



**Controlled Release Fertilizer**  
 A *smarter* source of nitrogen.  
 A *smarter* way to grow.



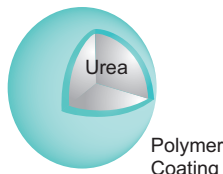
**corn**

**Use Recommendations**

**How the ESN Technology Works**

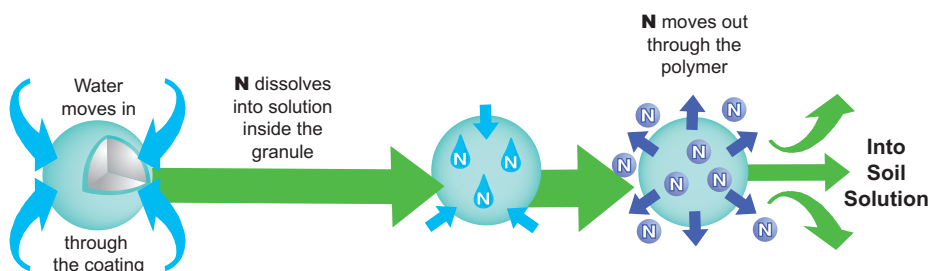
**Coated Nitrogen Granules**

ESN is a coated nitrogen (N) fertilizer that delivers N to the crop with control and predictability. A flexible, micro-thin polymer coating, over top of the N granule, enables this precision.



**Predictable Nitrogen Release**

This unique membrane allows water to diffuse into the granule, dissolving the N within. The N liquifies into a solution, yet remains encapsulated within the coating. The N release rate through the coating is governed through soil temperature, which is a major factor in crop growth and nutrient demand. The N solution moves through the membrane in a predictable manner, matching the N demand curve of the crop.



**Temperature Controlled Diffusion**

**ESN Recommendations For Corn**

**Nitrogen Nutrition of Corn**

Proper N nutrition of corn is critical to high yields and overall plant health. Nitrogen is essential for vegetative growth and protein synthesis. Nitrogen is a critical component of the photosynthetic factory that converts solar energy to proteins, starches, and oil in the grain. Excess N early can cause excessive vegetative growth and lodging. Excess vegetative growth can also deplete soil moisture leading to greater moisture stress during grain fill. Corn takes up very little N in the first month after planting, but takes up about 60-80% of its total N needs in a few weeks of rapid vegetative growth. Controlling the rate of N supply with ESN can help increase N-use efficiency by protecting most of the N from loss until the period of rapid crop uptake.

Interactions of weather conditions, timing of N demand, and potential for N loss should be considered in determining the

most appropriate ESN application for different geographies and uses.

Nitrogen management presents numerous challenges. Corn requires high N rates, but most of the N fertilizer is applied in advance of peak crop demand. Excess precipitation during winter and especially during early spring produces high potential for N loss by leaching and denitrification. Nitrogen sources containing urea are subject to volatilization losses when applied on the soil surface. ESN provides greater protection against N loss than conventional N sources and is a tool that can help overcome these losses if used properly.

Corn is commonly grown in the semi-arid plains. The potential for winter N-loss is low in this environment. ESN generally performs best when applied in the spring before planting but may also be applied in the fall in this region. ESN blends easily with other granular fertilizers and provides convenient one-pass fertilization. Fall and spring ESN applications in the Great Plains should follow the guidelines provided below.

**Table 1. Geographic regions and general use guidelines for ESN**

Region	Boundary	N-Loss Potential	Recommended Use
Semi-arid Great Plains		Low To Moderate	Spring: Preferred Fall: Acceptable

## ESN - A New Nitrogen Technology for Corn

### Application Timing

Agrium supports local recommendations for N applications as well as other best-management practices. We do not support use contrary to locally supported N management practices. Information to date suggests ESN produces the greatest benefit when applied in the spring close to planting time - one application for season-long feeding. ESN performance is more stable than conventional N fertilizers over variable soil and weather conditions.

The release of N from ESN is proven to be slower than N release from urea, but research work with fall application is limited. Under normally accepted fall N practices, ESN is expected to reduce N loss with fall, winter and early spring applications compared with currently accepted practice.

### Application Rates

ESN is generally recommended at rates similar to conventional N fertilizers. When applied at normal recommended rates, increased N efficiency with ESN usually results in yield increases. Studies indicate, where N efficiency is a yield-limiting factor, ESN may produce yields similar to conventional N fertilizers at lower rates than conventional fertilizers. However, economic analysis usually indicates greater profitability from increased yields at standard recommended rates than similar yields at reduced N rates. Where N efficiency does not limit yields, increased N efficiency may not produce significant yield increases, and greater advantage of ESN may be observed by maintaining yields with reduced N rates.

### Application Recommendations

#### ESN Applied in Spring

- Surface application is acceptable if sufficient residue is present to prevent surface movement of ESN in the event of surface runoff. We do not recommend surface application on bare soil.
- Surface application is acceptable if precipitation frequency is normal for the region or if sprinkler irrigation is used. Nitrogen availability from surface-applied ESN may be reduced if precipitation is limited, and the soil surface remains dry for extended periods during rapid crop growth.

- For early spring applications, ESN provides greater protection against N loss than conventional N sources applied at the same time. Where potential for N loss is high, we recommend applying ESN close to planting time.
- Where potential for N loss is extreme, such as in sandy soils with high rainfall, split applications of ESN have performed better than all ESN applied before planting and better than similar applications of conventional N sources. Under these conditions, apply 25-50% of the N requirement at planting as ESN with the remainder top-dressed at 4-6 weeks after planting (about V6-V8).
- ESN may be applied as a top-dress after planting or emergence. We recommend this application be made by about V6 to V8. If ESN is to be applied as late as V6 to V8, a small amount of N before or at planting, such as a starter or sufficient residual available soil N, is recommended to prevent early N deficiency.
- ESN is compatible with “weed-and-feed” programs. Applying most of the N requirement as ESN before planting can minimize the amount of N solution needed in the weed-and-feed application.
- Impregnating chemicals on ESN has not been tested for effects on herbicide efficacy or ESN performance. If impregnation is desired, we recommend impregnating chemicals on other fertilizers before blending with ESN. We do not recommend impregnation on ESN alone because of unknown results.

#### ESN Applied in Fall

- ESN is expected to reduce losses from fall N application compared with conventional N sources. Apply ESN in the same manner as you would conventional N sources.

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