Reducing Greenhouse Gases in the Canadian Hog Sector

Cedric MacLeod - Canadian Pork Council

Reduced greenhouse gas emissions are the result of improved production efficiencies and can put more dollars in a hog producer's pocket

The issue of greenhouse gas emissions is receiving increased attention in the Canadian agricultural industry. Internationally, many scientists agree that global climate change is occurring. It is believed that global warming is being caused by increasing atmospheric concentrations of greenhouse gases such as carbon dioxide, methane and nitrous oxide. To reduce the impact of climate change, the government of Canada has launched a number of national programs, some of which apply specifically to the agriculture industry.

The agriculture sector has been called upon to provide voluntary reductions of greenhouse gas emissions. On April 22, 2002, the Honorable Lyle Vanclief, Federal Minister of Agriculture, announced the Greenhouse Gas Mitigation Program for Canadian Agriculture funded under the Climate Change Action Fund 2000. This program is aimed at promoting the adoption of beneficial management practices, through communication and on-farm demonstration activities, which have the potential to reduce greenhouse gas emissions while maintaining or improving the economic viability of the farm.

The administrative responsibilities for the program are being shared by four national agricultural industry groups: Soil Conservation Council of Canada, Dairy Farmers of Canada, Canadian Cattlemen's Association and the Canadian Pork Council. The inclusion of the four industry partners will allow the program to be tailored specifically to individual commodity producers, as well as provide an opportunity for the entire sector to work together to find solutions to reduce greenhouse gas emissions. A Greenhouse Gas Mitigation Program Coordinator has been hired by the Canadian Pork Council to represent the pork industry in the program and implement this three-year program for the hog sector.

A planning workshop, held in December 2002, provided the CPC with stakeholder feedback and guidelines for undertaking communications with producers about ways to reduce greenhouse gas emissions on their farms. There has been considerable concern within the producer community that mitigation strategies will be costly and that emissions targets for the industry are not economically feasible. This is not necessarily the case, as most management practices that reduce greenhouse gas emissions are the result of improved production efficiency, which generally result in increased profitability.

Some of the management practices that the program will highlight include: hog ration manipulation to maximize growth efficiency and reduce manure nutrient excretion, matching hog manure application rates and timing to crop nutrient uptake, and the use of manure storage covers to decrease methane produced during storage.

The program is aimed solely at demonstrating and communicating beneficial management practices that reduce greenhouse gas emissions. However, through the development of infrastructure on demonstration sites, the program will provide opportunities for western Canadian universities and research institutions to conduct practical on-farm research, and collect valuable economic data. This will better enable producers to determine whether the demonstrated practices can be worked into their individual operations.

Among the first projects to be funded through the Greenhouse Gas Mitigation Program is the development of a "Guidebook for Environmental Management in the Hog Industry". It will serve as a benchmark for environmental management information for the Canadian hog industry, and inform producers of the latest research findings. One factor that sets this guidebook apart from those developed previously is the inclusion of economic analysis for all the management practices discussed, allowing producers to evaluate the viability of the practices on their own farms.

Regular updates on the Greenhouse Gas Mitigation Program will be featured in each edition of the Western Hog Journal over the next year and will include details on the management practices being demonstrated across Canada, as well as local events that producers may wish to attend. For more information about the program, please contact Cedric MacLeod, Greenhouse Gas Mitigation Program Coordinator for the Canadian Pork Council

Canadian Pork Council / Conseil canadien du porc

Benefits of a Manure Storage Cover

Cedric MacLeod - Canadian Pork Council

A manure storage cover near Sherbrooke, QC significantly reduces manure odour, rainwater dilution and conserves valuable crop nutrients

The summer season is upon us, and as liquid manure storage temperatures begin to rise, thus producing odor, so may the concerns of those living near your operation. It may seem odd to begin a greenhouse gas article with comments on manure storage odors, but there is a remarkable similarity between periods of significant manure odor and greenhouse gas (GHG) production. Warmer temperatures mean more microbial activity in your storage, and this in turn increases the amount of microbial bi-products being produced, whether hydrogen sulphide or methane.

A recent fact-finding trip to North Carolina highlighted some options available to Canadian pork producers when it comes to actually *maximizing* the benefits of on-farm GHG emissions, while achieving significant odor reduction. Methane is a bi-product of organic matter decomposed in an oxygen-free environment, i.e. decomposition of waste feed and feces in your liquid manure storage. Methane is the primary component of natural gas. In fact, natural gas is approximately 95% methane. In essence, manure storages are a source of the same gas used to heat many hog rearing facilities during the cold, Canadian winter. The issue, therefore, becomes how do we capture this gas, and what do we do with it once we have it?

Cover Technologies

Manure storage covers have received increasing attention in the past several years with their ability to suppress odor. Straw covers offer this benefit, but have a finite lifetime, and may require modifications to manure application equipment. Additionally, storages will continue to release odor and GHGs upon agitation, and thus may not offer a net reduction in gaseous emissions, but simply change the timeline of when they are emitted.

A more effective odor and GHG mitigation option is the use of synthetic fabric manure storage covers. These covers offer a host of benefits which may help justify the initial costs of implementing the technology. Upon installation of fabric covers, manure volume will be reduced as rainwater is collected on top of the cover, and can be pumped into a potable water reservoir. Odor from the storage is essentially eliminated, and the option for collecting and using methane gas becomes viable. Simple options for the utilization of trapped methane include firing water boilers for barn, shop or home heating needs, an on-farm incinerator, or simply flaring (burning) the gas and the odor contained therein.

Energy Generation with Manure

A more advanced methane treatment option is the production of electricity using a methane-fired diesel engine and matched power generation unit. I witnessed, first-hand, a Caterpillar 3304 engine turning 84 kWh of energy from the methane produced on a 4000 sow, farrow-to-finish operation. The 1.2 acre manure storage was covered with a synthetic fabric cover, essentially turning a basic hog manure storage into an anaerobic digester. While in North Carolina, one producer explained that the Caterpillar engine working on his dairy farm in Vermont ran for 65,000 hours with minor maintenance, underscoring the viability of using methane with existing engine technologies. Anaerobic digestion with energy co-generation is gaining increased attention throughout Canada with several commercial facilities in operation, or under construction. These will be highlighted in more detail in subsequent articles.

Increased on-farm income through energy generation and the sale of GHG emission reduction credits are becoming a viable option through the advancement of manure storage cover technology. In order to weigh the full benefits of implementing this technology, be sure to factor in manure volume and odor reduction, potential GHG credit creation, conservation of the 40-60% of manure nitrogen lost annually during storage through ammonia volatilization, and a source of heat and/or electric energy to reduce barn heating costs.

Several manure storage covers are being installed at extension and research institutions across Canada with support from the Canadian Pork Council. For more information on this technology, or the Greenhouse Gas Mitigation Program, contact Cedric MacLeod, Canadian Pork Council, (613) 236-0011 or macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Maximizing Manure Nutrient Use Efficiency

Canadian Pork Council - Cedric Macleod

Karen Bolton: Saskkatchewan Agriculture, Food and Rural Revitalization

In-crop application of manure reduces greenhouse gas production and maximizes manure benefits

Sitting on the combine gives producers lots of time to think about the crop management decisions that were made this year, which ones to make again and which ones will require modification. One of the decisions you may be thinking about while watching the grain flow into the feeder house, is how well did your manure work as a fertilizer replacement, and can you make it work even better? The good news is that manure IS a resource and only becomes a problem when treated otherwise; the trick is to manage it accordingly and make as many dollars as you can doing so.

Dollars, cents and greenhouse gases

Field applied manure can be a source of greenhouse gases (GHG), however, emissions can be minimized by using simple and agronomically beneficial management techniques. The most important agronomic factor for reducing GHG emissions is focusing on manure nutrient use efficiency in the field, during and following application. Economically, it makes sense to apply manure at rates that match crop requirements. Nitrogen fertilizer prices will continue to increase with the price of natural gas. Bottom line, manure nitrogen used inefficiently will require purchasing more fertilizer nitrogen, leaving fewer dollars in your pocket.

So the question becomes, how does one maximize manure use efficiency?

The major factor affecting GHG emissions from land applied manure is simply how much nitrogen is being applied. Over-application of manure can result in significant emissions and will not maximize the economic potential for nutrient use. The first step is to test the nutrient content of your manure prior to application; and take regular samples during pump out to verify what nutrients are actually going down the pipe. Nutrient balances will vary during pump out so it is important to quantify this variation to aid in management for subsequent years. Secondly, test your soil to know what nitrogen is already present. Thirdly, select an appropriate nitrogen application rate for the crop you are growing and subtract the soil test nitrogen. The final step, after you know what you have in the soil and the additional manure nitrogen needed, work to get to an accurate application rate. By applying only what the crop can use, you will spread your manure out over the farm, reduce GHG emissions and your reliance on expensive chemical fertilizers. As a follow-up, a small pop-up fertilizer application at seeding will be recommended for most crops, and manured land is no exception. Don't put crops grown on manured land at a disadvantage by forgetting basic agronomic principles.

Timing Manure Applications

The second factor affecting GHG emissions is application timing. Spring time constraints require many producers to apply manure during the fall, although spring application will generally result in more efficient manure nitrogen use. If fall application is necessary, applying manure LATE into the fall will help to minimize losses. Much like anhydrous ammonia, liquid hog manure nitrogen has to be converted from ammonium to nitrate in order to be leached; conversion will be slow in cool soils and leaching will be minimized. However, ammonium will become ammonia gas if surface applied and not incorporated. Injecting manure will keep the nitrogen in the soil system where it belongs and not in the atmosphere. Ammonia, although NOT a greenhouse gas, can become nitrous oxide if deposited in aquatic systems, so minimizing ammonia losses will minimize incidental GHG production. If possible, manure should be applied in the spring prior to seeding, but caution must be taken to prevent soil compaction caused by heavy tanker spreaders. Drag-line systems will help to minimize soil compaction and provide some time saving benefits, making spring application a little more attractive.

In-crop manure application

In-crop manure application is practiced widely on forage land, but is seldom practiced within small grain production systems. Applying manure to coincide with crop requirements will improve nutrient use efficiency, minimize GHG emissions and provide new risk management options. Research conducted by the University of Saskatchewan and PAMI, suggest that in-crop application will cause minimal crop damage under the right conditions. The time window between seeding and harvest could, potentially, be filled with manure application. Waiting to apply manure according to crop growing conditions will further maximize the benefits or your manure nutrient resource.

At the end of the year, efficient manure management can result in more dollars in your pocket. Consider storage covers to conserve manure nitrogen, eliminate storage odors and reduce manure volume. With rising fertilizer prices, consider what manure nutrients are worth in grain production systems. Nutrient conservation is key, remember, the more nutrient you have, the less you have to buy, the more you have to use, or perhaps even sell.

Feeding Hogs to *Manage Dollars, Nutrients*

Cedric MacLeod - Canadian Pork Council

Until now, writing greenhouse gas (GHG) articles has been fairly straightforward, allowing me to rely on manure management training to suggest ways for producers to reduce on-farm GHG production. However, animal nutrition tends to be a much more complicated field than manure storage covers or manure tanker calibrations. It was therefore necessary to tap the minds of Canadian extension and research professionals to put this article together.

Essentially, as producers, you attempt to produce the greatest amount of pig with the least amount of feed possible. Traditionally, diets have been formulated with corn or barley and soybean or canola meal to provide energy and protein, respectively. The problem is, in order to provide sufficient lysine, the first limiting amino acid, protein meal was often over-fed, resulting in excessive nitrogen excretion in manure. This represents a loss in productivity and profitability, as finish hogs are only about 30 per cent efficient in feed nitrogen usage.

The problem then becomes that the excreted nitrogen will end up in the manure storage and it will have to be dealt with during field application. Further, if your manure storage is not covered, manure nitrogen is prone to loss to the atmosphere as ammonia gas.

So, your pigs are 30 per cent efficient at using nitrogen in the barn, and now you are losing between 30-50 per cent more of the nitrogen you bought as feed protein to the atmosphere. Perhaps the nitrogen fertilizer bill could use some re-evaluation and a storage cover system should be considered.

The ultimate goal in reducing GHG emissions will be to minimize the flow of feed carbon, nitrogen and phosphorus to the manure storage. Here are some quick options that you have likely heard before. Perhaps they deserve another look or a mention to your feed manufacturer.

To minimize feed carbon loss to the manure stream, eliminate feed wastage. Check feeder settings regularly, don't open the gate too much, and let the animals work a bit for the feed. Also, consider feeder design, if a hog raises its head to chew, is the overflow being caught in the feeder basin or the slatted floor? Further to feeder design, look into wet/dry or liquid feeding systems if you are currently using dry feeders. Both liquid based systems have been shown to increase daily gains and reduce overall barn water usage. Consider pelleting your feed, if the price is right, additional feeding efficiency gains will likely result.

To minimize nitrogen loss from your production system, use synthetic amino acid balancing techniques to provide your hogs with exactly what they need to grow efficiently. Split-sex and phased feeding will also reduce excess manure nitrogen output from the barn and minimize your feed:gain ratio.

Phosphorus excretion can be minimized by including the phytase enzyme in your ration, but will also provide a roughly 10 per cent increase in feed conversion efficiency. Phytase is *at least* cost neutral in most cases and a must for farms pushing the envelope with soil phosphorus concentrations.

Quite truthfully, we don't have all the answers on the balance between feeding strategies and GHG emissions. Basically:

- Keep feed in the pigs, not on the floor or in the pit
- Get feed protein levels down, and get the phytase enzyme working for you on your operation
- Protein management and phytase addition can also pay other dividends beside GHG reduction
- Reducing feed protein can lessen animal water requirements
- Using phytase will reduce land-base requirements for manure phosphorus application

Virtually any practice that makes you more efficient in your animal feeding strategy will reduce your GHG emissions as well. Feed is an expensive component of raising hogs. Make sure that least-cost formulation is least-cost in all aspects, economical and environmental

Canadian Pork Council / Conseil canadien du porc

Barn Management: Small Changes for Big Gains

Canadian Pork Council - Cedric MacLeod

DGH Engineering Ltd.

Demonstration of barn management strategies to reduce GHG emissions are housed in this commercial research facility in Manitoba

Winter has once again come to the Canadian prairies, wheat is in the bin, tractors and combines are safe in the shed. Now is the time to catch up on the reading you have been piling on the corner of your desk all season. Greenhouse gas (GHG) articles written so far have focused on the Canadian Pork Council's GHG program, covering liquid manure storages, and maximizing the benefits of manure as a nutrient source. This article will focus on barn operating efficiency, maximizing value of feed in the bin, and how barn management options can reduce the potential for GHG production on your operation.

There are three main areas where a producer might make improvements in barn management to reduce GHG production. Keep in mind that not all of these management options will reduce GHG production directly, but may have indirect effects further down the management chain, when manure is applied to cropland, for example.

Climate Control

Climate control systems, using electricity, propane or natural gas, can be a significant drain on finances. Proper maintenance and cleaning of fans and heating systems will keep your barn atmosphere clean and warm while minimizing the cost of powering the system. New heat pads for farrowing units may eliminate the need for power hungry heat lamps, and are worth considering. Another energy saving option demonstrated through the GHG program is a climate control system that reduces nighttime barn temperatures relative to the daytime climate. Research at the Prairie Swine Center has shown that feeder hogs prefer cool nighttime temperatures.

Feeding Strategies

Improved feeding strategies are always of interest to producers, as feed represents a significant cost of production. Currently, feed crude protein (CP) content is a popular target for nutrition research. Traditionally, to provide all essential amino acids required for efficient growth, hog feed has contained a high proportion of crude protein. As specific amino acids become available for use in feeds, CP content, an expensive component, can be decreased, reducing the amount of nitrogen being excreted in manure. Your nutritionist will have more detail on the potential for ration manipulation to reduce nutrient excretion. Reduced manure nitrogen means less to deal with in the field, and less potential for GHG production.

Water Management

Water conservation strategies may further improve feeding efficiency while reducing water wastage in your facility, as well. Positive gains can be made with a move to wet/dry feeding systems. Prairie Swine Center has reported a 30 per cent reduction in manure volume using wet/dry systems compared to dry feed and nipple drinkers. Low cost drinker bowls help to reduce wasted water entering the manure system. Other options include controlling drinker flow rate (pigs may not be able to consume all the water provided), and examining the quantity of water flowing through your barn misting system.

Greenhouse Gas Reductions

How are these practices going to reduce GHG production? How do they save you money? Efficient climate control uses less electricity and costs less to operate. Feed protein is expensive; amino acids are getting cheaper to buy. Low crude protein content diets will tend to produce less methane during hind-gut fermentation. Minimizing the amount of water wasted in your facility will reduce your manure pumping costs, reduce diesel fuel use, and the potential for nitrous oxide production at manure application time.

Small Modification for Big Gain?

These management options may seem insignificant to your operation, but put a few of them together and you *may* see significant changes. It is easy to suggest an anaerobic digestion system for every western Canadian hog farm as a way to mitigate GHG production. However, if we fail to consider the source of our production inefficiencies, even digestion technology becomes a symptom treatment, and we do not address the source. Continual gains in efficiency make us sustainable, big efficiency gains can be made with small changes.

For more information contact your provincial pork association or Cedric MacLeod at the Canadian Pork Council at macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Harnessing the Power of Anaerobic Digestion: *Part I*

Canadian Pork Council - Cedric MacLeod

Clear-Green Environmental Inc.

Clear-Green Environmental Inc., recently fired the first hog manure anaerobic digester in Saskatchewan at the PIC facility in Cudworth

These days, more and more agricultural publications are featuring articles on anaerobic digestion technology. This is a process that allows livestock producers to generate electricity and heat using manure from the farm, and is a concept far from new in the agricultural sector. A push on these systems in the 1970s saw numerous sites established for this manure treatment technology, but few remain. At the time, it was felt that these systems were too intricate and finicky, and required far more time for monitoring than producers were willing to spend.

New systems, however, are being designed with these challenges in mind. Partnerships between manure "treaters", livestock producers, and power companies allow pork producers to capture the benefits of the treatment technology without a heavy time burden for system maintenance.

The concept of anaerobic digestion is fairly simple. Manure is warmed and mixed in a tank that is free of oxygen, or *anaerobic*. In these warm conditions, bacteria become very active. They will begin to *digest* carbon, most likely the feed carbon not used in the animal digestive system, which has found its way into the manure stream. In the case of cattle operations, this carbon may also consist of bedding materials, such as straw or wood chips. The goal of anaerobic digestion is to produce *methane*, a combustible greenhouse gas, and a byproduct of having bacteria consume manure carbon under oxygen-limited conditions.

Power and Heat Production

Diesel engines are capable of running on a mixture of the methane produced in a digester, and diesel fuel, with some minor modifications. A mix of 10 per cent diesel and 90 per cent methane gas is working well for most systems. These engines are coupled with an industrial generator to turn methane and diesel into power and heat. Oil fields have been using methane-fired generators for years to supply power to remote locations, so the technology has been well proven.

System Benefits

Manure odour produced during storage generally results from the release of carbon compounds. This is the same carbon that will be used to produce methane in a digestion system. As such, digested manure produces very little odour and in many cases, these systems are used as an odour reduction measure, with electricity as a nice byproduct bonus.

BIOGEM Power Systems Inc. has been producing power and heat from a multiple manure source digester in Iron Creek, AB for two years

In addition, by using a heat exchanger, waste heat from the engine can be used to heat farm and home buildings, as well as the digester itself. As methane is a greenhouse gas, and digesters allow for its capture and use, there may also be opportunities to sell carbon credits. It is still unknown exactly how much income may be generated from selling these credits, but the option will likely exist.

System Challenges

Digesters *will not* solve nutrient management issues. Carbon is the only nutrient consumed in a digester, so nitrogen and phosphorus concentrations are the same for raw and digested manure. However, separation systems can be easily integrated into a digestion unit to capture phosphorus for other on or off-farm uses. Selling electricity into the local power grid is currently fairly difficult and yields little cash in most provinces. However, as green energy portfolios become more prominent in Canada, this is expected to change.

DGH Engineering Ltd., fired the first Manitoba digester system in February 2004. Both heat and energy production are planned for the hog finishing operation in Teulon

Anaerobic manure digesters reduce odour, generate heat and electricity and reduce greenhouse gas production. For an age old piece of technology, that's not a bad start.

Additional project pictures, information and contact info are available upon request.

Canadian Pork Council / Conseil canadien du porc

Anaerobic Digestion: Part II *Canadian-born Projects*

Cedric MacLeod - Canadian Pork Council

Clear-Green Environmental Inc.

Four Capstone micro-turbine engines operating at a Clear-Green Environmental digester installation in Cudworth, Saskatchewan. Turning methane into electrical energy will likely be a practice capable of netting carbon credits.

With all the talk about anaerobic digesters across the country lately, a two piece story seemed necessary to fully cover the topic. The digester concept was covered previously in Part I of this series in the January edition of Better Pork. The following will be a brief digester tour across Canada with emphasis on a few digestion system projects up and off the ground.

Bio-Terre, St. Edwidge, QC

Swine manure from a 200-sow, farrow-to-finish operation has been operating a biogas plant in Quebec for a number of years. Biogas is produced by special bacteria capable of metabolism at a relative lower temperature than conventional biogas reactors. The system was developed at the Dairy and Swine Research and Development Center of Agriculture and Agri-Food Canada, Lennoxville. Approximately 40 m^3 of methane is produced for every cubic meter of 8 percent solids content manure.

Klaesi Farms, Cobden, ON

The Klaesi brothers have nearly completed their first winter of operating an imported, Swiss-designed, digester system capable of processing the manure from their 140-cow dairy operation. The system produces 70-80 percent of the electricity required to run the farm and two on-site houses, and enough thermal energy to heat the digester, dairy parlour and houses down to about -5C. Manure is gravity-fed to the digester using the gutter cleaner in the tie-stall barn twice daily. The Perkins engine used to turn the German engineered generator, pictured here, runs on a mixture of digester methane and about 1.7 L of diesel per hour, 10-12 hours a day, to produce 450-500 kW of energy.

DGH Engineering Ltd., Bio-Terre, Teulon MB

After touring Europe and North American digester facilities, DGH Engineering Ltd, began design and construction of an in-ground vessel digester capable of treating the manure from a 6000-head finisher barn, expected to be on line for early spring 2004. The facility was proposed as an odour abatement technology, but is anticipated to produce 500 m^3 of methane daily which will generate hot water using a boiler system in operation year one and electrical energy in year two.

Clear-Green Environmental Inc., Cudworth, SK

Phase one of this two-phase project is complete, with biogas production initiated in early February 2004. The system is designed to process eight million gallons of manure annually from a 1200-sow, farrow-to-finish operation. An agreement with SaskPower will see the utility purchase the digester biogas to fire four 30 kW micro-turbine engine/generator sets, housed at the digester site, for electricity and heat generation.

BioGem Power Systems Inc., Bruce, AB

A 1200-sow farrow-to-finish operation, on an Alberta Hutterite colony, has realized the benefits of a digestion system, built in partnership with BioGem Power Systems Inc, for the past 2 years. The facility is capable of generating 350 kW of electricity per hour. Much is used on site to power the colony with excess sold into the Alberta power grid. Temporary gas storage allows for flexible power export at peak consumption periods, increasing realized revenue. Heat energy is captured and used to heat farrowing units, offsetting natural gas requirements. Further on-site manure polishing produces a dry fertilizer from separated solids and clean water used for barn sanitation.

Project Commonalities

Manure odour and pathogen reductions, electrical and thermal energy production, and the potential for generating carbon credits are benefits quoted by digestion system operators across Canada, and may provide the same for your farm. Several of the systems here are 'Cadillac' models, others are smaller less complex units. The applicability of either option for your operation will depend on a host of factors. Before dismissing the technology as a non-profitable investment, explore your options.

Additional project pictures, information and contact info are available upon request.

Canadian Pork Council / Conseil canadien du porc

Free Environmental Management Guidebook From the *Canadian Pork Council*

Rick Taillieu, Alberta Reduced Tillage LINKAGES

Direct seeding near Huxley, Alberta using a Flexicoil 5000 series Air Drill

After seeing the flurry of activity that follows the spring thaw in Western Canada, during my three years at the University of Manitoba, I hope that seeding for most is all wrapped up. Maybe you are reading this piece on a rainy June day, or perhaps during some well-deserved relaxation time after a satisfying day of field work, either way, hope the season is shaping up well for you. Instead of passing on basic information about the Greenhouse Gas Mitigation Program, this article will focus on some of the challenges we face in the industry, and a new product from the Canadian Pork Council that will hopefully help you make decisions on how to overcome a few of them.

I have had the pleasure of meeting a great many Canadian pork producers during the past year, and greenhouse gases (GHG), have been a fairly easy topic to broach for discussion. Most producers are willing to discuss the topic, and many have indicated that they are considering the pros and cons of new technologies geared towards reducing on-farm GHG production.

However, my travels have also revealed an ongoing challenge faced by the farming community, with respect to obtaining information on new products, technologies and management practices. There is no shortage of information out there for you to use in your decision making. Researchers are calling for letters of support, equipment manufacturers are pushing the new silver bullet for the latest issue facing the industry (real or perceived), and farm magazines and newspapers are continuing to pump out article after article. Despite all the information available, it is sometimes not well targeted or presented in a form that can be truly useful to producers.

During one of my recent farm visits, I talked nutrient management with a farrow-to-finish producer, and the conversation swung to phosphorus management. I am a soil scientist by training and can discuss soil phosphorus management at some length, but when this producer told me that including the phytase enzyme in his ration would cost him $4.00 per hog, I had little with which to respond. All previous discussions had led me to believe that phytase was at least cost-neutral, if not cost-positive. Perhaps this cost was representative of the area and the local availability of ration products, perhaps a nutritionist had forgotten to carry the '2'. In either case, it didn't seem right, and the producer had more-or-less given up on phytase working on his operation.

If it was going to cost $4.00 a hog, then we both needed to know, and be sure of the numbers. This experience again reinforced to me the importance of quality extension services in the agricultural industry. Without all the pertinent information, consultation on the merits of dicalcium phosphate versus phytase in hog rations, may lead a producer away from a cost effective option to help lighten the farm phosphorus load.

I thought about the challenge of a producer talking phosphorus management with a salesperson, leaning on the hood of a farm truck. Trying to talk while forgetting about the state of the industry, and the money he/she tried to make on the pod of slaughter hogs that left the yard at 5:00AM that morning, makes for difficult conversation. The options exist to manage soil phosphorus, but does everyone have access to the best information? Have the majority of producers heard about all the options?

Unfortunately, we do not have all the answers on phosphorus, greenhouse gases, storage covers or anaerobic digesters, yet.

What we do have is a new information resource, free to each Canadian pork producer, set for release to the industry in June 2004. This 'Guidebook for Environmental Management in the Pork Industry' will outline the *scientific and economic* specifics of all the environmental management practices you have been hearing about. It will be *very* comprehensive, on all aspects of environmental management, and, it's ***FREE***.

Contact the Canadian Pork Council for more information on receiving your free Environmental Management Guidebook.

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Canadian Pork Council / Conseil canadien du porc

Carbon Credits in the Canadian Pork Sector

Cedric MacLeod - Canadian Pork Council

Clear-Green Environmental Inc.

Four Capstone micro-turbine engines operating on methane produced from liquid hog manure in Saskatchewan. Turning methane into electrical energy will likely be a practice capable of netting carbon credits.

On August 26th 2004, many of you may have heard about the latest development in the Canadian carbon credit trading system. Canadian energy giant TransAlta Corp. bought into the carbon market by purchasing credits developed on a Chilean hog operation, where technologies were implemented to improve hog production efficiencies. The deal saw a reported 1.75 million tons of carbon dioxide equivalent emission reductions trade hands from the large Chilean hog operator to Alberta-based TransAlta Corp. with a price tag of $9-million US.

A Canadian system for trading domestic carbon has not yet been established. However, federal authorities are evaluating industry feedback, collected after a round of public consultations held in summer 2003, on a draft credit trading system. The release of the draft federal plan likely was not responsible for TransAlta's eagerness to enter the carbon market; rather, the province of Alberta has instituted a new set of greenhouse gas (GHG) emissions regulations for newly permitted power plants. Carbon credits must be in place to offset emissions produced in a new power plant, prior to it's commissioning.

Throughout western Canada, a lot interest has been generated by North American based carbon credit aggregator AgCert. Numerous hog producers have opted into the AgCert system, generating credits by emptying manure storages prior to them reaching warm summer temperatures. Manure methane production is a biological process, and warmer temperatures, which accelerates microbial activity, will result in increased manure methane production. Emptying storages prior to summer will, therefore, theoretically, reduce overall methane production.

AgCert is using emissions coefficients assigned to specific best management practices (BMP) by the Intergovernmental Panel on Climate Change (IPCC) to develop packages of tradable carbon credits. IPCC emission reduction coefficients assign values to specific farm practices for their potential to reduce GHG emissions if implemented. These IPCC coefficients are largely starting points for emissions trading, thus research efforts in specific climatic zones around the globe are encouraged by IPCC to further define these coefficients.

Canadian researchers have largely found that manure methane production on Canadian farms is already overestimated by IPCC coefficients. As a result, we haven't got as much to sell to potential buyers, but our total industry emissions are also potentially lower than the bar set internationally by the IPCC. As more players enter the carbon market, interest will be raised in the ability of the hog industry to provide credits for purchase. It will be important to have proper coefficients and farm operation baselines in place for this purpose. A baseline is used as a reference point to which newly implemented BMPs are compared. Thus, the GHG emissions reduced by a BMP, compared to the baseline, will be the tradable portion.

Determining baselines and the carbon credit trading potential on your operation could be somewhat difficult given the complexity of the processes that produce GHGs and the validation that will be required for any credits offered for sale. In the interests of Canadian pork producers, a technical working group has been established, led by the Government of Alberta, to develop a protocol for evaluating the current state of GHG emissions on Canadian pork farms, and using Canadian research findings, assign GHG emission reduction coefficients to a host of specific BMPs. The Canadian Pork Council is represented on this working group to provide industry perspective to the process.

Interest in trading carbon credits will likely be stimulated by TransAlta Corp's recent credit purchase. However, caution is encouraged before entering into any agreement to supply credits into the carbon marketplace prior to the Government of Canada producing a concrete set of trading rules, due out in 2005. Potential liabilities for failing to deliver on contracted carbon may be more risky than waiting for the national system to be developed and potentially selling carbon at a reduced price.

For more information on the national protocol being developed for trading pork sector carbon credits, contact Cedric MacLeod at the Canadian Pork Council, 613.236.0011 or macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Making Sense of Greenhouse Gas Production

Cedric MacLeod, Canadian Pork Council
Karen Haugen-Kozyra, Alberta Agriculture, Food and Rural Development

Small changes in feed composition can provide big dividends in reducing your overall farm nitrogen load, and reduce your greenhouse gas emissions.

You may have seen headlines in the news lately about Russia ratifying the Kyoto protocol, and the recent carbon credit purchase by TransAlta Corp. from a Chilean hog producer. It is becoming evident that you may soon have a new commodity market where reductions in greenhouse gas (GHG) emissions, caused by increased production efficiency on your farm, can be sold to the highest bidder.

If carbon credits do, indeed, become a new commodity in agriculture, how will a trading system work? Essentially, final emitters of GHG, coal fired power generation plants for example, will purchase credits from other industries that successfully reduce their own GHG emissions, presumably more cheaply than if the final emitters were to reduce their own emissions directly. Allowing these trades to occur is one way of allowing the whole country to benefit from reduced GHG emissions, while keeping costs in check, and pork producers may be able capitalize on the development of this new commodity.

The problem is that few producers know how much GHG they are currently producing, and how much they were producing in 2001. This date is especially important as it will be likely used as a baseline year to quantify GHG reduction practices on Canadian farms. To trade any carbon, your farm would be assessed for GHG emissions in 2001 and in the current year. Any improvements you have made for reducing GHG production during this time will be eligible for credit creation.

In order to carry out these assessments and ensure that they are done within a proper scientific framework, an evaluation protocol must be established. A Pork Technical Working Group comprised of policy, science and industry representatives is working together to develop a system of farm practice analysis tools, which will allow you to determine how much GHG your farm is producing currently, how much you were producing in 2001, and how your current GHG production might be reduced.

Take feeding strategies as an example of how a protocol might work. A finishing barn operator is planning to finish 1000 hogs from 23 to 110 kg, and has decided to lower his feed crude protein content by 0.5% to reduce the farm's GHG emissions.

The difference in manure nitrogen production from lowering the crude protein in the diet is 1,458 kg N. As a portion (1.25 per cent) of all manure nitrogen is assumed to end up as nitrous oxide, a potent GHG, reducing nitrogen output can reduce the farm's overall GHG production.

Employing this practice for *ONE* cycle through the barn will generate 9.4 tons worth of carbon credits. Assuming $10 per ton of GHG reduction, reducing nitrogen output would put $280 in the producer's pocket annually if all the GHG reduction credits are sold. This assumes that the producer turns the barn *THREE* times a year.

Ration	*High CP (%)*
Grower	19.5
Finisher I	17.5
Finisher II	17
Manure Nitrogen	5678 kg
Ration	*Low CP (%)*
Grower	19
Finisher I	17
Finisher II	16.5
Manure Nitrogen	4220 kg
Nitrogen Reduction	1458 kg

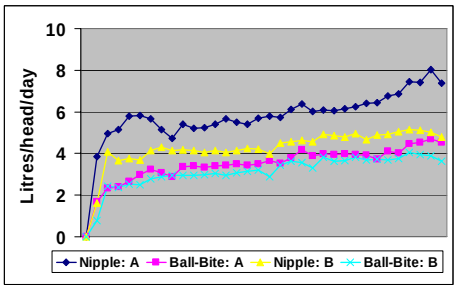
This example may not forecast a lucrative new income stream, however, this is a viable practice that you may be thinking about adopting on your operation, perhaps to reduce your required land base for manure application, which could present real economic benefit. The mandate of the Pork Technical Working Group is to provide the industry with practical information for your farm, including real-life examples of GHG production, and commercially available and viable management practices to reduce your GHG emissions.

GHG management is a complicated field, but we are working to bring you answers that work. For more information on this process, or greenhouse gas production and management on your operation, contact Cedric MacLeod at the Canadian Pork Council 613.236.0011 or macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Drinker Systems Reduce Manure Production

Cedric MacLeod - Canadian Pork Council



Low flow-rate drinker systems maintain pig performance and reduce barn water usage and manure volume production

As the snow piles up against the barn, your drinking water system may not be the greatest of your worries right now, unless it is to make sure that piping doesn't freeze. In fact, water flow rates in the barn may not be of great concern most times of the year, unless you are worried about your water supply during the hot and dry summer months.

The benefits of water supply management have been well documented at the Prairie Swine Center where the use of wet/dry feeders was found to reduce finisher barn water use by 29 per cent compared to dry feeders and nipple drinkers. You may recall reading about these results in previous greenhouse gas (GHG) management articles by the Canadian Pork Council. Since that time, a new demonstration project has been initiated at a commercial nursery site in southern Alberta. Through the project, barn water management and grower pig performance is being tracked on an ongoing basis.

One-half of the four-room nursery barn was outfitted with ball-bite drinkers and new nipple drinkers were installed in the other half of the barn. Ball-bite drinkers require a hog to place its mouth around and gently bite the drinker. This reduces the chance of water spilling from the animal's mouth and the opportunity for animals to play with drinkers, which are both water wasters. Two water-flow monitors were also installed, one to handle the ball-bite rooms and one for the nipple drinkers. The monitors track the amount of water consumed on each system.

The following chart shows the results of two batches of grower pigs through the barn in southern Alberta. *Group A* represents the first batch of animals housed from August to October 2004, *Group B* animals entered the barn in October and were moved to finisher spaces in late December.

Notice the substantial difference in *Group A* animal water use between the nipple and ball-bite drinker systems, represented by the dark-blue and pink lines. Animal water use on the ball-bite system was 35 per cent lower than the nipple drinker system, with no detrimental effect on animal performance. Animals in *Group B*, are represented by the light-blue and yellow lines. Again, animals in the ball-bite drinker rooms consumed significantly less water than those on the nipple drinker system. Note that the relative difference in water consumption between the ball-bite and nipple systems was greater in the summer compared to the cooler fall months. This difference is due to animals showering themselves with the nipple drinkers during the summer months, whereas animals in the ball-bite rooms were not able to manipulate the drinkers in the same way.

For costing out the system and its benefits, assume a nursery barn produces a million gallons of manure each year which costs $10,000 to apply ($0.01 per gallon custom rate). The ball-bite drinkers reduced water use and therefore, manure volume reduction, by 35 per cent. Thus, the cost of manure application could be reduced by as much as $3,500 annually. Retrofitting a small nursery barn will cost less than $10,000, providing a return on investment in one-and-a-half to two years.

So what are the GHG benefits of implementing a barn water management system? Diesel and electrical energy are required to move water to the barn and transport manure to the field for application. Reducing manure volumes reduces the need for both forms of energy and the GHGs associated with the production and use of this energy.

The manure nutrient composition will be the same with both drinker systems, however a less dilute manure reduces the manure application rate and cost per acre to apply these nutrients. Also, a less dilute manure should reduce nitrous oxide production by lowering the level of soil saturation following application. And finally, a more concentrated manure allows it to be moved further down the road to fields where it may not have been profitable to haul a more dilute manure product before. This should reduce the need to apply nutrients closer to the barn site and provide an opportunity to spread manure nitrogen over a larger land base, thus reducing the risk of over-applying nitrogen, resulting in greater GHG (nitrous oxide) production.

As always, GHG management is tied to resource management and is interwoven with numerous other farm management practices. To keep it simple, low-flow rate drinker systems can provide upwards of 30 per cent manure volume reduction. If GHGs aren't your concern, focus on saving money managing a less dilute, more valuable manure product.

Pig Barns, Energy Efficiency, the *Kyoto Protocol* and *Your Bottom Line*

Cedric MacLeod-Canadian Pork Council
Ron MacDonald & Mark Armstrong-Agviro, Inc.

Agviro, Inc.

Electric or hot water heat pads can save 50 per cent or more on energy expenditures in the creep

If asked to recall the significance of February 16th, 2005, many of you will cite the official cancellation date for the 2004-05 NHL season. However, if you were able to struggle through the rest of the evening news, you will also be aware that the Kyoto Protocol became internationally legally binding on the very same day.

A lot of the Kyoto discussion has so far focussed on renewable energy technologies: wind, water and biomass energy production. Parallel to the renewable energy movement, a quieter push towards energy conservation is also emerging. This should be of particular interest to Canadian pork producers.

Swine operations have likely become accustomed to the ever increasing February heat and hydro bills. Knowing the burden that energy expenditures can have on your bottom line, it might be worthwhile to consider a closer look at what those bills represent, and how you might be able to claw back some of those dollars by making your operation more energy efficient.

The main energy consumers on farms are heating, including creep heat, lighting and ventilation systems.

Each on-farm energy consumption point has opportunities for improved operating efficiency, and small changes can result in decreased barn operating costs.

1. Heating Systems

Creep heat is a major consumer of energy in farrowing units. Full-time heat lamps can be managed more effectively by installing dimmers and diode switches (1/2 power). These simple changes can save you roughly 30 per cent per year on creep heat energy costs. Installing high temperature cut-out thermostats to turn off creep heat on hot summer days can save another five per cent and makes sows more comfortable. Converting to electric or hot water heat pads can save another 50 per cent or more on energy expenditures in the creep.

Heating systems in all barns should be properly sized, located and most importantly, controlled so that the barn does not overheat. Overheating results in the exhaust fan system venting precious heat out of the barn, and a loss of cash from your pocket.

2. Lighting Systems

Barn lighting systems should be fluorescent unless lights are used for less than two hours per day. Compact fluorescents are a good first step, but 4-ft. tube fluorescents in vapour proof fixtures provide long life, low cost and excellent lighting. Expect to reduce energy use by 60-80 per cent compared to incandescent systems. In high ceiling barns, high intensity discharge (HID) such as metal halide and high pressure sodium light systems offer additional energy savings over fluorescent along with lower maintenance costs.

3. Ventilation Systems

Ventilation systems require careful evaluation when searching for energy efficiency options. Buying fans based solely on the diameter is dangerous. For example, 24-in. fans range in total capacity from as low as 4500 to over 8000 CFM (cubic feet of air per minute exhausted). Efficiencies vary from as low as seven to as high as 20 CFM per watt of energy consumed.

Breeding, gestation and finisher barns may find substantial savings in installing dual ventilation systems, using fans during cold weather and converting to natural ventilation for warm weather periods. In the dual ventilation scenario, operating savings are in the 80 per cent range and the barn environment condition is maintained or improved over conventional fan-based systems.

Putting it all together

Living and farming in Canada, where it is often cold and dark, requires us to spend significant cash on heat and lighting. We have little choice on this. We do however, have choices on how we go about expending energy. The heating, lighting and ventilation tips discussed could see you achieve energy efficiency gains ranging from five to 80 per cent. An 80 per cent reduction in energy use for your barn ventilation system will do the following two things: lessen greenhouse gas emissions by reducing the amount of fossil fuel used to run the system, and reduce your expenditures on ventilation by 80 per cent. You can choose which one you want to get behind.

For more information on Greenhouse Gas Mitigation Program activities, contact Cedric MacLeod at the Canadian Pork Council, 613-236-0011 or macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Value of Hog Manure Increased with the Price of Nitrogen in 2005

Cedric MacLeod-Canadian Pork Council

Storage covers reduce the loss of valuable manure nitrogen during storage

As you prepared for the spring planting season you were no doubt a little nervous to call the local fertilizer dealer to inquire about where the price of nitrogen is sitting this year. The situation for crop producers is looking tight again with fuel and fertilizer prices reaching ever higher, while commodity prices head the other way. There might, however, be a bright spot for livestock producers to consider, the ammonium fertilizer tank behind the barn that you likely call your liquid manure storage.

If you are a 2000-head finish barn operator producing 1.2 million gallons of liquid manure per year, and that manure averages 20 lbs of nitrogen per 1000 gallons, your manure nitrogen is worth roughly $14,000 this year. It was worth about $12,000 last year based on nitrogen fertilizer costs of $0.57 and $0.49 per lb of nitrogen in 2005 and 2004, respectively. This represents a fertilizer cost increase of 16 per cent over 2004 nitrogen prices.

Your 24,000 lbs of manure nitrogen will fertilize about 240-acres of canola with 100-lbs of nitrogen if it is injected to conserve its nitrogen value. At 20-lbs N per 1000 gallons, you will need to apply 5000-gallons of manure which will run you about $50 per acre, assuming a 1-cent per gallon application cost. Purchasing fertilizer to apply the same nitrogen will run you $57 per acre, plus $3 an acre for application, for a total of $60 per acre. Fertilizing your canola or wheat with liquid manure will cost you $12,000, while purchasing and applying nitrogen fertilizer will cost roughly $14,400 on 240-acres of crop.

Now that you are thinking about the money that is still sitting in the manure tank, think about the money you have lost out of the storage over the past year. Consider that the ammonia smell, which clings to your overalls when you walk out of the barn, is also worth $0.57 per pound. Now consider that you have likely lost half (50 per cent!) of the manure nitrogen that exited your barn over the past year as ammonia emissions during manure storage. This is the same process that robs you of manure nitrogen when manure is surface applied to cropland and not incorporated or injected. You might as well have written a check to the neighbour for $12,000, as this is the value of the ammonia nitrogen that escaped your storage and was deposited on his farm.

Now, consider that a manure storage cover will run you somewhere between $8-12 per square foot, so a 128' diameter, 16' deep, round concrete storage will cost $128,000-$154,000 to cover. Not a small investment, but consider that if you double your manure nitrogen content by installing a cover system, you go from 20-lbs to 40-lbs per 1000 gallons, and the value of your manure resource increases from $14,000 to $28,000, an annual fertilizer savings of $14,000.

Considering a medium-case cost scenario of $10 per square foot for a storage cover, your payback period is a cool 9-years. Now consider that the manure odour which used to emanate from the storage is essentially eliminated, you have excluded rain and snow water dilution from your hauling costs, your manure nitrogen to phosphorus ratio will be double what it was before the cover was installed, and greenhouse gas emissions from the farm will be lowered considerably.

The numbers will work for using manure nutrients effectively considering the following:

1. You save $10 an acre applying 100 lbs nitrogen per acre as 5000 gallons of manure (20 lbs N per 1000 gal) instead of urea-fertilizer
2. 5000 gallons of manure is worth $43 in phosphorus (60 lbs P) and $40 in potassium (110 lbs K), both already purchased as part of your hog rations
3. A $128,000 manure storage cover can be purchased in 9-years based on the offset costs for purchasing nitrogen fertilizer

The bottom line is that you have already purchased a lot of nitrogen fertilizer as protein in your hog feed. This nitrogen represents a major portion of the cost of feeding pigs, and your animals are only using 30 per cent of the nitrogen fed, leaving 70 per cent for crop production if this manure nitrogen can be conserved during storage. Assigning an appropriate value to this 'free nitrogen' further capitalizes on the potential for adding value to your cropping enterprise through livestock production. In this time of tight margins and high crop input costs, can you afford not to use manure nutrients as effectively as possible?

For more information on manure nitrogen management and how the economics on your farm might pencil out differently than presented here, contact Cedric MacLeod at the Canadian Pork Council 613.236.0011 or macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Targeted Manure Application Rates Deliver Increased Profit

Cedric MacLeod-Canadian Pork Council

Flow rate meters take the guesswork out of manure application rates and help maximize the value of manure nutrients

The concept of *effective manure nutrient management* is one that you likely hear about often. Conversations revolve around soil and manure testing, defining proper manure application rates to match specific crop requirements, calibrating application equipment and when and how to apply manure resources to cropland.

Producers do a great job mixing and testing manure nutrients, following proper manure sampling protocols, and getting the manure applied while the crop is growing, but after all that, just how even a spread are they getting of that manure, and how close are they to the application rate they were shooting for?

Farmers are well aware of the difficulties that arise when one tries to calibrate any type of application machine. It always seems easier to find that small field for which you know the exact acreage and set your application rate by trial and error. If you keep decent records, you will be able to easily set your application rate and skip the calibration step.

As nutrient management-related regulations focus more on individual fields and crops, and their supply and requirement for nutrients are tracked in more detail, our tanker operators will have to have the capability of managing application rates on the fly, with a high level of accuracy.

Flow-Rate Meter Technology

Flow rate meters allow an operator to achieve a higher level of application accuracy than would be possible without a lot of calibration downtime. The cost for these units run about $4,000 for a 4" pipe, $4,300 for a 5" unit and $4,600 for a 6" unit. There are a host of other attachments that can be linked to a flow rate meter to automatically control the rate of application, depending on the speed your machine is travelling. Add a data management system and you have a real-time, application rate field mapping system to add to your records. Thus, flow-rate meters and flow tracking systems are a great way to keep records of where manure went down and the nutrients that were applied. With the prices of nitrogen fertilizer hovering in that $0.50 per lb range, knowing where every gallon goes might make a significant difference to the bottom line for your cropping enterprise.

Dollars and Cents

Consider that if your manure contains 20 lbs-N per 1000 gallons and you are targeting a 100 lbs N-acre application rate, you will need to apply 5000-gallons of manure per acre to achieve this N-rate. Now consider that without calibration you are *actually* applying 5500 gallons per acre, and it costs you one cent per gallon to apply. That extra 500-gallons per acre is worth $5 in application costs (500 gallons x ¢1 per gallon). If you assume that nitrogen fertilizer is worth $0.50 per lb, and in 500 gallons of manure you apply 10 lbs of extra nitrogen per acre, that nitrogen is worth an additional $5 per acre (10lbs N x $0.50 per lb). Add up increased application and wasted nitrogen costs, and that extra 500-gallons costs you *$10 per acre.*

If a flow rate meter costs $5,000 to purchase and install, then the unit will pay for itself over 500 acres, based on $10 an acre savings. To go a bit further, eliminating the extra ten lbs of nitrogen per acre applied in 5500 gallons of manure, will provide a nitrous oxide (a potent greenhouse gas) emission reduction of 40 lbs of carbon dioxide equivalents per acre. Multiply 40 lbs of reduced greenhouse gas emissions over 55-acres and you have generated a one ton (2200 lb) reduction in greenhouse gases for your operation. One ton of GHG reduction is currently worth about $8.

If you apply 500-acres worth of manure in less than three years, you might consider purchasing a flow rate meter for your application system, as your $5000 investment will be returned to you fairly quickly. The reductions in greenhouse gases that can be achieved are modest, but your gains in manure nutrient use efficiency could be significant. To discuss these numbers or other manure related matters contact Cedric MacLeod at the Canadian Pork Council: 613.236.0011 or macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Pigs, Trees and Greenhouse Gas

Cedric MacLeod-Canadian Pork Council

One-kilometer of mature shelterbelt will sequester 250-tons of Carbon Dioxide

What do you get when you combine a pig barn with a few rows of trees? The start of a good joke, or reduced energy consumption, odour production and greenhouse gas emissions? The answer is not a joke.

The Canadian Pork Council has teamed up with the Atlantic Swine Research Partnership, Fédération des producteurs de porcs du Québec and Ontario Pork to deliver information to Eastern and Atlantic Canadian hog producers on how to get shelterbelt plantings working for them. The Prairie Farm Rehabilitation Administration (PFRA) also works with western Canadian pork producers to get shelterbelts established on barn sites Manitoba and westward.

A shelterbelt planting is a fairly simple process and can bring a host of benefits to the farm, some with direct positive economic effects, some with societal or community benefits. Depending on the reason for a shelterbelt planting, single or multiple rows of trees can be planted around a barn. If improving the appearance of the farm site is the aim, a single row of hardwood trees and intermixed shrubs planted around the property edge might do the trick. If energy conservation and odour control are the benefits being sought, three tree-rows consisting of a row of evergreens, one row of hybrid-poplars and a third row of mixed hardwoods and shrubs might be a good choice.

Whatever the goal of your shelterbelt planting, there will be a greenhouse gas benefit on your property. Trees, like other agricultural crops use carbon dioxide, a greenhouse gas, for growth and store it indefinitely as wood. Storing carbon in vegetation such as crop residues and trees is referred to as carbon sequestration. Agriculture has been a major focus for the Government of Canada's plan to reach our greenhouse gas reduction targets under the Kyoto protocol, because of agricultures ability to store carbon in soil and trees. PFRA research has shown that a mature hybrid poplar tree, capable of five to seven feet of growth per year, will trap almost 1000 kg of carbon dioxide over its lifetime. A full kilometer of hybrid poplar trees, planted four-meters apart, will have sequestered approximately 250-tons of carbon dioxide at maturity. The value of carbon dioxide is currently about $8 per ton, so the value of carbon stored in one kilometer of shelterbelt, at today's prices, is about $2000.

Sequestering 250-tons of carbon dioxide in a shelterbelt planting may bring you some satisfaction having done your part to curb climate change, but you've still got bills to pay. So the important question is, how do efforts to plant shelterbelts affect the pocketbook? Using tree rows to shelter big energy-use buildings, such as a 600-sow farrow-to-finish hog barn, from the harsh Canadian winter has been known to reduce energy consumption by 20-30 per cent. The price of heating and powering barns is incredibly varied, but a $40,000 annual heat bill isn't uncommon in some regions of Canada. A 25 per cent reduction in heating costs for this facility will reduce the energy bill by $10,000 annually, or $0.75 per hog marketed. Reducing the electrical energy consumption by 25 per cent, if the power is being generated in coal-fire power plants, will also reduce greenhouse gas emissions by about 85 tons of carbon dioxide.

From an economic standpoint, shelterbelt plantings around hog barns are a relatively easy and cost effective measure for reducing your heat and energy bills. A portion of the planting costs can also be covered through the National Farm Stewardship Program being offered through the Government of Canada's Agricultural Policy Framework, reducing the up-front cash required to establish shelterbelts.

Besides being cost effective, shelterbelts will also significantly reduce the movement of odour off the farm site and into the surrounding community. Trees act both as a filter for odourous compounds, such as dust particles, and as a barrier to wind movement across manure storages so odours can't be picked up and moved around by wind currents. Tree plantings also give a barn site a more pleasing appearance and may help to better integrate the site into its local surroundings.

Planting trees at a hog barn site makes a lot of sense if the aim is to lower the cost of production, reduce greenhouse gas emissions or keeping the neighbor happy. For more information on planning a shelterbelt installation or financial assistance to make it happen, contact your provincial pork association office or Cedric MacLeod at the Canadian Pork Council: 506.455.6088 or macleod@cpc-ccp.com.

Canadian Pork Council / Conseil canadien du porc

Interested in selling Greenhouse Gas Credits? Here's how!

Cedric MacLeod-Canadian Pork Council

How much Greenhouse Gas do you produce?

An average 600-sow farrow to finish hog operation located in Lethbridge, AB can be expected to produce roughly 2000 tonnes (CO_2 equivalent) of methane greenhouse gas each year.

January 1, 2006 is going to be a big day for most Canadians. Some will be anxiously planning for the new year, some will be busy making or breaking New Years resolutions. However, for some, the first day of the year will mean something entirely different; it will mark the day that greenhouse gas reduction projects will start generating carbon credits that can be sold to the open market.

It has been a bit of a journey for those working in the greenhouse gas (GHG) field, watching and waiting to see how policy will evolve at the federal level and guessing what opportunities or challenges each Canadian industry will face.

Agriculture has been given an opportunity to participate in the offsets market, something fairly unique to Canada with respect to many other industrialized countries. Of course, the big ticket item for agriculture, to date, has been soil carbon sequestration, or the storing of organic carbon in soils managed under a reduced tillage scenario.

The livestock industry has been largely overlooked for its potential to create offset credits. But given that most livestock sector GHG emissions are from a point source (liquid manure storage, mouth of a cow, barn ventilation fan outlets, etc.) the opportunity does exist to capture or avoid GHGs on the farm.

As with any emerging market, there will likely be some initial confusion as to how the system will operate. Although we don't have all the answers yet, the federal government is working to fit all the pieces of the offset system together, and here is what we know so far:

Carbon credits will be generated on a *project* basis. A project, for example, may include the GHG reductions produced on your farm by adopting one or a number of management practices known to impact GHG emissions.

January 1st, 2000, is the first date to consider if you plan on offering carbon offsets for sale into the market. This date is considered the minimum *baseline year* for GHG reduction projects. Meaning that a practice put into place to reduce GHG emissions had to have been initiated *after* January 1st, 2000 to be eligible to generate credits for sale from the project.

The second date of importance is January 1st, 2006 which represents the start of the eligibility period for generating carbon offsets. So what does this mean? Say you built an anaerobic digester on your farm in 2004, to generate your own heat and electricity and reduce your farm GHG emissions. Technically, you will have been reducing GHG emissions from your project since the point the digester was fired up. However, any GHG emission reductions created between the 2004 start date of the project and January 1, 2006 are not eligible for sale. The project, *itself,* is eligible, since it began after January 2000, however, you won't be able to start actually generating GHG offset credits from the digester project until January 1, 2006.

The dates are important and play a role in how you might be able to work within the carbon market. So what are the other key points? How will the system run? Here is a brief description.

If you've got a project in mind (installed a manure storage cover to trap manure gases) you will have to describe the project in a project design document. The federal government has been sponsoring work on a set of standardized protocols that will help streamline this task. The project design document will then need to be submitted to the program authority (Government of Canada) for review of the project's technical and scientific soundness. Once the project is accepted by the program authority, it will need to be verified. This means that someone will actually visit the farm to make sure that the project design document gives an accurate description of what is really happening on the farm. Once the project activity is validated, the program authority will assign an identification number to the project, and any credits generated will be placed into your own carbon account. At this point, you can offer your credits for sale to any domestic buyer. Those looking to purchase credits will include the federal government's Climate Fund, large power producers, steel foundries or other heavy industries, etc.

Sound complicated? It is, but not to worry, help is available. The Kyoto protocol has created a new market for individuals with carbon and business savvy. The policies that will drive the Canadian carbon market are slowly beginning to take shape, and there are people following the process and preparing to put these policies to use on Canadian farms.

For more information on the emerging carbon credit market and how the farm management practices you have adopted may qualify you for generating new farm revenue, contact your provincial pork association or Cedric MacLeod at 506.455.6088 or macleod@cpc-ccp.com

Canadian Pork Council / Conseil canadien du porc

Hog Sector Greenhouse Gas Management: *Top 10 List*

Cedric MacLeod-Canadian Pork Council

Since January 2003, the Canadian Pork Council has worked towards bringing the greenhouse gas management message to the Canadian pork producer community.

Through the Greenhouse Gas Mitigation Program for Canadian Agriculture, numerous environmental management practices and technologies have been examined and demonstrated, highlighting their potential to provide real reductions of greenhouse gas (GHG) emissions on Canadian hog farms. The challenges and successes of implementing these practices and technologies have been presented to the Western Canadian pork industry in a series of Western Hog Journal articles, and through numerous demonstration partnerships between the Canadian Pork Council and the research and extension community in Western Canada.

Funding for the Greenhouse Gas Mitigation Program (GHGMP), responsible for bringing you this ongoing source of GHG information, is set to expire in March of 2006. Thus, this will be the final article brought to you by the Canadian Pork Council, focusing on GHG management.

Achieving a real reduction in GHG emissions on a Canadian hog farm is not a goal that can be achieved with the adoption of any one management practice or technology. Effective reductions will come from analyzing the whole farm system and making a few changes in management, ranging from small adjustments to barn ventilation or feeding systems, to medium intensity modifications of manure application equipment or the installation of manure storage cover systems, to larger capital expenditures on technologies such as anaerobic digestion systems. Many of these management practices have been presented previously in some detail in the *Western Hog Journal.*

In an attempt to leave you with a comprehensive resource guide for evaluating your own operation, the following checklist of practices known to reduce on-farm GHG emissions, will help you to determine how far you have come in your reductions of GHG emissions already, and where you might go to achieve even more reductions.

√	***Top 10 Greenhouse Gas Reduction Practices***
	Increase feed conversion rate
	Lower hog ration crude protein levels
	Reduce overall barn water use
	Install a manure storage cover
	Regularly monitor manure and soil nutrient levels
	Apply manure nitrogen at agronomic rates only, offer excess nitrogen for sale to others
	Switch manure application timing from fall to spring/early summer
	Apply manure using injection techniques for small grain, forage and row-crops
	Install manure flow rate meters on application equipment: achieve accurate application rates
	Install an anaerobic digestion system: produce on-site green heat and electrical energy

The Canadian pork industry has recognized the potential for GHG management to increase hog farm revenues in several ways.
For one thing, the practices listed above are tried and true, and already at work on many Prairie hog operations, improving production efficiency and improving the bottom line. Secondly, the Canadian market for the sale of carbon credits (credit for each tonne of GHG emissions reduced) is heating up, providing an opportunity for producers who have reduced their GHG emissions and generated carbon credits for to offer them for sale as a new line of farm revenue. After all the improvements and efforts made by the pork industry to advance environmental performance, a true market has evolved which will allow producers to capture value from these improvements.

More information will be available as the Canadian carbon market develops, providing new opportunities for the Canadian agricultural sector to bolster revenues. Environmental management staff at provincial pork associations will be working with hog producers to capitalize on the opportunities that the carbon market will bring. For more information, contact your local pork association.

Greenhouse gas management on Canadian hog farms, although a bit complex when it comes to the science, is not a new concept to agricultural producers. It all comes down to carbon and nitrogen management. To really sum it up: feed energy (carbon) and feed protein (nitrogen) come into the barn as inputs. The more that stays in the pig, the less potential there is for this carbon and nitrogen to become a source of GHG in the manure storage. Further, the more that stays in the pig, the better your feed conversion efficiency, and your bottom line. Farming is all about the management of systems, so if greenhouse gas emissions are considered a part of your system, GHG reductions become another route to putting more dollars in your pocket.

Canadian Pork Council / Conseil canadien du porc