

Agrium

Environmentally Smart Nitrogen



Controlled Release Fertilizer

A *smarter* source of nitrogen. A *smarter* way to grow.

Environmentally Smart Nitrogen

Agrium, one of North America's largest nitrogen (N) manufacturers, brings a smarter N fertilizer to commodity agriculture. This revolutionary product is ESN smart nitrogen, a controlled release N fertilizer that reduces N exposure to potential loss until conditions are favorable for plant uptake.

Conventional N application methods apply much of the fertilizer in advance of crop needs. Nitrogen in the soil is subject to processes by which it can be lost to ground water or to the atmosphere before the plant can absorb it. These losses reduce economic efficiency of the applied N and may pose an environmental risk.

A variety of fertilization practices can be implemented to reduce N losses and increase N efficiency. Most of these require additional field operations that increase crop production costs, are inconvenient, or come at a time when weather prevents timely nutrient application. ESN technology allows the grower to maintain flexibility in field operations while reducing N loss.

How is ESN a smarter source of N?

Nitrogen in ESN is encapsulated within a patented polymer membrane that releases the N as the soil warms. ESN can be applied in advance of crop demand. As soils warm, crop growth and nutrient demand increase. Warmer temperatures also increase N release from ESN to keep pace with plant needs.



Research shows ESN improves N use efficiency and environmental safety.

Studies consistently demonstrate increased yield and N uptake with ESN. Studies measuring leaching, denitrification and volatilization (loss of N gases to the atmosphere) verify ESN reduces N loss compared with conventional N fertilizers.

A forage fertility study in Agassiz, B.C. (2003) demonstrates the environmental advantage of ESN.

In this geography, fall applied nitrogen is not recommended practice. This is due to the high potential for leaching losses of applied nitrogen.



Research shows ESN can keep more N in the root zone, reduce losses, improve efficiency and help protect our environment.



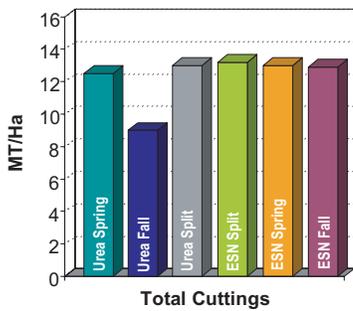


Figure 1. Orchard grass yield under various nitrogen application rates and products (Bittman, Agassiz, B.C. 2003)

Figure 1. shows orchard grass yields in various nitrogen management systems. Although fall applied, ESN performs similarly to spring applied nitrogen, and much better than fall applied urea.

Additionally, a single ESN application performs similarly to the multiple nitrogen application system. This reduces labour and fuel costs, benefiting both the producer and the environment.

Work conducted at two research sites in Manitoba (**Figure 2.**) relate nitrogen release from fall banded ESN and urea. Soil nitrate nitrogen was measured at two spring dates at both sites (Manitoba Zero Tillage Research Farm: MZTRF; Brandon Research Centre: BRC).

Fall banded urea showed greater soil nitrate levels than fall banded ESN at the spring sampling time (statistically significant), but fall banded ESN has greater soil nitrate levels at seeding time (MZTRF site).

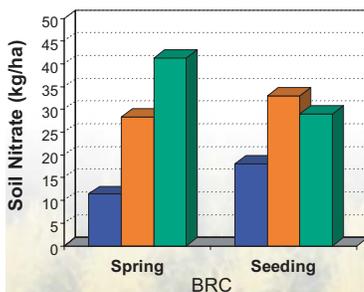
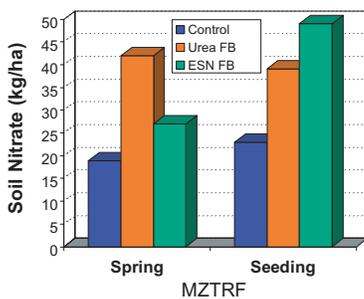


Figure 2. Soil nitrate content with fall banded urea and ESN (Grant, Brandon MB, 2005)

This may suggest that a lower spring nitrate - nitrogen loss potential exists for fall banded ESN, as compared to fall banded urea. Greater nitrate present in spring, prior to crop seeding and uptake of nitrate, may be susceptible to loss through denitrification and/or leaching.

However, (not statistically significant) a reverse trend was shown at the BRC site. The reasons for this are unclear, as fall applied ESN should release nitrogen slowly under the cool soil conditions of a fall band application. Work continues at this and other locations to more fully understand the mechanism of fall nitrogen release from ESN.

In general, fall applied ESN should offer a more protective nitrogen loss environment as compared to fall band applied urea.

Concerns about the effect of greenhouse gas emissions from crop production have increased scrutiny of N fertilizer use. The contribution of fertilizers to total emissions remains small, but environmental conditions and production practices affect N loss to the atmosphere. The results of a three-year Manitoba study show ESN can reduce the

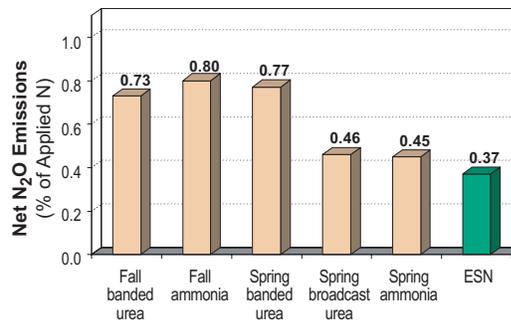


Figure 3. ESN reduces N loss to the atmosphere as nitrous oxide emissions from soil (Winnipeg, Manitoba, 2000-2002.)

amount of fertilizer N lost to the atmosphere (**Figure 3.**)

ESN: Environmentally Smart Nitrogen

If you are concerned about the environmental impact of your current N management program, and you want to protect your nitrogen investment, let us show you how ESN can help you take control of this important crop input. ESN can keep more N in the root zone, reduce losses, improve



How can we help?

To make ESN a part of your spring nitrogen program, contact an authorized retailer or Agrium representative. For technical information, our agronomists can be reached during business hours.

Agronomy Information Line

(800) 661-NPKS (6757)
USA and Canada
(877) 265-0405 USA

email: esn@agrium.com
www.agrium.com

Agrium

13131 Lake Fraser Drive SE
Calgary, Alberta T2J 7E8
(403) 225-7000

Senior Agronomist: Ray Dowbenko

Agrium U.S. Inc.

4582 S. Ulster Street Suite 1400
Denver, Colorado 80237
(303) 804-4479

Senior Agronomist: Alan Blaylock

Okemos, Michigan
(517) 349-7084

Midwest Agronomist: John Kaufmann

Cedar Rapids, Iowa
(303) 588-8333

ESN Coordinator: Mark Mangin

Salem, Oregon
(503) 371-8337

ESN Coordinator: Jim Peters

Breese, Illinois
(618) 526-7728

ESN Coordinator: John Niemeyer

DeWitt, Michigan
(517) 669-5499

ESN Coordinator: B.J. Bilas