Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Spotlight on Research 2001–2002




Canada

Spotlight on Research

Spotlight on Research
2001–2002

Companion to the annual

Directory of Research

2001–2002

Produced by
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Agriculture and Agri-Food Canada Publication 2108/E

Cat. No. A51-1/2002-1E
ISBN 0-662-31621-5
March 2002
7M-3:2002

Available from
Corporate Management Branch, Agriculture and Agri-Food Canada
Ottawa, Ontario K1A 0C5
Tel. (613) 759-6610
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E-mail publications@em.agr.ca

Également disponible en français sous le titre:
Pleins feux sur la recherche 2001–2002

What's inside...

Agri-food science: helping put Canada first

The Canadian agri-food sector has always been a good provider, delivering safe and high-quality products even in the face of the pitfalls that typically bedevil the industry. But why settle for good, or even better, when best is a reachable goal?

Paving over the potholes that slow the sector's pursuit of global leadership requires a concerted effort on everyone's behalf. That is why the budget speech of December 2001 called for Agriculture and Agri-Food Canada, other governments, and farm groups to create together "a new, integrated, and financially sustainable agricultural policy." Clearly, science has a role, but it's by no means a solo act. Or, to switch to a more apt analogy, science is like the cereal in the television advertisements, "part of this complete breakfast."

Carrying this thought a bit further, the sector's balanced diet is composed of several interrelated parts. **Food safety and quality**, for starters, is an absolute requirement of the sector—who will buy our output without that guarantee? The **environment**, too, is a key consideration, as the underpinning of sustainable production and to meet consumer demand. By engaging in constant **renewal**—acquiring new skills, adopting new technology and making informed business choices—farmers can continue to be successful in the new century. A **science and innovation** component ensures the sector has the tools to continually advance, and bolsters the impact of the other priorities. Finally, with effective **business risk management**, the sector is not so vulnerable to the vagaries of economic and climatic cycles.

Served with generous portions of these strategic priorities, Canada can become the world leader in food safety and quality, innovation and environmentally responsible production to meet the needs of consumers at home and abroad.

As a science organization, our job at Agriculture and Agri-Food Canada is to serve the sector through our expertise. But doing so is more than just putting new tools and techniques on the shelves. We have to be plugged into the whole range of big-picture issues that affect the agri-food sector. Consumer preferences, trade and regulatory issues, business and investment trends, and government policy objectives are among the factors that all have to be taken into account.

To achieve this, the department runs a network of 19 research centres located across the country. Work at the centres is linked to four national science programs.

- The **Environmental Health** program aims to develop knowledge and technologies that minimize the impact of agricultural production

on soil, air, water and biodiversity while maintaining the sustainability of the sector.

- The **Sustainable Production Systems** program targets the development of crop and livestock production systems that are economically and environmentally sustainable and improves the competitiveness of Canadian agri-food products in domestic and international markets.
- The **Bioproducts and Bioprocesses** program does research to discover and develop value-added biobased products and processes.
- The **Food Safety and Quality** program provides knowledge and technology that enhances the ability of the Canadian food industry and the government to keep the food system safe and produces quality food products to meet current and future consumer needs.

Each of the four national programs comprises a subset of interrelated themes that link back with the other three (see p. 6). But the national programs are not just interlinked across the science capability of the department—they are in fact part of interdisciplinary teams, encompassing a vast pool of expertise that gives science a far richer context. And it's a two-way street—the realities of science factor into the decisions of other departmental specialty areas.

Our science delivery gets a further boost from the Matching Investment Initiative (MII). The MII allows the department to match private sector investment in collaborative research in our labs. It also allows us to set our research priorities in tune with market signals.

This booklet is the companion piece to the more extensive, web-based ***Directory of Research 2001–2002***, found at www.agr.gc.ca/science/research-recherche/ann-dir/. Both are summaries of just some of the work that's taken place in our labs over the past year. The web-based version also contains information on our staff, organization and publications.

We hope that producers, businesses, researchers, students, government officials and consumers across Canada and around the world will take advantage of this directory to guide them in their search for information and contacts concerning our people and our science capacity. We invite you to get in touch with us.

Our national science programs and themes

Environmental health

- *Soil assessment, use and health*

  To develop knowledge, technologies and practices for the assessment, use and quality of Canadian agricultural soils

- *Water quality and quantity*

  To reduce the impact of agricultural land-based activities on the quality and quantity of water

- *Air quality*

  To reduce air-quality concerns (odours, contaminants) and greenhouse gas emissions from the agri-food sector

- *Biodiversity*

  To develop knowledge and take action to conserve and facilitate the use of biological and genetic resources important to agriculture

- *Nutrients and organic residues*

  To balance the requirements of crops with nutrients supplied by fertilizers and organic residues

- *Integrated pest management*

  To reduce the use of chemical pesticides in pest management

  Contact: Dr. Jean-Marc Deschênes
  National Program Leader
  (613) 759-1952

Bioproducts and bioprocesses

- *Specialty biobased products and processes*

  To develop specialty chemicals and microbial products, including biopesticides, pharmaceutical products, flavours and fragrances, and enzymes

- *Bioenergy and biomass products and processes*

  To develop commodity and intermediate chemicals and materials, including ethanol, biodiesel, ethylene, acetic acid and fatty acids

- *Genomics, bioinformatics and other bioinformation*

  To study genomics, proteomics, metabolomics, enabling technologies and bioinformatics

  Contact: Dr. Gordon Neish
  National Program Leader
  (250) 494-6355

Sustainable production systems

- *Cultivar development and other genetic enhancement*

  To develop new cultivars with increased yield, disease resistance, improved quality and greater tolerance to environmental stresses

- *Crop production systems*

  To develop new technology that reduces costs of production and ensures efficient crop production

- *Livestock production systems*

  To develop new technologies that reduce production costs and improve product quality and animal health

- *Animal behaviour and welfare*

  To develop welfare friendly livestock production systems that address consumer concerns such as housing and husbandry practices

  Contact: Dr. Steve Morgan Jones
  National Program Leader
  (403) 327-4561

Food safety and quality

- *Knowledge and tools supporting food safety and regulations*

  To develop knowledge of current and emerging pathogenic organisms implicated in human disease and death

- *Meeting consumer preferences and nutritional needs*

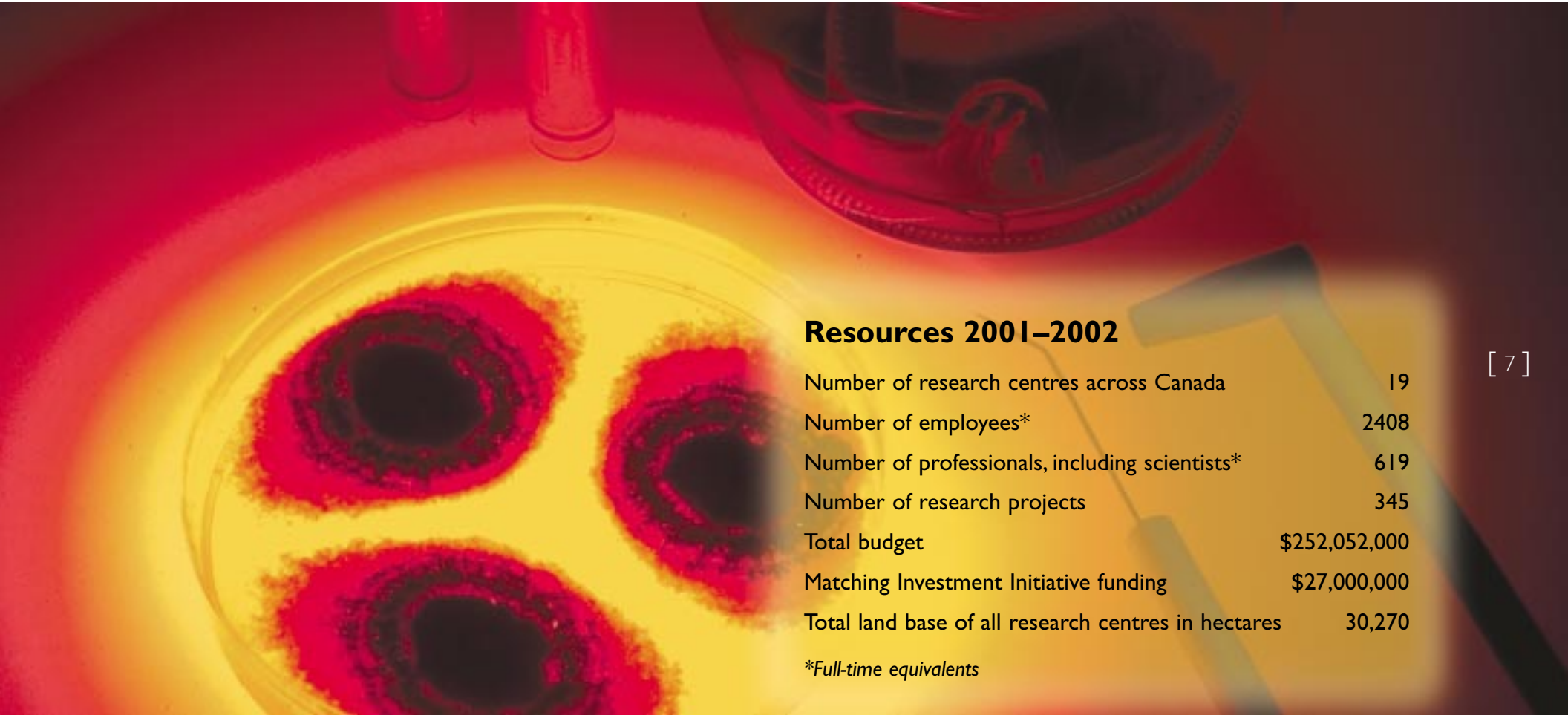
  To study quality attributes of food, including nutrition, and the basis for their maintenance and development

- *Improved and new products and processes*

  To develop improved fresh and processed foods

  Contact: Mme Angèle St-Yves
  National Program Leader
  (450) 773-1105

Research at a glance

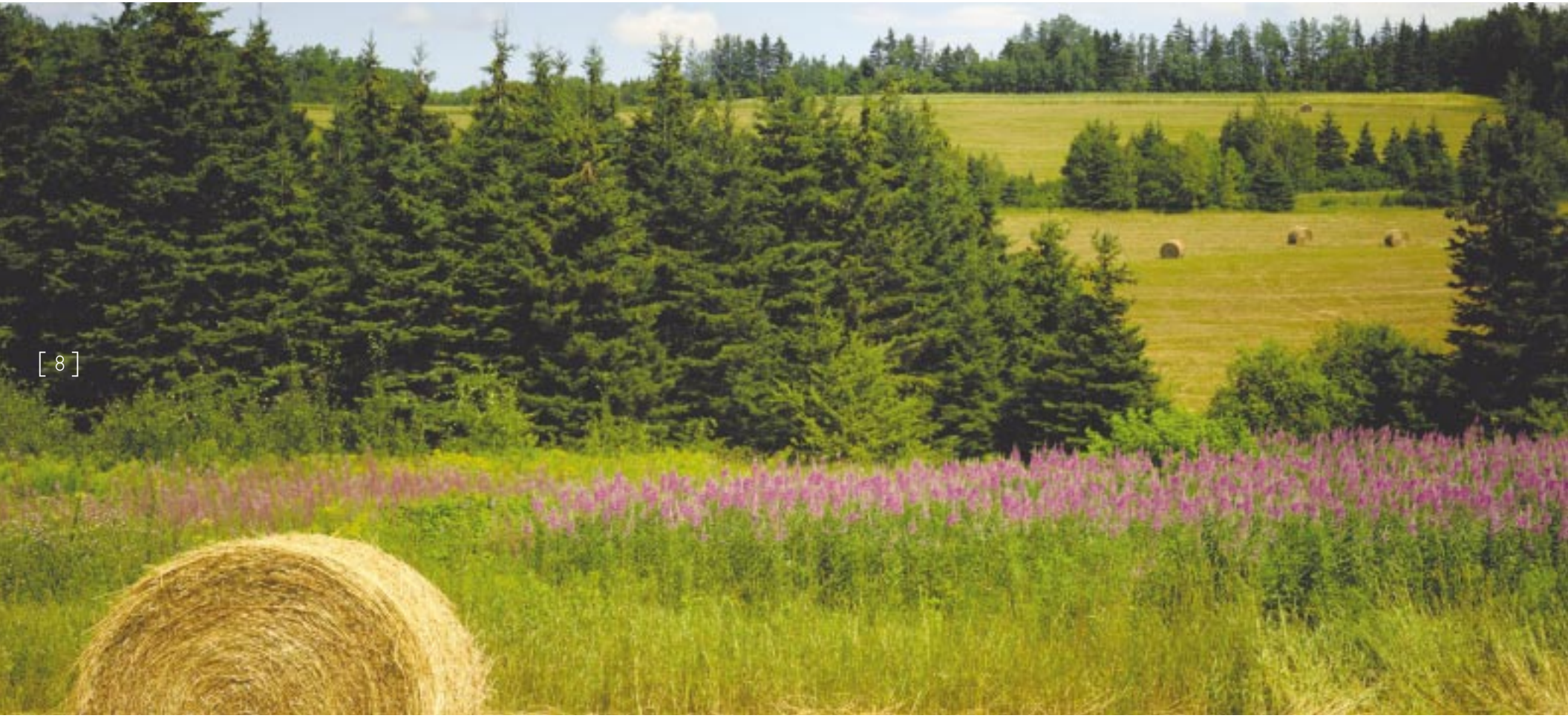


Resources 2001–2002

Number of research centres across Canada	19
Number of employees*	2408
Number of professionals, including scientists*	619
Number of research projects	345
Total budget	$252,052,000
Matching Investment Initiative funding	$27,000,000
Total land base of all research centres in hectares	30,270

**Full-time equivalents*

Environmental Health



With farmers using 68 million hectares of land in a variety of different ecozones, our natural resources are inevitably affected by agricultural practices. But that impact doesn't necessarily have to be negative, and our researchers at Agriculture and Agri-Food Canada (AAFC) are using science and innovation to make sure that farming activities are compatible with environmental health. Key research themes include protection of our soils, water, and air, conservation of biodiversity and organic nutrients, and development of alternative pest-control techniques.

The long-term success of the agricultural industry in Canada is based on the productive ability of our natural resources and the implementation of practices to this end. As the stories that come next indicate, our research efforts at AAFC aim to make sure farming activities and environmental health go hand in hand.

Soils, water and air

Soils, water and air are the basic building blocks of a successful agriculture and agri-food industry. Protection of these precious natural resources is imperative in order to ensure the long-term productivity of the environment and, in turn, the agricultural industry.

Experts at AAFC understand the importance of developing and implementing farming practices that have a minimal impact on the health of the environment. They are aware that some activities, such as the excessive use of fertilizers and pesticides, can potentially cause harm to our natural resources, in the form of soil contamination, runoff into the water system, and release of greenhouse gases into the air.

The stories that follow show how, all across Canada, AAFC's researchers are using their expertise in science and innovation to ensure that agricultural activities work to augment both the health of the environment and the continued success of the industry.

Good rhizobacteria become even better

Not all help comes from above. Farmers who grow leguminous crops like soybeans, peas and alfalfa get help from below, thanks to beneficial soil bacteria called rhizobia. These micro-organisms live in nodules within the plants' roots and work to transform nitrogen from the air into a form that can be used by the plant. This process is called nitrogen fixation.

Scientists at the Soils and Crops Research and Development Centre in Sainte-Foy, Que., are studying how best to use rhizobia for the enhancement and sustainability of crop production. Research projects under way include selecting strains of rhizobia that are especially efficient at nitrogen fixation, are able to function well in cool conditions, and promote the growth of nonlegume crops such as wheat and corn.

Contact: Dr. Gilles Rousselle, Director, (418) 657-7985
Field: Soils, Water and Air
Priority: Environment
National Program: Environmental Health
Theme: Soil assessment, use and health

New sulfur fertilizer ideal for coastal soils

A study on the effectiveness of a new sulfur fertilizer has been successfully completed by researchers from the Pacific Agri-Food Research Centre at Agassiz, B.C. The new fertilizer is made from the waste products of such activities as natural gas refining.

Sulfur in the elemental form is not water soluble, and therefore inaccessible to plants until it oxidizes to sulfate. This usually happens naturally in soil, but the rate depends on the size of the sulfur particle. The new fertilizer is granular, which not only makes it easier to handle and blend, but allows for a formulation that breaks down more readily in the field. Tests showed that the fertilizer breaks down and oxidizes, becoming available to plants relatively quickly. This new low-cost, controlled-release product offers opportunities for economic and environmentally friendly sulfur fertilizer management, while using waste materials.

Contact: Dr. Barry Grace, Acting Director, (250) 494-6412
Field: Soils, Water and Air
Priority: Environment
National Program: Environmental Health
Theme: Nutrients and organic residues

Buffer zones need the right vegetation

Buffer zones are strips of land that form a border between agricultural fields and bodies of water. The vegetation growing in these zones helps to prevent soil erosion. It also absorbs any excess nutrients or contaminants that may leach out of the fields and into the waterways.

The trick is to figure out which types of vegetation work best in buffer zones. Researchers at the Crops and Livestock Research Centre in Charlottetown are developing methods for measuring and comparing buffer zone effectiveness for various plant species. They plan to compare the nutrient content of sediment and runoff water at the top of the buffer to that collected at the bottom. These data will tell scientists how well the vegetation worked to prevent runoff.

Contact: Dr. Christiane Deslauriers, Director, (902) 566-6800
Field: Soils, Water and Air
Priority: Environment
National Program: Environmental Health
Theme: Water quality and quantity

Genetic resources, pests and biocontrol

The link between pest management, biocontrol and genetic resources may not be apparent at first. But, upon closer examination, it becomes clear—since genes are the basis for all life, the key to adding pest resistance to crop varieties is to incorporate pest resistance into the plant's genetic coding. Genetic resistance is just one form of biocontrol, which involves the use of nature-based strategies to combat pests.

That's where integrated pest management comes in. Our scientists are working on programs that combine a complementary array of control techniques—including traditional and alternative pesticides, genetic resistance, and other forms of biocontrol—into one, integrated approach for managing pests. The stories that follow demonstrate how integrated pest management contributes to the well-being of Canada's agricultural sector by providing new pest control strategies that result in a healthier environment while producing high-quality foods for consumers.

Pest-resistant potatoes lessen pesticide use

Colorado potato beetles and aphids can reduce a farmer's potato crop yield by 50%, making them a mega-pest of potatoes in Canada. Although pesticides are an effective control method, they can have a negative impact on the environment. That's why scientists at the Potato Research Centre (PRC) in Fredericton are continually looking for alternatives to pesticides for controlling these crop-wreckers.

One potential alternative is to create potatoes that are more resistant to the insects. Researchers at the PRC have discovered six different species of wild potatoes that are mighty unappealing to the pests, either because they taste bad, or because they contain compounds that inhibit the insects' growth. Scientists hope to discover the genetic basis for these pest-resistant traits in wild potatoes and crossbreed them into cultivated species.

Contact: Dr. Richard Butts, Director, (506) 452-3260
Field: Pests and Biocontrol
Priority: Environment
National Program: Environmental Health
Program Support: Biodiversity

Grasshoppers meet their own plague

Grasshoppers are a nuisance to prairie farmers, causing extensive damage to their crops. To help the farmers out, scientists at the Lethbridge Research Centre in Alberta are working to develop safer and more effective control systems for this problematic pest.

One method they are investigating is the use of parasitic flies and fungal pathogens that prey upon grasshoppers, with consideration for the safety of birds that might consume the infected insects. The researchers at Lethbridge are also studying other nonchemical control measures such as various microbial strains harmful to grasshoppers, antifeedant plant compounds that deter feeding, and natural plant compounds toxic to the insects. The advantage of these methods is international applicability, because they work against locusts as well as grasshoppers.

Contact: Dr. Peter Burnett, Acting Director, (403) 327-4561
Field: Pests and Biocontrol
Priority: Environment
National Program: Environmental Health
Theme: Integrated pest management

Wheat midge "johns" fall for pheromone spray

The wheat midge is a troublesome and expensive pest for prairie farmers. To address this problem, scientists at the Saskatoon Research Centre (SRC) have laid a trap and they're using the allure of sex for bait.

The male wheat midge is attracted to the female by natural chemicals, called pheromones, that she exudes to indicate mating time has arrived. With collaborators from Simon Fraser University, scientists at SRC have copied and patented this pheromone, and are using it in baited traps as a way to estimate populations of this insect in farmers' fields. The information is key to deciding whether control strategies will reduce crop losses. Another use for wheat midge pheromones that scientists are considering is a spray to disrupt mating. Spraying the air with pheromones hinders the males from locating the females, and since unmated females cannot reproduce, subsequent populations of the pest are diminished. The goal of mating disruption strategies is to reduce insect-related crop damage while decreasing pesticide applications.

Contact: Dr. David Wall, Acting Director, (306) 956-7211
Field: Pests and Biocontrol
Priority: Environment
National Program: Environmental Health
Theme: Integrated pest management

Sustainable Production Systems

Crop and livestock products account for the majority of Canadian farm income. The export of these products, for example, generates about $20 billion in sales every year.

But the marketplace is fickle. In order to ensure the renewal of our agriculture and agri-food sector, Canadian farmers need access to new information and improved technology related to the production of animals and plants. Our researchers at AAFC are providers of the tools and knowledge that can help to make Canadian producers the most efficient in the world and, in turn, to bolster the competitiveness of Canadian crop and livestock products in the global market.

The stories that follow are examples of how research efforts to develop new, improved crop varieties and more efficient, technologically advanced production systems will contribute to the sustainability of agriculture in this country.

Cereals

Next time you take a bite of bread or a sip of beer, keep in mind that the cereal crops used as ingredients for these food products were probably grown by Canadian farmers. Cereal crop production is a significant part of the agricultural industry in Canada, and includes wheat, oats, barley, rye and corn. Flour, pasta, malt and livestock feed are just a few of the products that cereal crops help to make.

As the following stories illustrate, cereal crop production is not without challenges. Scientists at AAFC's research centres are on the case, developing new varieties with improved qualities, new methods of managing production and new end-uses to increase market share.

This research helps to ensure that cereal crop production in Canada is economically and environmentally sustainable, thereby renewing the competitiveness of Canadian cereal products in domestic and international markets.

DNA markers adapted for wheat breeding

Resistance against loose smut disease and the pesky wheat midge can now be bred into new wheat varieties. Scientists at the Semiarid Prairie Agricultural Research Centre (SPARC) in Swift Current, Sask., are applying DNA markers for these two troublemakers in their wheat-breeding program.

The identification and use of resistance markers is beneficial in several ways. For one thing, it means reduced development costs in both time and money for breeding new wheat varieties with the ability to withstand these two pests. In addition, tolerant plants have little need for outside help from pesticides, thus reducing the amount of chemicals being applied to the environment.

Contact: Dr. Wayne Lindwall, Director, (306) 778-7200
Field: Cereals
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Cultivar development and other genetic enhancement

Wheat varieties show resistance to *Fusarium*

When it comes to developing new wheat varieties, the trait that breeders want most is resistance to fusarium head blight. Caused by a fungus called *Fusarium graminearum*, this disease is devastating to crop yields and grain quality.

Scientists at the Eastern Cereal and Oilseed Research Centre (ECORC) in Ottawa have tracked down genes for *Fusarium* resistance in a Brazilian spring wheat variety called Frontana, and then successfully incorporated this trait into winter wheat. In subsequent collaboration with industry science partners, ECORC researchers transferred genes from this new *Fusarium*-resistant winter wheat stock into a large number of winter wheat lines, using procedures that slash the time to produce new lines by 75%. The first winter wheat line tolerant of *Fusarium* has been submitted for registration in Canada. More new varieties are expected in coming years.

Contact: Dr. Lianne Dwyer, Acting Director, (613) 759-1952
Field: Cereals
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Cultivar development and other genetic enhancement

Old wheat genes make strong dough

Strong flour makes better bread dough. Scientists at the Cereal Research Centre (CRC) in Winnipeg are working to develop varieties of wheat that can be used to make stronger flours.

CRC researchers have discovered the genetic sequence of proteins that make dough strong by analyzing Glenlea wheat, which is an especially strong variety registered in the 1970s. With this genetic information, scientists are now able to monitor the strength components of wheat at the DNA level, allowing them to breed strength into weaker wheat lines. The ability to produce strong flour is key to capturing international markets for several wheat classes.

Contact: Dr. Jim Bole, Director, (204) 983-0099
Field: Cereals
Priority: Renewal
National Program: Sustainable production systems
Theme: Cultivar development and other genetic enhancement

Oilseeds

Canada produced almost two million tonnes of vegetable oil last year, from crops like canola, soybeans, sunflowers and flax. This crop group is called oilseeds, and it is a growing contributor to the Canadian agriculture and agri-food industry.

Canola production, in particular, has more than doubled in the last 10 years and is fifth in world trade of agricultural crops. In Canada, canola accounts for more than two-thirds of oilseed production. In addition to providing a healthy source of vegetable oil for use in salad dressings, cooking oils, and margarine, canola and other oilseeds can be ground into a meal for use as a nutritional, protein-rich additive to livestock feed.

At AAFC's research centres across the country, scientists are studying ways to improve and expand oilseed production. This research will equip producers with the knowledge and tools to help them compete effectively in the global economy of modern agriculture, thereby supporting the renewal of the oilseed sector in Canada. The following stories are just a sample of the research under way.

Test shows canola seed vigour

High vigour is an ideal quality of canola seed, because it means successful germination, seedling emergence, crop establishment and, at harvest, good yields. Of course, canola growers never mean to plant low-vigour varieties. The trouble is, canola seed can be highly variable in its vigour level and, so far, vigour is not an easy characteristic to distinguish prior to planting.

Scientists at the Brandon Research Centre in Manitoba are developing a test to identify the vigour level of canola seed. Research is at the experimental stage. Scientists are now gathering seed samples to measure the reliability of this new method on a large scale. Pending success, the next step is to make the vigour test available for canola producers. Brandon is looking for industry partners to help bring an on-farm test kit to market.

Contact: Dr. Reg Kucey, Director, (204) 726-7650
Field: Oilseeds
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Crop production systems

Researchers seek to ramp up isoflavone levels in soybeans

Soybeans contain chemical compounds, called isoflavones, that are widely recognized for their potential role in the prevention and treatment of diseases such as cancer, heart disease, kidney disease and osteoporosis. But not all soybeans are rich in isoflavones, and scientists at the Greenhouse and Processing Crops Research Centre in Harrow, Ont., wonder why.

Preliminary work suggests that isoflavone content of soybeans may be affected during growth by the levels of potassium and phosphate nutrients in the soil. Scientists are working to determine the quantities of potassium and phosphate fertilization that will maximize the isoflavone content in soybeans.

Contact: Dr. Gary Whitfield, Director, (519) 738-2251
Field: Oilseeds
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Crop production systems

New canola varieties are worth their salt

Two canola varieties, Quantum and Hyola 401, have a taste for salt. Researchers at the Semiarid Prairie Agricultural Research Centre (SPARC) in Swift Current, Sask., have demonstrated that these two canola varieties grow on saline land just as well as Harrington barley does, which is the crop typically planted in salty areas.

Even at today's low canola prices, producers can realize greater revenues from growing canola on saline land instead of barley. Also, rotating barley with a canola crop will help control weeds and pests.

Contact: Dr. Wayne Lindwall, Director, (306) 778-7200
Field: Oilseeds
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Crop production systems

Forages

The benefits of forage crop production are numerous. They add diversity to crop farming and they supply grazing pastures, hay, and silage as feed for livestock. The plant cover in forage fields provides a habitat for wildlife. Also, forage crops help to protect soil health by preventing erosion and adding nutrients. Examples of forage crops include legume plants such as clover, alfalfa, and trefoil and grasses such as timothy, orchardgrass, and bromegrass.

Equally numerous are the benefits of research into forage crops. Our scientists recognize the importance of forages for cash crops, animal production and soil conservation in Canada. As such, they are devoting much attention to improving forage farming practices. Studies include development of new varieties with better nutritional qualities, improving the value of forages in crop rotations and in conservation tillage systems, and increasing efficiency of forage farming while reducing production costs and losses related to climate, pests, harvesting and storage.

The stories that follow serve as examples of how forage research at AAFC can contribute to environmental health and to the renewal of agriculture in Canada.

Bloat-reduced alfalfa seed selling well

The world's first bloat-reduced alfalfa became available for planting in the spring of 2000, and all 50 tonnes of the seed produced sold out to Canadian producers. The quantity of seed sold for the 2001 season was even greater, at 75 tonnes.

Developed by scientists at the Saskatoon and Lethbridge research centres, AC Grazeland Br is the name of this new variety of alfalfa that reduces bloat in cattle by more than 60%. Bloat is an acute digestive disorder costing the Canadian cattle industry at least $25 million a year in treatment and prevention costs. The successful sale of this new bloat-reduced variety indicates how beneficial alfalfa can be to farmers. This forage crop is rich in protein and minerals, making it a healthy choice for grazing cattle. Plus, it increases pasture yield and soil fertility.

Contact: Dr. David Wall, Acting Director, (306) 956-7211
Field: Forages
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Cultivar development and other genetic enhancement

No-till methods seed legume pastures

The stony soils in many parts of Newfoundland make it almost impossible to plow in preparation for crop planting. Luckily, plowing isn't necessary in the no-till seeding methods being perfected by scientists at the Atlantic Cool Climate Crop Research Centre in St. John's.

In a recent study, researchers at St. John's demonstrated that using no-till methods for seeding legume pastures actually results in the production of superior forage in soil too stony to plow. Herbicide was used to control existing vegetation and seed was planted with a heavy-duty commercial seeder, proving that agronomic-limiting factors can be overcome to produce a successful crop yield.

Contact: Dr. John Richards, Director, (709) 772-7474
Field: Forages
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Crop production systems

Ice storm spurred forage research

Research on forage crops that can withstand icy conditions has been a focus of the Soils and Crops Research and Development Centre in Sainte-Foy, Que., since the ice storm of January 1998 caught Canada unaware.

Freezing rain can cause the formation of an impermeable layer of ice that covers the ground and prevents the exchange of gases between plant roots and the atmosphere. Gas exchange is crucial to plant survival. Lack of oxygen, for example, creates a condition called anoxia. Researchers at Sainte-Foy have been studying forage crops like alfalfa, red clover, orchardgrass and timothy to determine their ability to withstand such anoxic conditions. By identifying those species that are best able to survive and developing improved genetic material, Sainte-Foy scientists are helping to prepare Canada in case of extreme climatic events.

Contact: Dr. Gilles Rousselle, Director, (418) 657-7985
Field: Forages
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Cultivar development and other genetic enhancement

Horticulture

The practice of horticulture is much more than just gardening. A significant part of the agriculture and agri-food industry in Canada, horticulture includes the chain of activities from planting and cultivation to storage, handling and processing, until the foods it yields end up as a safe, nutritious meal on the dinner table.

Likewise, horticulture research is more than just the study of techniques for growing fruits and veggies. This field encompasses a wide variety of crops, including vegetables, tree fruits, berries, field crops and ornamental plants, like roses, all of which have their own unique needs. As such, the topics covered by horticultural researchers are also widely varied.

In every province, Canada has experts conducting research that will help to support the renewal of the horticultural food system in this country. Projects include breeding improved crop varieties, addressing quality and storage issues, and developing new technologies for increasing the efficiency of production. Examples of this research follow.

Designer potatoes destined for fresh market

Whether they're served baked, boiled or mashed, consumer demands for fresh market potatoes are on the rise with the increasing awareness that eating fresh can have health benefits. But customers aren't as easy to please as all that—they have expectations about the characteristics a fresh market potato should have. Small-sized gourmet potatoes, for example, have been gaining in popularity.

For the first time, breeders at the Potato Research Centre (PRC) in New Brunswick are talking about custom-designing a fresh market spud that will meet specific consumer needs. PRC scientists have entered discussions with the fresh market industry and the Marketing and Industry Services Branch at Agriculture and Agri-Food Canada to determine the national scope for such a project.

Contact: Dr. Richard Butts, Director, (506) 452-3260
Field: Horticulture (Vegetables)
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Cultivar development and other genetic enhancement

Tomatoes and peppers learn to resist bad bacteria

Tomato and pepper farmers trade one copper for another when they spend their hard-earned pennies on the metal-based pesticide that protects their crops from bacterial diseases. On top of being costly and potentially tough on the environment, copper sprays are losing effectiveness as bacteria develop resistance. But without an alternative to copper-based treatments, tomato and pepper growers have few options since bacterial diseases can cause devastating crop losses.

Scientists at the Southern Crop Protection and Food Research Centre in London are testing alternative controls. Systematic acquired resistance is one such method, which triggers the plants' natural defence mechanisms to protect against infection. London scientists have found that plant resistance can be effectively activated by a compound called acibenzolar-S-methyl. Another method involves prevention, with scientists working to develop a test for identifying the presence of harmful bacteria in tomato and pepper seeds.

Contact: Dr. Gilles Saindon, Director, (519) 457-1470
Field: Horticulture (Vegetables)
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Crop production systems

Mechanical cabbage harvester to replace back-breaking labour

Cabbage harvesting is about to change for the better, thanks to a new invention being constructed by scientists at the Horticultural Research and Development Centre (HRDC) in St-Jean-sur-Richelieu, Que.

Cabbages are still harvested by hand, which represents a considerable cost for producers. That's the reason researchers at HRDC have teamed up with Univerco Hydraulique to develop and test a prototype for a mechanical cabbage harvester. Studies will include which cabbage varieties are most suitable for mechanical harvesting and the impact that mechanical harvesting has on the quality of the vegetable. If everything goes as planned, researchers hope that growers can use the machine by the summer of 2002.

Contact: Dr. Denis Demars, Director, (450) 346-4494
Field: Horticulture (Vegetables)
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Crop production systems

Beef and dairy cattle, swine and other animals

After all this talk about cereals and vegetables, it's time to move on to the meat of the matter—animal production. Our livestock research covers a number of topics, including animal welfare and behaviour, nutrition and health, breeding and genetics, pest and disease control, and manure management.

Scientists are sensitive to society's concerns about livestock production. The effects of drug treatments on food products, control of bacteria that can compromise food safety, and the impacts of livestock farming on environmental health are valid issues and worthy of scientific study. Livestock research in our labs aims to address these concerns and, at the same time, to provide workers in the livestock sector with innovations to improve production and animal care.

The information, technology and programs provided by this research will help to maintain the competitiveness and ensure the renewal of Canada's livestock industry.

Show me the bull, say prepubescent heifers

Heifer development is an important area of research for scientists at the Brandon Research Centre in Manitoba. One particular study under way involves introducing bulls to the heifers and assessing the effects this has on the establishment of female puberty and pregnancy.

Brandon scientists demonstrated that introducing sterilized bulls to heifers nearing puberty aided in the establishment of regular estrous cycles in the females. In turn, heifers with regular estrous cycles showed an 81% higher first-service pregnancy rate. On the other hand, exposing females to bulls too soon before puberty had the opposite effect, causing irregular estrous cycles and significantly lower first-service pregnancy rates.

Contact: Dr. Reg Kucey, Director, (204) 726-7650
Field: Animals (Beef cattle)
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Livestock production systems

Anaerobic exercise solves swine manure conundrum

Bad smell and pollution are two major issues when it comes to making effective use of pig poo. But a solution has been found, thanks to scientists at the Dairy and Swine Research and Development Centre in Sherbrooke, Que. They've developed an anaerobic treatment system that uses new biotechnology to deodourize and stabilize swine manure slurry.

Researchers are currently demonstrating this new technology on a large-scale commercial swine farm to prove that it is cost effective, very stable, easy to operate and does not interfere with regular farm operations. The process has the potential to contribute to the long-term sustainability of integrated farm operations.

Contact: Dr. Jacques Surprenant, Director, (819) 565-9174
Field: Animals (Swine)
Priority: Renewal
National Program: Sustainable production systems
Theme: Livestock production systems

Happy honey bees work harder

Honey bees look after farmers by pollinating hectare after hectare of crops. After their hard day's work, honey bees deserve to have someone to look after them. That task has been taken on by scientists from the Lacombe Research Centre, at Beaverlodge, Alta.

Beaverlodge researchers are developing a number of strategies for more effective honey bee care, including better colony management systems for minimizing the risks of diseases and pests, production of safe, high-quality hive products and improved wintering conditions. These measures will help bee keepers promote sustainable development of their colonies, and thereby maintain a high standard of crop pollination and bee-made products.

Contact: Dr. David Bailey, Director, (403) 782-8100
Field: Animals (Other)
Priority: Renewal
National Program: Sustainable Production Systems
Theme: Animal behaviour and welfare

Bioproducts and Bioprocesses

Diet has an impact on health, and health has an impact on quality of life. Today's consumers are aware of this link—so they have expectations about the nutritional content of the foods they eat and the manner in which it is produced.

Our bioproducts and bioprocesses research program is designed to respond to these demands. Advances in agri-food science and technology allow the improvement of a wide range of industrial, pharmaceutical and nutritional products and processes derived from crops, livestock and other biologically based sources. An example of a bioproduct is described in the following story about blueberries, while the story about flax lignan shows one example of a bioprocess.

The scientists at AAFC are developing and studying a multitude of biologically based products and processes. This field of agri-food research offers many advantages for our country. It creates economic growth by opening new markets around the world to Canadian products.

Value-added foods and nonfood products

Scientists turn grape waste into face paint

When wine is produced, the seeds, skins and stems from the grapes are left at the bottom of the vat. But this leftover gunk isn't just garbage. The scientists at the Pacific Agri-Food Research Centre in Summerland, B.C., have found a way to turn the grape waste from the wine-manufacturing process into a product of value.

Summerland researchers are using microwave technology to gather oil from the dried grape seed, which can be marketed as a nonfood product and used, for example, by large cosmetic companies in Europe. The remaining grape waste can then be processed to recover polyphenolics, which are compounds thought to be effective in reducing cardiovascular disease.

Contact: Dr. Barry Grace, Acting Director, (250) 494-6412
Field: Products and Processes (Crops)
Priority: Renewal
National Program: Bioproducts and Bioprocesses
Theme: Specialty biobased products and processes

A blueberry a day keeps the doctor away

Not only do blueberries taste great, they're good for you. Blueberries contain a variety of bioactive compounds that have health-boosting properties. The blue colour of the fruit comes from anthocyanins, for example, which are powerful antioxidants believed to protect against cancer, cardiovascular disease and other illnesses.

Scientists at the Atlantic Food and Horticulture Research Centre in Kentville, N.S., are studying the bioactive ingredients of blueberries in collaboration with three different research teams, working on neurology, cardiac function and cancer. This project should help to establish a true life-sciences link between agricultural research and practical application of principles in medicine.

Contact: Dr. Wade Johnson, Director, (902) 679-5700
Field: Products and Processes (Crops)
Priority: Renewal
National Program: Bioproducts and Bioprocesses
Theme: Specialty biobased products and processes

Flax lignan has practical health benefits

Flaxseed contains a health-boosting, disease-preventing compound called flax lignan, and scientists from the Saskatoon Research Centre (SRC) have developed the technology for extracting and purifying this compound.

Flax lignan is believed to be helpful in the fight against heart disease, cancer, and kidney disease. Saskatoon researchers have teamed up with medical research scientists, and together the group is working to discover potential uses for flax lignan. Already, the team has licensed the technology to an agricultural processing company that will produce and market a flax lignan complex for use in functional foods, nutraceuticals, pharmaceuticals, animal feed additives and veterinary products.

Contact: Dr. David Wall, Acting Director, (306) 956-7211
Field: Products and Processes (Crops)
Priority: Renewal
National Program: Bioproducts and Bioprocesses
Theme: Specialty biobased products and processes

New use could rehabilitate tobacco

Tobacco dependence is about to take on new meaning as the potential health benefits of using this crop for molecular farming are becoming apparent. Most recently, scientists at the Southern Crop Protection and Food Research Centre in London succeeded in breeding and growing tobacco plants that contain interleukin-10. This compound is used to help treat the intestinal debilitation of Crohn's disease. Researchers are already testing interleukin-10 on animals, with encouraging results.

Molecular farming is the production of valuable proteins using plants, animals and cell cultures. Tobacco is an ideal plant for molecular farming. Proteins are produced in its leaves, so flowering is not a requirement. And because it has no close wild relatives in Canada to which it could pass on genes, it is easily contained in an agricultural setting. Also, no one eats it.

Contact: Dr. Gilles Saindon, Director, (519) 457-1470
Field: Products and Processes (Nonfood)
Priority: Renewal
National Program: Bioproducts and Bioprocesses
Theme: Specialty biobased products and processes

Food Safety and Quality

Above all else, food must be safe to eat. Our scientists across the country are making sure of this, with research aimed at ensuring food safety while optimising quality. Food safety and quality come into play at every level of the food production chain—on the farm, during storage and distribution, at the processing plant. At the farm level, for example, researchers are looking into alternatives for antibiotic treatments. An example at the processing level is the improvement of sterilization and preservation techniques.

The benefits of food safety and quality research should not be underestimated. First and foremost, the health and wellness of the Canadian people depends, in large part, on a reliable supply of safe, high-quality foods, whether fresh or processed. Economically, the use of scientific research to develop and implement cost-effective and technologically advanced food processing systems will promote Canada as the world leader in food safety and quality, thus giving the country's agri-food sector a competitive edge in the global food trade.

The stories that follow show how our research helps to support food safety and regulations, develop improved new products and processes, and meet consumer preferences and nutritional needs.

Meat, dairy and processed foods

New blueberry juice pours into the marketplace

With all the health-enhancing compounds that blueberries contain, it was only a matter of time before scientists at the Atlantic Food and Horticulture Research Centre in Kentville, N.S., teamed up with the production industry to develop a marketable blueberry juice. That time is now here.

It's been no simple task to make a drink that's both tasty and has a stable storage life, but researchers have come up with a product that is now being marketed with considerable success.

Contact: Dr. Wade Johnson, Director, (902) 679-5700
Field: Product and Processes (Crops)
Priority: Food Safety and Quality
National Program: Food Safety and Quality
Theme: Improved and new products and processes

Warm water better for washing lettuce

The development of technology to improve sanitation methods for ready-to-eat vegetables is an on-going area of study for scientists at the Pacific Agri-Food Research Centre (PARC) in British Columbia. The vegetable currently receiving their attention is iceberg lettuce.

Chlorinated cold water washes is the typical method to clean lettuce and to reduce the number of contaminating micro-organisms before packaging. Recent research at PARC has shown that warming the chlorinated water to between 47 and 50°C greatly improves the antimicrobial effect. Furthermore, lettuce sanitized with warm water shows reduced browning and better retains its eating quality after being packaged and stored. PARC researchers will soon begin commercial trials of this new process.

Contact: Dr. Barry Grace, Acting Director, (250) 494-6412
Field: Products and Processes (Crops)
Priority: Food Safety and Quality
National Program: Food Safety and Quality
Theme: Knowledge and tools supporting food safety and regulations

Probiotic bacteria help control pathogens

Hello bifidobacteria, goodbye *E. coli* and *Salmonella*. Scientists at the Food Research Program in Guelph are investigating the use of helpful bacteria, called probiotics, to control dangerous micro-organisms. Bifidobacteria are one variety of probiotic that have caught their attention.

In one study, Guelph researchers found that bifidobacteria help to protect against the harmful effects of *E. coli* in the human intestine. Other studies involve supplementing the diet of chickens with probiotics to prevent the colonization of *Salmonella*. Researchers are continuing to analyze the data from these studies to better understand the potential of probiotic bacteria as a treatment technique. Bifidobacteria are found in some commercial yogurts and kefirs.

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Field: Products and Processes (Nonfood)
Priority: Food Safety and Quality
National Program: Food Safety and Quality
Theme: Knowledge and tools supporting food safety and regulations

Canadian pork gets the thumbs up

Canadian pork breeders are able to breathe a sigh of relief following completion of a study that shows their pigs don't carry a costly genetic mutation.

Scientists at the Food Research and Development Centre in Saint-Hyacinthe, Que., recently concluded that the main pure breeds used for swine selection in Canada are free from a mutation of the RN gene. Swine that carry the defective RN gene produce poor quality pork, which results in significant industry losses of about $14 for each hog carrying the gene. These results will strengthen Canada's reputation as a reliable supplier of quality pork in local and international markets.

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Field: Products and Processes (Animal)
Priority: Food Safety and Quality
National Program: Food Safety and Quality
Theme: Meeting consumer preferences and nutritional needs

A Final Word

Spotlight on Research contains just a sampling of the research achievements from 2001–2002. A comprehensive report can be found on our web site at www.agr.gc.ca/science/research-recherche/ann-dir/. There, you can also find links to our centres to gain a fuller understanding of our research programs. For a complete list of centre directors and how to reach them, please see page 36.

Reaching AAFC's research centres

Find out more about us by visiting our homepage on the Internet at ***www.agr.gc.ca/science*** *or contact us directly at ....*

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