


Carbon as a Cash Crop

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*A more detailed, technical version of this presentation is available from Renaud@lanigangroup.ca for review by scientists
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Lanigan Group's Analysis of the Sustainability of Canadian Agriculture

This presentation is the 2nd of a 4-part series of analysis on the Sustainability of Canadian Agriculture:

1. **Misconceptions About the Sustainability of Canadian Agriculture** addresses false assumptions and misconceptions about Canadian agriculture's role in global warming due to lack of attention to on-farm sequestration by policymakers.
2. **Carbon as a Cash Crop** (this report) addresses why Canada's current narrative for agricultural climate action isn't working and why carbon credits are ineffective as a basis for incentivizing agricultural climate action. It proposes a more effective alternative based on the concept of incentives for excess sequestration services.
3. **Enteric Emissions are Climate Neutral** presents a detailed analysis of enteric emissions in Canadian dairy which establishes that enteric emissions in Canada are better than non-additive to global warming because they occur in a biogenic carbon cycle that sequesters more carbon than is emitted.
4. **Carbon Footprint of Canadian Agriculture** presents a comprehensive estimate of the net carbon footprint for Canadian agriculture that is otherwise unavailable from official sources. It documents why Canadian agriculture is already sustainable because it is already generating over \$3 B in unpaid, excess sequestration services.

Farmers Typically Demonstrate Environmental Responsibility

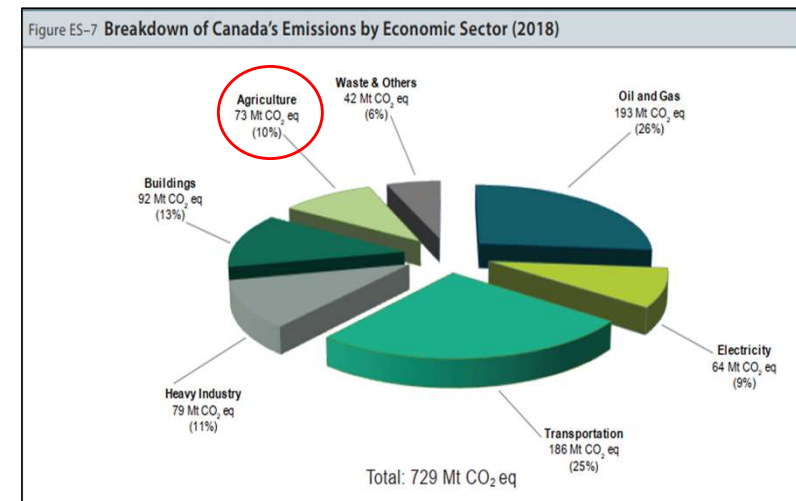
❖ **Farmers demonstrate environmental responsibility when presented with viable alternatives to current practices:**

- ❖ Crop rotation to restore soil quality, ground source water protection from manure, responsible application of pesticides are all universally practiced
- ❖ No-till in Canada was rapidly adopted by over 50% of farms (69% of Quebec farms) – **10 years ago**
- ❖ USDA Estimates that No-till and Reduced-Till is currently adopted on 51% of cropland in USA
- ❖ As of 2018, 47 % of farms nationally (81% in Quebec) had an environmental farm plan (EFP) or were working on one
- ❖ Acreage treated with chemicals to control insects, weeds, and nematodes declined over 10 years
- ❖ Farming of organic crops grew by 40% and number of farms raising organic crops more than doubled in 5 years
- ❖ As of 2021, 1 in 8 Canadian farms were producing renewable energy, an increase of 69% over 5 years
- ❖ Adoption of cover cropping increased by over 50% since 2012 and is adopted on 72% of Ontario farms with 86% likely to adopt in future [2020 Ontario Cover Crop Report]

Current Approach for Promoting Agricultural Climate Action (and why it is not working)

❖ Climate crisis response is no different, so why farmers are not responding well to current call-to-action?

- 1. Carbon Tax:** farmers are taxed on the cost of carbon in fossil fuels despite having tight financial margins (often with negative operating cash flows) and struggling with inflation on inputs and equipment costs
- 2. Negative Re-enforcement:** Farmers are criticized for contributing 10% of Canada's carbon emissions – a small percentage compared to major contributors that dominate emissions
- 3. Risk to Livelihood:** Farmers are asked to risk crop yields by reducing fertilizer use, yet many perceive 4R implementation to be financially risky –at the same time when climate impacts are reducing crop yields
- 4. Unreachable Incentives:** Income from carbon credits is unattainable by most farms



Source: 2018 EEE National Inventory Report of GHG

Carbon Credits are Inefficient – 1 of 2

❖ **Carbon credits are inefficient with 1/3 of funding provided via carbon credits is consumed by middlemen & overheads** [2022 Thallo Research]

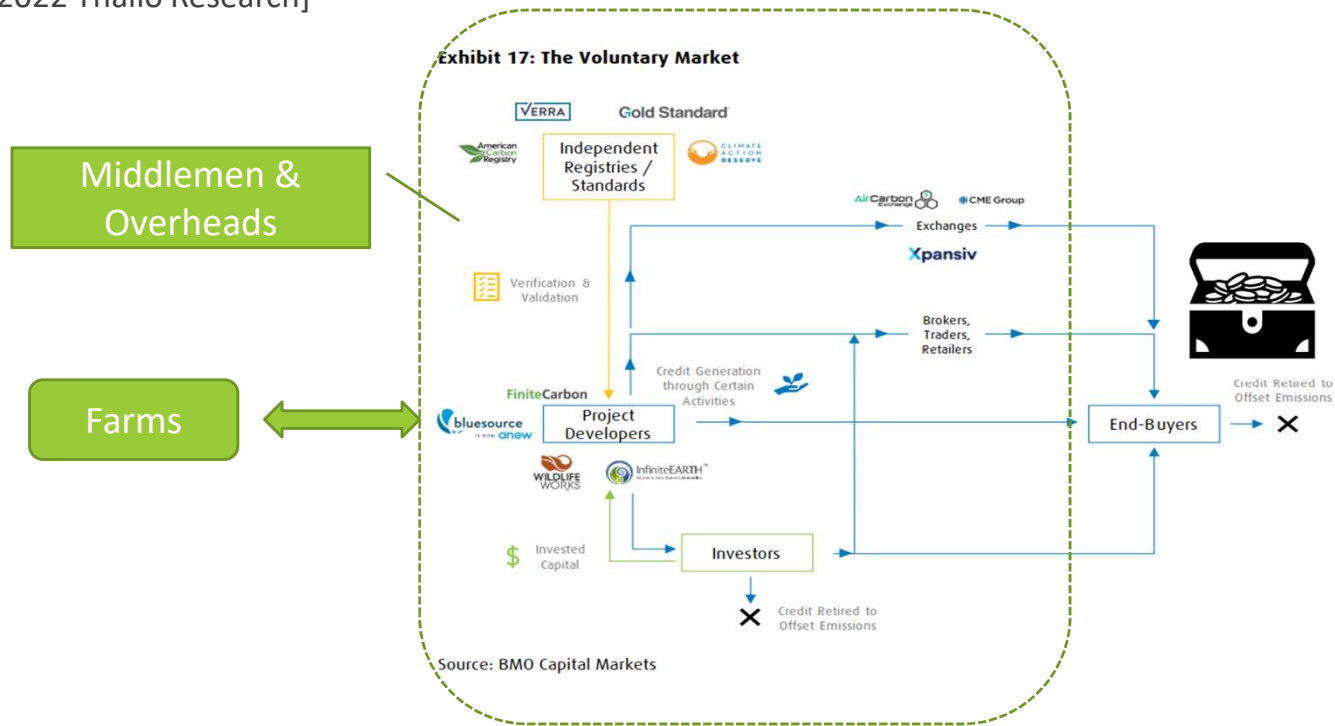


Exhibit 17 from BMO Capital Markets report on Voluntary Carbon Markets
Annotations in Green added

Carbon Credits are Inefficient – 2 of 2

- ❖ **Carbon credits are inefficient** and require the burden of proving additionality – a complex undertaking
 - Verification & issuance related delays will prevent the issuance of 4.8 GT of credits by 2030 [2022 Thallo Research]

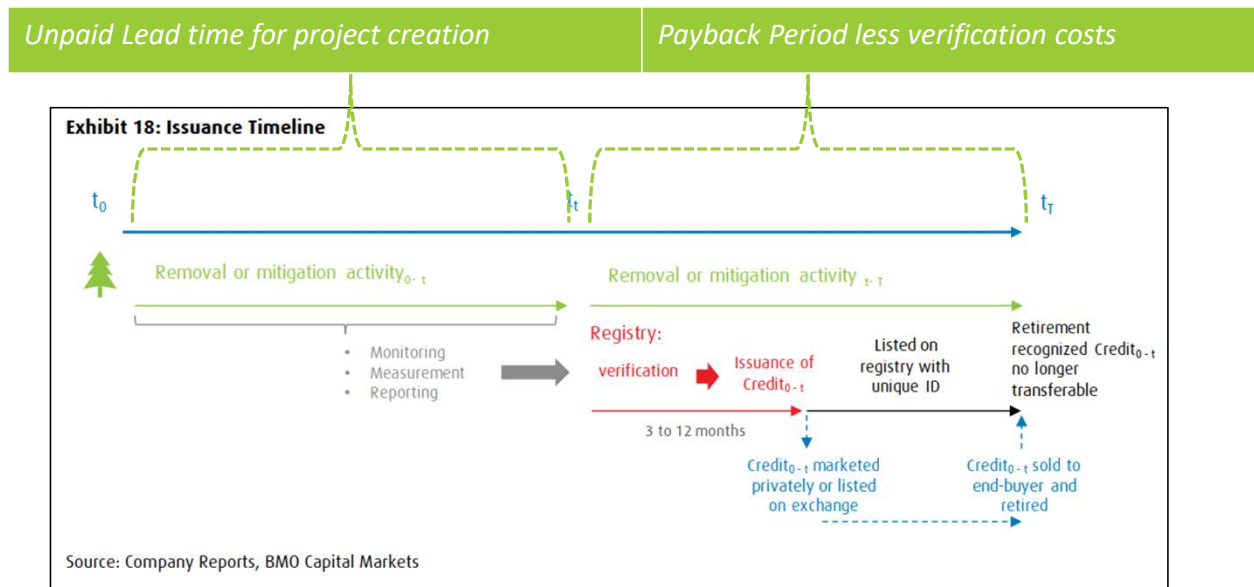


Exhibit 18 from BMO Capital Markets report on Voluntary Carbon Markets
Annotations in Green added

Carbon Credits are Unreachable by Majority of Canadian Farms

- ❖ At a farm level, **carbon credits are infeasible** for the majority of farms in Canada (who are mostly in Ontario & Quebec):
 - ❖ Most carbon credits in voluntary markets (e.g. VCS) require landowners to allocate 5,000 acres for carbon credits to be financially viable
 - ❖ Meanwhile over ½ of Ontario are < 100 acres, less than 16% are even above 400 acres, and virtually none in this size
 - ❖ Even in the Prairies, average farm size is less than 2000 acres
 - ❖ Across Canada, carbon credits are unreachable by the vast majority of Canadian Farms who are getting smaller, not larger over time

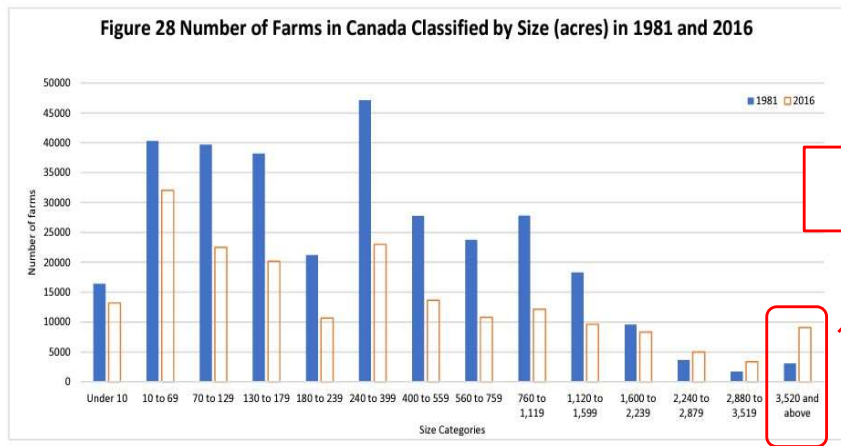


Table 1. Average Farm Size (Acres) 1971 and 2021, and Percentage Change, 1971-2021

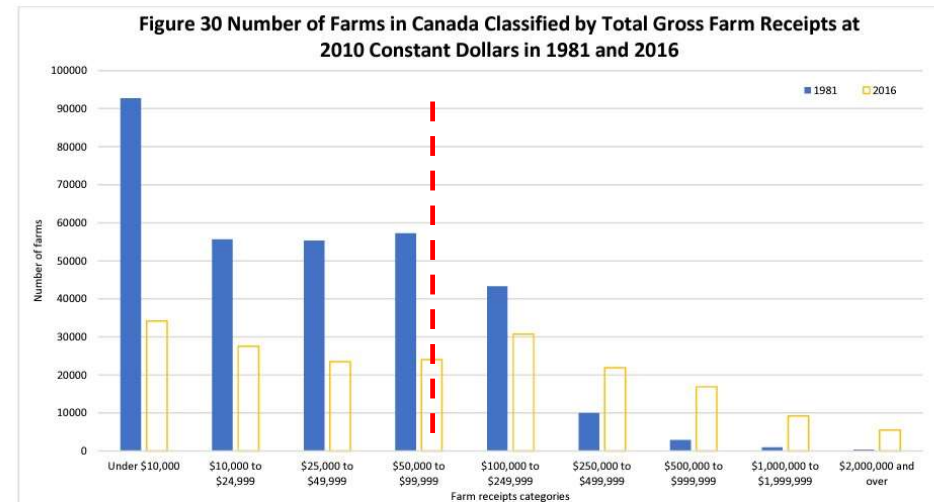
Province	Average Farm Size (Acres)		% Change	
	1971	2021	1971-2016 (avg)	2016-2021
Newfoundland	60	144	23.20	-17.24
PEI	171	422	11.37	-0.71
Nova Scotia	221	263	3.31	0.00
New Brunswick	244	370	6.08	0.00
Quebec	176	264	5.84	-5.71
Ontario	169	243	4.41	-2.41
Manitoba	543	1,177	9.57	-1.26
Saskatchewan	845	1,766	8.92	-1.01
Alberta	790	1,184	5.87	-4.28
British Columbia	316	357	3.31	-2.19
Canada	463	809	7.41	-1.34

Data from Statistics Canada, Table 32-10-0153-01 Land Use, Census of Agriculture historical data

Source: Statistics Canada CANSIM Tables 004-0005 and Table 004-0201.

Carbon Credit Value is Insignificant for Most Farms

- ❖ The vast majority of farms are barely profitable with limited means of investing other than loans
 - ❖ Ontario has the most farms of any province yet 1/3 of Ontario farms have revenues below \$25K , 2/3 have revenues below \$100 K
 - ❖ Across Canada, the majority of farm incomes are falling with over half less than \$50 K in 2016
 - ❖ In 2020, farm profit margins were less than 17% across Canada
- ❖ In 2022 credit value per ton was \$4 - \$16 (high end of the range from forestry projects, not farm-based projects)
- ❖ Assuming even a value per ton of \$16, with 0.5 tonne CO2 sequestration / ha for cover cropping, carbon credits at most are worth only \$2.5 / acre



Source: Statistics Canada *CANSIM Table 004-0006 and 004-0233.*

Carbon Credits are Uneconomic for Majority of Canadian Farms

- ❖ The value to be obtained from credits can be less than the cost of pursuing them
- ❖ Carbon Credits are uneconomic for many farms, even if audits done every 5 years at \$15/acre
 - ❖ BMO estimates 5 – 10 yr transition needed for pay back on reduced crop yields during transition - not including compliance costs
 - ❖ BMO estimates \$15/acre for compliance every 5 year
 - ❖ Nutrien estimates verification costs at \$10 - \$20 / acre
 - ❖ I.E. \$5/acre/year annualized cost vs \$2.5 / acre / year benefit
- ❖ The trend in voluntary carbon credit markets is to tighten compliance (increasing verification cost) to prevent leakage and reversals

Economics of Carbon Credits Not Improved By Aggregating Small Farms

- ❖ Even after aggregating smaller farms into cohorts, **carbon credits are infeasible both in Canada and USA:**
- 1. The complexity and cost of managing annual compliance from each participant in a cohort does not go away
 - ❖ Significant variation in soil carbon uptake exists between farms and even between fields in the same farm creating inconsistency in the value of carbon credits produced (as well as increasing verification costs).
 - ❖ Each participant in a cohort must still be verified, resulting in higher costs compared to auditing a single, larger producer
- 2. Carbon Credit Projects require commitments by farmers ranging from 5 - 20 years
 - ❖ The ability of farms to participate is fragile (due to crop disasters, illness, death, divorce, financial instability, etc.)
 - ❖ Necessitating aggregators to create a buffer pool of non-tradeable credits to be used as a reserve to cover defaults
 - ❖ Reducing benefits to participating farms / woodlots
 - ❖ E.G. annual payments by Bayer Carbon Initiative is only \$9/acre, less than half of max carbon credit market prices
 - ❖ E.G. Corteva pays out only 75% of carbon credit value and delayed over a 5-year period, subject to verification

Attempts to Aggregate Small Woodlots for Carbon Credits Also Didn't Work

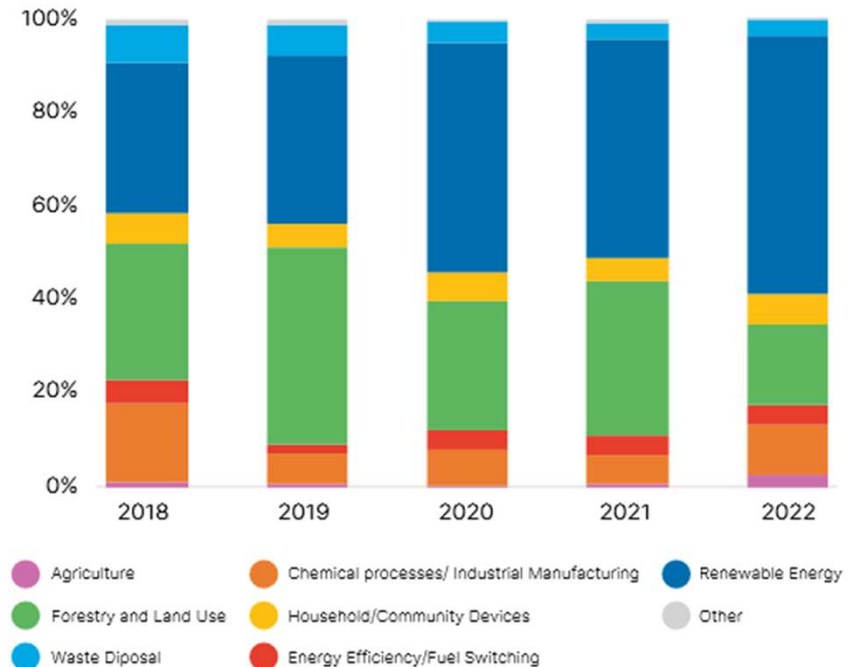
- ❖ Attempts to extend community forest-based carbon credit schemes to private woodlot cooperatives have stalled in both Ontario (EOMF) and Quebec (PIVOT)
- ❖ Eastern Ontario Model Forest (EOMF) cites a minimum threshold of 5000 acres to be financially viable
 - ❖ Implying that each cohort of 100 acres must have at least over 50 private woodlots participating (average farm size is 250 acres in Ontario)
 - ❖ Significantly increasing the likelihood of default by any one of them over a typical 20 to 40-year program cycle

Not Surprisingly Enrolment of Farms In Carbon Credit Schemes is Low

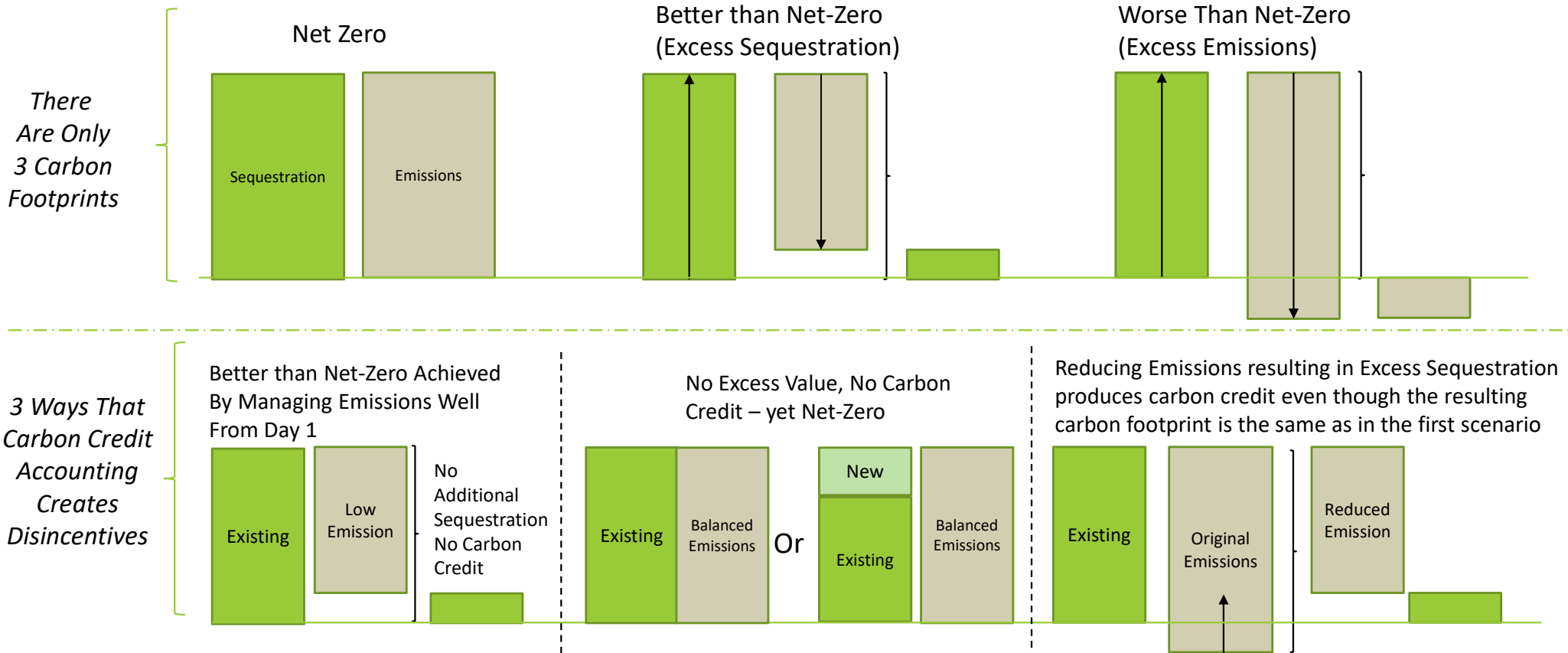
- ❖ There is no federally approved GHG Credit Protocol to facilitate carbon credits for agriculture in Canada
- ❖ Alberta is the only province that facilitates farms selling carbon credits (Saskatchewan is likely to launch a similar program)
- ❖ Less than 5% of more than 1300 US farmers surveyed by McKinsey in 2022 had participated in a carbon credit program
- ❖ Indigo Ag, a prominent US private carbon credit market targeting US farms, has less than 3.4 M acres in its program out of a potential of 396 M acres of cropland in the USA
- ❖ Total issuance of carbon credits for agriculture is less than 2% [World Bank State & Trends in Carbon Pricing 2023]



FIGURE 13
PERCENTAGE OF TOTAL ISSUANCE BY PROJECT CATEGORY AND YEAR



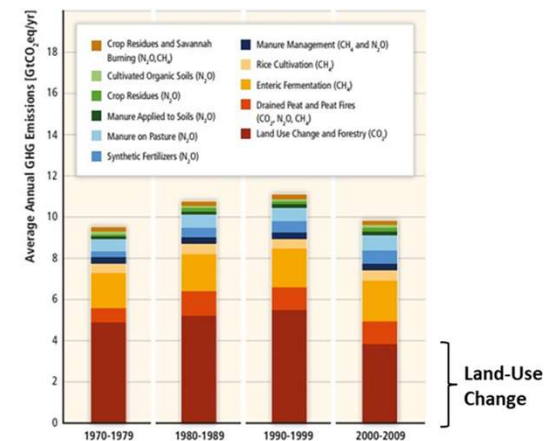
Visual Guide Illustrating How Carbon Credits Disincent Sequestration



Carbon Credits Miss the Mark in Agriculture's Role in Climate Mitigation

- Under carbon crediting schemes: if a farm is already sequestering carbon there is no additionality and therefore no value
- E.G. Canada's Enhanced Soil Organic Carbon protocol will generate carbon credits only to farmers who implemented cover cropping after 2017 – an arbitrary baseline date penalizing early adopters
- Implying there is no sequestration value ascribed to existing trees in fencelines and farm woodlots
- If there is no value for existing trees, is it surprising when farmers choose to cut them down?
 - E.G. change in land use from treed to cropland or pasture
- This is short-sighted and based on a presumption that there will be no change in land use over time and thus, no value in protecting existing land use and its climate services
- Yet the IPCC highlights change in land use is the largest source of emissions for agriculture globally (see illustration), and also permits sequestration from existing trees to be used to offset anthropogenic emissions on areas designated as "Managed Lands"
 - According to Env Canada, all agricultural land is designated as Managed Lands (see Annex)
 - Consequently, a requirement of additionality is inappropriate for Canadian farm incentives

Agriculture, Forestry and Other Land Use (AFOLU)




Source: IPCC AR 5 Ch 8 Figure 11.2

Excess Sequestration Enables “Carbon as a Cash-Crop”

- ❖ Existing sequestration is valuable because it needs to be protected from changes in land use
 - ❖ Farms arguably also have the exclusive right to apply existing sequestration from their own property’s trees against their own emissions first
- ❖ A primary food producer whose emissions are less than their existing sequestration has “**excess sequestration**”
 - Regardless of whether excess sequestration is sold, it still offsets someone else’s emissions (another farm, value chain partner, etc.)
 - Excess sequestration can be valued via incentives based on the national cost of carbon
 - and funded by extending the carbon tax to all heavy emitters currently sheltered for allegedly “competitive” reasons (all of whom are highly more profitable than most Canadian farms)
 - A producer can create excess sequestration via both sides of the net-zero equation and will do so if there is an economic incentive
- ❖ Agriculture is a valuable source for excess sequestration that Canada’s 2030 Climate Plan requires to increase
 - ❖ In the context of a broader national plan, this can offset emissions in other emitting activities without having to “sell” carbon credits
 - The challenge to encourage all agricultural producers create excess sequestration is far easier to achieve via an incentive-based scheme that is better-suited for the majority of producers compared to a carbon-credit based scheme that fits no one
 - I.E. **make Carbon a cash crop by incentivizing excess sequestration**

Advantages of an Excess Sequestration-based Incentive Program – 1 of 2

- ❖ Farms receive much larger payments - in 2023 this is \$65/ton instead of \$12/ton via carbon credits (assuming carbon credits made were even possible)
 - ❖ No complexity, lead time, or overhead to define and set up an offset project as there are no projects.
 - ❖ No need to justify additionality.
 - ❖ Elimination of all overhead, project, and insurance costs currently burdening a carbon credit scheme - only reduced verification costs remain, eliminating 70% of cost in the current carbon credit market
 - ❖ No reserves for reversals need to be withheld from farm payments because excess sequestration incentives can be based on previous year's harvest
 - ❖ Verification costs are reduced by not needing to track against forecasted project benefits, or verify robustness, or persistence
 - ❖ Verification can still occur on a 3 or 5-year cycle and verification results can feed the reporting cycle for national inventory of GHG
 - ❖ Funding of improvements (either via emission reduction or increased sequestration) is cash positive for farms already operating on a better than climate neutral basis
 - ❖ Funding of improvements for farms not already climate neutral can be financed with greater certainty and less risk in lending
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Advantages of an Excess Sequestration-based Incentive Program – 2 of 2

- ❖ There is no need to trade credits, funding for the incentive payments come from the carbon taxes on net carbon emitters
 - ❖ The cost of the incentive program is neutral from a gov perspective (assuming carbon taxes are applied fairly to all emitters)
- ❖ No need to stop trading credits where they are still useful for other industry sectors. Excess sequestration incentives are more relevant to agriculture and forestry sectors.
- ❖ The windfall advantage for farms already operating on a climate neutral basis is fair reward for already doing the right thing and a powerful motivator for less climate friendly farms to do so as well
- ❖ Excess sequestration is also easier to apply across the value-chain for food processors, packers and retailers to enable insets needed to support their own net-zero targets
- ❖ Value chain partners would have a vested interest in sharing the costs for verification, since excess sequestration incentives put more inset dollars into the value chain that they can benefit from.
 - ❖ Removing overhead cost from the farm (that would otherwise be incurred by a carbon credit regime) increases value available to downstream partners.

A New Narrative Is Needed For Climate Action in Agriculture

- ❖ Agricultural climate solutions can provide significant opportunities for mitigating climate change
- ❖ Agricultural producers should be encouraged to implement climate actions for mitigating climate change – yet the current narrative isn't working
- ❖ Agricultural climate action needs a new narrative that:
 1. **Recognizes the value of sequestration services already provided by farms**
– our modeling indicates that Canadian Agriculture is already operating at close to a climate neutral basis when existing sequestration is included
 2. **Provides reachable incentives** for excess sequestration services provided beyond net-zero
 3. **Based on fair value** for carbon as established by the national carbon tax (quid pro quo)
- ❖ Increase focus on sequestration, equally with emissions:
 - ❖ Land use change contributes significantly to GHG Emissions and **farmers make land-use decisions every year** as they decide what / where / when to plant -- this includes removal of trees and other factors influencing natural sequestration
 - ❖ Promoting “**going beyond climate neutral**” promotes emission reductions equally with increased sequestration as improvements in both directions create benefit
- ❖ To promote the value of sequestration, we need to identify & recognize the value from existing trees on farms
 - ❖ Adherence to “additionality” for the purpose of unattainable carbon credits devalues critical existing sequestration services
 - ❖ **There are better ways than carbon credits to incentivize climate action in agriculture**
 - ❖ The benefit of excess sequestration beyond the emissions generated from farming can be valued via an incentive-based scheme
 - ❖ Doing so unlocks a powerful motivator to improve both farm-based sequestration services as well as funding transitions that lower emissions

How Can We Make Carbon a Cash Crop?

- 1. Changed Narrative:** Recognize the value of existing sequestration services => Cdn Agriculture is already sustainable
 - Farms make land-use decisions every year that can change the profile of existing sequestration & emissions
 - Recognizing the value of existing sequestration helps them make better decisions, compared to just focusing on their existing emissions
- 2. Positive Re-enforcement:** Assess carbon footprint of farms and celebrate the farms that are net-zero or better
 - Establish standardized modelling methodology for farm-level carbon footprint modelling that can be used consistently with national GHG inventory calculation
 - Model footprint of farms and calibrate results using field measurements from real farms
 - Our preliminary modeling shows that Canadian Agriculture as a whole is already operating on a climate neutral basis when sequestration services from existing trees on farms is recognized
- 3. Reachable Incentives:** Create incentives for farms in proportion to the amount of excess sequestration services they provide
 - Farms will sequester more once they see that carbon can be a cash crop requiring minimal investment to increase farm income
 - Farms will invest in higher cost of emissions reduction if it enables them to be paid for net-sequestration that arise from lower emissions
 - Need to facilitate implementation of increased on-farm sequestration, as well as lower farm emissions, via education on best practices for agroforestry and afforestation
- 4. Fair Valuation for Carbon:** Incentives for excess sequestration funded on same basis a carbon tax on emissions
 - Compliance can be confirmed by agricultural product associations performing spot-checks to ground-truth & confirm use of best-practices

Annex

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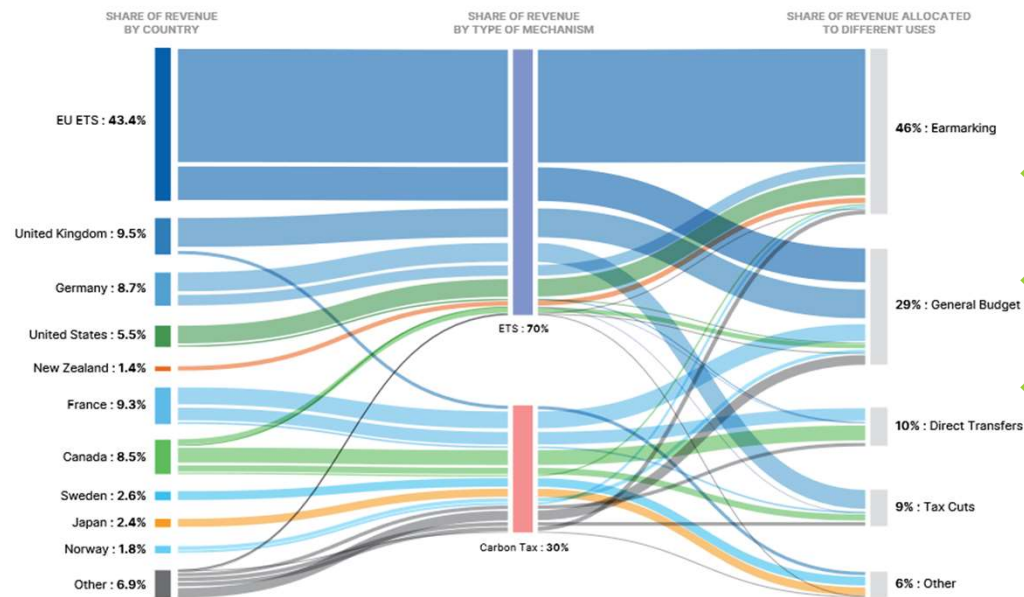
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Canada's Current Use of Carbon Tax Revenue is Out of Step with Other Countries

FIGURE 8
SCALE AND USES OF CARBON REVENUE IN 2021



- ❖ According to the World Bank, only 10% of countries refund carbon taxes or emission trading system credits
- ❖ 46% of countries earmark the funds to provide incentives for enabling climate transition
- ❖ Using proceeds from carbon taxes to fund incentives for excess sequestration is consistent with the majority of international carbon funding

Source: Based on 2021 data from Institute for Climate Economics.
 Note: All auction revenue allocated to EU Member States is reflected under the EU ETS revenue (not individual member states). Revenues collected under separate instruments (e.g., France Carbon Tax or Germany ETS) are displayed separately. Share of revenue allocated to different uses in 2021, meaning that revenue use displayed could include revenue collected prior to 2021.