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ALBERTA CLIMATE LEADERSHIP: BUILDING THE BIOLOGICAL BRIDGE

Karen Haugen-Kozyra explains how Alberta's model for agriculture and land-use offsets offers a model for other jurisdictions around the world.

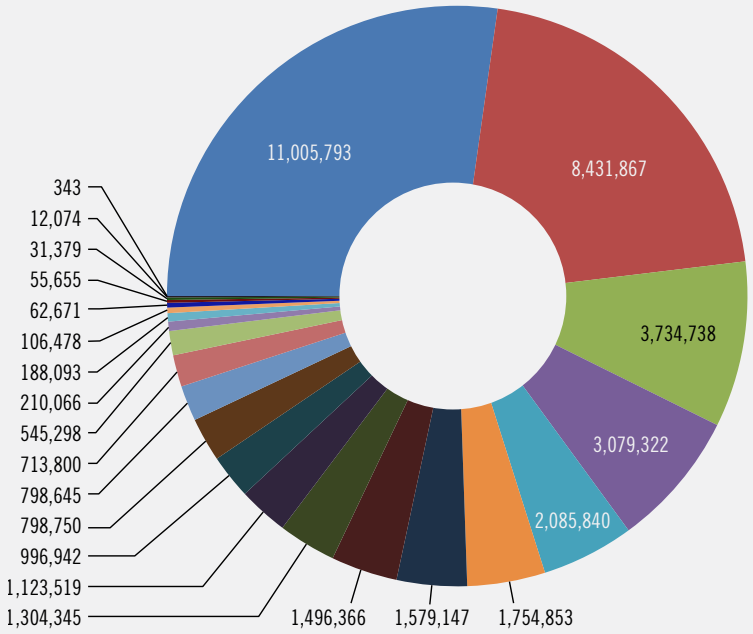
Alberta's new Climate Leadership Plan sets out strategic directions to achieve significant greenhouse gas (GHG) reductions in Alberta by 2030. The province's early action on climate change – as a first mover on an economy-wide carbon pricing framework - has resulted in it being recognized as a global leader in many aspects of GHG management, policy, verification and quantification.

Alberta's investments have developed a highly educated and skilled workforce and have developed world class research and training capacity. Alberta is well positioned to make significant contributions towards meeting low-carbon goals and diversifying the economy by capitalizing on these previous investments, and strategically investing in the low carbon development of its abundant natural resources in the energy, agriculture, forest and municipal waste sectors, securing its position as a global leader into the future.

Beginning in 2007, Alberta's GHG regulatory framework allowed companies the flexibility of using offsets to achieve regulatory compliance. By extending the carbon price signal beyond the regulated sectors, companies (both domestically and abroad) have been drawn to Alberta by the opportunity to test and commercialize innovative, low carbon technologies. They have also been able to implement and adopt innovative approaches to emission reductions/offsets activities to achieve significant impact[1].

Alberta's carbon pricing mechanism and robust offset system have enabled the carbon market to make significant emission reductions and in so doing have developed a tremendous resource in credible, transparent and consistent measurement, monitoring, reporting and verification (MRV) methods within the bio-based sectors.

FIGURE 1: TONNES REGISTERED (ALL VINTAGES, ALL YEARS)



Tillage System Management (11,005,793), Wind-Powered Electricity Generation (8,431,867), Nitrous Oxide Abatement from Nitric Acid Production (3,734,738), Diversion of Biomass to Energy from Biomass Combustion Facilities (3,079,322), Acid Gas Injection (2,085,840), Conservation Cropping (1,754,853), Energy Efficiency Projects(1,579,147), Landfill Gas Capture and Combustion (1,496,366), Enhanced Oil Recovery (1,304,345), Aerobic Composting Projects (1,123,519), Anaerobic Treatment of Wastewater Projects (996,942), Low-Retention, Water-Powered Electricity Generation as Run-of-the-River or an Existing Reservoir (989,750), Direct Reductions in Greenhouse Gas Emissions Arising from Changes in Forest Harvest Practices (798,645), Enhanced Oil Recovery (streamlined) (713,800), Engine Fuel Management and Vent Gas Capture Projects (545,298), Biofuel Production and Usage (210,066), Energy Efficiency for Commercial and Institutional Buildings (188,093), Energy Generation From the Combustion of Biomass Waste (124,074), Waste Heat Recovery Projects (106,478), Instrument Gas Conversion to Instrument Air Conversion in Process Control Systems (62,671), Waste Heat Recovery (streamlined) (55,655), Anaerobic Decomposition of Agricultural Materials (31,379), Substitution of Bitumen Binder in Hot Mix Asphalt Production and Usage (343), Waste Heat Recovery Project (-)

In the run-up to the Paris COP last year, more than 90% of nations that submitted Intended Nationally Determined Contributions identified the biological sector as a significant contributor towards achievement of those targets.

This level of commitment ensures that there will be a huge demand for robust MRV systems in the future.

Alberta's regulatory carbon market has a number of protocols applicable to the agriculture sector as well as a wide variety of other sectors. Some protocols have seen good uptake, facilitated by offset aggregators combining reductions across many farms, while others have not. Some protocols have yet to be reviewed or approved.

Of the over 40 million tonnes of registered, verified reductions that have been listed on the Alberta Offset Registry, more than half come from biological sources. To date, the number of offsets generated under the Conservation Cropping Protocol (CCP) – the most widely adopted protocol – is more than 12.76 million tonnes (see Figure 1).[2] This effort occurred when Alberta's technology fund price for carbon was C$15 per tonne of CO2e, but from January 2017 the price rises to C$30 per tonne and more opportunities are expected to emerge as the higher price renders previously marginal projects financially feasible[3].

Numerous protocols have undergone significant testing and revisions and although many are currently being implemented, awareness of the potential is limited. As a result there has been significant interest in exploring the concept of "offset stacking", where multiple, distinct and separate emission reduction opportunities could occur within one operation. Viresco Solutions completed a recent study that explored the benefits of participation in offset protocol stacking on a provincial and farm level, as well as gaps and recommendations for moving forward.

OF THE OVER 40 MILLION TONNES OF REGISTERED, VERIFIED REDUCTIONS THAT HAVE BEEN LISTED ON THE ALBERTA OFFSET REGISTRY, MORE THAN HALF COME FROM BIOLOGICAL SOURCES.

TABLE 1: UNDISCOUNTED VALUE OF GROSS REVENUES (AT C$30 PER TONNE) FROM CASE STUDIES[4]

CASE STUDY	Average annual revenue (C$)	Average annual tonnes(mt)	Revenue over the 10-year period (C$)
1 – Black Soil Zone– CCP, NERP and Wetlands	$20,280	676	$203,610
2 – Dk. Brown Soil Zone – CCP, NERP, Fed Cattle and Low RFI	$68,490	2,283	$684,900
3 – Brown Soil Zone – CCP, NERP, Dairy and Energy Efficiency	$103,470	3,449	$1,034,700

PROVINCIAL LEVEL ADOPTION

The study provided an analysis of the annual offset value at the provincial level based on wide adoption of specific protocols by Alberta farms and ranches. The estimates rely on previously published research into both nationwide and Alberta-based carbon reduction potentials. The analysis shows that emission reductions of up to 4.14 million tonnes CO2e a year could be achieved through wide-scale adoption of approved, and yet-to-be approved protocols. The anticipated value of these offsets at C$30/tonne is C$90,000,000 a year.

FARM LEVEL CASE STUDIES

Three case studies of representative farms, selected by soil zone, were used to assess the value of stacking protocols: agricultural nitrous oxide emission reductions (NERP); conservation cropping (CCP), reducing greenhouse gas emissions from fed cattle; selection for low residual feed intake (RFI), markers in beef cattle; emissions reductions from dairy cattle; and energy efficiency. The draft wetlands restoration protocol was also modeled. Table 1 summarizes the undiscounted value of the amount of gross revenues estimated at C$30 per tonne for each of the Case Studies.

Many of the practices outlined in the protocols result in significant co-benefits and the study assessed efficiency gains and co-benefits for the stacked offset opportunities. Conservation cropping, NERP and the fed cattle protocol have the potential to generate significant emissions reductions, but even on the largest farm case (Case 3) stacking still did not generate enough tonnes for a single operation to be economically viable in the carbon market.[5]

These projects must therefore be aggregated into a larger project so credits can be transacted in an economically viable manner. This is an area where Alberta has demonstrated innovation in best practices. The other protocols explored generate limited tonnes and require significant additional work in order to attract investment.

SUMMARY

Crossing the biological bridge requires MRV practices that have been developed, tested and commercialized in Alberta's offset market. Alberta is well positioned to engage and partner beyond its borders, and the world is ready and anxious to benefit from the investments made to date in knowledge creation, innovation and technology development.

While significant, the theoretical potential of Alberta's biological sector cannot be fully realized as there are many barriers and constraints preventing broad uptake. Challenges exist because most of the

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opportunities for these land- and activity-based protocols are characterized by small tonnage, geographically-dispersed projects requiring coordination and aggregation, with solid verification systems, to realize the potentials.

International focus on the goal of a deeply decarbonized future[6] will need to mobilize the "biological bridge" as we transition our energy sources. This suggests that immediate opportunities for partnering and alignment exist in the area of carbon offset technologies and strategies, including MRV infrastructure, modelling platforms and data capture systems.

As a leader, Alberta is positioned to share science-based knowledge, and generate further Investment in identifying additional immediate and future opportunities to expand science-based emission reductions and technological opportunities related to keeping produced carbon out of the atmosphere (through value-added carbon use, sequestration or emissions avoidance).

Agricultural offsets represent an important "bio-bridge", generating reductions today while future technologies are developed to reduce emissions. The bio-bridge improves agricultural production efficiencies and adaptation to a changing climate and is vital to stimulating reductions worldwide.

Failure to capitalize on the potential means that 20-30% of the world's reduction potential that lies in the biological sector is stranded. Climate-smart agriculture has the potential to advance environmental goods and services long-term which is critical to protecting and enhancing water, habitat, farmer economics and other societal goals.

Now more than ever, the role of the agriculture, forestry and land use sector will be critical to realizing a decarbonized economy globally. Therefore, investment is needed to bridge the knowledge gaps for new emission reduction opportunities, data and management platforms, education and information sharing, measurement and modelling, offset protocol development/ refinement, low cost validation and verification systems.

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(1) Examples include Australia's Carbon Farming Initiative methodologies; Best practice guidance references for protocols/methodologies on the American Carbon Registry and Verified Carbon Standard's proposed protocols; Integration of the Nitrous Oxide Emission Reduction Protocol's (NERP) MRV approaches into supply chain metrics through Field to Market; Fertilizer Canada $3M investment on furthering 4R Nutrient Stewardship science in the NERP; Royal DSM's clean cow compound investment for large scale field trials in Alberta; Shell Canada investment in researching grazing practices to biologically sequester carbon; the Climate Change and Emissions Corporation's Bio-Fund call interest. (2) Tonnes from the practice of reduced till include tonnes from the Conservation Cropping Protocol as well as the Tillage System Management Protocol (3) Alberta's technology fund is a compliance option under the regulatory framework and is administered by the Climate Change and Emissions Management Corporation (CCEMC) (4) The three representative farms include a cropping operation in central Alberta (3000 acres); a vertically integrated mixed beef and crop operation in S. Central (3500 acres; 25,000 head feedlot); and and a large cooperative-based farm consisting of dairy, poultry, hogs and cropping (10,000 acres, two thirds under irrigation). (5) To be economically viable, a project typically consists at a minimum of 10,000 tonnes to cover a buyer's due diligence and administrative costs. (6) Of the 188 countries who submitted their targets (Intended Nationally Determined Contributions or INDCs) to the UN for the Paris Agreements in December 2015, over 95% included the agricultural sector as having a significant mitigation/adaptation contribution to their national targets.