REDUCING GREENHOUSE GASES – PUTTING ALBERTA'S FARMERS IN THE DRIVER'S SEAT

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Steep increases in farm operating expenses are reducing net farm cash income to new lows. Adding to this burden, society may soon ask producers to reduce agricultural nitrogen emissions in order to curtail greenhouse gas generation. Addressing the greenhouse gas issue may present Alberta's producers with an opportunity to guide the development of economically viable, novel agricultural technologies.

Why is nitrogen (N) an issue for producers? Agricultural activities use applied nitrogen to produce higher crop yields. Ecosystems, for the most part, can absorb waste products without incurring damage. In some regions, however, intense agronomic practices combined with a high density of agricultural operations can create an excess of N in the environment. Above an optimum level, all forms of N can pollute the air, soil and water. Most of the changes in the N cycle are due to human food production rather than combustion – which is why the use of N in agricultural applications is coming under increased scrutiny.

Agricultural operations add N to the N cycle three ways – as fertilizers, as biologically fixed nitrogen from legume and pulse crops and as animal manure. From these three applications, N added to the soil can escape to the atmosphere in three "problem" forms – NH3, NO and N2O. N can also be converted to NO3 in the soil and become an issue as it moves into bodies of water and leaches into groundwater. Overall, agricultural practices are responsible for the creation and emission of 70 percent of global NH3 emissions, and about 30 percent of global N2O emissions are attributed to food production. Dealing with these issues as part of an overall N strategy may allow producers to reduce input costs and capture value at the farm gate, as well as take advantage of a number of unique value-added opportunities. A solid agricultural N strategy focuses on research projects in six areas – fertilizer, N fixation, livestock manure, green manure, sustainability and crop breeding:

1. Fertilizer – Modify recommendations for rates, timing and placement of N.
2. N fixation – Optimize N fixation by forage legumes and pulse crops.
3. Livestock manure – Develop methods to maintain the bio-stability of livestock manure.
4. Green manure – Producers may have to consider using green manure to remain economically viable if the cost of energy continues to rise.
5. Sustainability and integrated crop management (ICM) – Develop and select best management practices (BMPs) that optimize N use.
6. Crop breeding – Develop crop varieties for low and high nitrogen soils. Develop crop varieties that need higher levels of N for quality traits such as high protein. Develop crop varieties that extract N more efficiently or require less N.

Consider this example in the area of crop breeding. About 38 percent of farmland in Alberta has minimal amounts of residual N. Assume that producers seed these 9.12 M acres to a canola variety that requires 25 percent less N to produce a 35 bu/A crop. Canola has an average uptake of 112 lb/A N – so a canola variety that requires 25 percent less N will save Alberta producers $114.9 M each cropping season – assuming producers apply all the N as fertilizer, all of the N is taken up and N costs $0.45/lb.

A number of projects have been evaluated based on a return to producers at the farm gate. The benefit to producers ranges from $8M-115M annually per project in Alberta alone. The decision-making tool for choosing projects assumes that the goal is to maximize producer returns over the short term while maintaining sustainable returns over the medium to longer term.

Competitive forces in agricultural markets are also an important consideration in choosing projects. Consider the five forces that drive competition: New entrants to a market (countries entering a market with the same product), suppliers, buyers, substitutes (technologies or products that replace what farmers currently produce) and industry competitors (other local farmers). Increasing yield may drive prices down – and the producer gives power to the buyer. If the purchase of a new technology is required to capitalize on an innovation, the producer gives power to the supplier. From a farmer's perspective, projects chosen for development will be those that allow them to retain value at the farm gate – and not have that value captured somewhere else in the value chain over the longer term.