

Climate Change Policy, Markets and Greenhouse Gas Offset Trading

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■ Introduction

Climate Change refers to a change in long-term climate patterns. Farmers are accustomed to adapting to changes in climate, but experts predict that weather patterns will be more variable, accompanied by extreme weather events that will challenge current ways of farming. Regardless of whether one believes in the science of climate change, governments are designing policies and programs that enable markets for greenhouse gas (GHG) emissions trading - the result of which could impact the way farms are managed in Alberta.

■ Global Climate Change Policy

At Kyoto Japan in December 1997, Canada agreed to reduce GHG emissions to 6 percent below 1990 levels by the years 2008 to 2012. The Kyoto Protocol is a multi-lateral international agreement designed to:

- Set GHG reduction targets/emission caps for industrialized nations;
- Allow targets to be met through market-based strategies such as emissions trading which gives companies more choice and a cheap way to meet emissions caps; and,
- Have binding consequences for those signatory industrialized nations that do not meet their Kyoto target.

After 5 years of national discussion, Canada ratified the Kyoto Protocol in December 2002. The Protocol becomes legally binding when 55 nations representing 55 percent of the world's industrial GHG emissions ratify the

Protocol. At the time of writing, Russia had not signed the protocol – Russia is the vote needed to reach the 55 percent of industrialized emissions.

In 2001, a pivotal international decision allowing the use of agriculture soil sinks as a strategy to help nations offset their targets was made. This decision created more policy certainty around the agriculture sector's ability to (1) generate recognized GHG emissions offsets or credits for sale to interested buyers and (2) contribute to mitigating climate change.

Since 1999 interested buyers, attempting to manage their risk in an anticipated carbon-constrained future, have been approaching agricultural producers to enter into speculative 'trades' to purchase GHG emission credits. These bilateral contracts are based on speculation that the credits will be recognized under a future regulatory framework. Today, Canada and Alberta are in the mid-stages of designing both an offset and emissions trading framework. Under the developing rules in both Alberta and Canada, there will potentially be two cooperative systems operating:

1. A Large Final Emitter (LFE) Emissions Trading System

Likely a cap and trade system where allowance or permits are allowed to be traded. The total allowances or permits are limited or 'capped'. The government establishes the 'cap' and the allowances are created and allocated between LFEs to account for the total allowed emissions. The LFE's will need to meet their emissions caps by either:

- reducing company GHG emissions by increasing operating efficiencies or investing in reduction technology;
- entering the marketplace to purchase additional allowances/permits or offset credits.

2. An Offset System

A form of credit-based emissions trading. It allows uncovered sectors, such as agriculture and forestry, to voluntarily generate offsets for sale to the covered sectors in the LFE cap and trade system. This gives more choice to large emitters to meet their compliance options or emission caps and represents an incremental financial opportunity for the agriculture sector.

■ **What is meant by GHG Offset Credits?**

Greenhouse gas offset credits can be generated when a producer makes a practice change that results in either a **removal** or **reduction** of GHG emissions. Farms and ranches emit three GHGs - carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). When we speak of all three GHGs in a

credit context, they are called **GHG offsets**. From an agricultural perspective, there are two types of potential offset credits: GHG emissions removal credits and GHG emissions reduction credits.

GHG emissions removal credits

GHG emissions removal credits can be created when a change in a management practice results in an increase in the removal of CO₂ from the air (through plant photosynthesis) and returns that photosynthetic carbon to the soil in the form of crop residues and/or soil organic matter (a process known as **carbon sequestration**). For example, changing from conventional tillage to conservation tillage, or planting perennial forages are recognized carbon sequestration strategies. This increased carbon in the soil is known as a **sink**.

GHG emissions reduction credits

GHG emissions reduction credits can be created when a practice reduces the amount of GHGs emitted into the air from a particular source. This includes practice changes such as: increased fuel efficiency, better manure management, more efficient feeding strategies for livestock, and increased nitrogen fertilizer use efficiency (timing, application, form). Many of the practices conserve valuable inputs such as feed energy and nutrients, increasing a farm's efficiency.

■ **The Offset System in Canada**

Under the evolving rules of the Offset System, **valid** GHG offset credits from the farm can **only be** created through **projects** that meet certain conditions and are approved by a regulatory authority. These are known as "**project-based**" emissions reductions or removals. The proposed project involving a practice change or new technology to be implemented on the farm must go through a review process involving a pre-project screening and approval. The group or person proposing the project must submit a **project design document** to an as yet to be decided **Program Authority**. The project design document must describe how GHGs will be measured, monitored and verified from the new practice change or implemented technology. Claims for the amounts of GHGs reduced or removed must be based on sound science measured with approved methodologies. If the project meets certain eligibility criteria, and the methods are approved, then the project is registered with an as yet to be developed **Offsets Project Registry** (to prevent double accounting of GHG reductions). Once the project is started, GHG emissions from the project are monitored and reports filed with the Program Authority. A third party to ensure methods were followed according to the project design document must then **verify** the reports. Once verified, the offset credits are issued a certificate by the government

(either provincial or federal – as yet to be determined). These **certified** credits then become a commodity or exchangeable unit representing 1 tonne of GHG emissions reduced or removed. At this point in time, without clear rules in place, there are many policy and science unknowns that have to be accounted for when developing offset projects.

The goal of the federal and provincial offsets system is to have rules in place by 2005/2006 that would allow for a more transparent, lower cost approach to generating offsets from agriculture, forestry and other sectors. In the past, high transaction costs, low carbon prices coupled with high policy uncertainty and a lack of scientific information have made carbon credit trading too risky for agricultural producers. The Alberta government, as a part of the provincial Climate Change Strategy, is contributing to the development of an offset system that will make standardized protocols available for producers or other groups who wish to create offset credits for sale in the evolving carbon market. Alberta is focused on encouraging and recognizing sound action on offsets and enhancing biological sinks. In addition, the government is requiring new coal-based electrical plants to seek offsets as part of their permitting process – a requirement that will create more demand for certified emission offset credits.

■ What is GHG Offset Trading?

The availability of certified offsets will allow regulated companies to meet their GHG reduction target at the least possible cost. Instead of making costly technological changes a company has the choice to buy certified offsets credits in the carbon market to meet its GHG reduction cap, delaying internal technological changes to a later date. When the Offset System is in place, agricultural producers can create offset credits by changing management practices beyond a baseline or from their business as usual practice and submitting project design documents through the review process described above. Producers can then sell the certified project-based offsets either on an individual basis or through an aggregator (see definition in next section).

For example, to manage the risk of an impending carbon-constrained world, large industrial emitters have been looking for low-cost GHG offsets in the agriculture and forestry sectors. One such 'trade' occurred in 1999 between GEMCo, a consortium of Canadian energy companies, and a group of Iowa farmers. Through a bilateral contract, the farmers were willing to change to more GHG friendly management practices and sell their rights to the GHG offsets. Since that time, very few deals have occurred between the buyers and agriculture (sellers) sectors because of high policy uncertainty, perceived risk and lack of rules in the emerging carbon market. At this time the carbon market is not liquid and is characterized by bilateral contracts for future streams of offset credits that need to be managed on an annual basis. For producers who

have taken the time to understand the state of the carbon market, the transaction costs and time spent negotiating 30 to 40 page bilateral contracts is not justified by the current price of carbon.

■ What Else Should You Know About Offset Credits?

Before producers decide to change management practices and enter into a project-based contract to sell GHG offsets in today's 'pre-rule', speculative market, they should consider market uncertainties such as baseline, price of carbon and ownership. In addition, there are other factors such as evolving policy, incomplete rules for offsets, lack of awareness of the risks involved and the inherently unpredictable nature of weather and pests that can disrupt the creation of projected GHG offsets. All of these factors need to be considered when negotiating a bilateral contract for a 'sale' to an interested buyer.

Other firms who are positioning themselves as 'aggregators' of agricultural carbon credits and contracting with groups of producers to concentrate potential offsets, are aggressively designing projects and contracts that are flexible enough to address the changing conditions.

Whether approached by an interested aggregator or buyer, or whether considering engaging in their own project, producers need to be aware of the eligibility criteria for offsets that will define each and every project. These criteria are set by the international rules. Any offset project must be able to answer the following questions about GHG reductions and removals involved in the project:

- Are they measurable? (i.e. the reductions can be measured using acceptable monitoring and measuring methodology)
- Are they clearly owned? (i.e. the producer must have clearly demonstrated and secure ownership rights and entitlements to the reductions)
- Are they permanent? (i.e. not going to be re-emitted at a later date)
- Are they surplus? (a result of actions beyond those that are required by law)
- Are they real? (i.e. resulted from a real and demonstrable action)
- Are they verifiable? (i.e. Data and calculations used for measuring, monitoring and reporting offsets must be verified by a third party)
- Are they additional? (i.e. are they different from the baseline or emissions in the absence of the project)

The next few sections address the various risks that arise as a result of the listed eligibility criteria, as well as trading and market risks.

Future Regulations

Many farmers are worried that their emissions will be regulated sometime in the future, and that they may have to hold on to their potential GHG offset credits to meet their own targets. Canada plans to operate under Kyoto Protocol rules and regulations beginning in 2008 - the start of the first Kyoto accounting period. Before that time, the government will likely take a number of measures to regulate the amount of emissions that some sectors emit, and encourage other sectors (such as agriculture) to voluntarily reduce their emissions. There is no guarantee, that the agriculture industry, especially the livestock sector, will not be required to reduce emissions. However, the agriculture sector has traditionally adopted changes encouraged by governments on a voluntary basis, through extension and technology transfer, and developing appropriate incentives.

The greatest opportunities to reduce or remove emissions in agriculture are those that typically result in greater operating efficiencies and increased net revenues - the essence of sustainable development.

Policy Decisions

There is a risk that contract-based offsets may not be given credit for actions taken before the Kyoto accounting period in 2008. Therefore, potential offset credits created in a project before 2008 may not be certified and recognized by the federal government. The Alberta government would like project start dates to commence as soon as possible, but the federal government has not decided when these projects will start. As well, buyers are taking risks too when they enter into early contracts with sellers. The conditions in early contracts may be negated by new policies. **It's important to note that the usefulness of early contracts to buyers may not be certain until rules are in place to identify/certify the commodity being traded.** Therefore, entering into projects at this stage is speculative, but may be helpful in establishing what the rules should be. Some buyers are willing to take these risks. Current contracts are 30 to 40 pages long and have high transaction costs (e.g. lawyer fees, aggregator fees, broker fees and sampling/analysis costs for verification) associated with them (sometimes up to 50% of the value of the offset credits being contracted). Most of these costs are attributed to managing risk in bilateral contracts for a future stream of credits. Once rules are in place, risks and costs will be reduced, standardized protocols will be in place leading to buyers and sellers receiving greater value from their offset credits.

Baseline

Baseline refers to the GHG emissions that occur in the absence of the proposed project activity (i.e. changing management practice). Baselines are a critical part of any offset project. The project design document must prove that

the project is different from baseline in order to receive certified offset credits. This is driven by criteria known as additionality in Kyoto terms.

Price

In today's emerging carbon market, GHG offsets are currently selling from \$1 to \$3 US per tonne of GHG emissions. Experts estimate that prices will increase as the Kyoto accounting period (2008-2010) draws near and will probably settle in the range of \$10 to \$30 US per tonne. However the Canadian government put a ceiling on the price of carbon credits at \$15 per tonne (Canadian), to reduce uncertainty for the large final emitters. If the price of carbon exceeds \$15 per tonne on the international market, the federal government may have to subsidize the difference to prevent the seller from selling to the open market (i.e. international market place).

Ownership

In Alberta, **Bill 37** states that the landowner owns the carbon in the soil. Ownership of soil carbon is still up for debate in other jurisdictions. The Saskatchewan Justice Department ruled that soil carbon most likely belongs to the agricultural producer. However, this could be contested and would have to be confirmed in a court of law.

Bill 37: Climate Change and Emissions Management Act

Property rights in sinks:

- a. The title to a sink and to the benefit of a sink that forms part of or is affixed to land is a property right vested in the owner of the land,
- b. The ability of a mine or mineral or any pore space within a mine or mineral or surrounding the mine or mineral to act as a sink is a property right and is vested in the owner of the mine or mineral in the manner determined in the regulations; and
- c. Any instrument for the trading of rights in respect of a sink is personal property.

In the case of emission reduction credits, where the producer **reduces** emissions through adopting GHG friendly management practices (e.g. manure management), the underlying principle that buyers and sellers are speculating on is that ownership is in the hands of the initiator of the reduction/removal practice unless otherwise stipulated by contract. However it is unclear how these types of reduction credits will be treated in the federal offset system.

Another outstanding issue is federal claims to ownership of agricultural emissions reductions/removals derived from policy decisions and federal programming. In the Federal Climate Change Plan, the federal government is

laying claim to 10 Mt of offset credits from agriculture for its international Kyoto commitment. The rationale is that these credits arose from producer's business as usual management practices prior to 2008. Only management practice changes occurring in projects that are different from Business as Usual would belong to producers and be eligible for sale in an offset GHG trading system. So far, the federal government has not indicated when they will achieve the 10 Mt. In addition, any incentives received by a producer from federal programming (e.g. Green Cover or the National Farm Stewardship Program) may bring the ownership of the carbon reduced or removed under that cost-shared activity into question. The federal government has not made any decisions on this issue yet.

It is important for producers who initiate actions to reduce or remove emissions to get signed contracts with other possible claimants (investors, partners, land owners or land leasees) as to what portion of the reductions/removals they own and have the right to sell.

Science Risk - Measurement and Verification

Current understanding of the sources/sinks of GHG emissions on farms and ranches still requires a fair amount of research, particularly in the area of CH₄ and N₂O emissions. At this time, we are not able to calculate a net balance sheet of GHG emissions on the farm. Existing science will allow us to calculate crude estimates of net farm GHG emissions today or calculate emissions reductions from one small aspect of the farm area (e.g. from the manure storage and handling system, but not from the BMPs adopted at the barn or land application stage). To improve the precision of these estimates, more research on exact quantities of all three gases emitted from all sources is required. This science risk adds to the uncertainty surrounding the offset market. The Alberta government is supporting the offsets work by coordinating scientists in Canada and the US to produce a range of best available science estimates to those interested in starting offset projects.

Permanence and Maintenance

Buyers and sellers should be aware of two facts associated with sequestered carbon in agricultural soils before initiating projects for emissions **removal credits**:

- Agricultural soil sinks become saturated with carbon and offer only a short term (10 to 20 year) opportunity.
- The carbon stored in soils is not stable. The additional carbon stored in soil as a result of changing land management practices under the project is only stable for as long as those practices are maintained. Changing

weather conditions could also cause an inadvertent release of carbon from the stored sink.

The risk associated with the temporary nature of carbon sinks is the future liability for released carbon. If credit is given when carbon is sequestered, who gets the debit when carbon is released? To address these risks through early contracts, buyers and sellers need to agree on what the liability is, how long it lasts and who assumes the liability to guarantee a continuous responsibility for sequestered carbon. Currently, the federal and provincial governments are examining ways to address the long term liability surrounding soil sink/emissions removals credits. Some strategies under discussion are the use of temporary emission removal credits (leasing), setting aside a pool of backstop emission credits or insurance schemes. For example, to offset the transfer of long term risk to the producer, as the ultimate holder of the sink, certain conditions can be used such as buyers agreeing to replace temporary credits with more permanent ones after the contract expires. In this leasing approach there is no permanent transfer of carbon between buyers and sellers but a lease or loan from a producer (seller) to a buyer. When the contract expires, the buyer can either renew the lease to buy more temporary credits or replace them with permanent credits. These types of expiring credits would offer a short-term solution to those buyers who need to 'buy time' before they invest in internal company projects to reduce emissions. Temporary credits are expected to have lower value than permanent reduction credits. Another approach is for buyers and sellers to agree to set up third party liability insurance schemes. Some buyers/aggregators are also using Escrow accounts or setting aside a portion of the offsets purchase to cover off risks. All of these suggestions limit producers'/seller risk and potentially lower liability, but may result in increased costs. It's likely that in order to generate **certified offset credits** from sinks, project design documents will need to have a strategy to deal with the impermanence of stored soil or forest carbon.

In summary, participating in projects today can be a risky business, but there are a number of hedging strategies buyers and sellers can use to mitigate some of the above risks. The trick is to identify the risks, understand them and address them through contract-based strategies. It is essential that buyers and sellers define the risks in the contract, be clear on the seller vs buyer liability is and agree on a reasonable price reflective of the risk responsibilities. Also, getting acceptance on the details of the project by involved government agencies, commodity associations and other stakeholders will help to ensure that the eventual offset credits are recognized in the future Offsets system.

■ Where are the Dollars in GHG Emissions Offset Credits Today?

Until the rules for offsets are firmly established, the amount of money to be made is limited. This is due to the high transaction and administrative costs needed to develop typical 30 to 40 page contracts. To illustrate the potential revenue that can be made, two scenarios are presented describing the way producers can sell offsets. In this example, a project involving emissions removals (soil sinks) is used since the science is more accepted on the soil carbon side: one as an individual seller (scenario 1); the other is to sell them through an aggregator (scenario 2). Scenario 2 is based on the needs of the interested buyers to secure large amounts of offsets – in this case 750 000 tonnes of GHG emissions per year. In each of the scenarios the expected price of carbon increases as the Kyoto accounting period approaches (**Table 1**). This is because rules are expected to become firmer, reducing buyer and seller liability, and decreasing uncertainty all increasing the value of a carbon credit in the marketplace.

Table 1. Expected price of carbon in future years over the life of a 10 year contract.

Time period	Price
2003-05	\$1.50 tonne ⁻¹ CO ₂ e ¹
2006-08	\$3.00 tonne ⁻¹ CO ₂ e
2009-12	\$7.00 tonne ⁻¹ CO ₂ e

¹ Carbon dioxide equivalents (CO₂e) is the universal unit of measurement used to indicate the global warming potential (GWP) of each of the 6 GHGs. It is used to evaluate the impacts on the atmosphere of releasing/reducing different types of GHGs.

Contract Scenario 1

One producer sells offsets from a 500 ha piece of agricultural land located in the Dark Brown soil zone. The farmer switched from conventional till to zero till to reduce 1.00 tonne of emissions removals per hectare per year. The contract will expire after 10 years.

Contract Scenario 2

One hundred producers are needed with 500 ha each to reach the desired 50 000 tonnes the buyer is interested in. The same farm properties, price structure and contract terms presented in Scenario 1 applies here.

Offset Revenue	Total Transaction Costs	Portion of Transaction Cost to the Producer ¹	Net Revenue
Scenario 1			
\$20 750	\$12,075 (58% of total \$ from carbon sales)	\$6238 (30% of cost of total revenue from carbon sales)	\$14 512 over 10 years \$1 451 per year \$2.90 per ha per year
Scenario 2			
\$2 075 000	\$544,850 (27% of total revenue from carbon sales)	\$277 425 (17% of cost)	\$1 797 575 over 100 farms \$17 975 over 10 years (per producer) \$1 797 per year \$3.59 per ha per year

¹ Assumptions - both buyer and sell share equal cost (50:50); transaction costs include lawyer fees, 3rd party verification costs, brokerage and/or aggregator fees, no insurance fees included

■ Conclusion

More money can be made if going through an aggregator, but the net \$ per hectare is still minimal when the rules are not established for the offsets market. However, aggregation is a useful way to increase potential in supply and protect producers against individual risks of non-delivery of offset credits.

The calculations above are average estimates for Alberta. The assumptions were made after consulting lawyers, brokers and aggregators involved in early carbon transactions. A producer considering selling project-based offsets in today's market should look at the additional costs/benefits of each practice, to see if they make sense from a business perspective. Producers should be asking about the capital, labour and maintenance costs of any proposed technology that a buyer or aggregator is promoting in an offset project. A sound business case, with prior knowledge of economic hurdle rates and environmental co-benefits adequately assessed in the whole farm context, should be made prior to contracting on any management/technology change on farm. Many of these technologies/practices that reduce/remove GHGs have additional environmental and economic co-benefits, such as reduced fuel usage, reduced odour, soil and water quality improvements, and efficiencies in feed usage, which translate into a positive bottom line.

The value of selling offset credits is in providing incremental income, and the motivation for changing practices should primarily be for other reasons such as

increased efficiencies, environmental stewardship, lower costs of feeding and increased sustainability of the overall operation.

In the future, when rules are developed for an offset system, standardized methods for quantifying, monitoring and verifying project-based offsets will be available, substantially reducing risks and costs of offset transactions. Currently, companies positioning themselves as aggregators have developed methods to generate offsets from agriculture. Most of these firms are avoiding emission removal offsets (sink credits) because of the non-permanence and maintenance issues. Instead, firms are interested in emission reduction offsets typically in the area of manure management. Emission reduction offsets occur year after year once a change in management takes place and are attractive to potential buyers because they are permanent reductions. With the rules in place, standardized methods and strategies will be available to deal with non-permanence of soil sinks and claims made by technology developers regarding potential emission reductions in manure management.

■ **Bottom Line**

Agriculture producers are free to participate in the market however offset credit trading will become more financially attractive and less risky when offset systems are fully designed and operating. At the same time, early adopters can help to shape the market.