Growing stronger

REDUCING EMISSIONS FROM NITROGEN
FERTILIZER APPLICATION

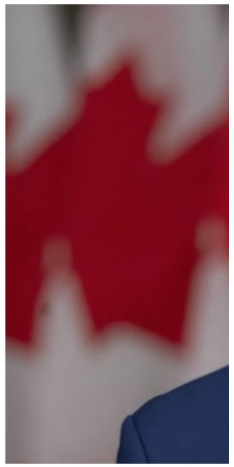
FERTILIZER CANADA

CURRENT ENVIRONMENT

NEWS

Net Zero:
ready unt

By iPolitics. Published



Environment and Climate Change Min
Press)

EDC.
comn

High fertilizer prices, tight supp
affect 2022 acreage

Photo: ©JON – STOCK.ADOBE.

12.06.2021 By Ron Sterk

KANSAS CITY — Fertilizer may have been thought of by some a
this year that word is H-E-L-P due to tight supplies and soarin
driving crop production costs upward and may impact planted
its high fertilizer (nitrogen) requirements and a high breakeve

Several factors have combined to limit supplies and inflate pri
applied to "grassy" crops such as corn and wheat, as well as otl

The Sprout: Industry awaits federal leadership on agriculture to secure economic recovery

By Rachel Emmanuel and Anchal Sharma. Published on Jul 3, 2020 2:15pm

(Shutterstock)

Email Facebook Twitter LinkedIn

Hello and welcome to the Sprout. Today is Eat Beans Day and what better way to do that than with baked beans? Check out Tasty's recipe for a delicious protein-packed meal.

The Lead

The government is missing an opportunity to use the agriculture and agri-food industry to drive Canada's post-COVID-19 economic recovery by not prioritizing the sector, industry representatives and the federal opposition ag critic say.

Chris van den Heuvel, the second vice-president of the Canadian Federation of Agriculture (CFA), said the agriculture sector is uniquely positioned to address the COVID-19-induced economic downturn as a national industry, but is awaiting help from the federal government to reach its full potential.

"We're incredibly well-positioned, but we need a government to stand up and say 'We're going to make the investment in agriculture, we're going to put it to the forefront,'" van den Heuvel said. "And that's what we haven't seen to date."

ion Agricultural
al Food Insecurity

d Sara Scott

d the potential impacts of the Farm
– the executive body of the
agricultural inputs in EU agricultural
efforts to promote a vision of sustain
Deal, these policy initiatives would c
nd the removal of existing farmland f

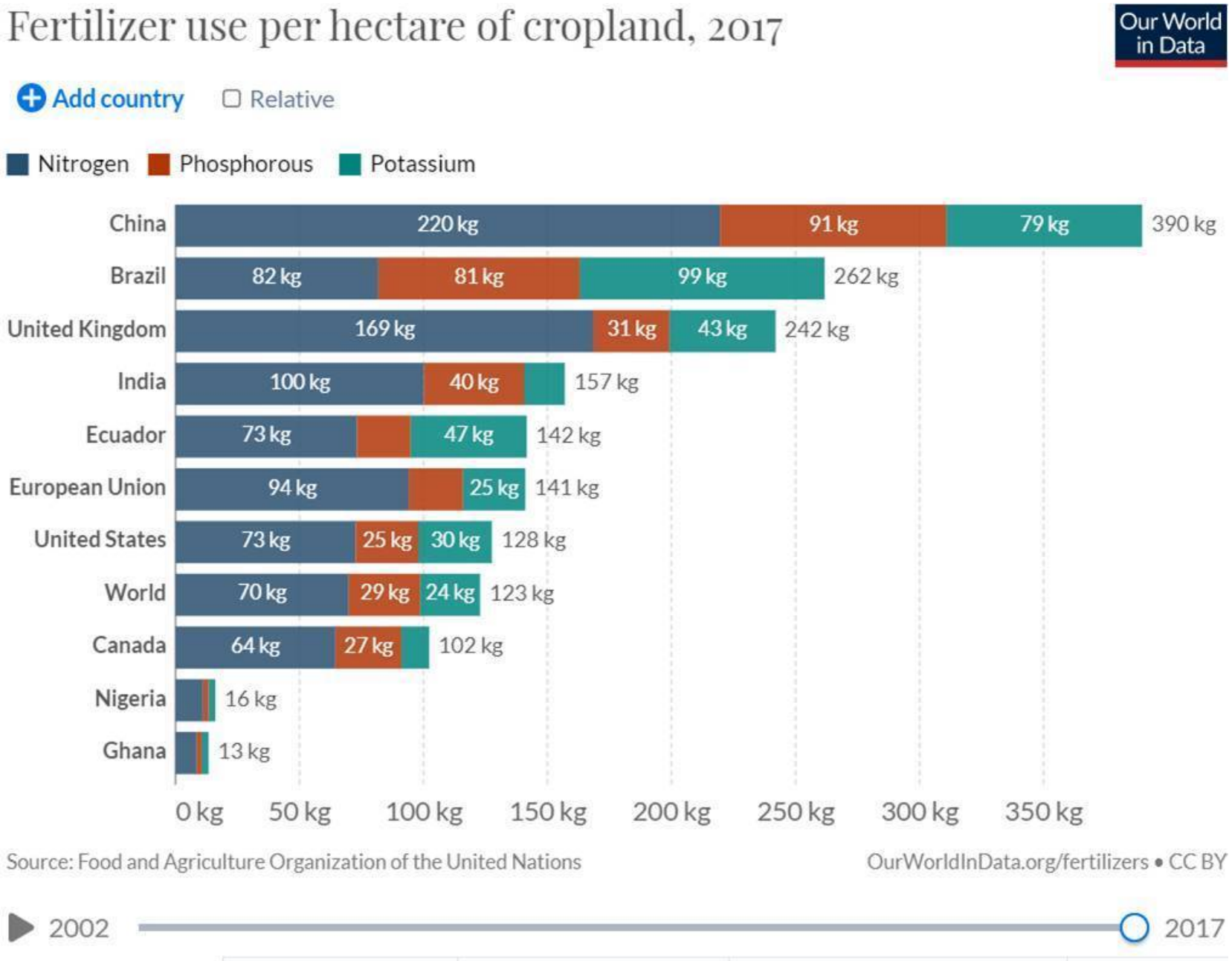
at least three ways. First, production
e as a result of fewer inputs being us
nelastic food demand. These rising co
sequentially, increase the number of fo

il their plan.
make the
that pay farmers
edits aren't yet
ey grow crops to

A Healthy Environment and a Healthy Economy plan pledges to reduce emission from fertilizer by 30% below 2020 levels.

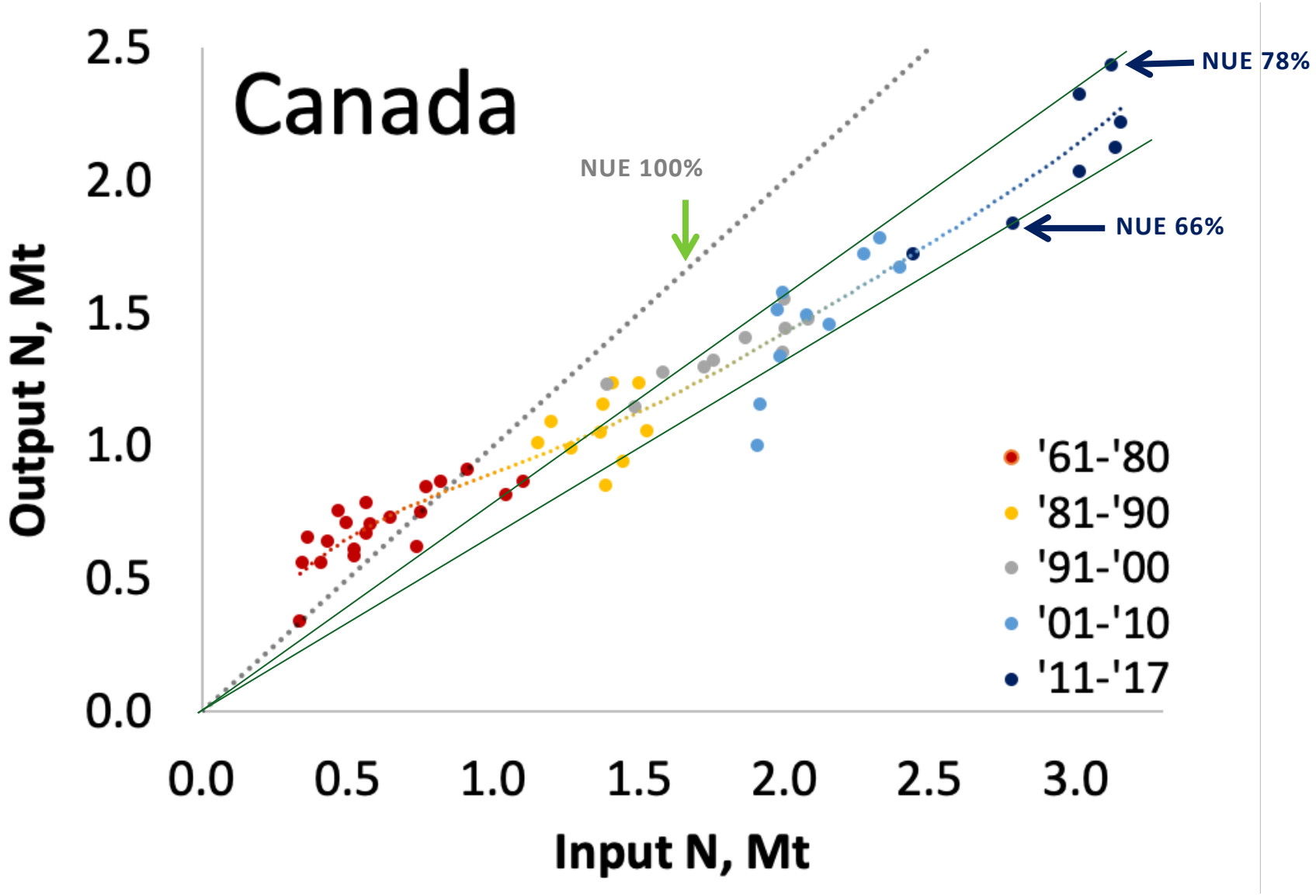
- **Voluntary**
- Reduce **emissions** from fertilizer by 30 per cent below 2020 levels.
- Intention to pursue an **absolute** emission reduction target.
- **Collaboration** but no prior consultation
- Desire to align with outside jurisdictions - **EU**
- Discussion paper – **Q1 2022**

Fertilizer use per hectare of cropland, 2017

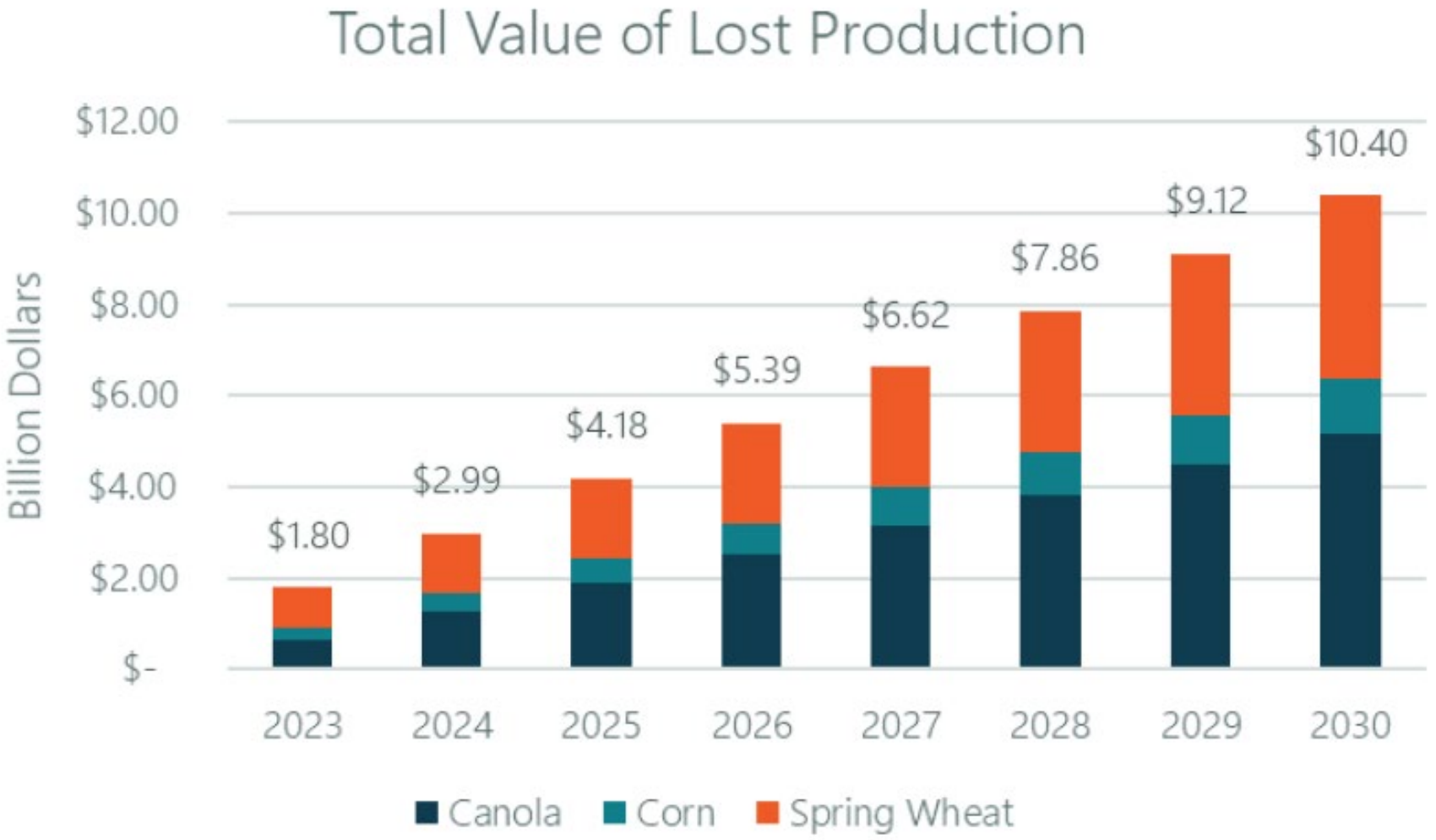


N use efficiency trajectories over 57 years (1961-2017)

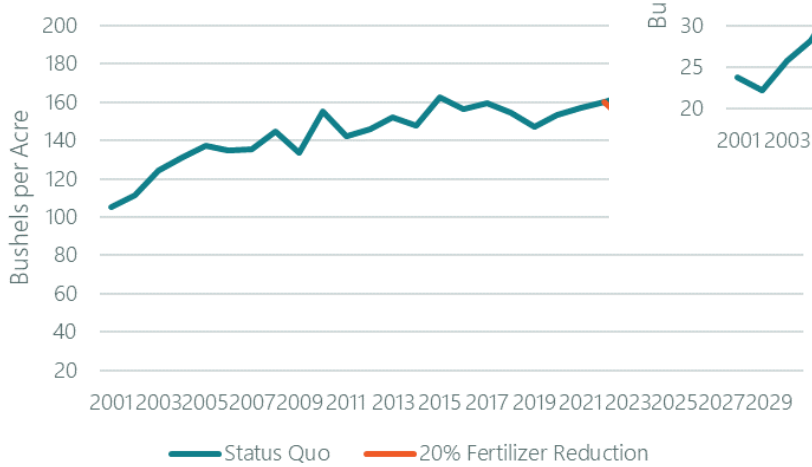
Output increasing, NUE stable and > world average

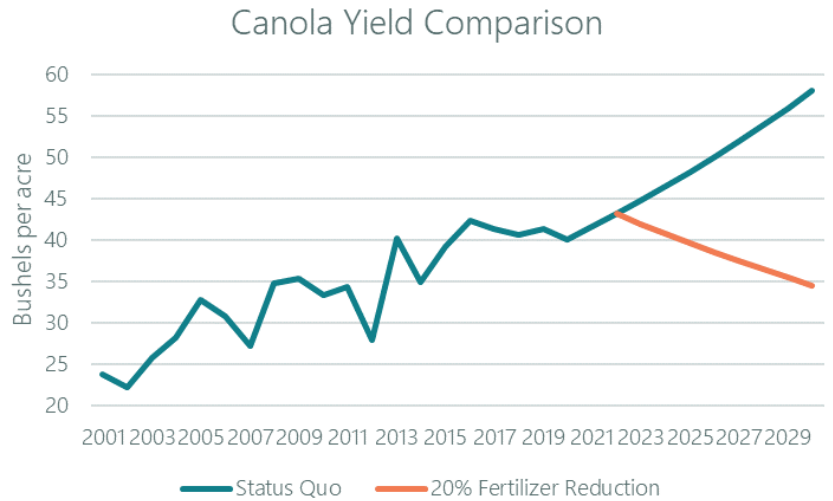


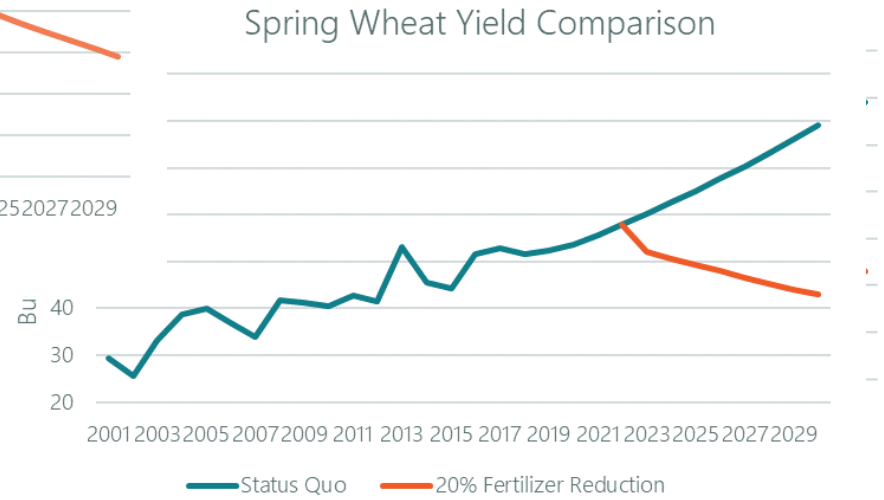
IFA, 2020 – NUTRIENT USE EFFICIENCY DATABASE. INPUT = FERTILIZER + FIXATION +



If Canada follows the EU path there could be $48 billion lost in farm profits by 2030.

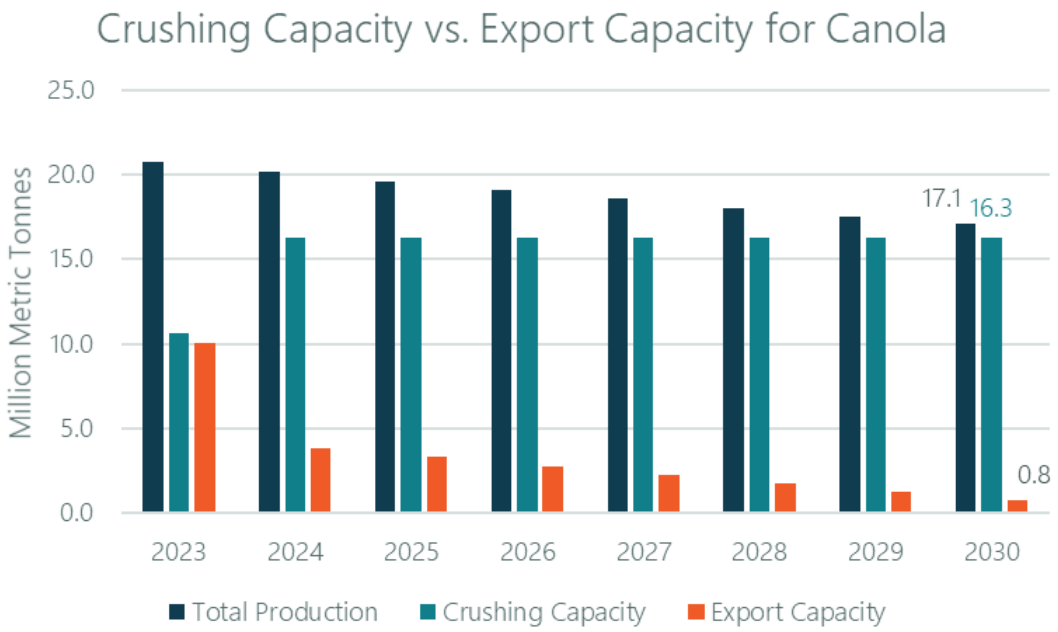


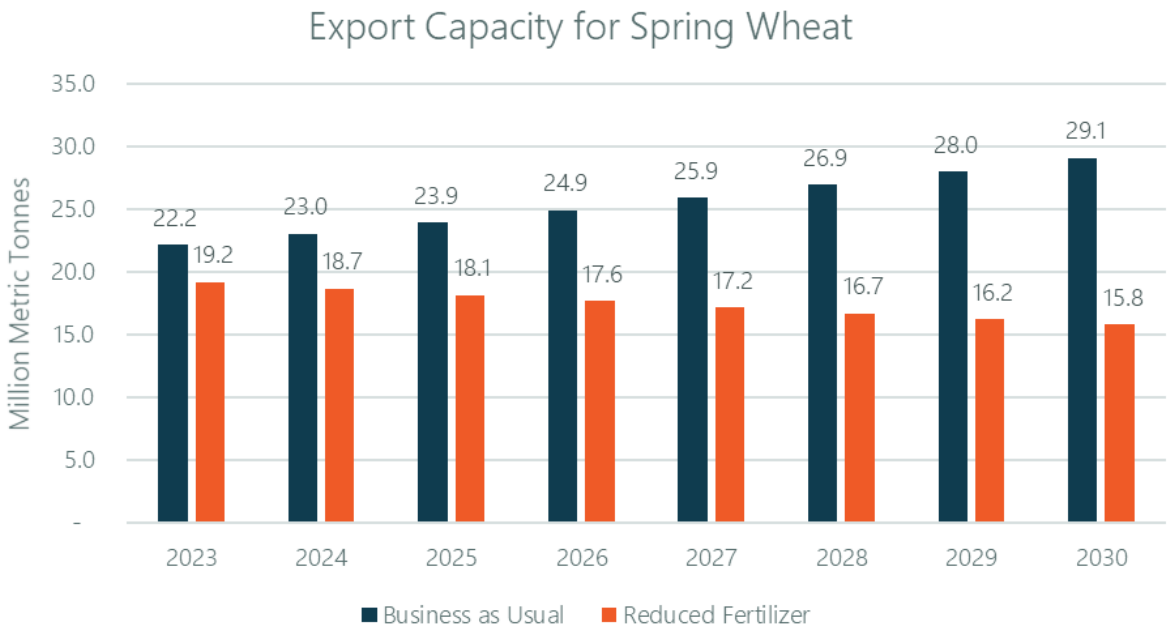




This is due to the lost yields that will occur.

We have less room to cut fertilizer without impacts to yield.





By 2030, with reduced yields, there would be virtually **no export capacity for canola.**

Similarly, the **export capacity for spring wheat is almost halved.**

4R Nutrient Stewardship

Right source

Matches fertilizer type to crop needs.

Right rate

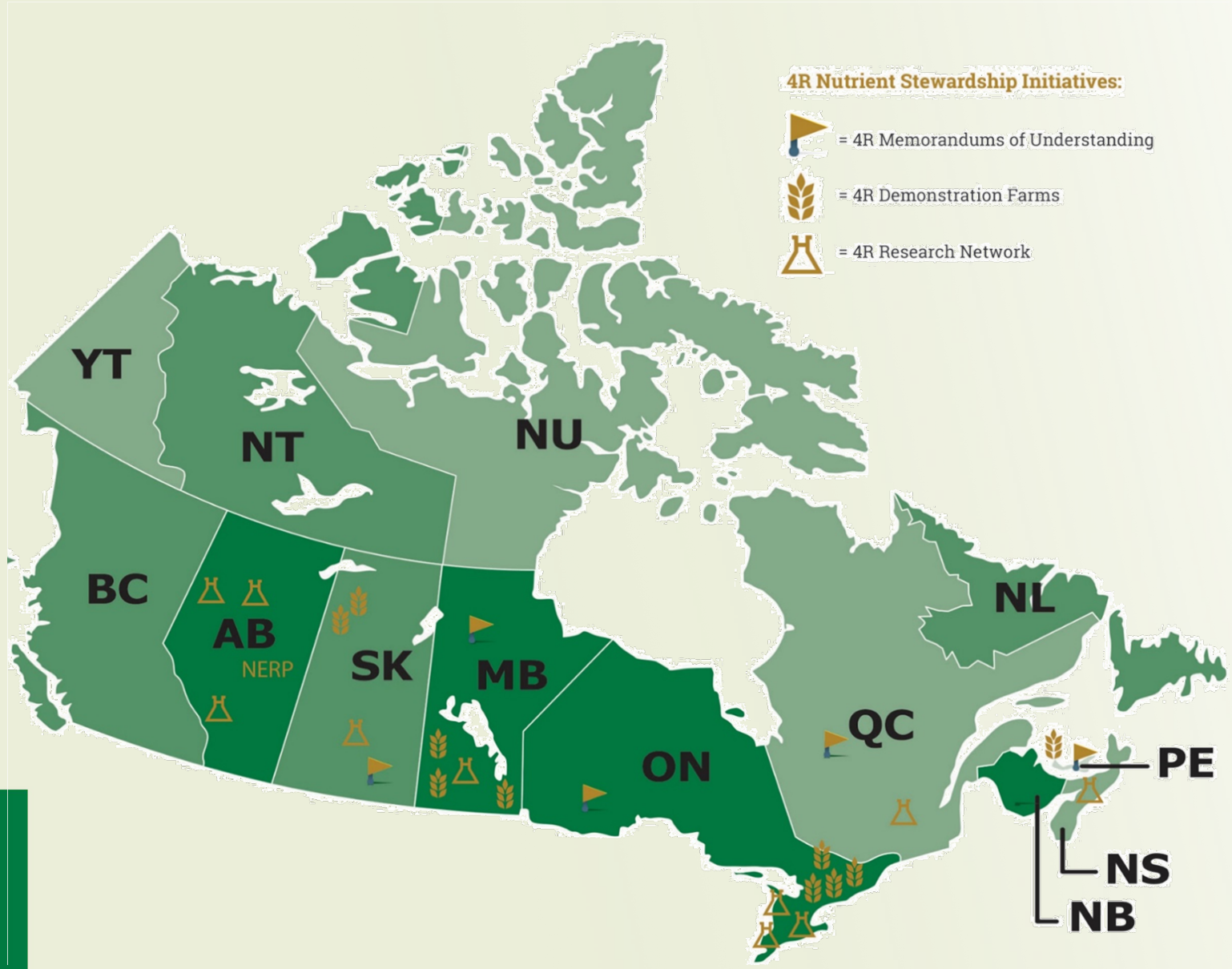
Matches amount of fertilizer to crop needs.

Right time

Matches nutrients available when crops need them.

Right place

Keeps nutrients where crops can use them.



4R NUTRIENT STEWARDSHIP ACROSS CANADA

Since 2013 – Almost 7 million acres under 4R management.

Grower targets – 95% of Canola under 4R.

Provincial agreements in Saskatchewan, Manitoba, Ontario, and PEI.

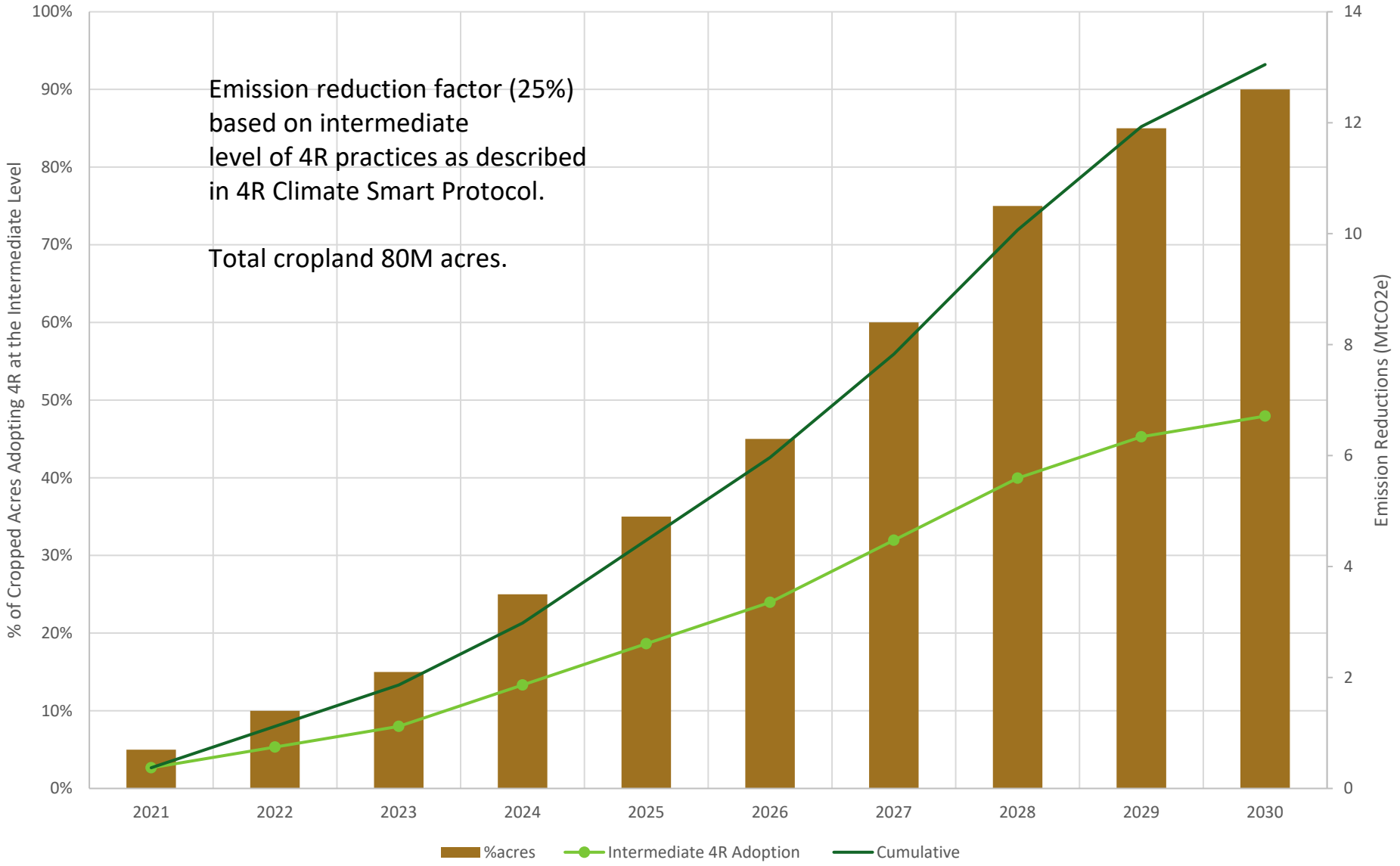
10-15 leading Canadian soil scientists working with our 4R Research Network.

Integrated into provincial environment plans in Saskatchewan, Manitoba, and Ontario.

Moving the Needle on N_20

- Subset of practices under the broader foundation of 4R Nutrient Stewardship specifically address nitrous oxide by up to 35%
- (source) nitrification inhibitors, (place) banding nitrogen, (rate) prescription fertilizer rates \ variable rate
- Qualified agronomist making the recommendation and signing off on it
- Environmental benefit of these specific practices outweigh the agronomic benefit
- 5% are implementing practices that are consistent with a 4R protocol

Estimated Nitrous Oxide Emission Reductions on Canadian Prairies with 4R Adoption



THE RIGHT SOURCE POTENTIAL

- **Increase the use of fertilizer products that enhance nutrient use efficiency and reduce environmental impact on Canadian farms.**
- Nitrogen enhanced efficiency fertilizers (urease inhibitors, nitrification inhibitors, and polymer coated) have been shown to consistently reduce emissions between 20% - 40%
- Inhibitors and controlled-release fertilizers have more impact on emissions than on yield
    - N_2O emission: **20% - 40%** reduction
    - Yield: **1% - 10%** increase
    - NUE Gain: **8% - 15%** increase
- Compilers can develop Tier 2 emission factors specific to mitigation options such as the application of **nitrification inhibitors** (Akiyama et al. 2010)

THE RIGHT SOURCE

To help growers mitigate risks and unpredictability in their seasons, the Right Source recommends specific enhanced efficiency fertilizer (EEF) for grower's crops that reduces loss and improves yield during adverse weather, equipment breakdown etc.

PERCENTAGE OF GROWERS CHOOSING TO USE AN EEF:

30%

OF GROWERS IN CANADA

FERTILIZER USE SURVEY 2020

SOURCE

IN 2020 – FARMERS ELECTING TO USE AN EEF:

CANOLA: 27% OF ACRES IN WESTERN CANADA (6 MILLION ACRES)

CORN: 30% OF ACRES IN ONTARIO (650K ACRES)

RATE

CANOLA: N SOIL SAMPLING ANNUALLY ACHIEVING HIGHER YIELDS 4/5 YEARS.

CORN: APPROX. 42% OF GROWERS WERE SOIL SAMPLING THEIR FIELD FOR N EVERY 1-3 YEARS.

TIME

CANOLA: 90% OF GROWERS ARE MAKING A SPRING AT PLANTING APPLICATION OF THEIR N FERTILIZER.

CORN: 56% OF GROWERS ARE ELECTING TO UTILIZE AN IN-CROP APPLICATION OF NITROGEN ON THEIR CROP.

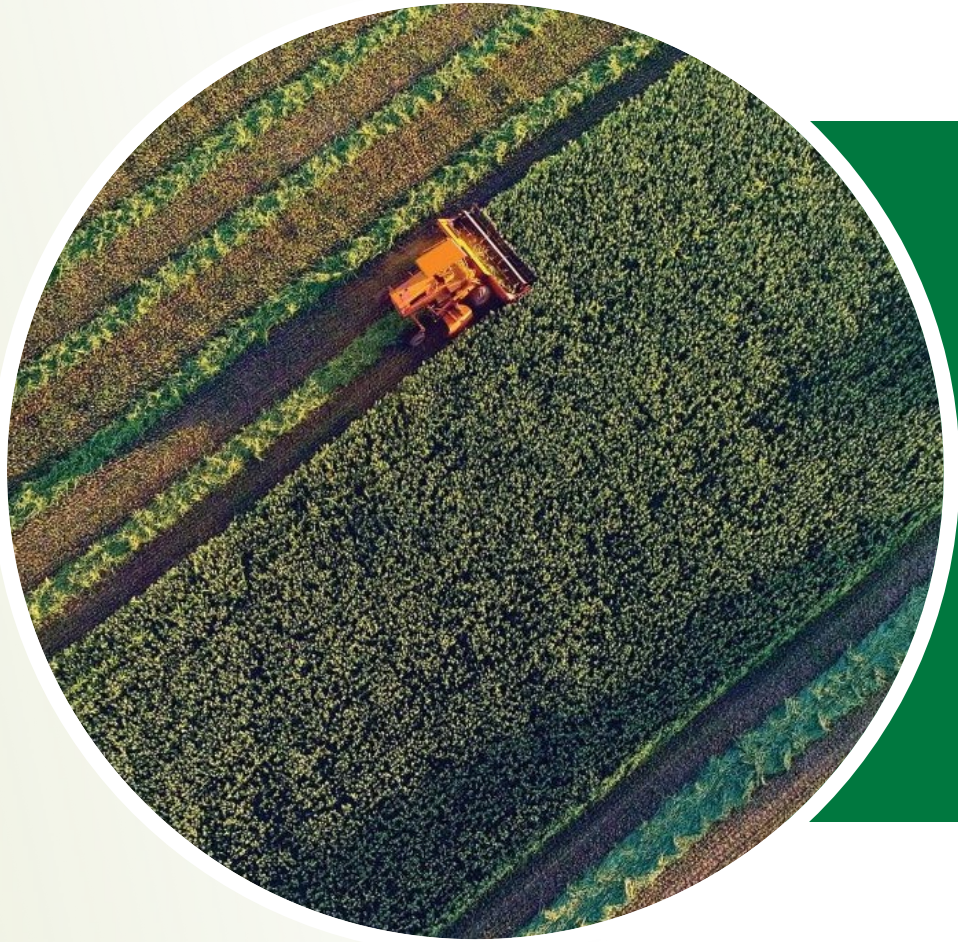
PLACE

CANOLA: 74% OF NITROGEN FERTILIZER APPLIED TO CANOLA WAS APPLIED IN A BAND.

CORN: 48% OF NITROGEN FERTILIZER WAS APPLIED UTILIZING BANDING.

Desired Outcomes

- Definition of the target as emissions intensity and consider emissions per unit of crop produced to maintain growing agricultural exports vs an absolute emission target.
- Mechanisms identified to achieve the target are voluntary, incentivize farmers and integrate 4R Nutrient Stewardship as the recommended approach to nutrient management.
- Utilize Canada's network of Certified Crop Advisors (CCAs) as the most significant extension resource for Canadian farmers.
- Utilize the OFCAF to build capacity for farmers to access programs like private sector / gov regulated offsets or credits.
- Do not punish early adopters of practices and ensure efforts to increase adoption over the next two years are accounted for towards 2030 targets and beyond under the NIR.



FERTILIZER CANADA

Making changes that positively impact the environment, economy, and social fabrics of Canadian life

FERTILIZERCANADA.CA | T: (613) 230-2600 | E: INFO@FERTILIZERCANADA.CA

2022 Canadian Fertilizer Products Forum

Kim Timmer | January 2022

Setting the stage - 2022

Keurig to pay $3-million fine for misleading claims on recycling of its K-CUPs Jan ‘22

Liberals release long-awaited regulations to ban single-use plastics, but there’s a loophole Dec ‘21

Waste-management firms have a plastics problem

'In Canada and the U.S., recent commitments by leading consumer-goods companies to use recycled plastics in their packaging far exceeds supply of said plastics.' Sept ‘21

cleanfarms

Setting the stage - 2018

Canada reducing (but not banning) use of plastics at G7 in Quebec *June 2018*

The world is facing a massive pile-up of plastic trash *June 2018*

111 million tonnes of plastic waste will have nowhere to go by 2030 due to Chinese import ban: study *June 2018*

Cleanfarms

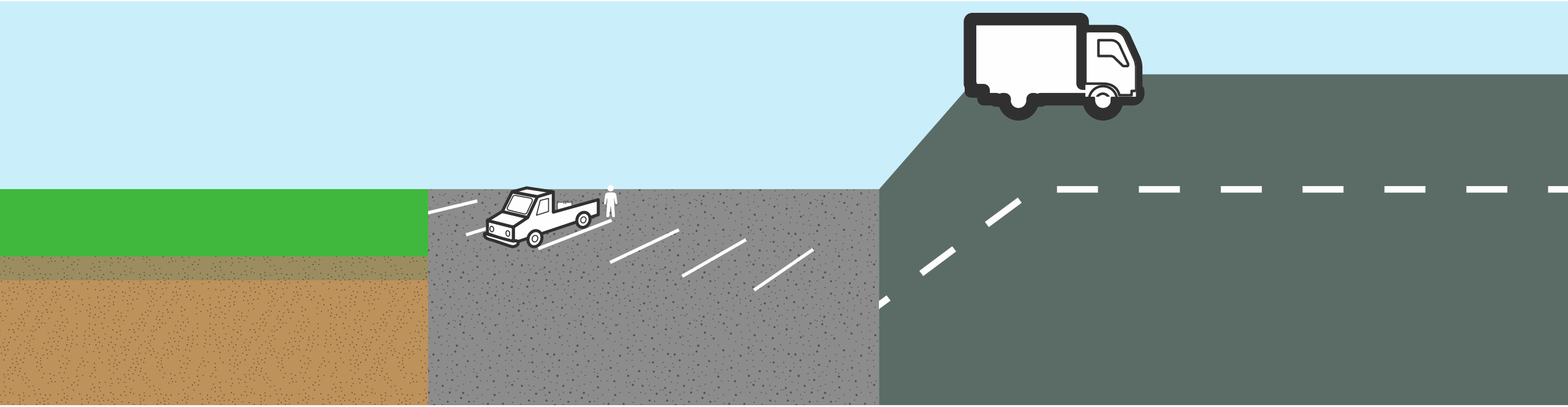
Non-profit industry stewardship organization committed to environmental responsibility through proper management of inorganic ag waste.

Our members

Industry leaders: Pesticide, fertilizer, seed, animal health medication, ag plastics sector

cleanfarms

Managing Ag Plastics at End-of-Life

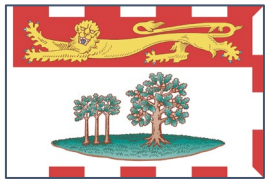


cleanfarms

… zero ag plastic waste & packaging to landfill…

Government Activity = New obligations on industry

Prince Edward Island



- Materials Stewardship and Recycling Regulations (EC349/14)
  - New obligations on industry
- Start: Dec 1, 2022

Quebec

- Recovery and reclamation of products by enterprises *(draft reg only)*
  - New <u>comprehensive</u> obligations on industry
- Start: 2023 (tbd)

Meeting obligations

- Operate an ‘agricultural plastic product stewardship program’

or

- Appoint an agent to operate an ‘agricultural plastic product stewardship program’ on your behalf.

Notes:

- Financial commitment
- Reporting & remitting obligations
- Robust system already in place in PEI & Quebec

PEI: Products/Packaging

"agricultural plastic product" means a product manufactured for use in the agricultural industry and includes

(i) low density polyethylene grain and silage bags, silage bunker covers and tarps,

(ii) low density polyethylene bale and silage wrap, and

(iii) polypropylene twine;

(iv) low density polyethylene or polypropylene bags, and paper bags, whether lined with plastic or other material or not, used for seed, pesticide and fertilizer,

(v) high density polyethylene containers of up to 23 litres in capacity for pesticide and fertilizer, and

(vi) (vi) bulk liquid transport products in sizes of 23 litres and greater used for pesticide and fertilizer;

Quebec: Products/packaging

(2) other bags designed and intended for agricultural purposes, such as grain bags and grain silo bags, seed bags, feed bags, peat moss bags, growing medium bags, as well as bags that have been used to market a product referred to in paragraph 7;

(3) containers designed and intended for agricultural purposes, such as canisters, tanks and barrels holding seed or sanitary supplies and containers that have been used to market a product referred to in paragraph 7;

(7) Class 1 to 3A pesticides according to the Regulation respecting permits and certificates for the sale and use of pesticides (chapter P-9.3, r. 2), as well as chemical fertilizers, soil amendments and seed coated with pesticides intended for non-household purposes.

Excerpt only

Programs currently available in PEI (and Quebec)

Pesticide & fertilizer containers (23L and under)

Pesticide & fertilizer drums & totes (over 23L)

Seed & pesticide bags, all sizes

- fertilizer bags only collected in Quebec

Unwanted pesticide & livestock/equine medications

Recommended next steps for brand owners & retailers

- Determine if this/these new regulation(s) apply to your business
  - Is your business a brand owner or retailer?
  - Do you supply ‘agricultural plastic product’?
- For certain brand owners or retailers… do you want to meet your obligation via Cleanfarms?
  - Already a Cleanfarms member? *Very little impact*
- How can we make this easy, low maintenance for the retail sector.
- Watch for similar obligations in other jurisdictions.

Next steps for Cleanfarms - PEI

- Cleanfarms will ‘act as an agent on behalf of brand owners or retailers’ for its current programs

December 2022 deadline

- Brand owners can meet their obligations on the following products via Cleanfarms:

• **Pesticide containers** • **Pesticide drums & totes** • **Pesticide bags**	• **Fertilizer containers** • **Fertilizer drums & totes** • **Fertilizer bags (tbd)**	• **Seed bags**

- More info about our process: https://cleanfarms.ca/pei-product-stewardship-program-development/

Next steps for Cleanfarms (tbd) - Quebec

- Still waiting for final regulation

Deadlines - tbd

- Similar to PEI, Cleanfarms will ensure its members can meet their obligations via Cleanfarms.
- ***Expectations for 'round-up' of 'obsolete' fertilizer***

Recommended next steps for all

- Let's work together to make this a positive

PEI

New study tracks agricultural plastics across Canada, with goal of more recycling

Sept 2021

Cleanfarms says just 10 per cent of ag plastic currently being recycled

What will this be in five or ten years?

For more information

Kim Timmer
Manager, Stakeholder Relations
timmerk@cleanfarms.ca
877-622-4460 ext. 2229

crsc
Canadian Roundtable for Sustainable Crops

HOW SOIL HEALTH MATTERS IN THE MARKET

Canadian Fertilizer Products Forum

January 12, 2022

Market Considerations

- International Certification Standards
  - Based on specific practices
- Carbon capture and emissions reduction
  - Soil health as a means to an outcome
- Regenerative agriculture
  - Practice based but intended to lead to outcomes

crsc
Canadian Roundtable for Sustainable Crops

International certification standards for grains

Grains is the first farm commodity to have established international sustainability standards

- First commodity-specific standards was Roundtable for Sustainable Palm Oil, followed by Roundtable for Responsible Soy: responsive to deforestation, land tenure and employment issues
- Unilever set own standards
- E.U Feed Industry set own standards
- E.U. uses ISCC (International Sustainability and Carbon Certification) for biofuels
- SAI – Farm Sustainability Assessment is benchmarking system that measures comparability; used by many food companies

crsc
Canadian Roundtable for Sustainable Crops

Certification requirements for soil health - 2018

- A **crop rotation** plan is implemented on the farm to promote a time gap on the same field.
- A **soil management plan** shall be established in a continuous process including a risk assessment of the areas regarding wind erosion, water erosion, loss of soil organic matter, soil compaction, and loss of soil fertility, as well as the contamination with hazardous substances or salinization.
- Crops, pasture and animal housing are allocated to land with **suitable soil and topography**.
- In order to maintain or improve soil conditions, **periodic soil analysis** shall be conducted on soil pH, macro- and micronutrients, salinization and soil organic matter.
- Management practices must be put in place that maintain or **enhance Soil Organic Carbon/Organic Matter.**
- Producer **adopts techniques to maintain and control soil quality** (physical, chemical and biological) such as precision farming, residue management, crop rotation, no tillage, contour tillage, grass waterways, terraces, nitrogen-fixing plants, green manures and agro-forestry techniques.
- Producer adopts techniques to **prevent soil erosion** such as contouring and using terraces, seeding cover crops, minimizing tillage and placing wind breaks

crsc
Canadian Roundtable for Sustainable Crops

SAI – Farm Sustainability Assessment 3.0 - 2021

The highlighted practices, added since 2018 , is evidence of increased focus on soil health

- Present a **clear soil management plan**
- Have evidence available to show the farm **monitors soil cover** and uses effective land management systems to minimise erosion.
- Demonstrate evidence of practices adopted to **enhance soil organic matter**.
- Show the farm adopts practices to **stimulate soil biological activity** and thereby build up long-term soil productivity and health.
- Be aware and demonstrate evidence of practices adopted to **minimise soil disturbance**.
- Identify areas of the farm most susceptible to **compaction** and demonstrate evidence of practices adopted to reduce the risk of compaction.
- Identify areas of the farm most susceptible to **waterlogging** and adopt practices to reduce the risk of poor drainage.
- Adopt the **use of soil amendments** as part of the soil management plan to improve the physical, biological and chemical health of the soil.
- Show that **crops are grown in rotation** or that the farm uses a mixed cropping system.

crsc
Canadian Roundtable for Sustainable Crops

Challenges/opportunities with international standards

- International standards often based on addressing risks that are less applicable in Canada
- Regulation is often used as a proxy for practices: limited national soil health regulations
- Practices in standards are not always flexible so challenges with applicability across all climate and crop types
- Soil health measurement is outdated, so doesn't provide accurate picture of Canada's situation

crsc
Canadian Roundtable for Sustainable Crops

GHG emissions reduction/ sequestration

The following are examples of sustainability commitments by large international food brands

- **General Mills**
  - **Brands include Pillsbury, Nature Valley, Betty Crocker, Pillsbury**
  - **2030 goal:** Reduce absolute GHG emissions across our full value chain by 30 percent.
  - **2050 goal:** Reduce absolute GHG emissions across our full value chain to sustainable levels in line with scientific consensus.
- **McCains Foods**
  - **Brands include McCains plus other international potato brands;** large users of vegetable oils, plus in Canada virtually all potato farmers also grow grains and oilseeds
  - 30% reduction in emission intensity (Scope 3) by 2030 (2017 baseline)
- **Maple Leaf Foods**
  - **Brands include Plant-based Field Roast Meat and Cheese Co.**
  - Execute our science-based targets (SBTs): 30% absolute reduction for Scope 1 & 2 emissions and 30% intensity reduction (per 1,000 kg. of product produced) for Scope 3 emissions (2018 baseline)
- **McDonalds**
  - 36% reduction in supplier GHG emission by 2030 (2018 baseline)

crsc
Canadian Roundtable for Sustainable Crops

Challenges/ opportunities
GHG emissions reduction/ sequestration

- Soil health equated with carbon sequestration
- Based on present and future actions; farmers not credited for past actions
- Carbon sequestration on no-tilled crop land decelerating
- Conversion to no-till in higher-moisture zones will **not** reduce GHG emissions because of nitrous oxide emissions
- Highest potential is in non-cropped land: wetlands, conversion to perennials, woodlands: GHG crop emission calculations do not consider non-cropped land

crsc
Canadian Roundtable for Sustainable Crops

Regenerative agriculture

- Although some proponents include other goals, soil health is the common denominator
- First time in North America that has engaged those beyond agriculture that has soil health as the primary goal
- Extending the knowledge of importance of soil health
- Adopted widely by organic organizations as a descriptor of existing system, but also “Regenerative Organic”, with enhanced soil management requirements
- For some is very prescriptive and includes other goals
  - Livestock must be integrated into the farm; “circular” economy
  - Social justice goals
  - Reduction or elimination of synthetic fertilizers and/or pesticides

crsc
Canadian Roundtable for Sustainable Crops

Use of Regenerative in the market

- Branding: philosophical, basis of “movement”
- To demonstrate commitment to sustainability
  - **General Mills**: *Advance regenerative agriculture on one million acres of farmland by 2030 - estimated to be more than 20% of our North American sourcing footprint.*
  - **PepsiCo:** *We’re working to spread regenerative practices that restore the earth across seven million acres of land by 2030*
  - ***McCain Foods****: Implementing regenerative agriculture practices across 100% of potato acres by 2030*
- To help achieve carbon footprint reduction goals
  - *Research by Maple Leaf Foods and Nutrien*

crsc
Canadian Roundtable for Sustainable Crops

Challenges/ opportunities Regenerative Agriculture

- Variety of definitions so opportunities to be declared Regenerative, particularly if focused on the outcome of soil health
- However, some definitions limit use of synthetic fertilizers so Regenerative not feasible under those definitions for most grain production in Canada
- Include core practices that are not always beneficial (such as use of cover crops in dryland Prairie)

crsc
Canadian Roundtable for Sustainable Crops

Key takeaways

Market demands are constantly changing - but soil health currently has an unprecedented focus

crsc
Canadian Roundtable for Sustainable Crops

The health of soil, plants, animals, people, environment and the Planet is one and indivisible

Dr. Rattan Lal

Winner, 2020 World Food Prize

Government of Canada | Gouvernement du Canada

Canada.gc.ca | Services | Departments | Français

Canadian Food Inspection Agency

Canada

Search

About the CFIA | Food | Animals | Plants

Home > Plants > Fertilizers > Trade Memoranda > T-4-120

Plants

Acts and Regulations

Fertilizers

- Program Overview
- Registered and Regulated Products
- Registration Requirements
- Sampling and Testing
- Trade Memoranda

T-4-120 - Regulation of Compost under the *Fertilizers Act* and *Regulations*

Share this page

The Canadian Food Inspection Agency (CFIA) has introduced a streamlined registration process for fertilizers and supplements. Streamlined registration is reserved for products that have been deemed safe by the CFIA and have been shown to be effective based on foreign trial data or scientific literature.

July 2009

I Purpose

The purpose of this document is to provide information on the regulatory requirements for compost under the *Fertilizers Act* and *Regulations*, and describe the safety, efficacy and labelling standards that must be met in order to legally sell or import compost into Canada. This document is also designed to assist compost producers, facility operators, importers, and retailers in meeting the regulatory requirements prescribed by the Acts administered by the Canadian Food Inspection Agency (CFIA).

CCME

Canadian Council of Ministers of the Environment | Le Conseil canadien des ministres de l'environnement

Guidelines for Compost Quality

ALLIANCE DE LA QUALITÉ COMPOST QUALITY ALLIANCE

Compost Quality Parameters for the CQA

USE	pH	C/N ratio	Moisture	Particle size	Soluble salts	%Na
Remediation	5.8-8.5	10-40	NA	<2 inch	<20	<3%
Soil Amendment	5.8-8.5	10-30	NA	<1/2 inch	<6	<2%
Landscaping	5.8-8.5	12-22	<50%	<1/2 inch	<5	<2%
Planting Media	5.5-7.8	12-22	<50%	<1/2 inch	<4	<2%
Turf Topdressing & establishment	5.8-7.8	12-22	<50%	<3/8 inch	<3	<1%
Potting Soil	5.5-7.2	12-22	<50%	<1/4 inch	<2	<1%

Conseil canadien du COMPOST Council of Canada

The Future Starts Here **COMPOST !** L'Avenir Commence Ici

ALLIANCE DE LA QUALITÉ COMPOST QUALITY ALLIANCE

Recycle your organics. Return Life to your soil. • Recyclez vos matières organiques. Redonnez vie à votre sol.

1-877-571-4769 • info@compost.org • www.compost.org

PREPARING the GROUND for HEALTHY SOIL

Organics Recycling across Canada
Recyclage des matières organiques à travers Canada

# of Facilities *Nombre d'installations :*	**317**
Tonnage Processed *Tonnes traitées :*	**5,310,867 Tonnes**

(Information gathered through the voluntary completion of facility surveys & literature searches during Winter 2019/2020; info will be updated on an ongoing basis) • (Renseignements recueillis au moyen de sondages volontaires et de recherches documentaires effectués pendant l'hiver 2019-2020; les renseignements seront régulièrement mis à jour)

Current	Potential 3 x current
1 billion km driven	>3 billion km driven
260 k tonnes CO_2 eq	780 k tonnes CO_2 eq
3.4 M tpa organics composted	10 M tpa organics composted

Soil the foundation of nutrition

2015 International Year of Soils

fao.org/soils-2015

Promote plant growth

Improves winter hardiness

Involved in photosynthesis

Involved in carbohydrate metabolism and translocation of starches

Promote reproduction

Aid translocation of photosynthesis from leaves to fruiting organs

Acts as an O_2 carrier

Fruit formation

Quickens maturity

Fruit quality

Fruit flavour

Seed formation

Seed quality

Enhances maturity of small grains

Responsible for enzyme activity

Aids in enzyme functionality and plant use of Fe and P

Helps enzyme activity and increases the availability of P and Ca

Increases disease resistance

Reduces plant respiration

Promotes root formation and growth

Increases water-use efficiency

Stimulates microbial activity

Promote nodule formation on legumes

Role of **18 nutrients** necessary for **plant growth** and **human health**

Plays a key role in brain and muscle function

Contributes to perception of taste

Needed for immune system health

Key component of protein

Essential for muscle and nerve activity

Important in immune system health, blood clotting and pressure regulation

A component of proteins, DNA, RNA and blood

Promotes digestive process

Maintains acid-base balance

Needed for proper fluid balance

Essential to fetal development and functioning of reproductive system

Key component of enzymes

Helps deliver oxygen to the tissues

Important for healthy bones

A component of enzymes, DNA, RNA, proteins and promotes immune system health

A component of enzymes and involved in Fe metabolism

Soil degradation leads to the **loss** of **soil micro** and **macronutrients**

Nutrient-poor soils are **unable** to **produce healthy food** with all the **necessary nutrients** for a **healthy person**

Over **2 billion people** suffer from micronutrient deficiencies

O OXYGEN

C CARBON

H HYDROGEN

P PHOSPHORUS

K POTASSIUM

N NITROGEN

Soil macronutrients

Cl CHLORINE

Si SILICON

Ca CALCIUM

Mg MAGNESIUM

Mo MOLYBDENUM

Na SODIUM

B BORON

S SULPHUR

Fe IRON

Cu COPPER

Zn ZINC

Mn MANGANESE

Soil micronutrients

Sustainable soil management for **healthy soils**, **healthy food** and **healthy people**

Reduce erosion

Ensure crop rotation

Increase soil organic matter content

Minimize tillage

Keep soil surface covered

Food and Agriculture Organization of the United Nations

With the financial support of the Russian Federation

Healthy soils for a healthy life

Our soil influences our brain health

Bonnie J. Kaplan, PhD

Professor Emerita, Cumming School of Medicine, Univ of Calgary

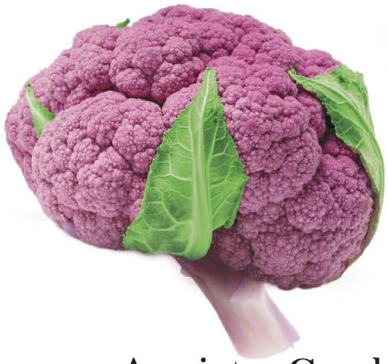
World Soil Day

December 5, **2021**

Website: BonnieJKaplan.com

Foreword by Dr. Andrew Weil

THE BETTER BRAIN



Overcome Anxiety, Combat Depression, and Reduce ADHD and Stress with Nutrition

BONNIE J. KAPLAN, PHD *and* JULIA J. RUCKLIDGE, PHD

Our brains

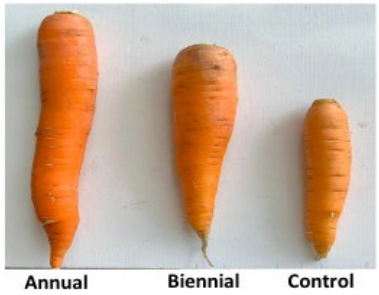
account for ≈ 2% of our body weight

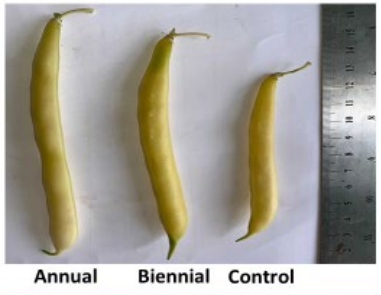
represent 20-50% of our metabolic demands

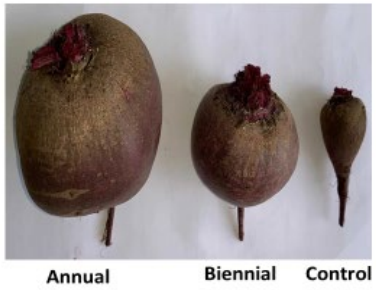
Compost and Plant Metabolites

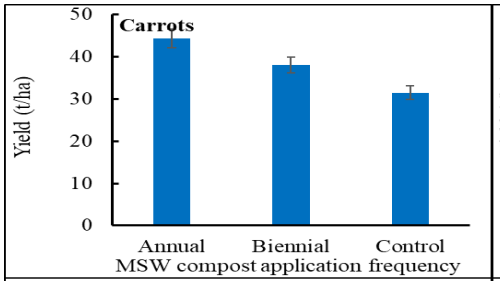
Compost Council of Canada-sponsored project led by Dr. Lord Abbey of Dalhousie University.

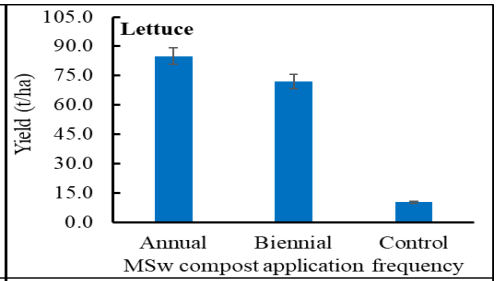
Five-year project in Brandon, Manitoba.
Goal: To assess differences in metabolic profile of three vegetables grown with two different application rates of CQA compost (no compost, annual and bi-annual).

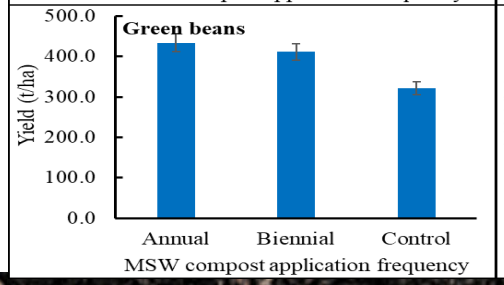


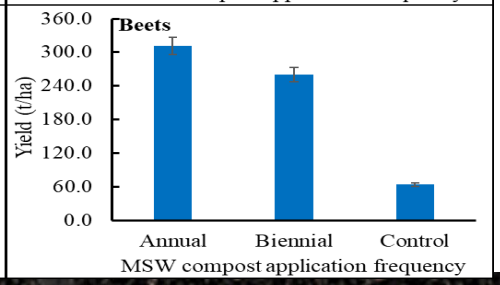




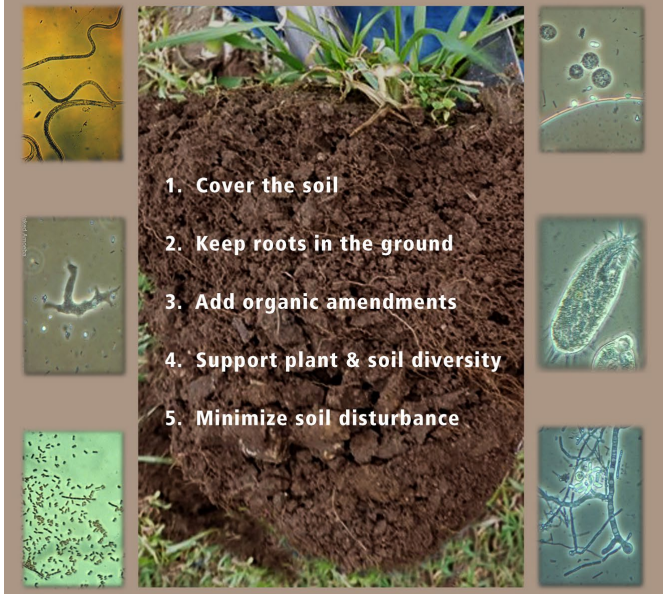








BE A SOIL BUILDER



Conseil canadien du COMPOST Council of Canada

ALLIANCE DE LA QUALITÉ COMPOST QUALITY ALLIANCE

This project was funded in part through *Growing Forward 2 (GF2)*, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of *GF2* in Ontario.

Growing Forward 2 · AAC agricultural adaptation council · Ontario · Canada

The Biology of Soil Health

An interactive, hands-on workshop for farmers to better understand the abundant life in soil

Date: --- ---, 2017 Time: 10am-3pm

Location:

ADVANCE REGISTRATION REQUIRED for this NO-FEE SESSION. SPACE IS EXTREMELY LIMITED. REGISTER EARLY.

Topics will include:

- beneficial soil functions (water infiltration and holding capacity, natural fertility, disease suppression, and carbon sequestration)
- organisms of the soil food web (who eats whom and why it matters)
- requirements of healthy soil ecosystems
- basic soil health principles
- how all of the above relate to best management practices such as conservation tillage, cover crops, and organic amendments

Hands-on Exercises will include: identifying soil organisms, using a penetrometer, conducting slake & soil infiltration tests.

Bonus Session:

At the end of the workshop, those interested may stay (until as late as 4:30 pm) to run some of the following tests on their own soil samples:

- Bring approximately one-litre sample of your own soil to the workshop;
- Using microscopes provided, and with assistance in using them from workshop staff, you'll be able to view your own soil at 400x magnification to get a better understanding of the micro-organisms in your soil.
- Take the fencerow/woodlot challenge where you can test your soil's ability to absorb rain and keep its structure in wet conditions as compared to samples taken from fencerows and woodlots in your region (slake and infiltration tests).
- If you plan to participate in the bonus session, please note this on your registration form so that further soil sampling instructions can be provided in advance.

REGISTRATION FORM FAX BACK TO 416 535-9892 or EMAIL info@compost.org

❑ I plan to stay for the BONUS Session

NAME: _____

AFFILIATION: _____

ADDRESS: _____

CITY: _____ PROV: _____ POSTAL CODE: _____

TELEPHONE: _____ FAX: _____

EMAIL: _____

This project was funded in part through *Growing Forward 2 (GF2)*, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of *GF2* in Ontario.

Growing Forward 2 · AAC · Ontario · Canada

Let's go on a SOIL SAFARI

A series of interactive exhibits where you'll learn about life in our soils.

Friday March 20th

Dundas Valley Conservation Area

650 Governors Road, Dundas ON L9H 5E3

Arrive at 9:30am
Finish by 12:15pm

FREE* but register in advance please by visiting conservationhamilton.ca/events

Learn • Explore • Have Fun • Be Inspired

LET'S DIG IN!

SOUP, COOKIES & REFRESHMENTS provided post-session at no cost.

*There is a $10 parking charge per car.

PREPARING the GROUND for HEALTHY SOIL

Conseil canadien du COMPOST Council of Canada

The Future Starts Here

COMPOST !

L'Avenir Commence Ici

ALLIANCE DE LA QUALITÉ COMPOST QUALITY ALLIANCE

Recycle your organics. Return Life to your soil. • Recyclez vos matières organiques. Redonnez vie à votre sol.

1-877-571-4769 • info@compost.org • www.compost.org

A Crash Course in Carbon

A **Roadmap** for Optimization of Carbon in Canada's Managed Soils

SOIL CONSERVATION COUNCIL OF CANADA

CONSEIL CANADIEN DE CONSERVATION DES SOLS

Conseil canadien du COMPOST Council of Canada

Funding for this project made possible through support from the Metcalf Foundation
Ce projet a pu être financé grâce au soutien de la Fondation Metcalf

METCALF FOUNDATION

Contents of Roadmap

1: Purpose of the Roadmap and How to Use It

2: What is "soil carbon" and why do we want to increase it?

3: How carbon is "sequestered" in soils

4: Moving From principle to practice

5: The potential for building SOC in Canada

6: Innovators and early adopters lead the way

7: Challenges to Change

8: Conclusions and Recommendations

The New Science of SOC and Why it Matters

SOIL HUMUS IS NOT WHAT WE THOUGHT IT WAS!

It is NOT big molecules that are too tough for the bugs to eat…

It IS a mix of substances (e.g., necromass, metabolites) created by soil microbes and protected from further degradation in various ways

Why Does This Matter?

This MAY open the door to faster rates of sequestration in some instances.

But it also emphasizes the innate reversibility of soil carbon sequestration.

Most importantly, this takes the emphasis off of the nature of the carbon inputs and puts it directly on soil management.

From Science to Basic Principles

GOAL:
Maximize Soil C

OBJECTIVES:

Manage Carbon Flows Optimally

Protect/Enhance the Soil Food Web

PRINCIPLES:

- ❑ Keep Live Roots in Ground
- ❑ Minimize Soil Disturbance
- ❑ Optimize Inputs
- ❑ Promulgate Diversity
- ❑ Cover the Soil

Soil Carbon: Where We Stand in Canada

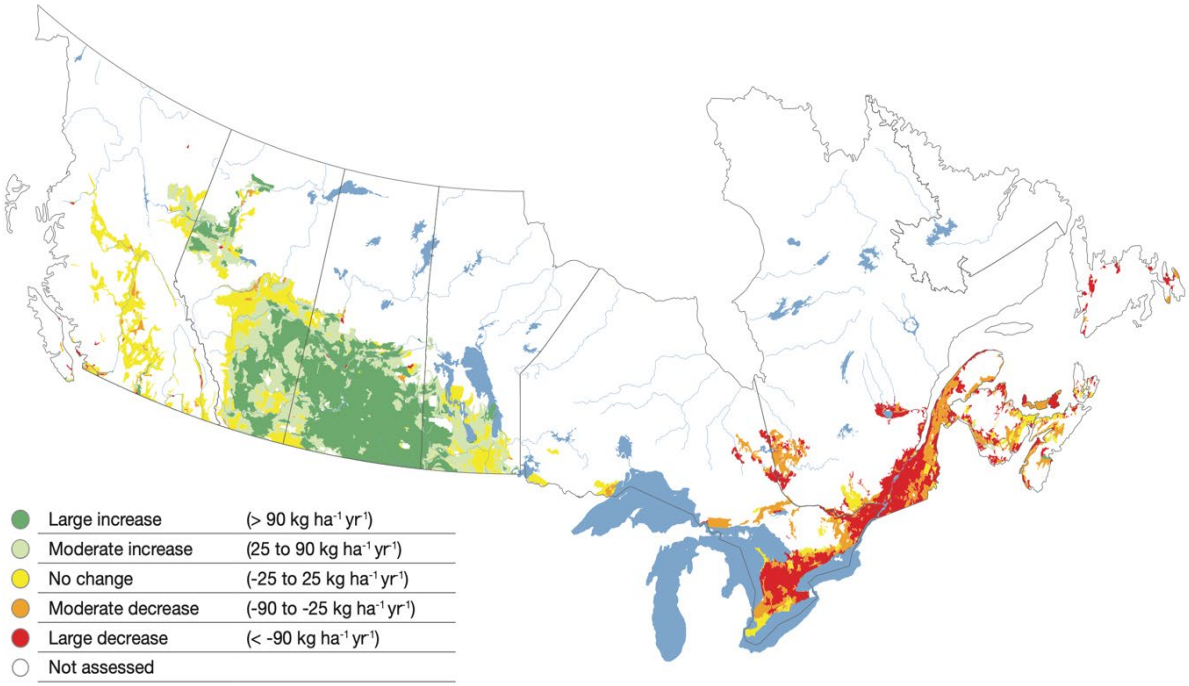
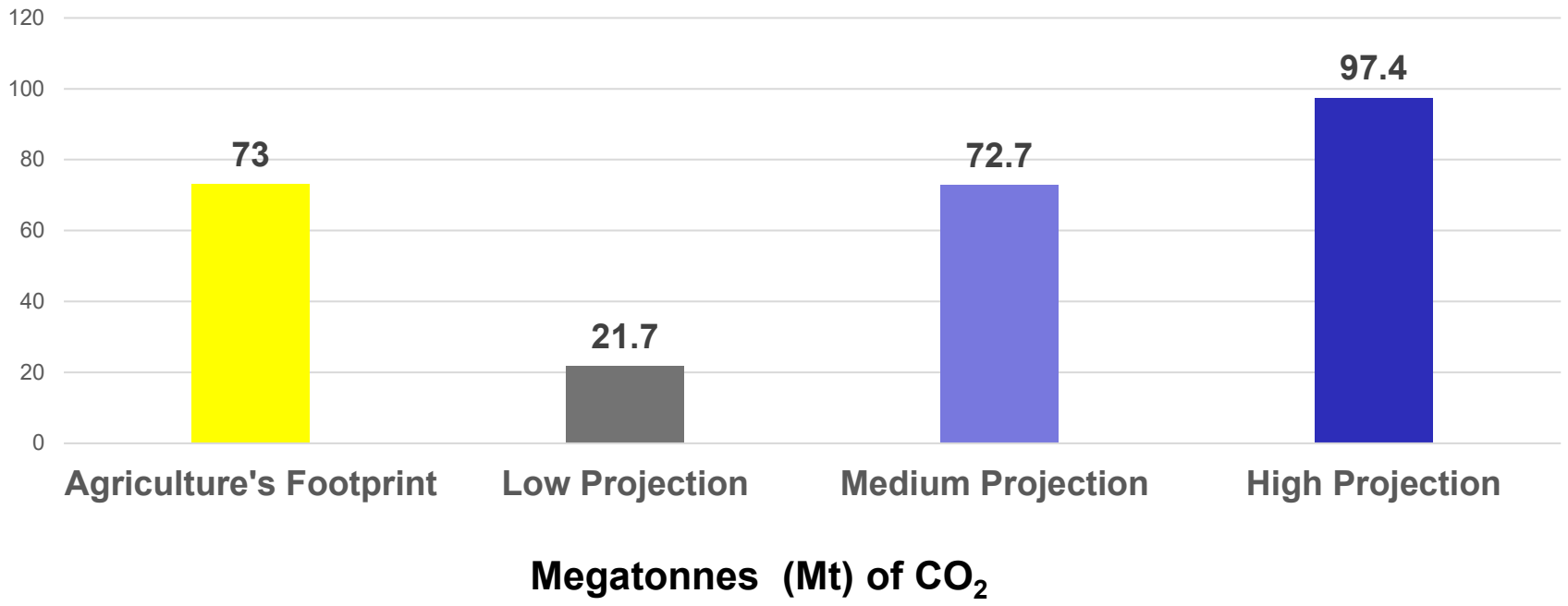


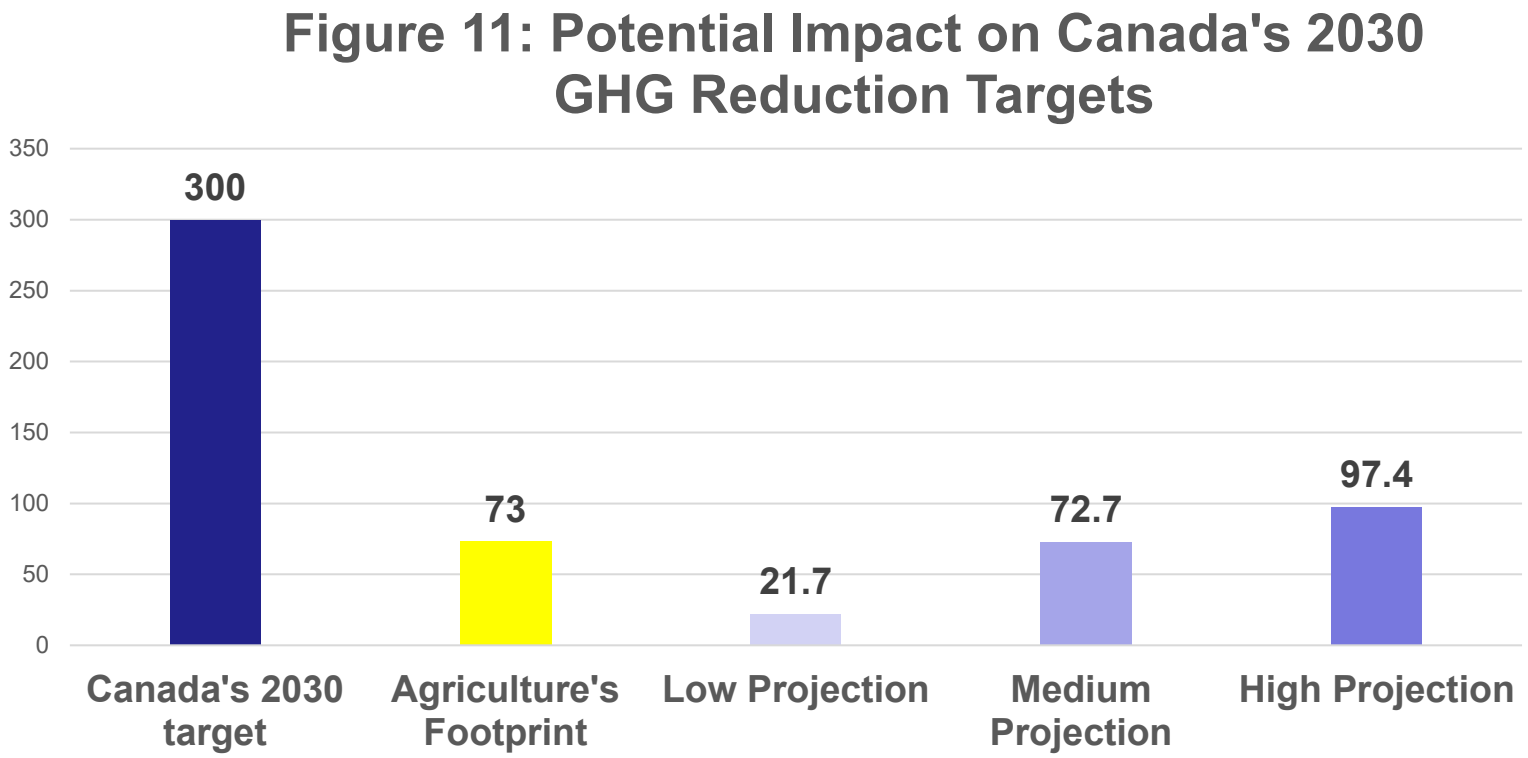
Figure: Soil Organic Carbon Change (kg C ha^{-1} $year^{-1}$) during 2011 (AAFC, 2019).

What Should We Aspire to by 2030?

Figure 10: Potential to Offset Agriculture's GHG Footprint



Helping Canada to Meet 2030 GHG Targets



Recommendations

1. Soil Health Roundtable (multi-stakeholder)
2. Soil Health Strategy
3. Build a basic understanding among soil managers of how management practices impact soil health and soil organic carbon (SOC).
4. Develop a mechanism to sustain communications and collaboration between farmers, other soil managers, scientists and researchers.

Recommendations (cont'd)

5 Promote and enable leadership activities among leading edge farmers (innovators and early adopters) – mentorship program

6 Raise the public profile of soil to the same level of importance as air and water.

7 Build independent extension and knowledge transfer capacity.

8 Soil data collection program

9 Cost-benefit tools

10 Review government programs and mitigate barriers

For more information:

Contact:

Glenn Munroe – gmunroe@compost.org

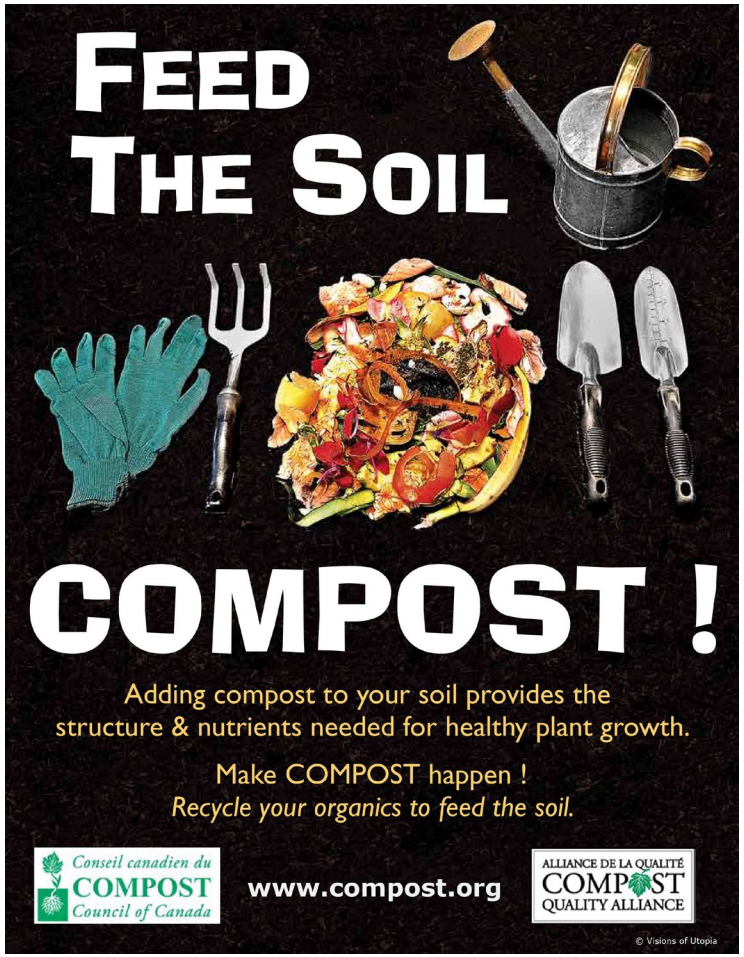
or

Jim Tokarchuk – jimtokarchuk@soilcc.ca

Compost's unique role in this soil-management re-set

- There are many BMPs that have been shown to build SOC and optimize soil health
- These include:
  - Zero and strip tillage
  - Cover crops
  - Diverse rotations
  - 4Rs
  - Rangeland management

Compost makes all of these practices work better!



Conseil canadien du COMPOST Council of Canada

The Future Starts Here

COMPOST !

L'Avenir Commence Ici

ALLIANCE DE LA QUALITÉ COMPOST QUALITY ALLIANCE

Recycle your organics. Return Life to your soil. • Recyclez vos matières organiques. Redonnez vie à votre sol.

1-877-571-4769 • info@compost.org • www.compost.org

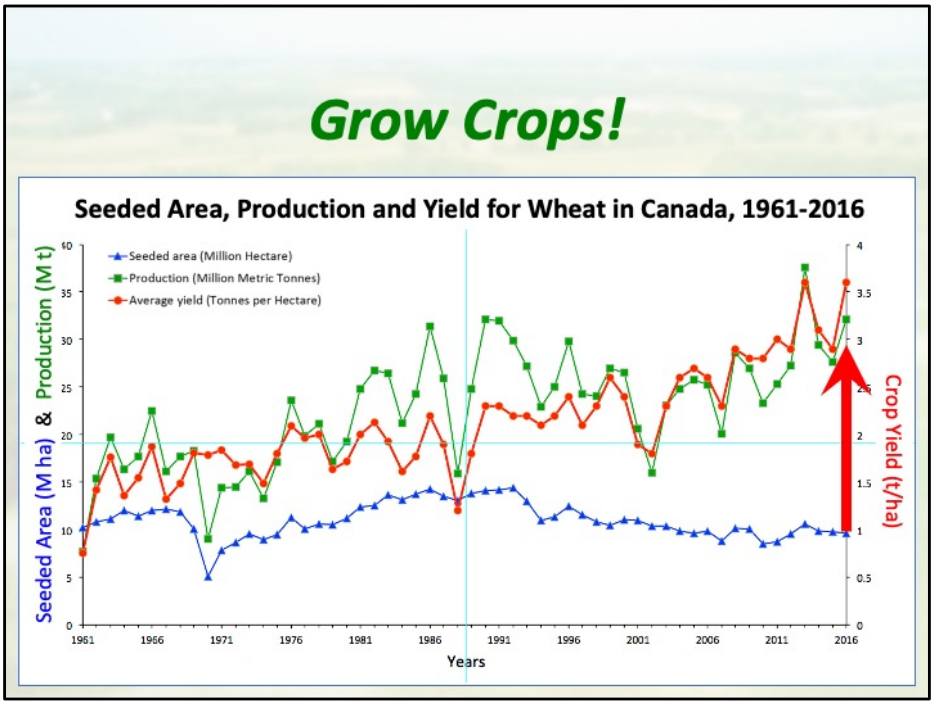
I would like to thank the organizers for inviting me to participate in this panel.

Over the past 30 years, my research program to address water quality and climate change issues has become more focused on soil and crop management.

Based on this research, the message I have for everyone today is simple:

Grow Crops!

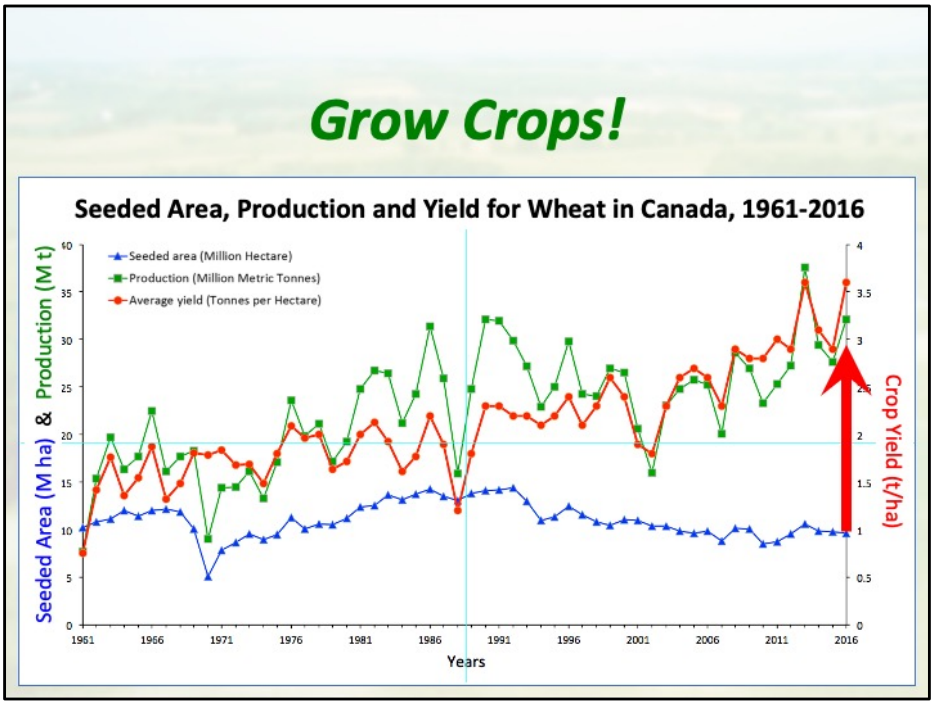
This may seem like an odd solution to propose, but hear me out….



Since the 1960s, most crop yields have increased greatly, in this example, wheat grain yields have tripled.

These yield increases have been largely been achieved through technologic advances: breeding, better equipment and inputs, and better crop management.

And they have been achieved in spite of problems such as decades of soil degradation and increasing weather extremes.



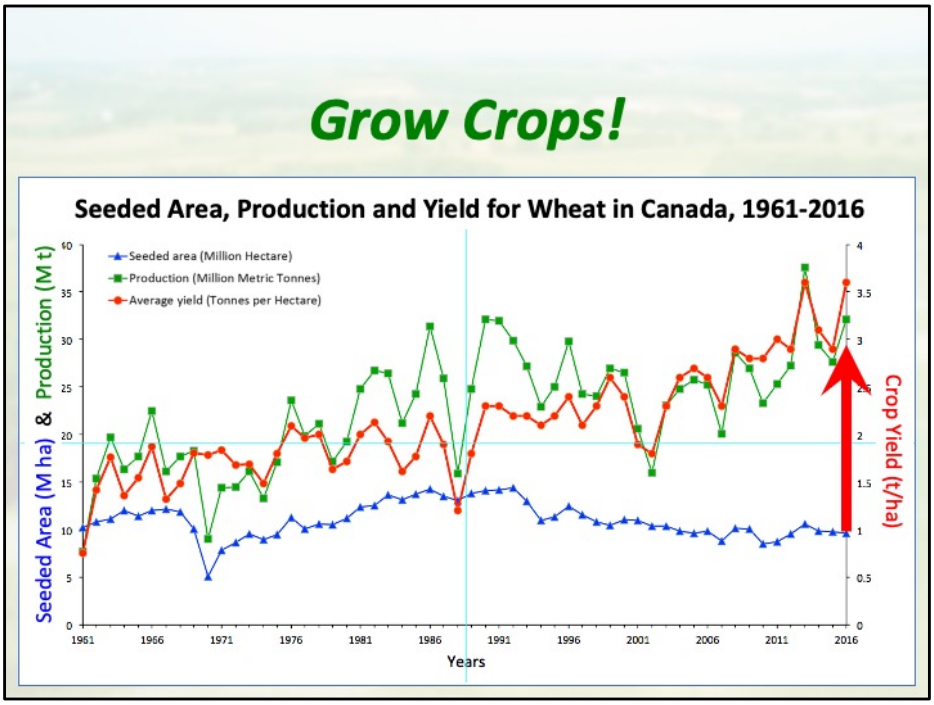
It is important to consider what the implications of greater crop yields are for the environment.

Higher yields normally mean greater vegetative cover and higher biomass, both above ground and below ground.

This means more carbon removed from the atmosphere and sequestered in the soil.

These benefits from increased crop yields could exceed the benefits of cover crops.

As well, higher yields normally mean more efficient use of moisture and nutrients. More vegetative cover means greater interception of rainfall, greater trapping of snow, greater infiltration of rain and snowmelt, and greater consumption of soil moisture. This means less runoff of water, sediment and contaminants into surface waters. This could also mean less production of the greenhouse gasses methane and nitrous oxide.



Such a dramatic increase in crop yields over this time raises a few questions:

Have recommendations for fertilizers and other cropping inputs kept pace with these yield increases?

With respect to research trials, how are these yield increases, which are about 3% per year, dealt with when interpreting results?

Do soil carbon climate models capture these increases, and what do they attribute it to?

Extending this solution a bit further…. Grow Crops Throughout the Landscape

We need to apply a very broad view of the term crop in farming.
Along with traditional agricultural crops, and we need to better manage other forms of vegetation that cover the agricultural landscape. This includes vegetation in woodlands and wetlands, and in riparian areas of streams, ditches and drains.

Why?

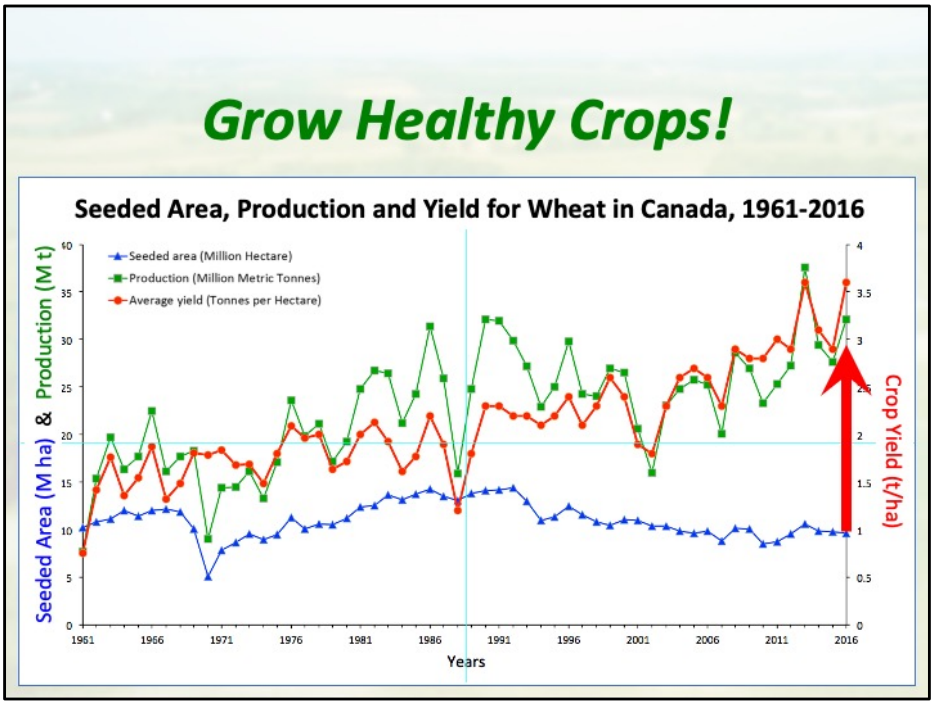
Agriculture is the business of producing and harvesting food, fuel and fibre. We need to maximize vegetative cover and biomass production and use. And, we need to do so while optimizing input use efficiency.

More importantly, **Grow Healthy Crops!**

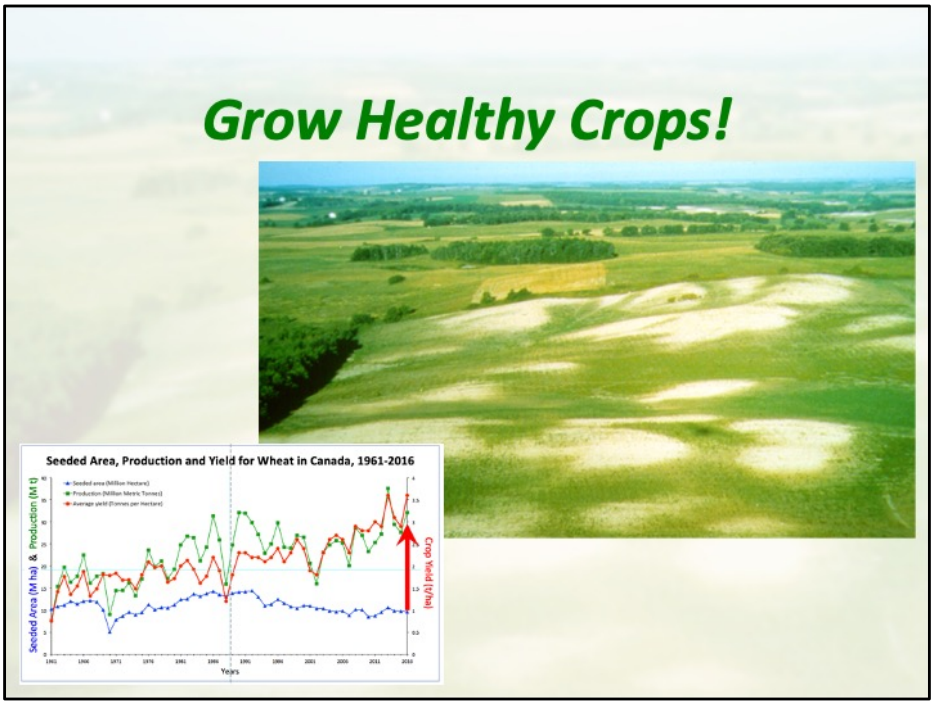
What do I mean by that?

To grow productive and profitable crops, with maximum environmental benefits….

We must grow crops with a high degree of uniformity within fields.
And, grow crops with a high degree of stability from year to year.



The crop yield data shown here reflects production that is variable from year to year due to weather, and could become more variable if climate is changing.



It also reflects crop production on landscapes with a history of soil degradation, primarily through soil erosion. If soil could be restored, the yield increase shown would be even greater.

The environmental benefits of producing more vegetation would also be greater.

As I noted earlier, these yield increases have occurred in spite of the degradation of the soils.

Arguably, the most critical action to ensuring such healthy crops, and thereby improving environmental performance is to, build and sustain healthy soils.

Thick, organic-rich topsoil improves crop growth, its uniformity and its stability.

This is best achieved by minimizing soil erosion, and where possible restoring eroded soils.

In my research, it has been estimated that Canada's crop production would be about 10% greater, if eroded soil could be restored.

Recognition of the variability of soils and crops within landscapes raises an important question:

How well does research on crop breeding, nutrient management and soil carbon management on classic flat research plots reflect the reality of the majority of agricultural landscapes which are mostly hilly and eroded?

Research on such landscapes may be more challenging, but it has the potential for far greater benefits.

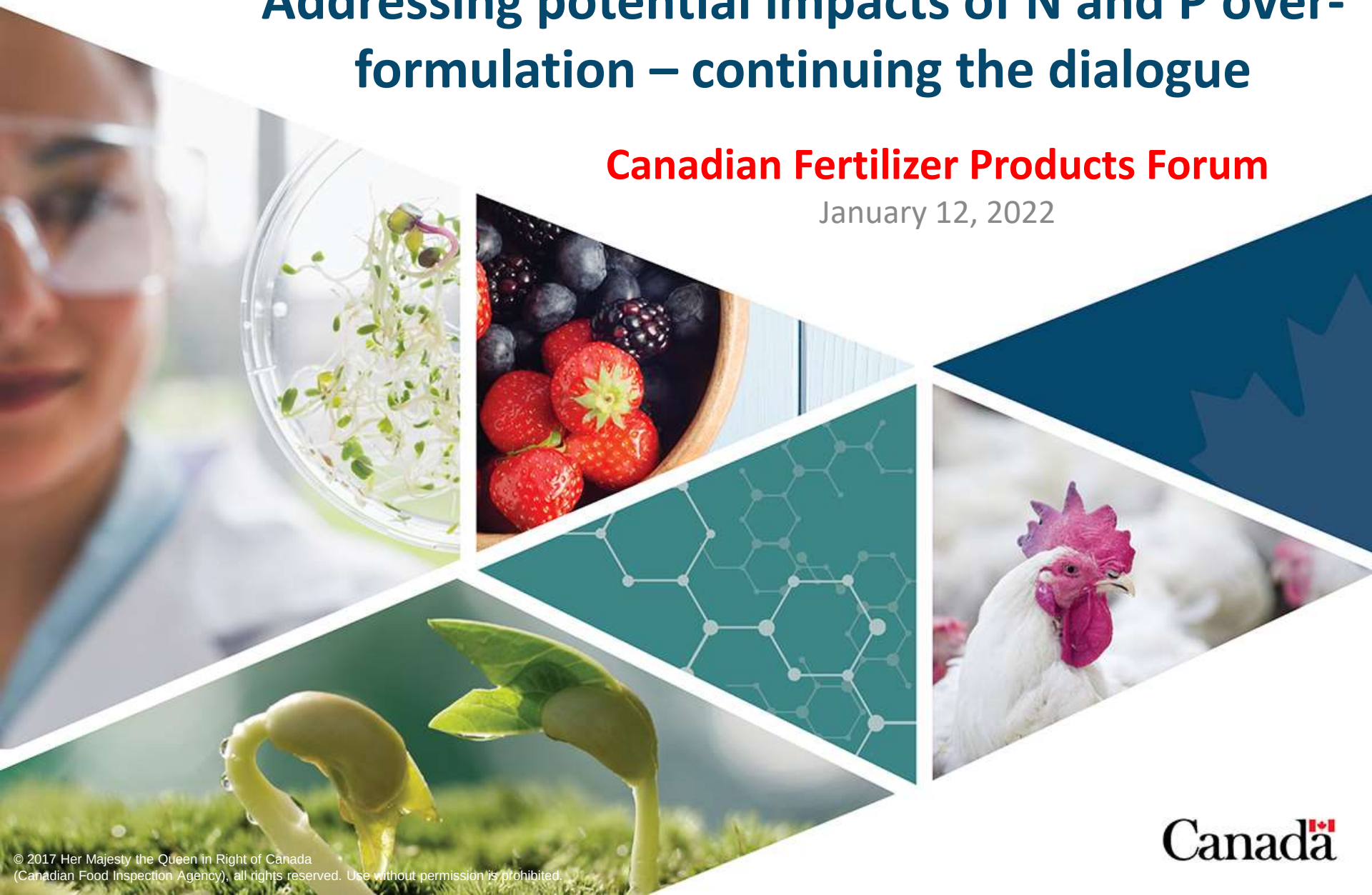
Thank you.

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Addressing potential impacts of N and P over-formulation – continuing the dialogue

Canadian Fertilizer Products Forum

January 12, 2022



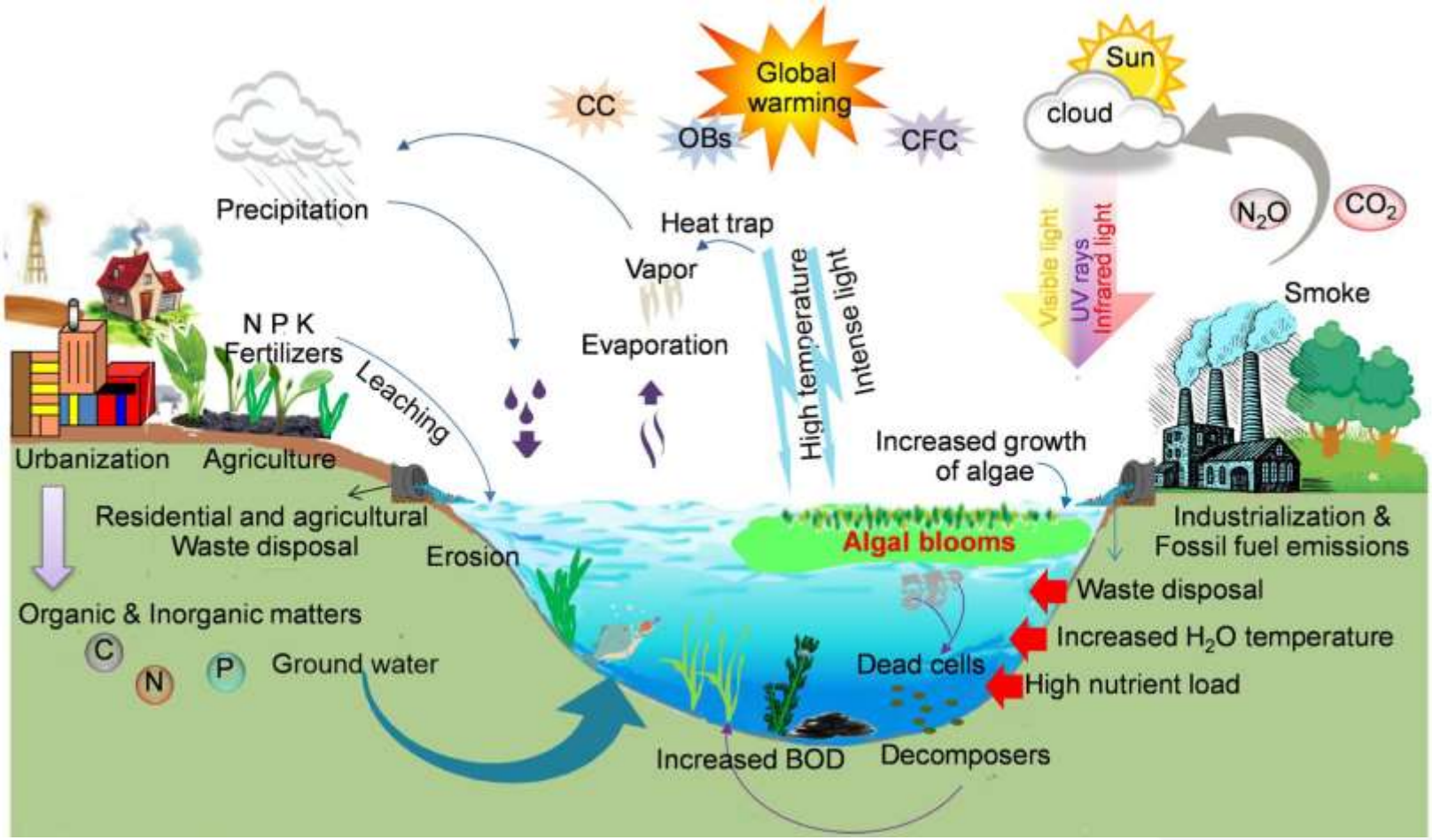
Canada

Outline

- **Overview of the initiative, risks and triggers:**
  - **Nutrient pollution and climate change**
  - **Nutrient management – the 4R principles**
  - **Regulatory Landscape – roles and responsibilities**
  - **Amendments to the *Fertilizers Regulations***

- **Risk mitigation options – are they necessary?**
- **Approach**
- **N and P industry questionnaire**

Nutrient pollution and climate change



Principles of Nutrient Management

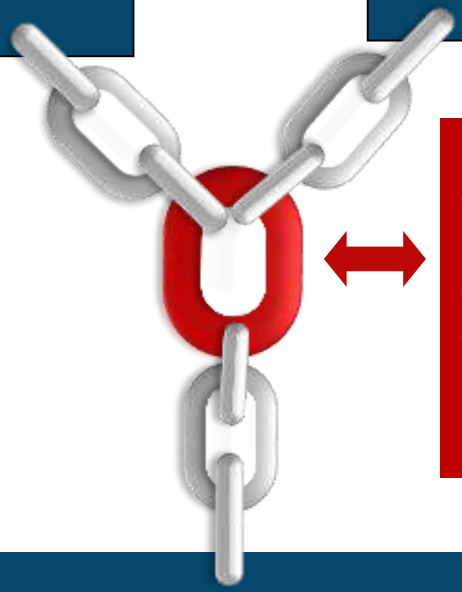
nutrient stewardship

Sustainable agriculture, Nutrient stewardship, Environmental Safety, Climate change mitigation

Nutrient Management – joint effort

Provincial Requirements:
- Only applicable to non-commercial waste-derived materials
- Rate of application recommendations
- Nutrient Management Plans
- Storage and transport restrictions

Industry Programs:
- 4R nutrient stewardship
- Education and outreach – *Nutrients for Life*
- On-farm Best Management Practices



Fertilizers Act and Regulations:
- Only applies to fertilizers and supplements that are sold or imported
- Labelling- Accurate nutrient guarantees
- Directions for use – Often defaults to provincial recommendations or advice of an agricultural crop advisor

Effective Nutrient Management which enables sustainable agriculture

Amendments to the *Fertilizers Regulations*

- As part of regulatory modernization it was initially proposed that macronutrients be guaranteed on actual basis as opposed to minimum.
- This was met with strong opposition from industry:
  - **Feasibility of implementation** ☒
  - **Alignment with international regulatory bodies** ☒
- In response, the CFIA retained minimum guarantees for macronutrients providing:

"appropriate risk mitigation measures"

- were put in place to protect the environment from negative impacts of nutrient over-application
- However, there are currently no upper tolerances for Nitrogen [N] and Phosphorus [P] guarantees on labels and potential over-formulation is not regulated or monitored
- As most fertilizers (both chemically and organically derived) are exempt from registration; the CFIA does not collect or review such marketplace intelligence data
- Preliminary data on over-formulations is scarce and not representative of the sector

Risk mitigation options

There are a number of regulatory and non-regulatory tools available to effectively manage environmental risks:

- Regulations (mandatory registration, labelling, standards)
- Administrative policy tools (upper tolerances for nutrient guarantees)
- Facility registration/licensing
- CFIA marketplace monitoring programs
- Sampling and analysis for N and P content
- Third party accreditation
- Industry voluntary codes of practice
- Industry standards
- Other?

Implementation of the most appropriate risk mitigation option requires in-depth understanding of the magnitude of risk and marketplace realities

Approach

HAZARD x EXPOSURE = RISK

INDENTIFY THE RISK

- Over-formulation of N and P (exceedance of nutrient guarantee on the label
- Over-application ➔ nutrient losses through volatilization and leaching, environmental impacts, ineffective nutrient management plans

ASSESS THE RISK

- An environmental impact assessment requires appropriate input parameters to determine:
  - ✓ **likelihood**
  - ✓ **occurrence**
  - ✓ **magnitude**

Data collection [industry questionnaire]
- Nutrient sources (organic vs. inorganic)
- Sectors within the distribution chain: importers, manufacturers, blenders, distributors, sellers)

CONTROL THE RISK

- Data analysis/Report on results/Validate trends on data trends
- Design regulatory controls if deemed necessary that are commensurate with the risks

REVIEW CONTROL

- Measure performance

Industry questionnaire

DEADLINE *EXTENDED*

The CFIA is seeking industry's data to better understand:

- ✓Modern manufacturing practices
- ✓Quality assurance and control systems
- ✓Frequency of sampling (final product and input materials
- ✓Nutrient content variability:
  - ✓ Primary fertilizer materials
  - ✓ Bulk fertilizers (excluding custom blends)
  - ✓ Prepackaged fertilizers for commercial users
  - ✓ Home and garden fertilizers
  - ✓ Custom blends

NOTE: Confidential Business Information or company data provided to the Agency in support of this initiative will be protected under the *Access to Information Act* and *Privacy Act*.

Discussion

Questions:

1. **Based on what you have heard to date are the drivers, objectives and deliverables of the initiative clear?**
2. **What has been your experience with the questionnaire so far? Do you find the spreadsheet easy to use? Do you feel it captures the data necessary to conduct an environmental impact assessment that is representative of the sector?**
3. **Do you have any thoughts on implementation strategies and timelines?**

Contact:
Doug Sasaki
Tel/Tél.: 343-573-5673
Douglas.Sasaki@inspection.gc.ca
Safety Evaluator - Toxicology, Fertilizer Safety Section
Canadian Food Inspection Agency / Government of Canada

Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Poursuite du dialogue pour s'attaquer aux impacts potentiels d'une surformulation en N et en P

Forum canadien sur les produits fertilisants

12 janvier 2022

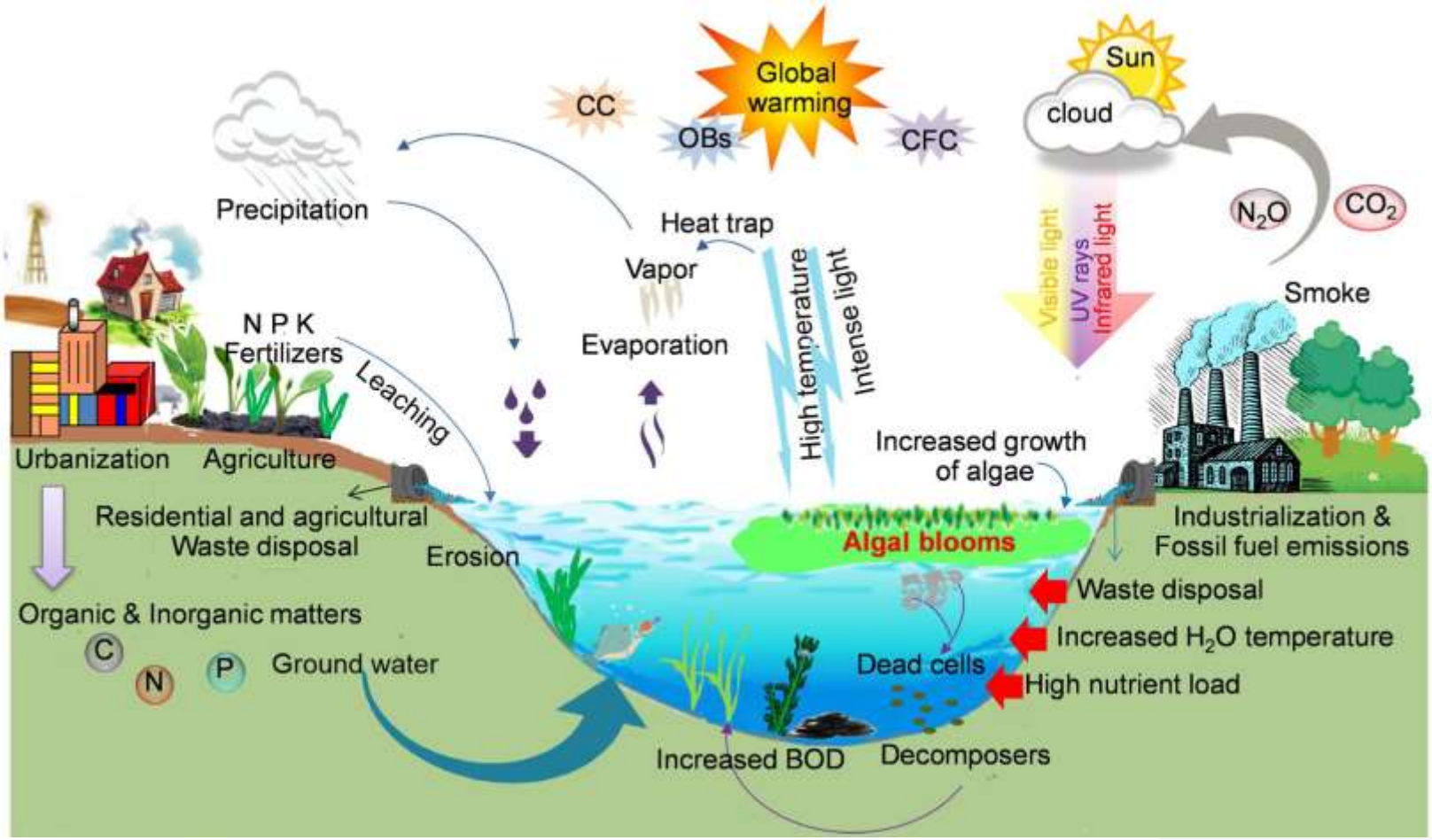
Canada

Contenu

- **Aperçu de l'initiative, risques et éléments déclencheurs :**
  - **Pollution par les éléments nutritifs et changement climatique**
  - **Gestion des éléments nutritifs – principe des 4 B**
  - **Paysage réglementaire – rôles et responsabilités**
  - **Modifications apportées au *Règlement sur les engrais***

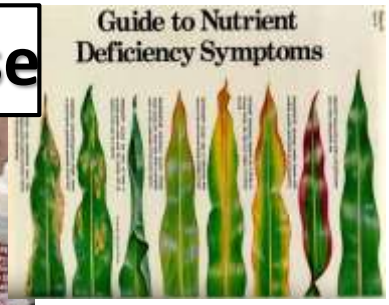
- **Des options d'atténuation des risques sont-elles nécessaires?**
- **Approche**
- **Questionnaire sur le N et le P à l'intention de l'industrie**

Pollution par les éléments nutritifs et changement climatique



Principes de gestion des éléments nutritifs

Bonne dose



Bon endroit

Agriculture durable, gestion des éléments nutritifs, risque environnemental, atténuation du changement climatique

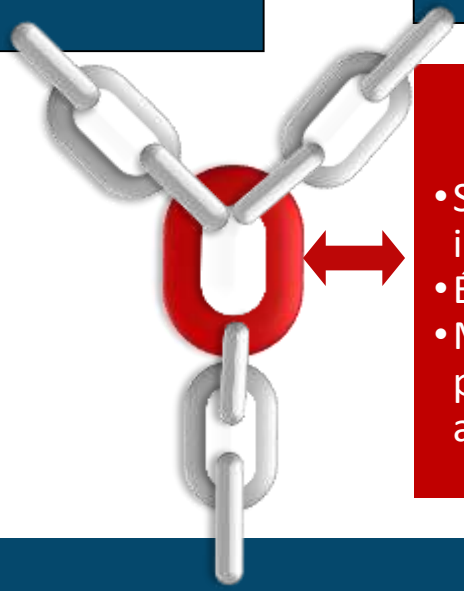
Bonne produit

Bon moment

Efforts concertés pour la gestion des éléments nutritifs

Exigences provinciales
- Visent seulement les matières dérivées de déchets non commerciaux
- Recommandations relatives aux doses d'application
- Plans de gestion des éléments nutritifs
- Restrictions relatives à l'entreposage et au transport

Programmes de l'industrie
- Gérance des nutriments 4B
- Éducation et sensibilisation – *Nutrients for Life*
- Pratiques de gestion exemplaires à la ferme



***Loi sur les engrais* et son règlement d'application :**
- Seuls les engrais et les suppléments vendus ou importés sont visés
- Étiquetage – Exactitude des analyses garanties
- Mode d'emploi – Les recommandations provinciales ou les conseils d'un conseiller agricole sont souvent utilisés par défaut.

Gestion efficace des éléments nutritifs qui permet des pratiques agricoles durables

Modifications apportées au *Règlement sur les engrais*

- Dans le cadre de la modernisation du Règlement, il a été initialement proposé que les macronutriments soient garantis sur une base réelle plutôt que minimale.
- Cela a suscité une forte opposition dans l'industrie :
  - **Faisabilité de la mise en œuvre** ☒
  - **Alignement avec les organes de réglementation internationaux** ☒
- En réponse à la réaction suscitée, l'ACIA a retenu l'option des garanties de teneurs minimales, à condition que :

« des mesures appropriées d'atténuation des risques »

- soient instaurées pour protéger l'environnement des impacts négatifs de la surfertilisation
- Toutefois, il n'existe actuellement pas de limites supérieures de tolérance pour les garanties des teneurs en azote [N] et en phosphore [P] qui figurent sur les étiquettes, et les surformulations potentielles ne sont pas réglementées ni surveillées
- puisque la plupart des engrais (qu'ils soient d'origine chimique ou organique) sont exemptés d'enregistrement; l'ACIA ne collecte pas et n'examine pas de telles données sur le marché
- Les données préliminaires sur les surformulations sont rares et ne sont pas représentatives du secteur

Options d'atténuation des risques

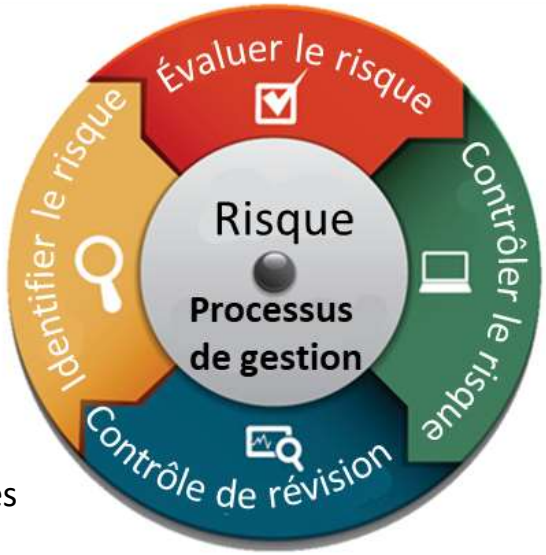
Il existe des instruments réglementaires et non réglementaires pour gérer efficacement les risques environnementaux :

- Réglementation (enregistrement obligatoire, étiquetage, normes)
- Outils de politiques administratives (limites supérieures de tolérance pour les garanties d'éléments nutritifs)
- Enregistrement/licence des établissements
- Programmes de surveillance du marché de l'ACIA
- Échantillonnage et analyse des teneurs en N et en P
- Accréditation de tierces parties
- Codes de pratiques industrielles à adhésion volontaire
- Normes de l'industrie
- Quoi d'autre?

La mise en œuvre de l'option la plus appropriée pour l'atténuation des risques exige une compréhension approfondie de l'importance des risques et des réalités du marché

Approche

DANGER x EXPOSITION = RISQUE



IDENTIFIER LES RISQUES

- Surformulation de N et de P (dépassement des garanties des teneurs en éléments nutritifs qui figurent sur l'étiquette
- Surfertilisation ➔ pertes d'éléments nutritifs par volatilisation et lessivage, impacts environnementaux, plans de gestion des éléments nutritifs inefficaces

ÉVALUER LES RISQUES

- Une évaluation des impacts environnementaux exige des paramètres d'entrées appropriés pour déterminer :
  - ✓ **la probabilité**
  - ✓ **la présence**
  - ✓ **l'importance**

Collecte de données [questionnaire à l'intention de l'industrie]
- Origines des éléments nutritifs (organique et inorganique)
- Secteurs de la chaîne de distribution : importateurs, fabricants, mélangeurs, distributeurs, vendeurs)

CONTRÔLER LES RISQUES

- Analyse des données/Rapport sur les résultats/Validation des tendances fondée sur les tendances des données
- Concevoir des contrôles réglementaires, si cela est jugé nécessaire, qui soient proportionnels aux risques

CONTRÔLE DE RÉVISION

- Mesurer la performance

Questionnaire à l'intention de l'industrie

L'ACIA sollicite des données de l'industrie pour mieux comprendre :

- ✓Les pratiques de fabrication modernes
- ✓Les systèmes d'assurance et de contrôle de la qualité
- ✓La fréquence d'échantillonnage (produits finaux et matières premières)
- ✓La variabilité des teneurs en éléments nutritifs :
  - ✓ Matières premières des engrais
  - ✓ Engrais en vrac (excluant les mélanges préparés sur commande)
  - ✓ Engrais préemballés pour les utilisateurs commerciaux
  - ✓ Engrais pour la maison et le jardin
  - ✓ Mélanges préparés sur commande

DATE LIMITE *PROLONGÉE*

REMARQUE : Tous les renseignements fournis à l'Agence à l'appui de cette initiative seront traités comme des renseignements commerciaux confidentiels et protégés en vertu de la *Loi sur l'accès à l'information* et la *Loi sur la protection des renseignements personnels*.

Discussion

Des questions?

1. **D'après ce que vous avez entendu jusqu'à maintenant, les éléments moteurs, les objectifs et les produits livrables de l'initiative sont-ils clairs?**
2. **Quelle a été votre expérience avec le questionnaire jusqu'à maintenant? Trouvez-vous que le chiffrier est facile à utiliser? Croyez-vous qu'il capture les données nécessaires à la réalisation d'une évaluation des impacts environnementaux qui soit représentative du secteur?**
3. **Avez-vous des commentaires à nous faire part sur les stratégies et les calendriers de mise en œuvre?**

Personne-ressource

Doug Sasaki
Tél. : 343-573-5673
Douglas.Sasaki@inspection.gc.ca
Évaluateur d'innocuité - Toxicologie, Bureau de l'innocuité des engrais
Agence canadienne d'inspection des aliments / Gouvernement du Canada