Innovation Express

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Science and Technology News from Agriculture and Agri-Food Canada

We would like to take this opportunity to tell you about some developments in the way we at Agriculture and Agri-Food Canada (AAFC) support the sector through science and innovation.

In July 2012, a new Science and Technology Branch brought together all of our research, development and technology transfer capacity from what were different parts of the organization.

The new Science and Technology Branch consolidates our science capacity, provides a single point of access to our science and technology expertise and increases our effectiveness in getting our science out to those who can make it pay – producers and industry. The Branch is set up with outreach and collaboration capacity and senior executives in each of four agricultural ecozones to balance national science priorities with regional needs and build on local and regional partnerships.

In September federal-provincial-territorial ministers of agriculture agreed to a new policy framework for the next five years – *Growing Forward 2*. The new agreement, which will take effect in April, includes investments of $3 billion to support innovation, as well as market development and competitiveness.

The new *Growing Forward 2* programs will build on the success of existing programs to provide more streamlined support to the sector to help it remain a world leader in agricultural innovation and trade. For example, the AgriInnovation Program will focus on investments to expand the sector's capacity to develop and commercialize new products and technologies. It provides funding to industry-led research and development through Agri-Science Clusters as well as smaller projects.

The structure of the new branch and programming that will continue to encourage more industry leadership and investment are some of the ways AAFC will be positioned to help Canadian farmers and the sector focus on innovation through the value chain and move research from the lab to practical applications in the marketplace.

This issue illustrates some long-standing collaborative projects between what used to be known as Research Branch, Agri-Environmental Services Branch and the Pest Management Centre – now all parts of the new Science and Technology Branch. We hope you enjoy reading about these and other innovative projects that are helping farmers improve their environmental sustainability, profitability and productivity.

Dr. Siddika Mithani, Assistant Deputy Minister and
Dr. Gilles Saindon, Associate Assistant Deputy Minister
Science and Technology Branch
Agriculture and Agri-Food Canada

Inside

Barley is "In" When it Comes to Heart Health

Canadians looking to lower their blood cholesterol may soon be choosing food products that contain barley.

This summer Health Canada officials accepted an application submitted by the Alberta Barley Commission for a health claim linking the consumption of barley beta-glucan to lowering blood cholesterol. Agriculture and Agri-Food Canada (AAFC) scientists in Winnipeg, Manitoba, contributed to the scientific work backing up this claim.

The barley health claim is based on scientific evidence showing that consumption of at least three grams of beta-glucan per day helps reduce blood cholesterol, which is a risk factor for heart disease. Beta-glucan is a type of soluble fibre found in barley.

Suitable barley food products can now include labels with statements regarding the recognized health benefit. To use this claim, the food must contain at least one gram of beta-glucan from barley grain products per serving and consumers would need to choose three of such servings to obtain the minimum daily intake for lowering cholesterol.

Barley grain products include dehulled or hulless barley, pearl barley, barley flakes, grits, meal, flour, bran as well as beta-glucan enriched milling fractions.

The health claim gives credibility to barley as a healthy food choice. There is real potential to increase consumer demand for barley food products, giving farmers incentive to grow more food-grade barley and opening up new market opportunities for both producers and processors.

This success shows how government and industry work together for the benefit of the agricultural sector and all Canadians.

DID YOU KNOW?

- AAFC researchers in Guelph, Ontario, contributed to the scientific work for the health claim on oats "Oat fibre helps reduce cholesterol, which is a risk factor for health disease."
- AAFC researchers in Summerland, British Columbia, contributed to the scientific evidence supporting the health benefits of berries, cherries and flax.

Soil Microorganisms Hold Potential to Boost Crop Yields

A number of soil microorganisms have known benefits to crop plants. Rhizobia, for instance, have been studied thoroughly and are well recognized for their contribution to cropping systems. They help legumes, such as lentils, chickpeas and alfalfa, access nitrogen more efficiently, which leads to improved nitrogen levels in the soil and better crop growth.

Now scientists at Agriculture and Agri-Food Canada's (AAFC) Semiarid Prairie Agricultural Research Centre (SPARC) in Swift Current, Saskatchewan, believe another tiny microorganism may hold the key to increasing crop yields and also help reduce the use of fertilizers.

Endophytes, a diverse array of bacteria and fungi that live in the plant without causing disease, are believed to play an important role in stimulating crop growth.

Scientists at Swift Current have discovered three beneficial endophytes, or "plant-growth-promoting microorganisms," with promising results. They've added the three bacteria to chickpea plants and subjected them to various stresses. Normally, when a chickpea plant is stressed due to drought, flooding, disease or excessive heat, it produces ethylene gas which hinders growth. The plants with the added bacteria produced less ethylene when stressed.

DID YOU KNOW?

More than 90 per cent of the durum wheat and 50 per cent of the spring wheat grown in western Canada trace their roots to research at SPARC.

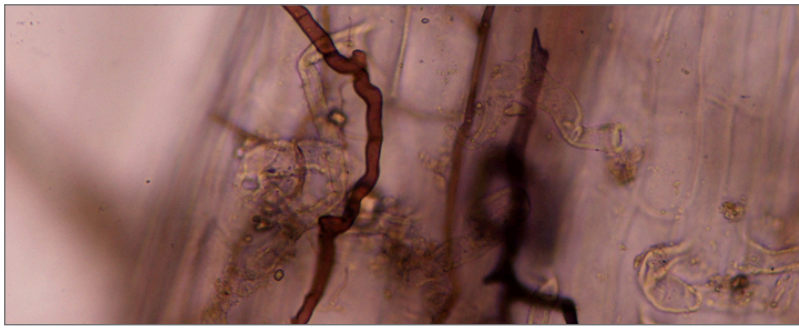
Scientists with the Centre's wheat breeding program believe the same holds true for wheat. Using genetic markers being developed in the new greenhouse, scientists hope to examine specific wheat cultivars for their special ability to benefit from, and multiply, beneficial microorganisms in the soil.

With only a small portion of endophytes identified by scientists, their full potential remains unknown. Scientists at Swift Current are now using the new greenhouse facilities to maintain a collection of beneficial fungi found in the Canadian Prairies and explore their potential.

By more effectively using the beneficial microorganisms living in prairie soils and adding endophytes to plants, the cropping systems could improve their stress tolerance and increase their efficiency in using nutrient resources from the soil. This strategy could help mitigate the impact of climate change on agriculture and resolve problems of greenhouse gas production from residual nitrogen fertilizer and world phosphorus resource depletions.

SPARC at Swift Current, Saskatchewan, recently celebrated the opening of a new greenhouse research facility. The $5.34-million project was one of eight AAFC laboratories that received funding from the Modernizing Federal Laboratories Initiative under Canada's Economic Action Plan in 2009.

The new, modern and energy-efficient greenhouse strengthens the centre's capacity to conduct research in crop development, pest management and food safety and will help keep SPARC researchers on the cutting edge of science. Collaborative research conducted with the Canadian Food Inspection Agency and Health Canada will also help develop new standards for innovative food products and processes.



Top photo: beneficial endophytic fungi entering a root.
Lower photo: Dr. Ron DePauw, wheat breeder at SPARC, examines his wheat plants.

Heather McNairn, Research Scientist, and Grant Wiseman, Resource Analyst, take soil moisture readings in a soybean field.

The SMAP Project involves researchers from government and university groups in Canada and the United States - pictured are representatives from Ohio State University, AAFC, NASA, Environment Canada, Texas A&M University, Jet Propulsion Laboratory, California Institute of Technology.

Satellite Monitors Soil Moisture from Space

The U.S. National Aeronautics and Space Administration (NASA) is known for heading out into the unknown. Recently, though, they took a trip next door to Canada, prompting a large-scale collaboration with scientists, governments and universities in both countries.

In the summer of 2012, Agriculture and Agri-Food Canada (AAFC) researchers looked to the skies over Manitoba as part of a global experiment to test methods for monitoring soil moisture from satellite information.

From June 7 to July 17, NASA flew two piloted aircraft several times a week over an area of mixed agricultural and forested land from Portage La Prairie to Carman in south-central Manitoba. These aircraft carried instruments similar to those onboard a satellite that NASA will launch in 2014.

Once in space, NASA's *Soil Moisture Active Passive (SMAP)* satellite measured surface soil moisture and temperature that will be used to produce maps of global soil moisture, temperature and freeze/thaw states on a regular basis. These maps will help researchers monitor surface soil moisture conditions that impact agricultural production and update models used to predict crop yields. The new information will help Canadian producers make informed farm-operation decisions based on changing weather, water and climate conditions.

During the field campaign, a validation experiment called SMAPVEX, scientists calibrated the models that will be used to estimate soil moisture from the satellite. To do this, scientists took measurements on the ground for soil moisture and temperature, plant biomass and surface roughness. More detailed information about the plant canopy, such as plant spectral properties and leaf area index, was also collected. These traits indicate plant growth and yield potential by measuring leaf development and the amount of light intercepted by plant leaves.

Seventy field and aircraft crew were in the field during SMAPVEX. In addition to the collection of field data, 50 temporary soil moisture monitoring stations were installed to provide continuous measurements over the six weeks of the experiment.

The participation of producers in the Portage La Prairie–Carman area has contributed to the success of the satellite mission. In 2011, AAFC installed permanent soil monitoring stations on a number of private farms in the area, which will serve as a long-term site for assessing the satellite data after the launch.

Manitoba was chosen for this project for many reasons. One is the extreme variability in soil moisture that typifies the Red River Watershed – from drought to flood conditions. Others are the range of crop type (both annual and perennial), land cover (farmland, wetland and forest land) and soil texture. This research effort will also build on other well-established projects that have produced data on soil moisture and tap into existing collaborations with area farmers.

SMAP is expected to become an important source of soil moisture data for Canada.

SMAPVEX team members: NASA's Goddard Space Flight Center, U.S. Department of Agriculture, California Institute of Technology's Jet Propulsion Laboratory, Massachusetts Institute of Technology, University of Southern California, University of California at Irvine, University of Southern Carolina, Texas A&M University, University of Washington, Ohio State University, University of Florida, University of Montana, Florida International University, Georgia Institute of Technology and University of Colorado in addition to Agriculture and Agri-Food Canada, Environment Canada, University of Guelph, University of Manitoba, University of Sherbrooke, Manitoba Agriculture, Food and Rural Initiatives and the Canadian Space Agency, which is providing financial support to the Canadian participants.

The science objectives of the SMAP mission are to map soil moisture and freeze/thaw states from space to:

- *understand processes that link the water, energy and carbon cycles*
- *estimate global water and energy fluxes at the land surface*
- *quantify net carbon flux in boreal landscapes*
- *enhance weather and climate forecast skill*
- *develop improved flood prediction and drought monitoring capabilities.*

Please visit the SMAP Web site at http://smap.jpl.nasa.gov/ for more information.

AAFC Contributes to Overview of Canadian Soils

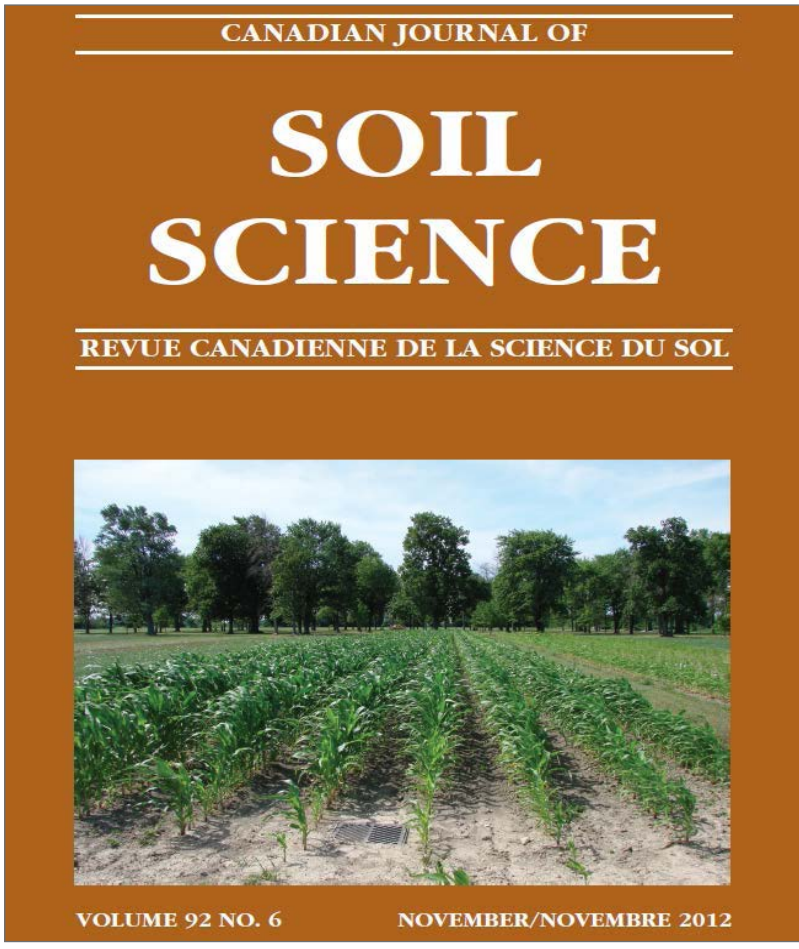
Along with their colleagues at Canadian universities, Agriculture and Agri-Food Canada's (AAFC) soil specialists from across Canada are major contributors to the authorship, editing and production of the *Canadian Journal of Soil Science* and its special issues. Recently, these AAFC experts contributed to a special issue on the *Soils of Canada* – the first comprehensive overview of Canadian soils, their formation, distribution and management since 1978.

The publication is a collaborative effort of the Pedology Subcommittee of the Canadian Society of Soil Science (CSSS). Pedology is a sub-discipline of soil science relating to the origin and classification of soils. The publication captures the knowledge of a generation of Canadian pedologists and condenses it into a single journal issue intended for use both as a text for university teaching and as a reference document.

Because it has been published as a special issue of the *Canadian Journal of Soil Science,* it is available both online (free for journal subscribers) and as hard copy which may be purchased through the CSSS. The special issue is composed of 12 papers, each examining one of the soil orders of the Canadian System of Soil Classification. A listing of abstracts of chapters in the book can be viewed at: http://pubs.aic.ca/toc/cjss/91/5.

The 245-page issue contains colour maps of the distribution of soil orders and great groups, 65 colour figures of soil profiles and landscape images and hundreds of data tables and references. Maps were produced from data stored within the Canadian Soil Information Service and processed by a working group of AAFC specialists.

The *Canadian Journal of Soil Science* has a long history of involvement from AAFC specialists. Current editorial board members include:
Editor in Chief - Dr. Craig Drury (Harrow, Ontario),
Editor - Dr. Martin Chantigny (Ste-Foy, Quebec),
Special Issues Editor - Dr. Marie Boehm (Saskatoon, Saskatchewan)
and co-editor for this special issue -
Scott Smith (Summerland, British Columbia).



Pest Management Centre Helps Keep Pests at Bay

Coping with the ever-changing threats from bugs, weeds and diseases demands not only constant vigilance, but also new technologies and pesticide use registrations that put more effective controls into the hands of growers.

Since 2003, Agriculture and Agri-Food Canada's Pest Management Centre (PMC) has been helping Canadian growers improve their access to safe and effective pest management products and technologies and increase their competitiveness. Ideally, the new pest control strategies and products developed through the PMC should attack the pests while leaving beneficial species unharmed, and applying the pesticides should be as safe as possible for both growers and the environment.

In order to accomplish this, the PMC operates from its headquarters in Ottawa and at various research centres across Canada where field, greenhouse and growth chamber trials are conducted. The two programs overseen by the PMC – the Pesticide Risk Reduction Program (PRRP) and the Minor Use Pesticides Program (MUPP) - are both driven by grower input in response to specific pest management needs identified by Canadian farmers.

The Pesticide Risk Reduction Program has funded over 203 projects to develop and implement pest management tools, technologies and approaches to help manage their pests effectively and reduce the risk associated with pesticides. Through this program beneficial management practices and mechanisms to encourage the adoption of Beneficial Management Practices (BMP) are developed in consultation with stakeholders to promote improved pest management practices.

PMC has coordinated:

- **15 pesticide risk reduction strategies for priority issues;**
- **30 crop profiles, vetted, published and used by growers, registrants, Health Canada's Pest Management Regulatory Agency (PMRA) and the Canadian Food Inspection Agency (CFIA);**
- **25 biopesticide product submissions to the PMRA with 214 new biopesticide uses registered for 19 products.**

The Minor Use Pesticides Program (MUPP) facilitates a process working with growers, the provinces and pesticide manufacturers to identify and match key pest/crop problems with potential solutions. Each year the MUPP holds a priority setting workshop where AAFC agrees to conduct the required efficacy, crop tolerance, and crop residue research necessary to support submissions and registration of the pest control products and uses selected by the grower representatives as their primary solutions.

Since its inception in 2003, the MUPP has made 427 submissions to Health Canada's PMRA on behalf of farmers – resulting in 1130 new uses of crop protection products.

This program has now become integrated with similar activities in the United States with the goal of introducing new pesticide uses in both countries simultaneously.

Like many programs at AAFC, the success of the PMC is based on collaborative partnerships with the producers themselves, grower organizations, product manufacturers, the PMRA, the provinces, AAFC scientists and our counterparts in the United States. Each of these allies has demonstrated a strong commitment to assisting growers increase their competitiveness while contributing to producing safe and healthy food products and protecting the environment.

For more information on projects conducted or supported by the PMC please visit: www.agr.gc.ca/prrmup.

DID YOU KNOW?

PMC is partnering with the Canadian Horticultural Council to help facilitate and coordinate a strategic approach to pest management research and outreach efforts pertaining to two new invasive species threats: The Spotted Wing Drosophila and the Brown Marmorated Stick Bug. A Coordination Group of growers and stakeholders was initiated in the summer of 2012 and two technical working groups comprised of provincial specialists and researchers are being formed to provide scientific advice.

Bees: The New Pest Control Applicators

Breakthroughs in crop protection aren't just in the development of new and effective compounds that can control weeds, insects or plant diseases. Some of the biggest breakthroughs are in technologies used to deliver those solutions directly to the problem.

With funding and support from Agriculture and Agri-Food Canada's (AAFC) Pest Management Centre (PMC), researchers at AAFC's Harrow Greenhouse and Processing Crops Research Centre and at the University of Guelph have developed a process known as "vectoring", where bumblebees deliver a biopesticide directly to plants to control major insect pests in greenhouse vegetable crops.

This ground-breaking delivery method, the first of its kind in the world, recently received regulatory approval from Health Canada's Pest Management Regulatory Agency.

As with all pest management products, this mandatory approval now allows commercial growers to use the technology.

The biopesticide contains live spores of a naturally occurring fungus, which is not harmful to the bees, plants, greenhouse workers or consumers. Utilizing this technology, greenhouses can maintain their high organic standards, while controlling insects that are potentially devastating to greenhouse crops.

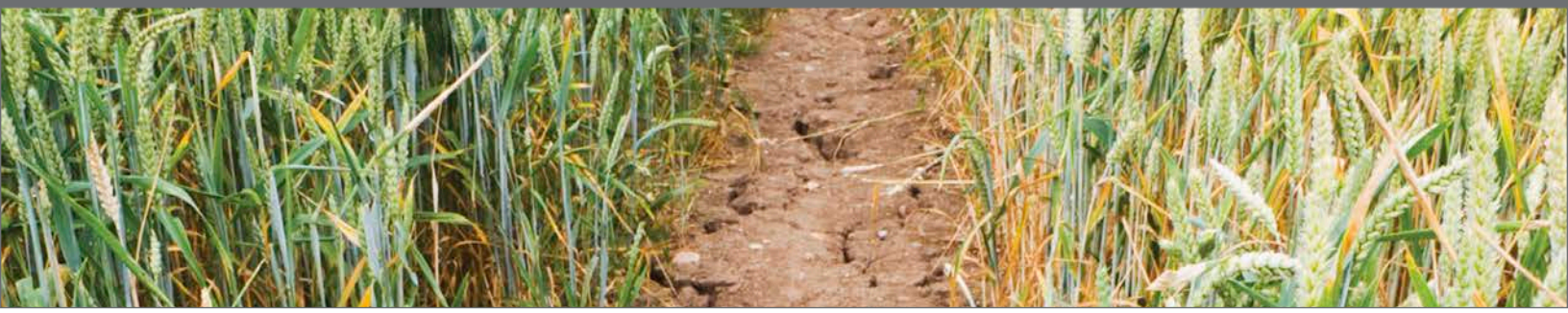
Dispensers containing the biopesticide are attached to the beehives. When the bees exit their hives to collect pollen, they take with them tiny amounts of the spores, delivering them to the flowers, fruit and leaves. The spores attach to the body of the pest, germinate and penetrate the body of the insect, eventually killing them. Although it seems a simple process, a lot of work went into fine tuning it so that it would deliver the biopesticide in the right amount to be effective and not interfere with the main pollination activity of the bees or alter crop yields.

The system adds up to considerable savings in labour costs to greenhouse operators who do not need to have greenhouse workers spray the product. In addition, the bees target very small volumes of product precisely to where it is needed, so they're using less of the product, which is cost-effective. It's environmentally sound, and biopesticide are fulfilling a role of older pesticides that are being taken off the market.

There's work being done now on outdoor crops, and the potential there is huge. Already the return on investment in this research is significantly impacting the industry. A new company, *"Bee Vectoring Technology"* has been established and is actively working across Canada to produce and commercialize the new technologies which have resulted from this work.

This project is a good example of the Pest Management Centre's collaborative efforts to bring new and effective crop protection tools to Canadian farmers. PMC's expertise in the area of regulatory support and technology transfer complements that of AAFC and academic pest management scientists, the private sector and growers. As result of this collaborative effort, Canadian growers will soon have access to a new way to control pests that can cause serious damage to the yield and quality of greenhouse crops.

Dispensers containing the biopesticide are attached to the beehives.



Bioreactor Reduces Nitrates in Tile Drainage Water

Tile drainage systems are often installed by farmers across Canada to remove excess water from their fields. But sometimes a portion of the fertilizers applied to the field may get carried away in the process as well. Now water quality experts at Agriculture and Agri-Food Canada (AAFC) are testing a system to treat the tile drainage water before it is carried away from the fields.

The bioreactors are essentially long trenches full of woodchips under anaerobic conditions that treat the water that passes through. They are being examined for their potential to reduce nitrate levels in tile drainage water. Research already done in the United States has provided modest results in reducing nitrates and phosphorous in shallow ground water. In Canada, the concept was introduced in 1991 when the University of Waterloo and Upper Thames Conservation Authority installed pilot-scale bioreactors in southwestern Ontario in an effort to reduce nitrate levels from tile drain effluent.

Since then, work has continued in Ontario to move the concept from a research idea to workable Beneficial Management Practices (BMPs) by creating demonstration sites and a patented design. To date, bioreactors have been installed at field sites in Ottawa, Quebec and New Brunswick with another two-cell unit installed at AAFC's Harrington Research Farm in Prince Edward Island during the summer of 2012.

AAFC is helping take this concept from a local level to a national scale by examining how it can be transferred to various locations across Canada.

As part of a national effort, it involves expertise from across the country in the design and evaluation of projects placed in various ecoregions. Scientists are also examining additional research concepts, such as treating different pollutants or using bioreactors to treat diverse sources of pollutants that could be applied with an established BMP.

For instance, the sites in Ottawa build upon the concept of using a simple bioreactor to treat nitrogen-enriched tile water by examining how the system operates in combination with other water management technologies such as controlled drainage. These sites are also examining various media to treat other pollutants such as phosphorus and pathogens.

The Harrington site is the first one outside of Ontario looking at taking the initial concept of a bioreactor to treat nitrogen-enriched tile effluent and testing whether it is transferrable to other jurisdictions where elevated nitrogen levels in tile drains are an issue. The sites in Quebec and New Brunswick are examining the effectiveness of bioreactors at reducing nitrate levels from barnyard runoff, which is typically much more potent than tile drain effluent.

The results from this research will be relayed to farmers across Canada for possible on-farm application. This project is one component of a national approach that is examining excess field and greenhouse water management systems in an effort to create more sustainable and profitable farming systems for the benefit of all Canadians.

DID YOU KNOW?

Work on crop fertility by scientists at the Crops and Livestock Research Centre in Charlottetown, Prince Edward Island has helped carrot growers save money by cutting their nitrogen use from 112 to 28 kg per hectare (100 to 25 pounds to the acre) without a loss in yield.

Farming Practices Studied to Improve Water Quality

Innovative, interdisciplinary research at nine watershed sites across Canada is helping farmers decide which farming practices might work best on their farms to improve water quality and foster better agri-environmental stewardship. The program, known as Watershed Evaluation of Beneficial Management Practices (WEBs), was launched in 2004 and is funded under Growing Forward, the federal-provincial-territorial agricultural policy framework in place until April 2013. It unites science and agricultural professionals from over 70 government, academic, industry and sector partners. Ducks Unlimited Canada has been a key partner, contributing funding and expertise.

Each of the WEBs studies includes a biophysical, economic and hydrologic modelling component. The locations and beneficial management practices (BMPs) reflect the unique conditions of each watershed, as well as local and regional interests.

By assessing BMPs at the watershed scale, researchers can get a clearer picture of their performance by evaluating the combined effects of soils, topography, local climate and land use. And to make the findings applicable to the agricultural landscape, WEBs studies are conducted on working farms where operational realities are taken into consideration in designing and conducting BMP experiments.

The WEBs projects have made significant progress in building our understanding of the environmental and economic performance of the BMPs selected for study.

More than half of the BMPs tests conducted to date have been found to reduce the contamination of surface waters by nutrients or sediment. Researchers also discovered that some BMPs are more effective during the growing season than during snowmelt runoff when the ground is still frozen. In other cases, the performance of some BMPs varied with soil types.

Approximately 75 per cent of the BMPs tested may contribute to improved financial returns such as increased yields or cattle weight gain. For example, the controlled tile drainage BMP; tested in Ontario paid for itself through increased crop yields while also improving off-farm water quality.

Results from field-tested BMPs have also been used to validate hydrologic models. Most model projections suggest a long-term reduction in sediment and nutrient loading. These initial results are being validated using WEBs field data.

While more research and evaluation of the results are still required, overall these projects will help governments develop policies and programs to assist farmers in implementing effective BMPs. These combined efforts will help strengthen Canada as a leader in sustainable agriculture while contributing to a better quality of life for Canadians.

WEBs field sites:

Salmon River, British Columbia
Lower Little Bow River, Alberta
Pipestone Creek, Saskatchewan
South Tobacco Creek/Steppler, Manitoba
South Nation, Ontario
Bras d'Henri/Fourchette, Quebec
Black Brook, New Brunswick
Thomas Brook, Nova Scotia
Souris River, Prince Edward Island

The monitoring equipment installed within the South Tobacco Creek and other WEBs watersheds allows researchers to measure the impact of the applied BMPs.

Precision Farming and Earth Observation: Giving Eyes to Crop Models

Precision farming is transforming the way we farm by helping farmers make decisions for optimizing yield while preserving their resources. Global Positioning Systems (GPS), yield monitors and remote sensing are helping farmers pinpoint conditions on various parts of their cultivated fields and fine-tune their crop inputs accordingly. Now scientists believe satellite images can also feed into crop growth models over regions to more accurately estimate the impact of climatic conditions on crop yield and the environmental footprint of farming systems.

Crop growth models could be used in conjunction with soil and climate databases to predict crop yield and estimate the ecological footprint of crops over a region. These models can also help establish nitrogen, water and carbon budgets, water use, nitrogen requirements and nitrate leaching. However, climate databases do not capture well the spatial variations of precipitation, which are critical in crop growth predictions and environmental footprint calculations. Moreover, field identification and management practices such as seeding date and seeding density are not known for individual fields of a region.

Scientists at the Eastern Cereal and Oilseed Research Centre in Ottawa, Ontario, just completed a project to help adapt cropping systems to climate variations. The project, co-funded with the Canadian Space Agency's Government Related Initiatives Program, was part of a demonstration and planning phase to derive crop biomass and yield from remotely-sensed images from eastern Ontario.

Scientists developed methodologies to extract information from satellite images to run the crop growth models over regions. The Earth observation data compensate to some extent for the lack of spatial information otherwise found in the soil and climate databases. These experts have extracted crop characteristics such as leaf area indices from two to six remote-sensing images, taken at various times during the growing season to enhance the input data used to run crop growth models.

The Canadian research team adapted STICS, a crop growth model developed by the *Institut national de recherche agronomique* in France, to short-season corn, soybean and spring wheat cultivars grown in eastern Canada. They then evaluated different approaches for assimilating leaf area indices derived from satellite imagery into STICS to re-initialize seeding date, plant density and soil water content at field capacity over small regions. Using field subunits defined by field boundaries and soil texture maps for running the crop model, scientists found that yield and biomass could be predicted with greater accuracy as well as water use. Critical environmental constraints during the growing season driven by climate variations could also be identified and their impact quantified as part of risk assessment.

The study showed the importance of having access to basic daily climatic data such as solar radiation, minimum and maximum air temperature, precipitation, relative humidity and mean wind speed that is spatially representative of the region of interest to run the crop growth model. Getting better meteorological information from weather radar and satellites would greatly enhance crop model spatial predictions.

Scientists believe this assimilation of Earth observation data into crop growth models will provide a tool that better integrates climate variability when predicting agricultural production.

The information can also help establish local and regional environmental assessments and simulate agricultural practices better adapted to soil and climate conditions.

Such use of satellite imagery also provides valuable information that can be used to review fertilizer recommendations and adjust them to the growing conditions to increase the efficiency of nitrogen fertilizer use while maintaining production levels.

This research is another example of how scientific information, Earth observation and precision farming are helping Canadian farmers fine-tune their production practices to increase crop yield while minimizing the environmental footprint of their production practices.

Food Research and Development Centre Honoured

Agriculture and Agri-Food Canada's (AAFC) Food Research and Development Centre (FRDC) in Saint-Hyacinthe, Quebec, has been getting some good reviews lately.

For instance, the International Association of University Research Parks conferred its prestigious award for "Best Emerging Research Park in the World" to Saint-Hyacinthe and its *Cité de la biotechnologie agroalimentaire*, vétérinaire et agroenvironnementale. The *Cité* developed around two large research and higher learning institutions – the FRDC and the Faculty of Veterinary Medicine of the University of Montreal. Among other things, it boasts three business incubators, 22 research chairs and centres and 17 development support organizations, all of which are connected with the agri-food industry.

During a press conference held at the FRDC on November 10, 2011, Mr. Jacques Gourde, M.P. for Lotbinière–Chutes-de-la-Chaudière, on behalf of the Honourable Denis Lebel, Minister of Transport, Infrastructure and Communities and Minister of the Economic Development Agency of Canada for the Regions of Quebec, announced a contribution to Industrie gastronomique Cascajares, a "graduate" company of the FRDC's Industrial Business Incubation Program. The company Cascajares/Chef Brigade previously benefited from the FRDC's industrial program as it started adapting a Spanish company's products to the Canadian market and is now moving into its new nearby facilities in the industrial park. The lease of FRDC's plant and equipment enabled the company to launch its small-scale production and develop its client base and products. This is the same company that won the prestigious Innovation Award from the Salon international de l'*Alimentation* in Paris for its pork jowls a few months ago.

DID YOU KNOW?

Since 1987, 1,225 businesses have used the FRDC's Industry Program and nearly 2,250 projects have been tested to create innovative food products such as lobster butter, soy-based dessert mousses, ultra-concentrated probiotic yogurt, omega-3 enriched milk, organic sauerkraut, garlic flowers and many more.

Food Research and Development Centre.

New Books by AAFC Scientists

The Genera of *Hyphomycetes*, co-authored by Agriculture and Agri-Food Canada's (AAFC) Keith Seifert of the Eastern Cereal and Oilseed Research Centre in Ottawa, compiles information on approximately 1,480 accepted genera of *hyphomycetes*, commonly known as moulds, and 1,420 genera that are synonyms or names of uncertain identity. Newly prepared line drawings accompany most of the accepted genera, including many that have never been comprehensively illustrated before. More than 200 colour photographs supplement the line drawings. The proper identification of moulds is essential to all those working with fungi – including plant pathologists, industrial microbiologists, mycologists and indoor environment specialists. The new textbook is on its way to becoming a valuable, modern resource for researchers working on these fungi and for students entering the domain. Published by American Phytopathological Society (APS Press). www.apsnet.org

Top 100 Exotic Food Plants, by Agriculture and Agri-Food Canada's (AAFC) Ernest Small of the Eastern Cereal and Oilseed Research Centre in Ottawa, provides comprehensive coverage of tropical and semitropical food plants, reviewing scientific and technological information as well as their culinary uses. There are less than one hundred food plants that are very important to humans, but a few hundred more are already gaining importance, or could in the future. We have not yet imagined the potential value of hundreds of others. In many cases, we know little about them. Here Dr. Small has selected 100 of these 'exotic' food plants and provided a wealth of information. This book is a companion to his *Top 100 Food Plants*, for which he received the 2009 Lane Anderson Award for Canadian science writing. Published by CRC Press. www.crcpress.com

Tell Us What You Think

Innovation Express is Agriculture and Agri-Food Canada's quarterly newsletter to promote research partnerships and technology transfer to organizations interested in agri-food research and development.

We welcome your comments and suggestions.

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