N fertilizer is generally one of the biggest cash outlays required in producing a wheat crop. Topdress applications also allow producers to compensate for N used for forage production in dual-purpose systems and to remove nonuniform growth patterns that can be caused by uneven distribution of urine and manure (sometimes called cow pox). Finally, many producers choose to use urea-ammonium-nitrate solution (UAN) so they can include pesticides with topdress N applications.

Once the decision to apply topdress N is made, there are several products and application methods available to farmers. The purpose of this Fact Sheet is to describe some of the methods for applying topdress N to wheat and weigh some of the pros and cons of each method. Regardless of the method chosen, application uniformity and timeliness of application are critical to getting the most out of each pound of applied N.

Dry Fertilizer Application

One common method for topdressing wheat is to broadcast urea granules over the top of the growing wheat crop. This method has several advantages and disadvantages. Urea is a safe, easy-to-handle N source that can be obtained by most farmers locally. In addition, urea is frequently cheaper per unit N than other sources. On the down side, there is always potential for N losses due to volatilization when using any urea-containing fertilizer. Conditions are cool enough at the time of wheat topdressing, however, that N losses from urea due to volatilization are not a major concern most years.

The most frequent problem encountered when broadcasting urea granules is a non-uniform spread pattern. Urea is often spread using single or double-fan spreader buggies that are rented from, or provided by the fertilizer dealer. Inaccurate estimation of spread distance, spread pattern, and ground speed all decrease the uniformity and accuracy of N distribution with these machines. For this reason, it is advisable to reduce the N rate to half of the desired rate and spread the area twice, splitting the first set of tracks on the second pass.

Urea or other fertilizer granules can be spread accurately if specialized equipment is used. If calibrated properly, pneumatic delivery systems (air booms) are extremely accurate over the width of the boom, but can be expensive to purchase. Pendulum-type spreaders are commonly used in Europe and can also provide very accurate fertilizer delivery and placement. These spreaders generally have a smaller capacity than flat fan or pneumatic systems and might not be suitable for growers with large acreages to cover.

Liquid Fertilizer Application

There are many different types of nozzles that can be used to apply urea-ammonium-nitrate (UAN) solution. The most common type of nozzle used in Oklahoma is a broadcast nozzle, such as a floodjet nozzle. Using this type of nozzle allows for the inclusion of pesticides with the UAN solution and can save passes across the field. Broadcast applications of UAN solution greater than 10 gallons per acre can cause leaf burn on young wheat plants. This is especially true if applications are made to actively growing wheat when ambient air temperatures are greater than 60 F. This type of injury is generally cosmetic and rarely results in yield reduction, but if leaf burn is severe and conditions following application are not favorable for recovery, yield can be significantly impacted. Other disadvantages to broadcast nozzles include susceptibility to drift and increase immobilization of N on crop residues as compared to stream nozzles and/or streamer bars.

Streamer nozzles have increased in popularity in recent years. These nozzles generally work with existing sprayer nozzle bodies and require minimal retrofitting. Unlike broadcast

Double-fan Spreader

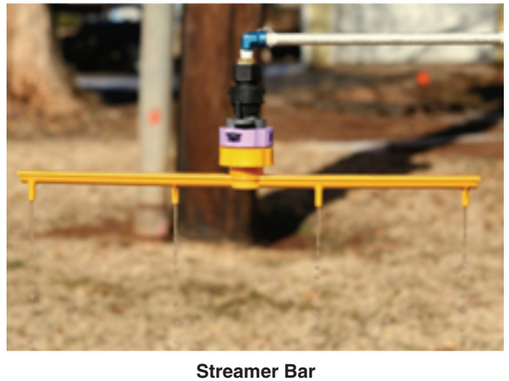
Air Spreader

Pendulum Spreader

Broadcast Nozzle

Foliar burn from UAN

Streamer Nozzle



Streamer Bar

nozzles, streamer nozzles can be used in windy conditions. Since the UAN is being placed in a concentrated band on the soil surface, there is less opportunity for immobilization by microbes on decaying crop residue. Some research has shown that this can lead to more efficient use of applied fertilizer N. Depending on the type of streamer nozzle being used, boom height can play a critical role in the uniformity of application across the boom width, so it is important to know the specifications of the nozzle being used.

An alternative to the streamer nozzle is the streamer bar. Streamer bars are very common in Europe, but are not used as widely in the U.S. They offer the same benefits as streamer nozzles, but boom height does not influence uniformity of application. Similar to streamer nozzles, color coding makes it easy for applicators to identify the orifice size that is currently being used and ensure that the same size orifice is being used across the entire boom width. Since streamer bars are manufactured in Europe, an adapter is frequently required to make them compatible with most sprayer nozzle bodies used in the U.S. This can make them more expensive initially than streamer nozzles. Like streamer nozzles, tank-mixing of pesticides is not a viable option when using streamer bars.

Which Method is the Best?

Several factors will influence which application method and N source are best for an individual producer. First and foremost, growers should choose an application method that will allow them to topdress N in a timely fashion. Modern agricultural sprayers, for example, might be able to make it across a wet field easier than a tractor and buggy. Conversely, a farmer with a properly-equipped tractor sprayer might be timelier with N fertilizer applications than a custom applicator with a long waiting list.

A study was conducted at Lahoma, OK in 2006 and 2008 to determine the effect of N source and application method on wheat grain yield (Figure 1). All applications were calibrated to deliver 40 lb/ac actual N, regardless of the N source used. There were no differences in grain yield between plots receiving UAN through broadcast floodjet nozzles and those with N applied through streamer bars. In 2008 plots receiving UAN produced statistically greater yield than those receiving urea. This was likely because sufficient rainfall to move N fertilizer into the soil did not occur for approximately two weeks following application in 2008. This might have created a favorable environment for N volatilization from urea which would have favored the N use efficiency of UAN treatments.

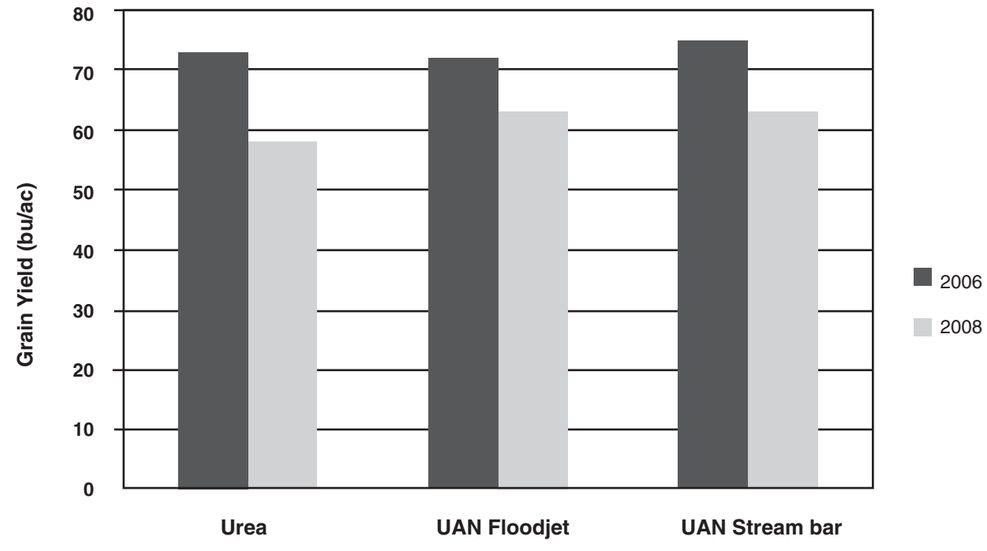


Figure 1. Effect of N source and application method on wheat grain yield at Lahoma, OK in 2006 and 2008