



LP CONSULTING

Lise LeBlanc

lise.leblanc@lpconsulting.ca



NEWEA
WORKING FOR WATER QUALITY

**Northeast Residuals & Biosolids
Conference
Portsmouth, NH
November 1-2, 2023**

Opportunities for Biosolids and Residuals in the Carbon Market



Agenda



Who is LP Consulting?



Healthy Soils and Climate Change Impact



Can Residuals fit into Carbon Market Programs?



How is the Agricultural Carbon Market Developing?

Who is LP Consulting?

**For
Farmers**

**For
Industry**

**For Agri-
economy**



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LP Consulting Ltd
902-256-2636

Healthy Sustainable Soils

More than just for Food!



Maintain & Protect one of the our most valuable & fragile natural resources:

Soil

Critical to Health of the Planet

- Regulates climate through carbon cycle
- Store water to moderate floods and drought
- Environmental protection:
 - Water quality
 - Air quality
 - Soil quality



Climate Change Impacts On Agriculture

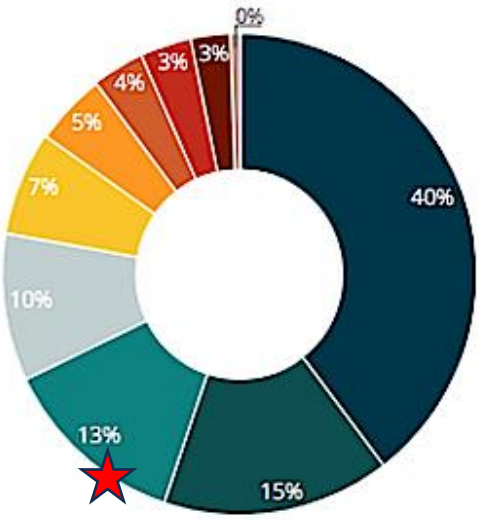
**Severe Rainfall Events in Short
Period of Time**

Droughty Summers

Wet Spring & Fall

Less Snow Cover

Can Residuals Fit into Carbon Credit Programs?



- Enteric Fermentation
- Manure left on Pasture
- Synthetic Fertilizers
- Rice Cultivation
- Manure Management
- Burning - Savanna
- Crop Residues
- Manure applied to Soils
- Cultivation of organic soils
- Burning - crop residues



Carbon Footprint of Chemical Fertilizers

Nitrogen (Resource Based – captured from air)	Phosphorus (Mined)*	Potassium (mined from salt deposits)
China (36.9 M mt)	China – 41%*	Canada – largest reserves (Sask)
India (13.7 M mt)	Morocco	Russia #1 MOP producer
US	US	Belarus
Russia	Russia	China
Canada (3.9 M mt)	Jordan	Germany
Indonesia	Brazil	Israel
Qatar	Saudi Arabia	Jordon
Pakistan	Egypt	Chile
Egypt	Israel	Spain
Saudi Arabia	Vietnam	US

Using Residuals will decrease our reliance on fertilizers & reduce GHG Impacts

Fertilizer Market Trends

Most major nutrients have been in decline since the early 2000's due to global competition which has reduced profit margins while fertilizer and lime input costs have increased.

- Macro – N-P-K
- Supplementary – Ca, Mg, S
- Micro – B, Zn, Fe, Mo, Mn



There has not been enough attention to Industry partnering with Agriculture.

Agriculture and Industry can partner to earn carbon credits

This not only saves money/revenue for Industry but also incentivizes increased residual program adoption in the Ag industry.



Example:

Canada Compost fertilizer displacement

- Reduce GHG emissions by at least **41,000 tCO₂e** (BEAM Model).
- Replaces over **\$881M** in chemical inorganic fertilizers sourced from China Russia, Morocco and the USA
- adds over **5.6M MT** of organic matter



What is the Value of Residuals?

- Essential to determine the economic value of a residual
 - ✓ Base it on the cost of inorganic commercial fertilizers
 - Determined by world market
- Inorganic commercial fertilizer nutrients are based on their **total nutrient** content within the product
 - Do the same with residuals!

Nutrient	\$/Kg
N	\$2.40
P ₂ O ₅	\$2.30
K ₂ O	\$1.60
S	\$9 per 1%
Mg	\$68 per 1%
B	\$12 per 0.1%
Zn	\$45 per 1%
Lime	\$40/tonne



Carbon Market Potential

Partner Residual Generators with Agriculture

- Potential to earn carbon off-set credits

Volunteer Market

- Addition of carbon to soil & reduction of greenhouse gases (GHG)
- Validation and verification
- High demand – companies want to partner with agriculture

LP has partnered with RoCarbon to develop a program to verify and broker on-farm credits

CARBON CROPPING



Companies purchasing credits to jumpstart the voluntary agriculture credits market:

Microsoft
IBM,
JP Morgan Chase,
Boston Consulting Group,
Dogfish Head Craft Brewing,
Shopify,
Anheuser-Busch
Barclays

Can Carbon Farming Reverse Climate Change?

EVERYTHING BAD IS GOOD AGAIN

Capturing the very gas that leads to global warming could not only lead to tasty veggies—it could potentially help cool a hotter world.



Neel V. Patel
Senior Editor, Science & Innovation

Updated May. 08, 2019 4:33PM ET / Published Jul. 17, 2018 4:54AM ET



Photo Illustration by The Daily Beast

What if the carbon dioxide that leads to global warming could be captured, stored, and used for farming?

Farmers can generate carbon credits from implementing soil health practices that sequester CO₂ from the atmosphere and into their soils

2019 National Academy of Sciences Report

US market for carbon credits is estimated at **\$5.2 billion annually**,

Market for other ecosystem services related to N & P at **\$8.7 billion annually**





Greenwashing

[ˈgrēn-,wə-shɪŋ]

The act of providing the public or investors with misleading or outright false information about the environmental impact of a company's products and operations.

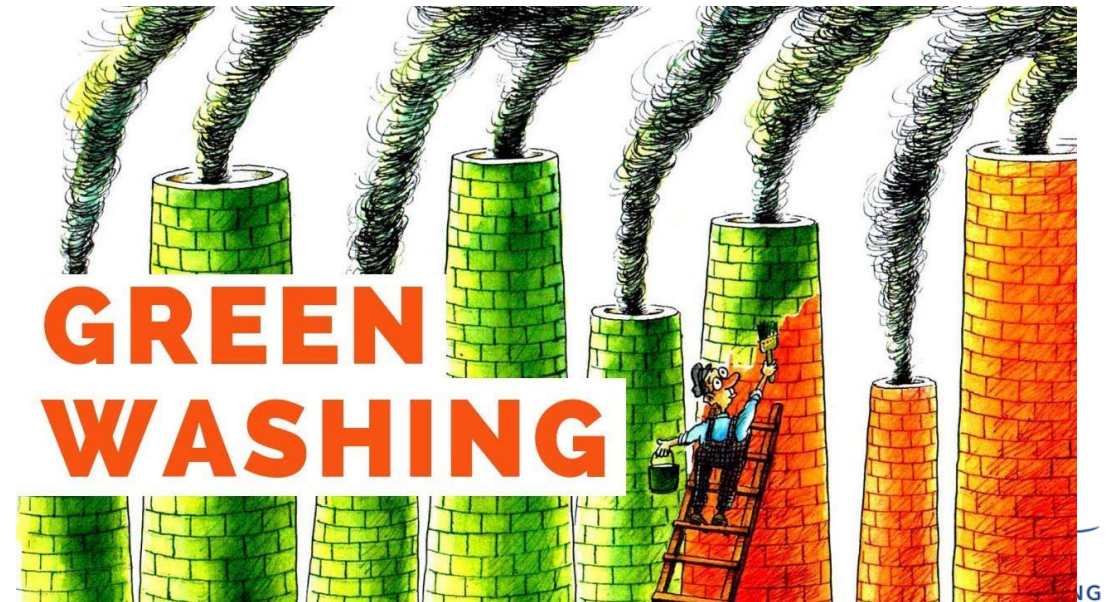
- ✓ Unverifiable carbon claims
- ✓ False low emission claims
- ✓ Misleading climate ads
- ✓ Gaslighting of general public

Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless. *The Guardian, Jan 2023

VERRA

Junk offsets are feeding wave of greenwashing *The Japan Times, Aug 2023

Companies need to stop greenwashing and get serious with net-zero pledges *The Globe and Mail, Feb 2023



Offsetting vs Insetting

OFFSETTING is when a company invests in carbon-reduction projects elsewhere to compensate for the carbon its value chains produce.

INSETTING is when a company invests in reducing carbon emissions within its own upstream and downstream value chains.

**more companies are moving towards insetting (inside 1st as seen as cheapest next credits– issues to being fair to those in value stream)*



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Funding a patch of forest in a foreign country (**offsetting**), you grow the forest (**insetting**).

Companies can:

- ✓ Acquire carbon credits via insetting
- ✓ Buy credits via offsetting

Companies can:

- ✓ Retire the carbon credit
- ✓ Place the carbon credit within a hedge fund for future retirement or sale
- ✓ Resell the carbon credit for a profit

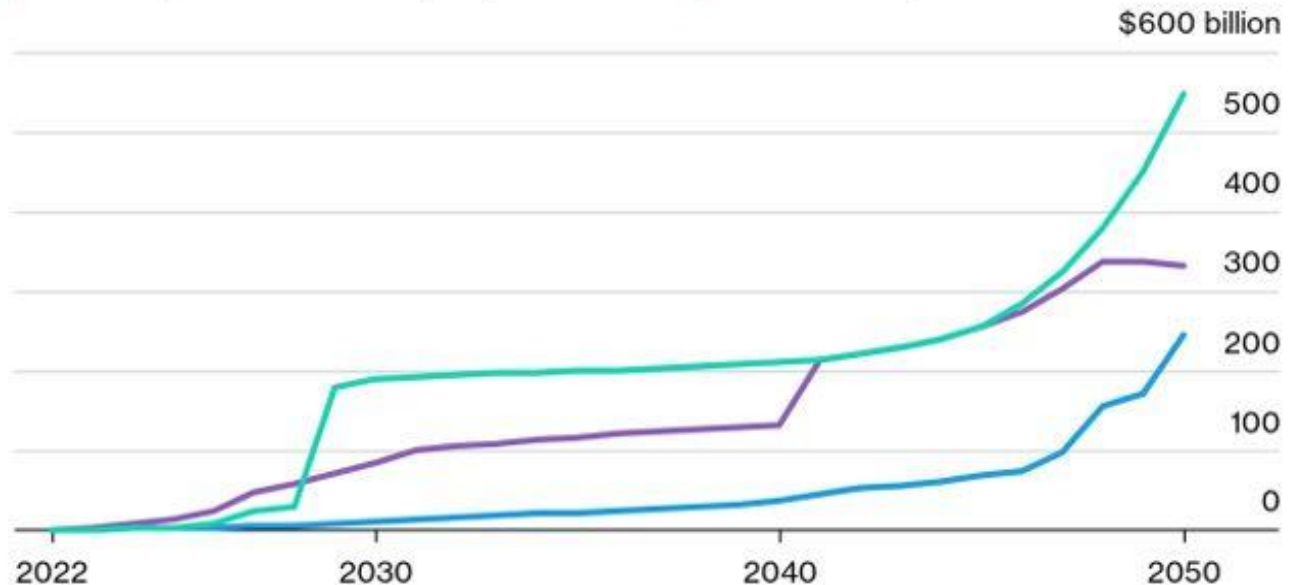
Agricultural Potential is in Removals over Avoidance Fastest way to NET ZERO Pushing for Government to Mandate

Huge Potential

Bloomberg NEF

The value of the carbon offset market could top \$500 billion in 2050

Voluntary market scenario Hybrid scenario Removals only scenario





Canada began pricing pollution in April of 2023

Province & Territories Must Implement

(1) Price-Based System – a carbon penalty on fossil fuels (April 2023)

or

(2) Cap and Trade System – Capping company emissions and opening trading

** many jurisdictions have signed onto the Paris Agreement & have not implemented anything. EU is leading.*

Year	2023	2024	2025	2026	2027	2028	2029	2030
Min Carbon Pollution Price/MT CO ₂ e	\$65	\$80	\$95	\$110	\$125	\$140	\$155	\$170

By 2030 - All imports will need a certification report of their embedded GHG's.

Will have to prove if a carbon credit has been paid on that product. If not, then have to pay the tax to the EU.

- Reduces carbon leakage and puts a fair price on carbon emissions
- October 2023 – Iron, steel, cement, fertilizers, aluminum, electricity, hydrogen
- 2026 – Chemicals and polymers
- 2030 – All EU Emissions Trading System products



CBAM

World's first carbon border tax

USA Farmer Survey

93% are aware, 3% participate

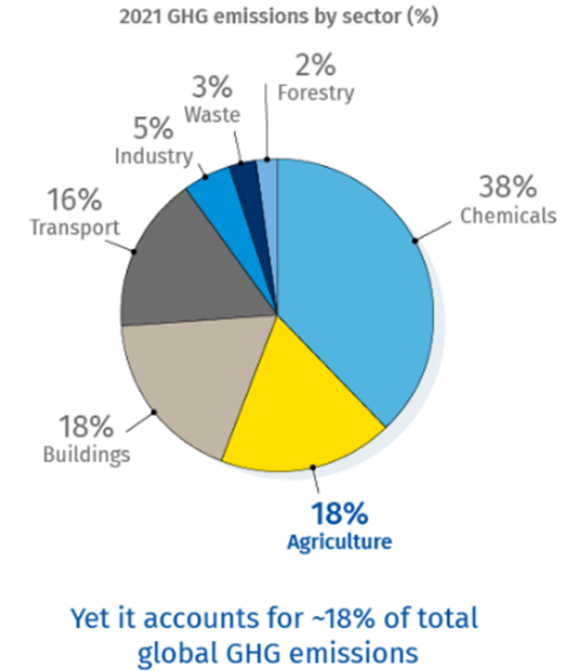
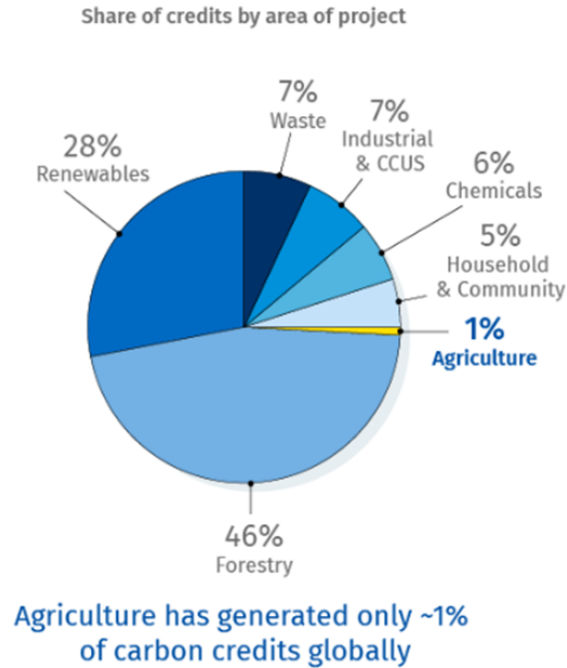
Barriers to Entry

- Measurement and reporting costs
- Upfront cost to implement projects
- Data collection time
- Early adopters disallowed
- 40 to 100 year permanence
- Confused about the carbon market

* USDA Report; Trust in Food, 2022

In the past 9 years within the USA, only 2 sustainable agricultural projects have issued carbon credits.

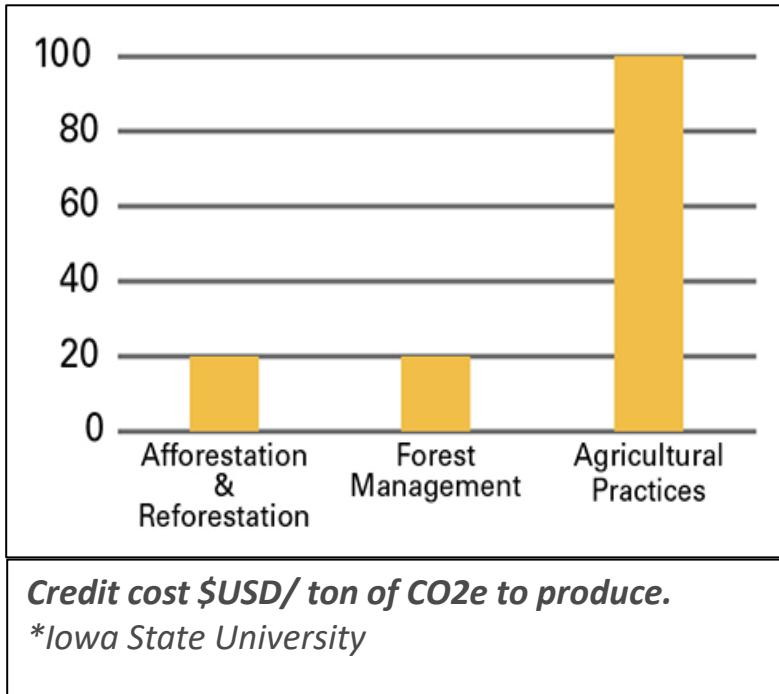
Agriculture could be a much larger source of emissions reduction and removal



Source: Elis (2021). BCG Analysis



High Cost to Ag for Carbon Programs



AG - \$100 US/credit – must either increase value of credit or reduce cost to produce and validate credit

Gov't are looking at programs to reduce these costs

- **Standardizing protocol calculations and assumptions**
- **Producing soil carbon data**
- **Encouraging the use of digital, AI and satellite data**
- **Investing in public carbon modules**
- **Standardizing verification protocols within registries**

BEAM Model

Research is providing the science to include utilizing waste-to-resource programs to reduce the heavy dependence on fossil fuel resources.

One example is the BEAM model.

The general default value from the verified carbon crediting model BEAM (Biosolids Emissions Assessment Model) research is 4 kg CO₂ e/kg for nitrogen and 2 kg CO₂ e/Kg for phosphorus.

NEBRA is working on updating the model



Calculator Tool for Determining Greenhouse Gas Emissions for Biosolids Processing and End Use

SALLY BROWN,^{1,*} NED BEECHER,² AND ANDREW CARPENTER³

School of Forest Resources, University of Washington Box 352100 Seattle, Washington 98195, United States, North East Biosolids and Residuals Association, PO Box 422 Zanesville, New Hampshire 03086, United States, Northern Tilt, P.O. Box 367 DeFur, Maine 04915, United States

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BEAM at Work Summerside, PEI



- **Population 20,000**
- **67% renewable electricity***
- **No natural gas available***
- **Fuel = furnace oil**
- **4,300 tonnes SSA annually**
- **5 year wait list**

* BEAM modifications pending

Process	Scope 1	Scope 2	Scope 3	Total
Storage	0	1	0	1
Conditioning/ Thickening		5	20	25
Dewatering	0	25	58	83
Drying	486	193		679
Alkaline Stabilization	0	10	0	10
Land Application	-1490	0	-194	-1684
Transportation	10	0	0	10
Totals	-994	233	-116	-876

Scope 1 – plant program

Scope 2 – Associated with purchase of electricity, steam or heat – in this case – SS uses 67% renewable from solar and wind (not a BEAM option yet),

Scope 3 – activities owned/controlled by company. The push has only started as penalties are implemented. i.e. Processing company



SWATMAPS



LP Advice

NMP

BEAM



Certification



Verify

CARBON OFFSET
REGISTRY 

We are working with the agricultural sector to easily **extract** on-farm data, **certify** its credibility and add **value** to carbon credit markets. Every piece of certified data adds value.



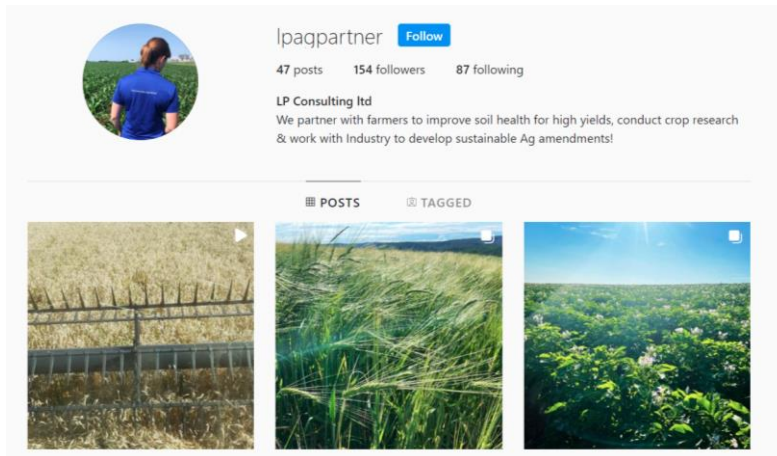
Working the land is not just a living. It's a life, a passion, and a business.

We help make it work and work well.

We work with stewards of the land — farmers and industry alike — to make the most of the energy we invest in growing. Our office is wherever you are: on the tractor, at the kitchen table, and in the barn.

We are meticulous and evidence-based in our expertise, advice, and methods. 'No' is not in our vocabulary. There is always something new to try. And we're independent — you can always trust our advice to be just right for your field.

When you need fresh ideas for the resilience and healthy balance of your farm or industrial operation, call us. At LP, we



Questions?

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