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Growing Forward 2—Organizations and Collaborations

INVESTING IN RESEARCH TO ADVANCE ONTARIO'S ORGANIZATIONS AND COLLABORATIONS

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These projects were 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.

Investing in Research to Advance Ontario's Organizations and Collaborations shines a spotlight on some of the exciting research projects funded through *Growing Forward 2* (*GF2*).

The projects are as diverse as the agriculture and agri-food sector itself, from sausage-making, drone technology and weed management to poinsettias, sugarbeets and sheep. The common thread among them all, however, is a desire to continually advance the sector by seeking new and better ways of doing things and adapting to challenges and opportunities—with the ultimate goal of producing safe, healthy products both sustainably and profitably.

Led by different agricultural organizations and including value chain partners from producers to processors, the research results achieved through *GF2* have had and continue to have a positive impact on the agriculture, agri-food and agri-based products industry in Ontario.

GF2 is a federal-provincial-territorial initiative that encourages innovation, competitiveness and market development in Canada's agri-food and agri-products sector. In Ontario, the Agricultural Adaptation Council (AAC) delivers *GF2* to organizations and collaborations.

For a complete listing of *GF2* research projects for organizations and collaborations, visit the project search page on the AAC website http://adaptcouncil.org/projects

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A NEW PROGRAM TO MANAGE WEEDS IN ONTARIO'S EDIBLE BEANS

Edible bean plants are very sensitive when they are exposed to weeds, resulting in an average yield loss of 58 per cent, according to research conducted in Ontario.

That means growers should be diligent in managing weeds in their fields, but edible beans are also quite sensitive to many herbicides—so much so that many soybean herbicides can't be used without causing injury to the edible bean crop.

In fact, there was only one soil-applied herbicide for broadleaf weed control registered for use in Ontario, for edible beans, when a recent Ontario Bean Growers research project on weed control was initiated. So, growers have been searching for additional tools for better weed management. A new herbicide shows promise, but to date, there has been little available information on its crop safety, efficacy, environmental impact, and economic sustainability in Ontario's climate and soil.

With support from *Growing Forward 2*, renowned bean researcher Dr. Peter Sikkema, of the University of Guelph Ridgetown Campus, is leading the four-year Ontario Bean Growers project to complete research trials to learn more about how this herbicide performs on various types of edible beans in Ontario. Through this research, the most efficacious, environmentally sustainable and economically profitable weed management programs in edible beans will be identified.

Specifically, white bean yields were higher when the herbicide was worked into the soil before the crop was planted (pre-plant incorporated) or applied before the plants emerged from the soil (pre-emergence). Weed control was reduced when the herbicide was applied after the weeds had emerged from the soil (post-emergence). When applied post-emergence, researchers found that the tolerance was market class specific with greater injury in adzuki bean.

The weed control performance and yield impact while using the herbicide was also evaluated when used in tank mixes either pre-plant incorporated (PPI) or pre-emergence (PRE). Overall, both showed good weed control and yields comparable to the weed-free control in white beans.

Controlling weeds more effectively with less impact on the crop results in higher crop yields—ultimately, this can translate into greater returns for Ontario bean growers.

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THE BEST USE OF NITROGEN IN ONTARIO SUGARBEET PRODUCTION

Using nitrogen is a delicate balancing act in sugarbeet production. Higher nitrogen levels mean more beets per acre but too much nitrogen lowers the sugar content. So, it's important to ensure both the crop and the environment get the right amount of the nutrient at the right time.

Sugarbeet production practices in Ontario have changed in recent years. With farmers using high-yielding, glyphosate-resistant varieties, harvest dates have moved from late October and early November to early and mid-September. And some growers have switched to narrower row-spacing and higher plant populations compared to traditional 30 inch rows.

With the support of *Growing Forward 2* funding, Dr. Laura Van Eerd, of the University of Guelph Ridgetown Campus, led a multi-year research project to evaluate whether these production changes have any impact on the nitrogen fertilizer requirements of the Ontario sugarbeet crop and to develop best management practices for growers.

The trials at the Ridgetown Campus showed that the tested plant densities and harvest dates did not influence nitrogen fertilizer requirements or the most profitable nitrogen rate for sugarbeets, so growers can apply nitrogen at the same rate regardless of when they harvest their crop or what plant density they choose.

However, later harvest showed significantly higher levels of nitrogen removed from the soil into sugarbeet roots that are removed from the field. This means growers who harvest their crop late may reduce the potential for nitrogen losses.

Overall, the most profitable nitrogen application rate for sugarbeets in southwestern Ontario was found to be 136 kilograms per hectare. This was the first study to include variable revenue and variable costs into calculations of recommended nitrogen rates for sugarbeets.

The best management practices developed as a result of this project were shared with the sugarbeet industry in Ontario and Michigan.

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INNOVATIVE TECHNOLOGIES HELP HOLLAND MARSH GROWERS PROTECT THEIR CROPS

Collaboration between vegetable growers, a farm organization, and a grower co-operative is leading to improved plant health and more efficient vegetable production in the Holland Marsh.

The Bradford Co-op, the Fresh Vegetable Growers of Ontario and individual vegetable growers in the Holland Marsh—an extremely fertile vegetable growing area near Bradford just north of Toronto—are collaborating on a project with the University of Guelph to test innovative technologies that will make their Integrated Pest Management (IPM) programs for key crops like onions and carrots more efficient and cost effective.

"We work together with industry partners and growers to fund and collaborate on our IPM programs in the Marsh," explains Bradford Co-op General Manager Matt Sheppard. "There is tremendous value in early detection and this project is helping us identify issues in real time so we can provide the correct advice and solutions to growers."

Weekly photos are taken of the vegetable fields in the Marsh using an octocopter drone. Lead researcher Mary Ruth McDonald and her team at the University of Guelph's Muck Crops Research Station run the IPM program and use the images for early detection of diseases and insects so growers can take appropriate measures to protect their crop and prevent or minimize damage.

Downy Mildew, which causes lower yields and decreased storability, is the most damaging disease for onions in the area; Stemphylium leaf blight is also a significant concern.

"The technology we are able to access through this project makes our crop scouting program more effective and lets growers be proactive instead of reactive when it comes to crop protection," explains Sheppard. "It's very quick for a grower to have a problem area identified early and then decide how to treat it correctly to keep the crop healthy."

Using information generated from the aerial images to prevent or minimize problems means less and more targeted use of crop protection materials, resulting in immediate savings of $5,000 – 50,000 per grower depending on the crop and the size of the farm.

More importantly, though, use of the technology ultimately ensures growers can keep supplying the market

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with quality produce and consumers have access to locally grown vegetables.

The Marsh's unique soils mean growers in the area have to work together to find solutions for their crop challenges, says Sheppard, adding that funding from *Growing Forward 2* has been instrumental in bringing the collaboration together.

"Muck soil like ours doesn't exist in other areas so we have to be self-sufficient and proactive to find solutions," he says. "The technology is expensive so it's something we wouldn't be able to initiate on our own, but the investment with *GF2* has allowed us to access the funds to make it happen."

Watch the video on YouTube

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IN SEARCH OF ALTERNATIVE FEED FOR LAMBS

Corn cob meal may be a suitable feed alternative for lambs for some Ontario sheep producers. A research project supported by *Growing Forward 2* (*GF2*) focused on finding new, inexpensive ways to feed lambs.

The project was in response to producers asking the Ontario Sheep Marketing Agency to investigate whether high moisture corn cob meal would be a suitable replacement for corn. With production costs increasing on-farm, the opportunity to save $5 to $10 per lamb can make a significant difference to a sheep farm's profitability.

Dr. Paul Luimes of the University of Guelph Ridgetown Campus completed a lamb feeding trial to determine feed consumption, lamb growth, carcass characteristics and meat quality of lambs fed three different types of concentrate diets: whole corn and mixed grain, whole corn grain, or corn cob meal. In each case, a vitamin/mineral premix and dried distillers' grains with solubles as a protein supplement were added.

Corn cob meal was found to be less expensive to feed than the corn and mixed grain diet, with savings of approximately $13.40 per lamb based on 20 kilograms of gain. The advantage was less clear when comparing corn cob meal to whole corn only, but could still provide some producers, especially larger farms, with benefit.

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IMPROVING CROP STRESS DETECTION TECHNOLOGY

When a plant's health is stressed through lack of nutrients or by weeds, taking the right action at the right time is critical. But how can farmers know when the right time is?

This Grain Farmers of Ontario research project, led by Dr. Clarence Swanton, of the University of Guelph, and the University of Waterloo's Dr. Roydon Fraser, has shown that a corn plant's leaf temperature can tell you whether that plant is healthy or not—and do so before the problem is readily visible.

Supported by funding from *Growing Forward 2*, they've been working on a proto-type sensor for corn that can rapidly detect changes in leaf surface temperatures.

This helps farmers identify and respond to plant stress like nitrogen deficiency or weed competition quickly and accurately, and often before any visual evidence of stress, like yellowing leaves, is apparent.

Four controlled environment trials using corn were completed in the University of Guelph greenhouse which let the researchers control inputs like water and nitrogen. Three outdoor field trials, two in Woodstock and one in Elora, were also conducted.

Swanton and Fraser observed that healthier plants had cooler temperatures during the day compared to plants lacking nitrogen or fighting weeds, especially when comparing low and high nitrogen rates. The results were less clear with nitrogen rates in the middle of the dose range, and more research will be needed to establish what is causing that variability.

Being able to identify stressed plants early, growers can target applications of nitrogen or crop protection materials precisely and rapidly, ensuring they're only used where and in the quantities they're needed—a benefit for both the environment and growers looking to manage costs.

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BOOSTING FOOD SAFETY IN ARTISANAL SAUSAGE WHILE MAINTAINING TASTE, QUALITY

A protocol developed at the University of Guelph is letting meat processors strengthen food safety in fermented sausages without using heat.

Since 2014, provincially licensed meat processing plants have been required to adopt one of the five interventions identified in Health Canada's Guideline 12 for the control of *E.coli* 0157:H7 and Salmonella in fermented sausages.

Traditional processes for making fermented sausage products like salami and summer sausage don't allow for the use of heat over 33°C.

So meat processors had to find a way to be compliant—but without heat, which can change the taste and texture of the artisanal products.

That's when the Ontario Independent Meat Processors (OIMP) together with three processors used funding received through *Growing Forward 2* to approach the University of Guelph's Canadian Research Institute for Food Safety to help find a solution.

OIMP wanted to find a way for the industry to control pathogens in fermented sausages outside of the interventions approved by Health Canada. They wanted their members to be able to continue offering artisanal quality product without compromising food safety and regulatory compliance.

A CRIFS team developed a protocol that can decrease pathogens to Health Canada-approved levels by adding natural antimicrobials to the meat during the sausage-making process.

The products are shelf-ready in only three to four weeks from the first day of processing, with no change in appearance or palatability, and the protocol is applicable to production batches of all sizes.

The goal was to develop a solution that processors can immediately and easily apply. Previous work of this nature, called "challenge studies", had to be completed in the United States because there were no Canadian facilities with the required equipment and expertise available to industry for use.

Although the project was specific to fermented sausage, these principles of pathogen control could also be applicable to other ready-to-eat meat products, cheese, and even fruits and vegetables in the future.

The work completed through this project will help OIMP's members retain their current markets, as well as expand into new ones in the future.

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FOR POINSETTIAS, PREVENTION IS BETTER THAN CURE

With their red and white bracts, poinsettias are a Canadian Christmas favourite. They're the second-largest potted ornamental crop in Canada, half of which—approximately 4.2 million pots per year—is grown in Ontario.

When it comes to potted plants and flowers, consumers demand an aesthetically perfect crop, free of pests and blemishes. That led Flowers Canada (Ontario) to access funding from *Growing Forward 2*, for a project led by Dr. Rose Buitenhuis, of the Vineland Research and Innovation Centre, to provide growers with tools to respond to emerging pest issues.

Her goal is to identify an effective control to reduce infestation levels of whitefly, a pest that can enter a greenhouse on imported poinsettia cuttings, at the beginning of the production cycle. This will allow biocontrol strategies—using a natural predator to control a pest—to work more effectively and keep pest populations from developing and ultimately damaging the plants.

Earlier research has shown that dips for poinsettia cuttings which contain products like fungi, insecticidal soap or horticultural oils can significantly reduce whitefly numbers on affected cuttings.

In the current project, Buitenhuis is applying the "clean start" principle to poinsettia production by making cutting dips part of an integrated pest management program for the holiday crop. She is evaluating the effectiveness of the combined approach and determining the risk of plant pathogen build-up and transfer through the dipping technique.

To date, results are positive, showing that whitefly numbers are lower on dipped plants than plants that didn't receive the dip. The risk of plant pathogen transfer was low and a cost-benefit analysis shows the approach makes economic sense too—dips followed by biocontrol is the preferred option for reducing whitefly infestation in poinsettia production in Ontario.

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MANAGING NUTRIENTS FOR ONTARIO'S HAZELNUT TREES

Hazelnuts are a new crop for Ontario agriculture, but one with potential. A large Ontario hazelnut products manufacturer is interested in buying locally produced nuts, there are farmers willing to grow the crop, and there's suitable land that formerly produced Concord grapes that is now sitting idle.

Missing are nutrient management benchmarks for growers that reflect Ontario's soils and climate, and the hybrid hazelnut cultivars being grown here.

That need led plant material supplier Earthgen International to form a collaboration with interested hazelnut growers to access *Growing Forward 2* funding for a multi-year feasibility study to look at the nutrient needs for Ontario hazelnut trees planted in soils with varying levels of clay.

Independent researchers are looking at impact nutrient management during container propagation (growing young seedlings in containers rather than in the ground) has on nursery tree quality, as well as if there is any difference in tree growth between container and bare root nursery trees in the field.

They will also evaluate how nitrogen fertilizer affects tree survival, growth and yield, and whether potassium availability in the soil is affected by the soil's clay content and fertilizer application rates.

Early results to date show the varieties to be sensitive to water hardness and salt levels, particularly in their early stages, meaning growers will have to pay attention to water filtration to avoid tree damage. The hot, dry weather of summer 2016 had an impact on tree growth at all sites and in some cases, resulted in tree loss. Work will be completed in 2017 with site specific fertility programs and assessment of tree growth and vigour.

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