

TO ASS

# REFLECTIONS ON A THREE-YEAR JOURNEY



At McCain's Farm of the Future in New Brunswick, **innovation** and **sustainability** intersect, demonstrating that the implementation of regenerative agriculture not only supports better crop yield and quality, but can have significant benefits to farm resilience overall.

## Our Mission

The Farm of the Future Canada is committed to supporting our industry transition from conventional to regenerative practices. Our mission is to ensure robust potato yields while prioritizing soil health, water conservation, biodiversity, and climate resilience.

Through meticulous monitoring and data-driven decision-making, we are cultivating a farm ecosystem that thrives on resilience, diversity, and innovation.



## **Our Path**

#### **Regenerative Agriculture Framework:** The roadmap guiding our sustainable farm practices.

With a focus on progressing further on our **Regenerative Agriculture** Framework, this past year, we've achieved five out of seven indicators at an advanced level or higher, showcasing our **advanced overall** status. We lead in enhancing crop diversity and farm/ecosystem biodiversity as well as reducing toxicity of pesticides. We've advanced in minimizing soil disturbances, reducing adverse agro-chemical impacts and optimizing water use, and have engaged in armouring soils and increasing soil organic matter.

We have introduced several beneficial practices at a commercial scale that collectively enhance soil conditions and reduce environmental impact:

The adoption of cover crops should enhance soil health while reducing erosion.

The chisel plow as a form of conservative tillage before potatoes as well as no tillplanting of our rotation crops preserves soil structure.

**Controlled traffic farming** minimizes soil compaction, enhancing water infiltration, thereby increasing yield potential.

Fall bedding prepares soil for early spring planting, improving drainage and temperature control.

#### Scientific collaboration and innovation: Evidencing and building on regenerative agriculture benefits.

Through scientific collaboration with leading experts and academic institutions, we've incorporated diverse expertise, resources, and funding that not only enhances the credibility of our efforts but also facilitates the integration of cutting-edge research and best practices into the industry.

Knowing collaboration will drive our collective success, we've engaged **12 subject** matter experts from Agriculture and Agri-Food Canada in a two-year collaborative project to validate our progress. Additionally, partnerships with reputable academic **institutions** — Cornell University, Dalhousie University, and the University of Guelph have propelled innovation projects across carbon sequestration, farm mechanization, and biodiversity measurements, enriching our endeavors with diverse expertise and resources.







Agriculture and Agri-Food Canada

# **DALHOUSIE** UNIVERSITY



# our impact Spotlight.

Our journey in regenerative agriculture is demonstrating promising results and tangible benefits across our key impact areas. We've **reduced our greenhouse gas emissions, improved water infiltration**, and **enhanced soil health** through cover cropping and reduced pesticide application. Our yields have remained robust, with varieties like Caribou Russet and King Russet showcasing resilience and quality.

By prioritizing biodiversity conservation and enhancement, we've witnessed thriving farm ecosystems, with increasing earthworm and wild bee populations as key indicators of our progress. Our commitment to climate resilience is evident, with initiatives like solar panel installation and greenhouse gas monitoring driving us towards a carbon-neutral future.

We are steadily uncovering that regenerative practices are not just sustainable; they're essential for the future of farming.



## **Our impact detailed**

#### Enhancing **farm resilience** and delivering on environmental outcomes across four key impact areas: soil health, water, biodiversity, and climate.

#### Yield and Quality

Varieties like Caribou Russet and King Russet have showcased resilience and quality, with stable gross yields and minimal storage losses due to rot, likely a result of reduced soil compaction and increased water infiltration in our fields with the implementation of control traffic farming.

Harvesters equipped with yield monitors provide net yield (Greentronics) and geolocated quality insights (HarvestEye) throughout a field. Additionally, an innovation in the mapping of potatoes in storage units will ensure accurate size estimation and allow for better quality control and resource optimization. We will be working to deploy prototypes across several farms in the coming season.

- subsequently organic matter, enhancing soil health over time.
- diverse soil ecosystem in soil animals.
- cost more than \$2,000 to purchase from the local utility.

Additionally, greenhouse gas monitoring is evidencing our progress over time, with our carbon footprint remaining **below the provincial average** (an average carbon dioxide equivalent of 66.8 kg/t vs 83 and 107.8 in 2021 and 2022 respectively). These efforts are driving us towards a **carbon-neutral future**.

SOIL HEALTH: Soils are less compacted overall with cover cropping and reduced tillage demonstrating the **potential for increases in soil organic carbon**, and

WATER MANAGEMENT: Innovations like controlled-traffic farming have reduced soil compaction thereby increasing water infiltration by 117%, reducing soil erosion and nutrient loss by 20–60%, thus contributing to retaining nutrients into the system and preventing the pollution of our surface and ground water resources.

**BIODIVERSITY**: Livestock integration is highlighting the potential for more diverse farming revenue systems while also supporting farm insect diversity. Thriving ecosystems, with wild bee populations and soil biodiversity flourishing, demonstrate the success of our biodiversity conservation efforts.

We are also working to produce insights from the complex diversity of soil animals, bacteria, and fungi we have catalogued with DNA metabarcoding — 500 million sequences uncovered so far. When examining fungal functionality, seven broad groups of saprotrophs (64%) — key in organic matter production — made up the largest portion of diversity. We are also observing patterns indicating the benefits of cropping diversity where, for example, a higher cropping diversity is linked to a more

**CLIMATE RESILIENCE**: Solar panel installation on the Farm has the potential to produce approximately 139,000 kWh of **clean energy annually**, offsetting the power bill by an estimated \$16,000 or more per year. Since commissioning the solar farm in January, the system has generated 17.0 Megawatt-hours of power that would have

#### Sharing our successes

Our work was featured in a short film produced by **RE:TV**, an initiative that showcases innovations that are emerging all over the world in response to the climate and biodiversity crisis. We also welcomed more than 400 visitors this year, including customers, government officials, scientific advisors, McCain employees, and our growers. We proudly shared our stories of innovation:

- Potato growers can use AI to monitor and predict potato nutrition in real time | The Conversation
- Soil's complexity must be understood | The Western Producer







## Showcasing progress within McCain's Regenerative Agriculture Framework.



#### Armoured soils, preferably with living plants

The potato fields on the Farm had living plants for 171 days, accomplished by underseeding our grains, and applying cover crops following our potato seed bed preparation the previous fall. It is noteworthy that across our non-potato fields, the farm had armoured soils with living roots for the entire year.



#### Enhanced crop diversity

In total, there were 23 crop species grown, including 12 grasses and eight legumes. These were used mostly in multi-species mixes as underseed or cover crops showcasing strong potential to increase potato yields while suppressing disease.



#### **Enhanced farm and** ecosystem biodiversity

#### More than a quarter of the farm area (140 of 500 acres) is dedicated to

natural habitat, such as hedgerows and forested areas. In eight of our fields, we have introduced pollinator strips (6.16 acres total), micro ecosystems that attract and encourage pollinating insects. Additionally, we are quantifying the insect biodiversity, including pollinators, using expert taxonomists and DNA metabarcoding.



#### Reduce agro-chemical impact and optimize water use

All inputs were applied based on Decision Support Systems (e.g. DACOM, petiole testing), like in 2022. We have reduced the application of fertilizers and pesticides across our fields. Compared to other farms in the area, **nitrogen** was reduced by 8%, phosphorus by 40%, and potassium by 53% contributing to our deduction in greenhouse gas emissions.

#### **Innovations like real-time plant nutrient** sensing and "see-and-spray" for the precise spot application of pesticides will

further revolutionize our approach, reducing environmental impact while maximizing yields and providing a toolkit for McCain growers.



#### Minimize soil disturbance

By adopting the use of a chisel plow and fall bedding, we **reduced tillage by two** events in the potato crop and embraced no-till practices for more than 50% of the non-potato crops. Deep ripping was used when soil was compacted in the first year before employing control traffic.



#### Increase soil organic matter

Soil health assessments have been completed and will be reassessed annually, including soil biodiversity assessments. A total of 1,074 soil samples on a 50 m by 50 m grid serve as a baseline for soil physio-chemical properties including 504 biological samples.



#### **Reduced toxicity of pesticides**

The Farm has achieved an **Environmental** Impact Quotient (EIQ) of 189, a reduction by 81% in our potato production system compared to 2021. This was accomplished largely due to the use of fewer, less harmful products and well-timed application. While the selection of newer and less harmful chemistry has come with an increased cost, we see a far greater associated reduction in EIQ (71%). Also, we actively reduced this expense through diligent pesticide management.





6

# Join us, tomorrow awaits.

The Farm of the Future Canada is not just a farm; it embodies McCain's deep commitment to **innovation**, **collaboration**, and rigorous **environmental stewardship**. We are dedicated to developing cutting-edge tools and insights that not only minimize risk for our growers but also pave the way for their shared progress.

Join us on this **transformative journey** where each seed planted is not just growth for today but a step towards a sustainable, prosperous future for all. Together, we are setting new standards, ensuring that our advancements lead directly to your success and a healthier planet for future generations.







# <image>



