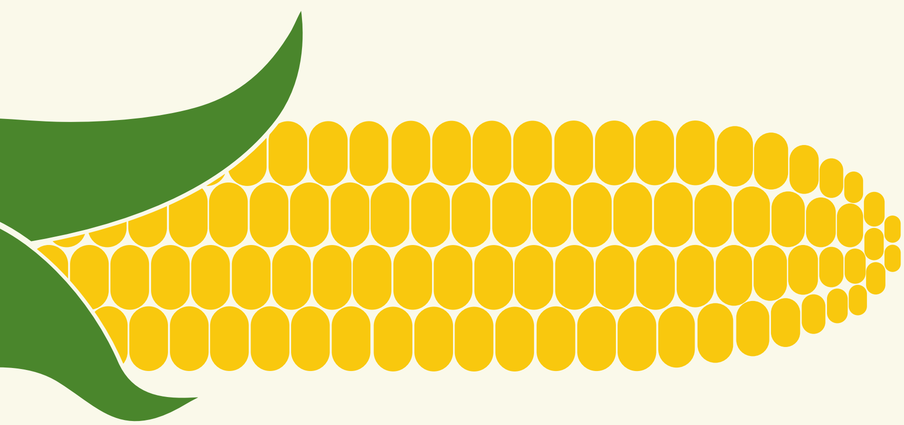
Fūsn

Fused-Safe Nutrients™

FŪSN™ Responses to Corn in Improving Yield and Nitrogen Use Efficiency

Terry A. Tindall, Ph.D., Director of Agronomy,
and Galen Mooso, Ph.D., Agronomy Manager

Treasure Valley, Idaho, 2012–2015



Simplot
Bringing Earth's Resources to Life

Nitrogen (N) is critical for all living things and most crops. Plants that are grown for human consumption especially depend on this essential nutrient. Nitrogen is plentiful on this planet and makes up about 78% of the atmosphere in which we breathe, as well as an additional amount within the soil we walk on. However, most of the N that we are surrounded by is not in the form that can be utilized by plants, animals, or civilizations to grow and prosper. It was not until the turn of the 20th century, at a time when predictions were the most dire in regard to future populations and feeding those populations with N-enriched animal byproducts, that N was actually harnessed from the atmosphere and processed into a form that could be easily used by growing plants and transported from one region to another. This unique, very important early development solved a long-term problem and is credited as being the reason more than 40% of today's world population is alive. Nitrogen fertilizer is fundamental to man's existence and the form of that nitrogen is also of great value to mankind.

Despite the positive attributes of a given technology there are always challenges that need to be addressed. These include (a) Homeland Security concerns about the use of some N forms as explosives (directed or unintended), (b) N sources that contribute to poor air quality and greenhouse gases, (c) non-targeted impacts of N (water quality of surface waters including algae blooms and hypoxia), (d) general inefficiencies of N resulting in poor yield or crop quality and, (e) economic challenges of using an alternative N source.

FŪSN™ (fused safe nutrients) is a newly developed, modern N fertilizer source that is completely unique to anything that has been developed in the past. The chemistry is such that it can be labeled by the Department of Transportation as a non-oxidizer and is being recognized by Homeland Security as low-detonable and not suited for bomb making. Ammonia volatilization is the transformation of ammonia-N based fertilizers into the atmosphere as ammonia gas. Studies that have been reported in other FŪSN technical articles indicate very little or no losses of this form of N. These changes, appreciated by both agriculture communities and environmental groups, are a positive aspect of the new FŪSN technology. FŪSN is two-thirds ammonium N and as such is less likely to be lost into the environment as with nitrate-based materials or an N fertilizer product that is easily converted into a nitrate-based N source without a nitrification inhibitor. This form of N can then be leached below the effective root zone of a plant. FŪSN therefore allows growers to utilize a new fertilizer material that addresses both environmental stewardship considerations as well as agronomic performance related to a variety of western agriculture crops.

Field trials—corn

FŪSN has been utilized over several years in research trials in an effort to provide agronomic evaluations for corn growth, development N utilization, and yield responses. A few research trials from the Midwest are available upon request, but most of the Simplot-directed projects have been conducted on irrigated land in the arid semi-desert production areas of the West.

Corn yields have been consistently higher with FŪSN compared to other N fertilizer sources. Large demonstrations were conducted from 2012 through 2015 in the Treasure Valley area of Idaho, which provided four years of observations on land that is owned and farmed by the J.R. Simplot

Company. Various N dry fertilizers were broadcast preplant and incorporated at rates dependent upon yield goals established for this particular area. All applications, farm management, and harvest were done using full scale farming equipment. Two replications were incorporated every year within the experimental design that allows statistics to be performed across years and with a total number of replications of eight observations.

An example of long-term FŪSN trials are given for the Karcher Road location from 2015 that demonstrates how these field trials were established. The field was surface-irrigated using furrow irrigation (Figure 1).

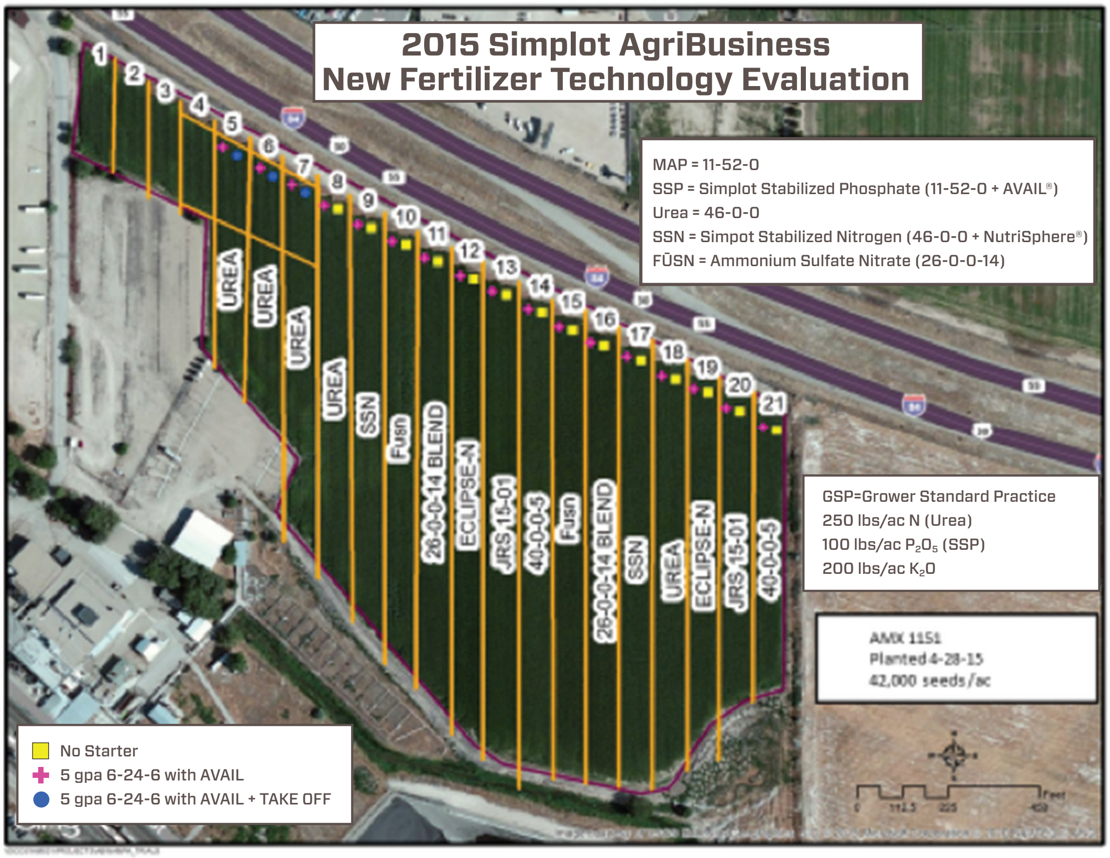
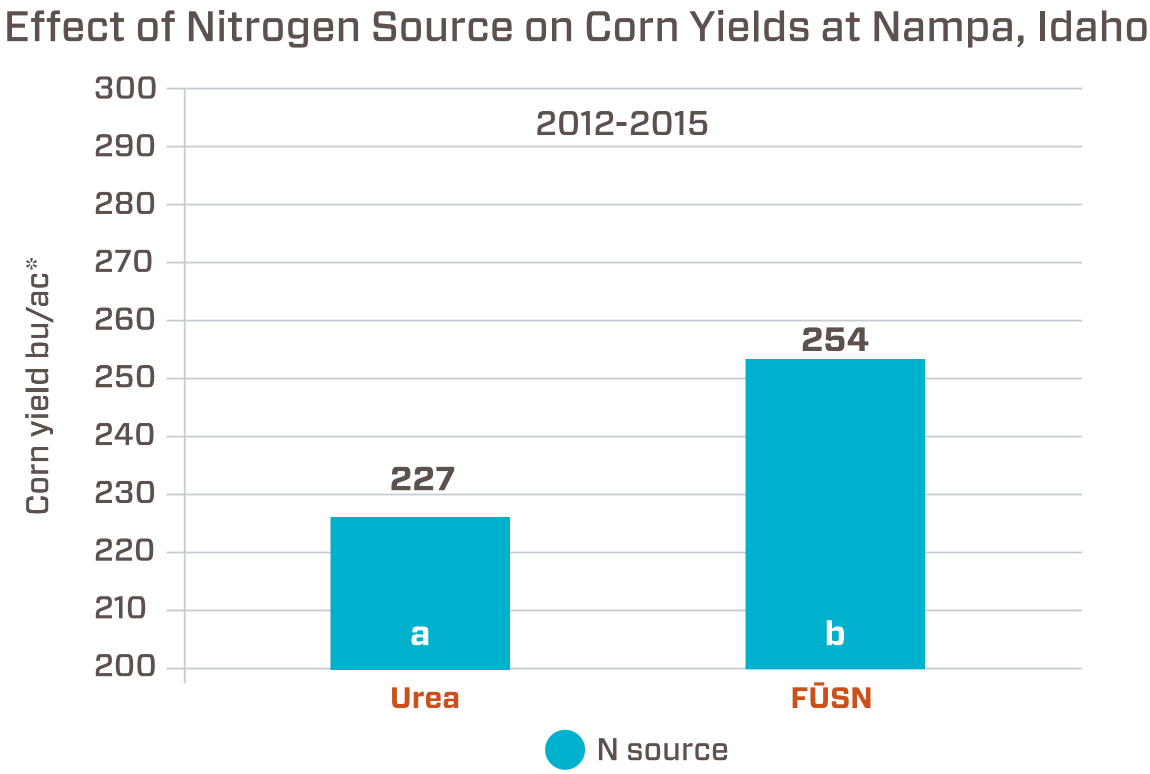


Figure 1. FŪSN field trial plot plan for 2015 that includes N fertilizer sources as well starter formulations for Karcher Road location, Treasure Valley, Idaho.

Yields were improved (12%) over the traditional grower standard practices of using urea when compared with FŪSN from 2012 to 2015 (Figure 2). When averaged over the four years of treatment applications, FŪSN yield increases resulted in an increase from 227 to 254 bu/ac.



Each data point represents the mean of two, approximately .5 acre plots/year for three years.

*Adjusted to 15% moisture. All plots received 100 lbs/ac/yr of P_2O_5 as MAP w/AVAIL®. LSD_1=16 bu/ac

Figure 2. Corn yields comparing FŪSN with urea as source of dry N fertilizer produced under furrow irrigation at the Karcher Road site, Treasure Valley, Idaho, for 2012–15.

The increase of 24 bu/ac was statistically significant ($P \leq .10$) allowing crop advisors, managers, and growers to appreciate that these responses are truly consistent across several years of corn production during differing growing seasons. Reasons for improvements in yield would be related to less N losses into the environment from topdressed applications, more N available in the ammonium form resulting in less leaching potential, as well as the FŪSN molecule allowing greater amounts of sulfur (S) to be available. The complete comparison of treatment responses with other formulations are also available upon request, but a direct comparison between GSP and FŪSN is a key focus of this paper.

Additional field trials on corn have also been established under pivot irrigation at the Arena Valley location, near Wilder, Idaho (Figure 3). In-season satellite imagery allows visual comparisons to be made compared to the rest of the field based on photosynthesis evaluations.

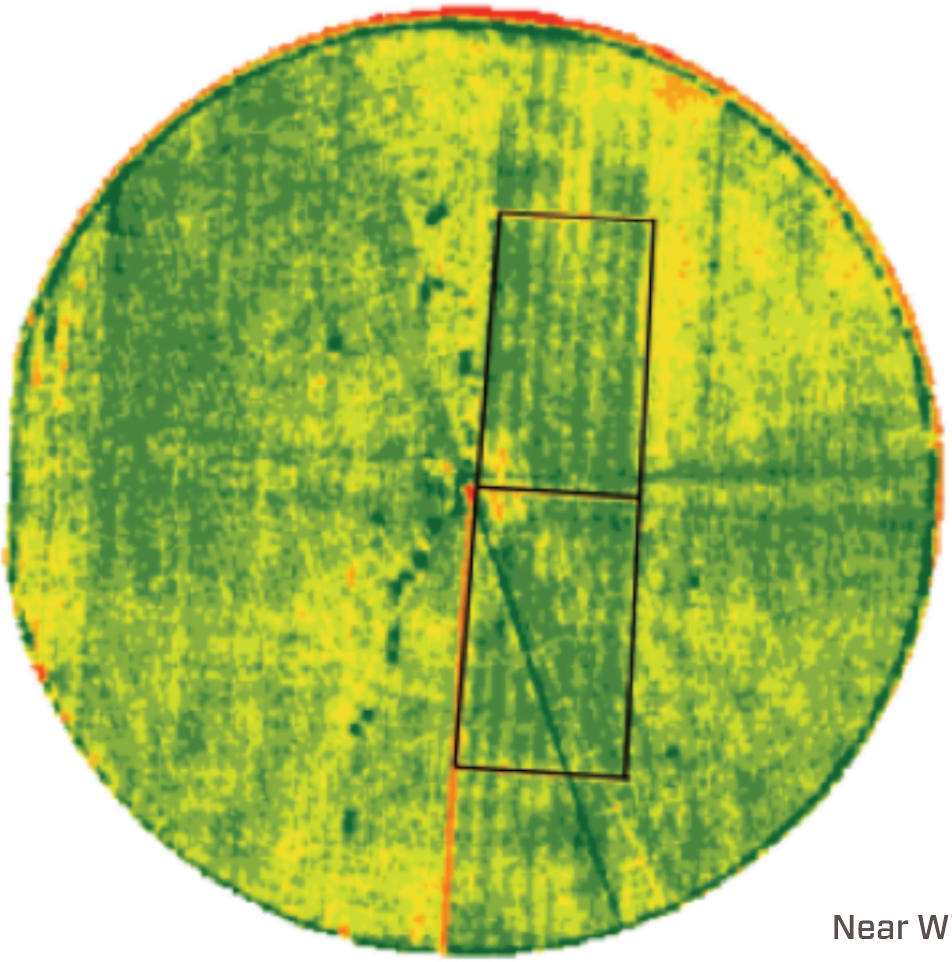
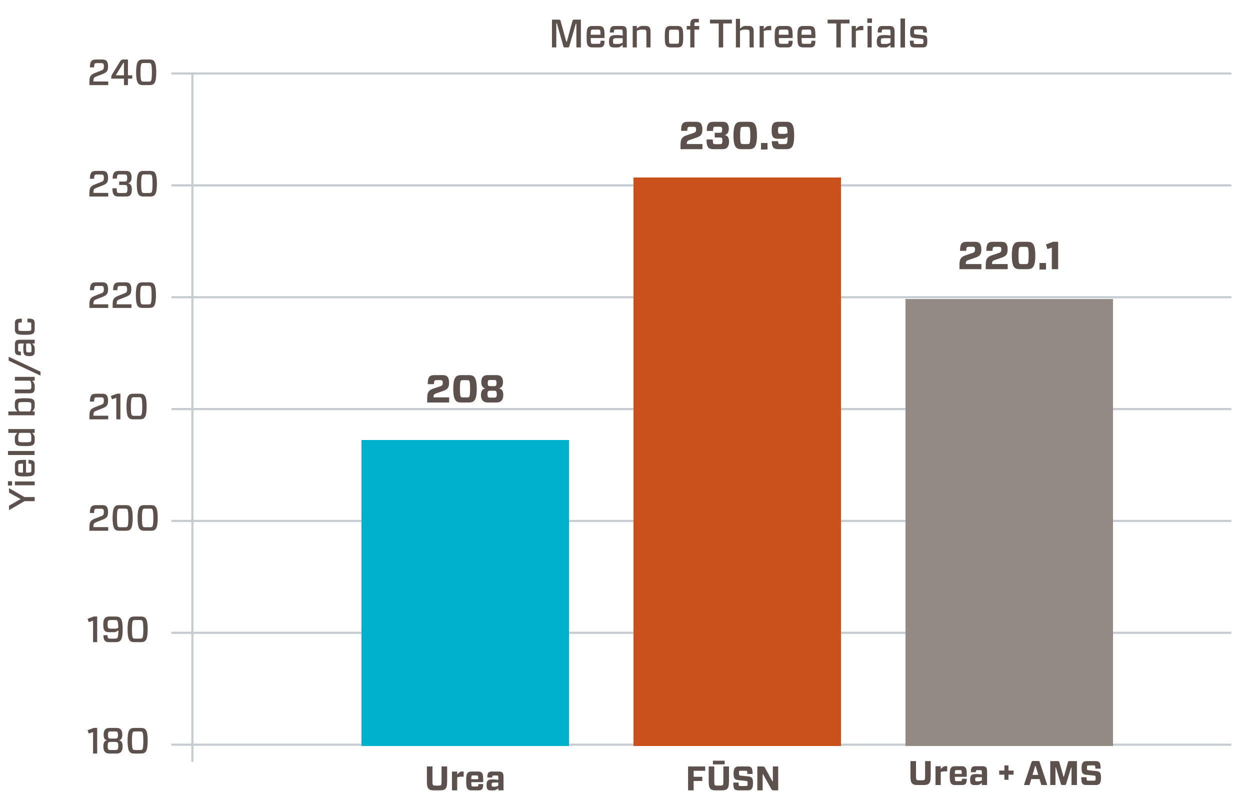


Figure 3. Indicates FŪSN fertilizer treatments compared to other dry sources of N fertilizer within an area of an irrigation pivot during the 2015 growing season located in the Arena Valley near Wilder, Idaho.

Yield comparison between FŪSN and urea, which represents the GSP for this area, was one of the trial's main objectives. FŪSN was also compared to a blend of urea and AMS with the same analysis as FŪSN. Productivity comparisons were made for each year of the trial with positive yield improvements being observed for all years of the study (Figure 4).

Corn yields were also increased across three separate field trials by an average of 32 bu/ac between FŪSN and urea or a 10 bu/ac increase when compared to creating a blend from AMS and urea. These field trials, which included both types of irrigation, provide stronger recommendations to be considered for the use of FŪSN as a source of dry fertilizer N within a high yielding corn production system. These trials should serve to encourage crop advisors and growers to consider supporting recommendations under similar conditions in irrigated areas of western North America.



Nitrogen treatments were broadcast applied at 200 lbs N/ac.
Plots were approximately 0.5 ac/plot. Replication=6

Figure 4. Corn yields from FŪSN source of dry fertilizer compared to urea and a urea + ammonium sulfate (AMS) blend under pivot irrigation at Arena Valley near Wilder, Idaho—2015.

Simplot

Bringing Earth's
Resources to Life

Fūsn
Fused-Safe Nutrients™