Regenerative and Sustainable Agriculture for Climate Change Adaptation and Carbon Sequestration: Rebuilding Soil Health and Increasing Crop Productivity of Canadian Potato Production Systems

LEAD RESEARCHER

Claudia Goyer
Research scientist with Agriculture and Agri-Food Canada at the Fredericton Research and Development Centre

Regenerative and sustainable agricultural practices (RSAPs) are being studied in several locations across Canada to mitigate soil degradation and loss of bio-diversity caused by intensive farming practices and ensure long-term viability of potato farms.

On flagship farms on Prince Edward Island, an increase in plant diversity in the rotation phase was tested this past year. Researchers found that direct seeding of an alfalfa-grass treatment showed greater biomass and soil quality improvements than compared to a conventional practice and alfalfa-grass under seeded in the preceding summer. The direct seeded alfalfa-grass treatment likely provided a nitrogen credit for the 2026 potato crop. The researchers are planning to test reduced nitrogen fertilization rates alongside standard practices for the 2026 potato crop.

At a flagship farm in New Brunswick, researchers have found that plant mixes of timothy, verticillium resistant alfalfa and ryegrass, and of ryegrass, pearl millet and sorghum Sudan grass don't favour nematode growth when compared to a timothy, red clover and ryegrass plant mix. There's a greater abundance of nematodes in soils with low seeding rates of ryegrass, pearl millet, Sudan sorghum grass mix than compared to a high seeding rate of the same mix. This could indicate that a lower seeding rate of the plant mixes is not effective in reducing the growth of nematodes.

The research team has used satellite images in New Brunswick to develop a simple approach to determine field management zones. These images provide Normalized Difference Vegetation Index (NDVI) that shows how green and healthy plants are. By analyzing NDVI images taken over several years, researchers can identify patterns in crop growth. They tested this method on 17 potato fields at the McCain Farm of the Future in Florenceville-Bristol, N.B., using data

(L-R) Tyler Nugent and Thomas Foster harvesting potatoes at the McCain Farm of the Future in Florenceville-Bristol, N.B.
Photo: Claudia Goyer

Sean Whitney bagging potatoes at the McCain Farm of the Future in Florenceville-Bristol, N.B. Photo: Claudia Goyer

from 2015 to 2023. From 230 satellite images, the researchers created maps dividing each field into three management zones based on their potential for crop production. They compared these zones with actual potato yields and soil tests from 2023. It was found that areas with higher potential had better yields and more nutrients including organic carbon and nitrogen.

KEY TAKEAWAYS:

- A direct seeded alfalfa-grass treatment has shown greater biomass and soil quality improvements compared to the grower standard practice, likely providing a nitrogen credit for potatoes.
- Plant mixes of timothy, verticillium resistant alfalfa and ryegrass, and ryegrass, pearl millet, and Sudan sorghum grass reduced nematode abundance when compared to grower standard practice.
- NDVI maps in New Brunswick showed that high NDVI management zones of the fields were linked to greater crop yield and nutrients.
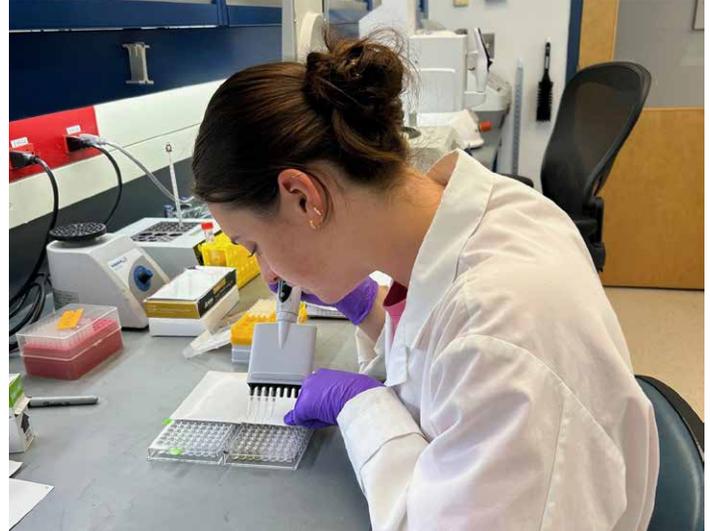
Master of Science student Taylar Austin working in the lab at the Agriculture and Agri-Food Canada Fredericton Research and Development Centre. Photo: Claudia Goyer