

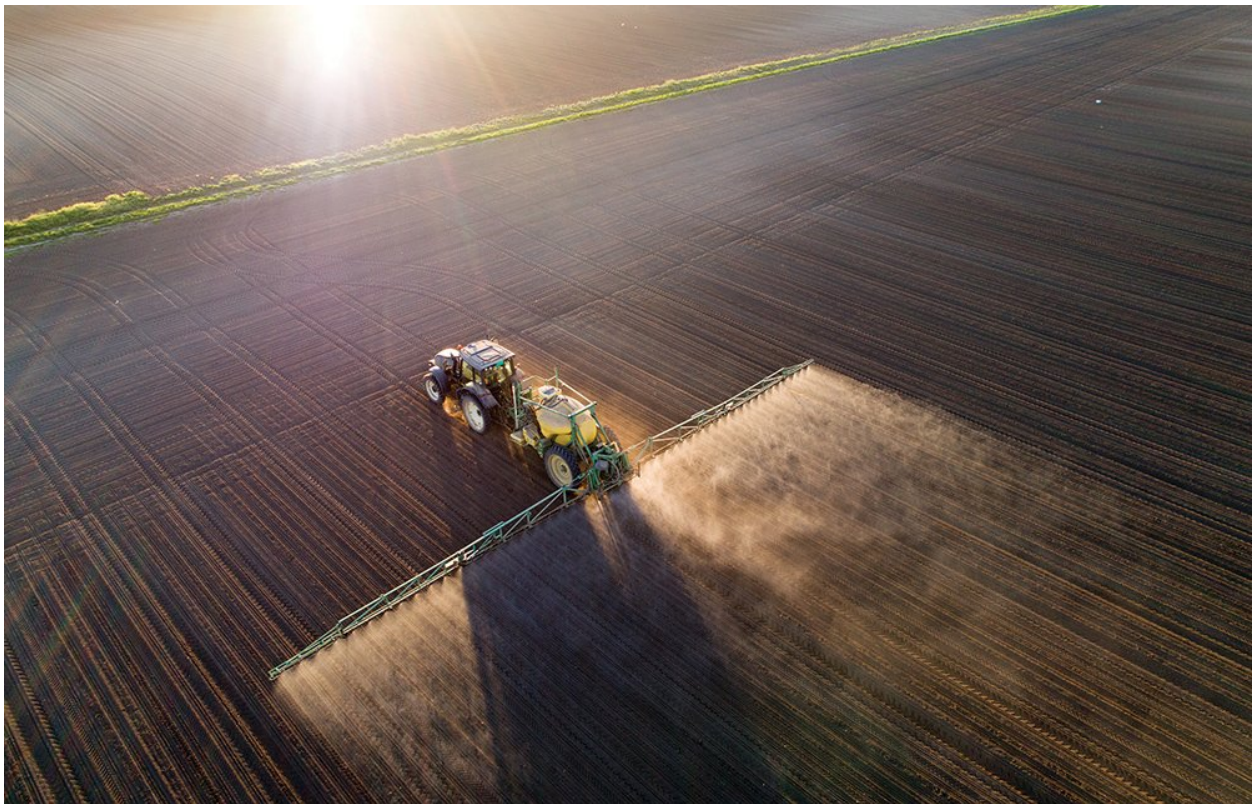
<https://www.grainews.ca/features/finding-the-fit-for-premium-fertilizer-products/>

Finding the fit for premium fertilizer products

Good for reducing the environmental footprint, crop production and management

By [Lee Hart](#) January 27, 2020

Field Editor



Enhanced efficiency fertilizer (EEF) products that provide a range of benefits in terms of crop production and management, as well as environmental benefits, are likely to play an increasingly important role in coming years of Western Canadian crop production, says Mario Tenuta, a University of Manitoba soil scientist.

The products, with familiar brand names such as Agrotain, ESN, N-Serve and SUPERU — to name a few in an ever-growing field of products — do work, says Tenuta, a U of M professor of applied soil ecology. But, he says more research is needed to answer the fine-tuning questions such as proper rates and placement.

“I’m not an economist, but I expect these enhanced efficiency fertilizer products will be the go-to products for farmers within 10 to 15 years,” says Tenuta, speaking recently to farmers at the Farming Smarter conference in Lethbridge, Alta. “The more they are in demand, in an increasingly competitive marketplace, I would expect prices will come down.

“Our research has found they are effective at reducing greenhouse gases and reducing nitrogen losses and also can produce a number of other benefits, including increased yield under certain circumstances. There are several products on the market now. And it is a very busy area in terms of research and development as companies are looking at new products with completely different chemistries and different formulations. As more are used and as more are produced, I’m expecting the economics of using the products will change as well.”

Generally, the EEF products, regarded as premium fertilizers, can add anywhere from eight to 15 cents more per pound of nitrogen. If a producer is applying 100 pounds of nitrogen for example that could increase fertilizer cost by \$10 to \$25 per acre.

The new fertilizers

The enhanced fertilizer products have been developed with different modes of action, all intended to protect nitrogen. The three product categories are:

- Nitrogen stabilizer products: the urease inhibitors, such as Agrotain; nitrification inhibitors such as N-Serve and eNtrench; and dual- or double-inhibitor products such as SUPERU.
- Controlled release products: polymer-coated urea products, such as ESN.
- Slow-release products: described as the next generation of EEF products such as sulphur-coated urea. Koch has one, for example, in which urea is coated by a thin layer of polymer, then sulphur, followed by wax, but there are several other formulations as well such as methylene urea, urea formaldehyde and urea triazone.

The nitrogen stabilizer and polymer-coated urea products are the ones most familiar to western Canadian farmers.

Tenuta's team has looked at various enhanced efficiency fertilizers in a number of research projects over the past six years. During his presentation in Lethbridge, he reviewed results of research involving the inhibitor products — the urease inhibitors, nitrification inhibitors and the double inhibitors. Bottom line is they all worked to reduce nitrogen losses.

The nitrification inhibitor products such as eNtrench and the double-inhibitor product SUPERU, for example, were effective in reducing nitrous oxide (N₂O) losses to the atmosphere by as much as 50 per cent.

And that is a good news story as nitrous oxide is one of the more serious greenhouse gases — on a per-molecule basis it is about 300 times more potent than carbon dioxide in warming the atmosphere. Globally, much more carbon dioxide is produced primarily from using fossil fuels, but nitrous oxide emissions from soil are about two to five per cent of national emissions of all greenhouse gases in Canada. That's a small but important amount because agriculture is the main emitter of nitrous oxide.

Nitrous oxide emissions

Nitrous oxide, or N₂O, is a gas produced mainly by bacteria in soil when they convert nitrogen in organic matter, animal manures, green manures, crop residues, and ammonia/ammonium/urea synthetic fertilizers to nitrate (the most crop available form of N in soil). Basically, any source of nitrogen converted to nitrate results in nitrous oxide.

“When we used these products in what might be described as normal conditions of the black soil zone in Manitoba, nitrous oxide emissions were reduced by about 30 per cent compared to untreated urea fertilizer,” says Tenuta. “And when the EEF products were used under wetter soil moisture conditions of spring and early summer, the nitrous oxide emissions were reduced by as much as 50 per cent.”

Similarly, Tenuta found that urease inhibitor products such as Agrotain or SUPERU EEF's reduced ammonia losses anywhere from 25 to 75 per cent, compared to either conventional granular urea or UAN.

Surface-applied urea or UAN can be lost through a process known as volatilization. The urea, exposed to microbial enzymes in soil is converted to ammonia (NH₃) and is lost to

the atmosphere. If conventional urea is applied to the soil surface and not incorporated into the soil, nitrogen losses can range from a few pounds up to about 20 pounds in a worse case scenario, over a few days to a couple of weeks.

“The gold standard recommendation is to always incorporate urea into the soil to avoid nitrogen losses,” says Tenuta. “But sometimes that isn’t always possible. It could simply be a timing issue — with a lot of acres to cover there just isn’t time to get it incorporated, or perhaps field conditions are such that making that tillage pass to incorporate or banding isn’t an option. The urease inhibitor-treated fertilizers can reduce nitrogen losses.”

Upcoming research

Tenuta says the next round of research will focus on the four Rs of fertilizer application, which includes the Right rate, the Right timing, the Right source, and the Right placement. Part of that work will include trials with various rates of EEF fertilizers to determine what rate is most economical to crops grown on the prairies.

“When we have applied the EEF fertilizers at an arbitrary research rate of 70 per cent of the recommended rate to slightly short the plant of N, we did observe improved yield compared to conventional nitrogen fertilizer. This indicates they are improving the efficiency of crop use of added N,” says Tenuta. “But we’re not recommending anyone only apply 70 per cent of the recommended fertility. But what is the most economic or beneficial rate?”

“If treated urea, for example, reduces nitrogen losses making more nitrogen available to the plant, can a producer apply a different amount of the recommended rate and still achieve an optimum economic yield? That’s what we hope to determine by fertilizing at multiple rates and developing a nitrogen response curve. After all, fertilizer N recommendations have been largely developed using conventional granular urea.” He’ll be doing that work with canola and grain corn crops.

Aside from the environmental benefits, which are important, Tenuta says further research with EEF products will hopefully determine other practical production and management benefits.

In their work with urease and nitrification inhibitors, researchers found those fertilizer products also increased the protein level in spring wheat by one-quarter to one-half per cent.

In extensive studies by others, with ESN — polymer-coated, controlled release product, Tenuta says the findings show that they can be safely used with canola and other crops, to increase the amount of fertilizer placed in the seed row without causing injury to seedlings.

In Manitoba, there are some potato growers using ESN to eliminate the need for split applications of fertilizer. “We found with the ESN product they can apply all fertilizer at time of seeding, and eliminate the need to top dress with urea or add more fertilizer in-crop through fertigation,” says Tenuta.

“We are reasonably confident the products work,” he says. “But now we need to figure out the details when it comes to what is the right rate, and timing and placement. And I believe that is the job of researchers to help farmers find the best fit when using these products.”