

# Greenhouse Gas Emissions Trading and Agriculture - Risk and Opportunities

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## Greenhouse Gases - Things You Need To Know

### What is Climate Change?

The majority of scientists agree that increasing levels of greenhouse gases (GHG) caused by fossil fuel combustion, land use changes and agricultural and industrial activities are contributing to changes in temperature, precipitation, and extreme weather patterns.

The main GHG from the agriculture sector are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). The ability of each of these GHG to trap heat depends on its capacity to absorb and re-emit radiation and on how long the gas remains in the atmosphere. This is referred to as the global warming potential. To assess the collective impact of GHG emissions of different gases the global warming potential is multiplied by the amounts of each gas emitted to get units of CO<sub>2</sub> equivalents (Table 1).

Table 1: Greenhouse gas global warming potentials over 100 years

Greenhouse Gas	Global Warming Potential (or CO <sub>2</sub> equivalents)
Carbon Dioxide (CO <sub>2</sub> )	1
Methane (CH <sub>4</sub> )	21
Nitrous Oxide (N <sub>2</sub> O)	310

With a growing understanding and awareness of global climate change, the issue is taking a more dominant position on the international policy agenda.

### What is a Greenhouse Gas Emissions Credit?

Greenhouse gas emissions credits are also known as

carbon credits. They include all three GHG, as in Table 1. From an agricultural perspective, if we reduce the concentration of GHG we create two types of credits: (1) greenhouse gas removal credits and (2) greenhouse gas emissions reduction credits.

*Greenhouse gas removal credits* are created when a change in management practices result in the removal of CO<sub>2</sub> from the atmosphere through photosynthesis, which converts CO<sub>2</sub> to organic carbon and stores it in soil (carbon sequestration). For example, changing from conventional tillage to reduced tillage.

*Greenhouse gas emissions reduction credits* are created when a practice reduces the amount of GHG emitted into the air. This includes practice changes such as: increased fuel efficiency; better manure management; and efficient nitrogen fertilizer management (timing, application, rates).

Greenhouse gas emissions credits are usually measured in metric tonnes and converted to CO<sub>2</sub> equivalents. The key criterion for credit generation is CO<sub>2</sub> equivalents must be measured, quantified and recorded. These credits become a commodity or unit with the potential to sell only if there is surplus above the baseline emissions.

### What is Emissions Trading?

Emissions trading allow companies to meet emissions reduction targets at a lower cost than more rigid command and control approaches. One system currently being examined as a potential emission reduction tool by Canada is a Cap-and-Trade Permit System. Under this system, the government would cap the total amount of GHG emissions in order to meet an environmental target (six percent below 1990



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levels if Canada ratifies the Kyoto Protocol). Greenhouse gas emissions would be allocated by auctioning off permits to emit to individual companies. The total number of emission permits allocated adds up to the total emissions cap.

Under the Cap-and-Trade Permit System the government controls the *right to emit* by setting a cap, but allows companies to trade permits. This provides flexibility to companies with differing financial abilities to reduce emissions in a cost-effective manner. For example, if Company A has a variety of low-cost emission reduction opportunities, it may have surplus permits available to sell. Company B, however, has more emissions than it does permits and cannot afford expensive technology to reduce emissions at this time. Not wanting to sacrifice production, Company B buys surplus permits on the market to cover excess emissions instead of paying fines. At the end of the year, permits are submitted to the government. The requirement to reduce GHG emissions creates a demand for permits. The price of permits should become high enough to encourage companies to reduce their GHG emissions.

Under the Cap-and-Trade Permit system Canada is currently considering, primary agriculture is considered an *uncovered sector*, and may be able to opt-in by selling credits to the covered sectors (i.e. energy sector). There are 260,000 farms across Canada emitting GHG from thousands of crop production and grazing operations; therefore monitoring the agricultural sector is considered impractical and costly. However, there may be exceptions with large waste facilities, feedlots and processing plants.

Other sectors are interested in buying agriculture's GHG emission credits. But, a credible baseline of 1990 emissions for farms needs to be developed before agricultural credits can be sold. For a GHG removal credit, the baseline is the initial carbon content in the soil; the baseline for a GHG emissions reduction credit is the initial level of GHG

emissions from the farm. Baselines allow the amount of credits generated from a management or practice change to be quantified. Selling credits could be an opportunity for the agriculture sector, but agricultural producers need to consider all the information and understand the risks before selling credits.

### **Status of the Emerging Greenhouse Gas Emissions Trading Market**

For Canada, it is important that a robust, mature emissions trading market, complete with rules and regulations, are developed to minimize the energy, transportation and manufacturing sectors costs of meeting GHG reduction targets. This could help keep farm and processing input costs from rising further. Agriculture producers need to be aware of the emerging GHG market in order to make informed decisions before selling GHG emissions credits.

Greenhouse gas emissions credits are currently being traded on the open market. This emerging market is not mature and is characterized by:

- No domestic/international law recognizing what a GHG emissions credit is;
- Uncertainty about international acceptance of soil carbon sinks;
- Low price of GHG emissions credits due to the lack of domestic rules and regulations;
- Most trades do not involve a commodity, they involve the purchase or sale of rights to emit associated with expected GHG emissions reductions;
- Agreements between buyers and sellers (agriculture producers) could place an unfair burden of risk on the seller.

Current trading or purchase of GHG emissions credits by the energy sector and others from the agriculture sector is speculating on future regulations and taking advantage of low market prices.



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### Why is Greenhouse Gas Emissions Trading Important to Agriculture?

Nationally, agriculture contributes approximately 10 percent to Canada's total GHG emissions. However, the agriculture sector can offset Canada's GHG emissions by three methods:

1. Reducing GHG emissions – practices that directly reduce GHG emissions, primarily from better use of fossil fuels, fertilizer and improved livestock and manure management;
2. Removing GHG – change management practice to enhance removal of CO<sub>2</sub> from the atmosphere by capturing it in growing crops (and storing it in soils);
3. Producing biomass energy – using animal waste or plant biomass for energy, either in cogeneration or producing ethanol from crops. This method replaces fossil fuels.

Many conservation practices currently available reduce or remove GHG as well as provide other environmental and economic-benefits such as:

- Minimize loss of costly inputs such as nitrogen (lost as nitrous oxide) and feed energy (lost as methane);
- Improve soil quality and fertility and;
- Improve water retention in soils (see Information Bulletins No. 3 and 5 in this series for management practice information).

Over the past 10 years, agricultural soils have changed from a net source of carbon dioxide to a net carbon sink. This has been accomplished through the adoption of conservation farming practices and new technologies, including zero till, direct seeding and good fertilizer management (placement, timing, rate). By

increasing the adoption rates of these practices, carbon sequestration potentials could be substantial (See Figure 1).

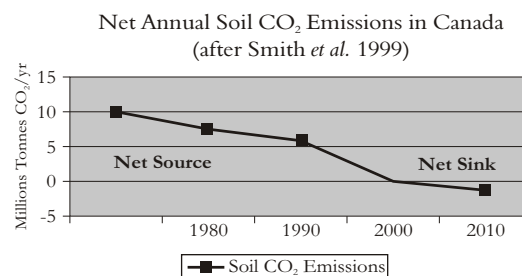


Figure 1: Net Soil CO<sub>2</sub> Annual Emissions in Canada (Source: Sinks Table Options Paper, 1999)

Opportunities could exist for the agriculture sector to reduce GHG emissions and sell GHG emissions credits to sectors that need them to offset their own GHG production. This would result in increased cash flow for the agriculture sector, a good public stewardship image, and offset rising fertilizer and fuel input costs.

### Risks and Opportunities for the Agriculture Sector

Over the last few years, two major trades have occurred between the agriculture sector and industry: (1) GEMCo and Iowa Pork (GHG emissions reduction credit); and (2) GEMCo and Iowa Corn Producers (GHG emissions reduction and GHG removal credit). Contract agreements between buyers and sellers have been the chosen method in these transactions, not fluid exchanges on the open market. Since the GHG market is new, the sellers tend to be under-informed and unaware of the risks involved.

A consortium of soil conservation associations across Canada have identified three main risks producers should consider when entering into



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GHG emissions credit agreements:

1. Price Risk – selling emission credits now for \$.50 to \$2.00 per tonne of GHG, is taking a risk that the price of carbon will not rise in the future when markets mature;
2. Future Regulations – the agriculture sector may be regulated as the science improves and we understand the sources and sinks of GHG on the farm;
3. Permanency and Maintenance of Soil Carbon Sinks – after the soil carbon sink becomes full, it (a) no longer provides GHG removal credits and could become a source of emissions; and (b) reduces management options for the farmer because the soil carbon sink is not stable and subsequent tillage or some other management change may turn it into a source of GHG emissions.

Soil conservation associations in Canada and the United States are promoting the idea of temporary agreements, also known as *leasing carbon credits* or *bankable carbon credits*, which loans or leases GHG removal credits. Leasing of GHG removal credits is viewed as a viable risk management tool for producers. There is no permanent transfer of carbon between buyers and sellers, rather a *lease* or *loan* from a farmer (seller) to a buyer to be paid back once the buyer has had time to purchase GHG emissions reduction technology.

At today's GHG market prices, opportunities for making money by selling emission credits are not attractive. For example, a 2000 acre grain farm, switching to direct seeding from conventional tillage would create emission credits worth about \$3000 US per year. Reducing GHG emissions by 10 percent from a 500 sow farrow to finish operation (barn only) would equal roughly \$130 US a year.

Achieving a 14 percent reduction in GHG emissions from a 50 head cow herd in central Alberta by adjusting feeding strategies would result in approximately \$22 US a year for the entire operation. These figures do not take into account the net costs/savings of implementing these practices, only money from the sale of the GHG emissions credits.

### Summary

A Cap-and-Trade system is one of the options being examined by Canada, as part of the national strategy to reduced GHG emissions. The agriculture industry is classified as an uncovered sector in this system but other sectors are interested in buying agriculture's GHG emissions credits. Agriculture GHG reduction strategies can potentially generate credits, but before buying or selling GHG emissions credits, it is necessary to understand the risks and be fully informed. Any formal framework developed to exchange GHG emissions credits between the agriculture industry and buyers should be based on consultations with all stakeholders, including the agricultural community to addresses the risks and opportunities of emission credit trading.

Other additional environmental and economic benefits include increased fuel efficiency, soil and water quality improvements, and efficiencies in feed usage, which translate into a positive bottom line.

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