



Innovation keeps Ontario's biggest crop growing

RESEARCH IS VITAL TO A HEALTHY ECONOMY. ONTARIO'S agri-food industry — the largest in Canada — thrives on research, which is underlined by advances in the development of soybeans. Over the last decade, this oilseed has grown to become Ontario's largest cash crop, covering more than two million acres and yielding more than two million tonnes at harvest. Its impact is felt year after year, in the province's rural and industrial economies.

Determined research efforts by both the public and private sectors have resulted in the creation of varieties that the industry can count on for performance. Soybeans are renowned for their versatility, producing products ranging from crayons to hand cleaners to flooring and even shampoo.

They're highly touted for their potential. Soybeans' high levels of isoflavones have been linked to reduced risk of cardiovascular disease and some forms of cancer. They've become a staple in the rapidly expanding soy-based food market. Considerable evidence shows soy protein reduces the risk of cardiovascular disease, the number one killer of adults.

That potential is creating excitement in the research community. And as synergy between industry, government and academia grows, so do the innovative efforts to identify and capitalize on lucrative new markets for soybeans.

Public breeding programs, such as the one at the University of Guelph, have played a critical role in the cultivation and evolution of soy from a niche market crop to a major commodity. The concentrated efforts of public breeding programs facilitate the development of varieties specifically suited to Ontario's geographic regions.

Most notable is OAC Bayfield. Ten years

ago, the University of Guelph soybean-breeding program — sponsored by the Ontario Ministry of Agriculture and Food — released OAC Bayfield to the agri-food industry. It was a high performer, and attracted the interest of SeCan, a conduit to seed breeders who propagate the seed and make it available to dealers and farmers.

OAC Bayfield now stands as the most successful soybean variety in Ontario, consistently outperforming other varieties and remaining a contender for 10 consecutive years,

about five times longer than most new soybean varieties. As much as 20 per cent of Ontario's soy acres grew OAC Bayfield during the 1990s, a feat unlikely to be duplicated.

Outstanding varieties continue to emerge from OAC Bayfield parentage including OAC Kent, OAC Exeter and, OAC Wallace. Given OAC Bayfield's unprecedented performance, the lion's share of this issue of *Focus* is dedicated to it.

Soy's untapped potential has sparked a number of collaborative initiatives at Guelph that seek new and innovative uses for soy. For example, a program called Soy 20/20 is taking the lead in adding \$24 million annually to Canadian farmers' profits by the year 2020, by seeking out new value-added markets for soybeans. Guelph's plant breeding initiative has spawned better varieties of soy, capable of handling Ontario's cool summer nights, while displaying improved lodging resistance, and increased yields.

Those opportunities are likely to increase as the Ontario Soybean Growers moves its headquarters to Guelph this year and becomes an integrated part of the Guelph life science community. Here, partnerships will continue to grow, fostering further innovation and development.

Soy's untapped potential has sparked new collaborative initiatives at Guelph.

Top>> Plant agriculture professor Istvan Rajcan and PhD candidate Guangyun Hou conduct soybean research at the Elora Research Station. *Centre*>> A soybean reaching maturity. *Bottom*>> OAC Kent is a descendent of OAC Bayfield and one of the leading food grade soybean varieties in Ontario.



Top left>> Ontario Soybean Growers General Manger Wendy Jahn congratulates the University of Guelph at the OAC Bayfield 10th anniversary event.

Bottom left>> (From left) Wally Beversdorf, Vice-President of Syngenta Plant Science and co-developer of OAC Bayfield, U of G Plant Agriculture Prof. Clarence Swanton and Martin Harry of SeCan recognize OAC Bayfield's success in the field.

Hats off to OAC Bayfield

OAC Bayfield – The Producers' Choice

OAC Bayfield is a favourite among producers because it meets important criteria such as:

- High yield (consistent production)
- Familiarity (proven performance record)
- Low risk (strong disease resistance)
- Adaptability (thrives in various growing conditions)
- Availability (abundant seed supply at competitive prices)

Happy Anniversary OAC Bayfield!

OAC Bayfield was honoured for 10 outstanding years in the field at a recognition ceremony hosted by the University of Guelph. The event, held at the University's Arboretum Centre, celebrated the achievements of public plant breeding programs and recognized the contribution of government, industry and academic partners. Government and industry representatives and students attended the celebration as well as one of the original developers of the bean, Wally Beversdorf.

Research | Focus on Soybeans

UNIVERSITY OF GUELPH PLANT BREEDERS MADE history 10 years ago when they developed OAC Bayfield, a high-yielding soybean variety that's had a dramatic impact on Ontario's soybean industry. Today, OAC Bayfield is still favoured by producers and is providing the genetic foundation for future leading varieties.

Developed in 1985 by now retired U of G plant agriculture professor Jack Tanner, and former crop science professor Wally Beversdorf (now Vice-President of Syngenta Plant Science in Switzerland), OAC Bayfield was commercially released to growers in 1994 through SeCan, an organization that propagates the seed and makes it available to dealers and farmers. Its consistently high yields quickly catapulted it to preferred status among farmers and it has remained a leader in the field ever since.

"Soybean varieties often thrive for two- to three years," says Ontario Soybean Growers General Manager Wendy Jahn. "But OAC Bayfield continues to perform exceedingly well even 10 years down the road. This is a significant accomplishment given the ongoing advancements in technology and genetics and increasing competition."

According to Jahn, the secret of OAC Bayfield's 10-year reign in the field is due to

its consistently high yield and good agronomic factors. Its status as a conventional variety crop also places it high on the European-export demand list.

OAC Bayfield reached its peak in 1998 with 400,000 acres being grown in Ontario, representing approximately 20 per cent of total soybean acreage that year, the largest acreage ever for a single soybean variety in Ontario. The variety is so versatile that it can be grown successfully in a variety of regions, from the Ottawa Valley to the shores of Lake Huron.

Over the past 10 years, OAC Bayfield has contributed more than \$750 million to Ontario's economy. Through partnership with SeCan, the University of Guelph has also received approximately \$1 million in seed royalties, which has been re-invested in research.

There's evidence that OAC Bayfield's legacy will continue to live on. University of Guelph plant breeders have been successfully using OAC Bayfield genetics to develop new and superior bean varieties, such as OAC Kent, OAC Exeter, and the new kid on the block, OAC Wallace...which finally knocked OAC Bayfield out of the top position in the 2004 [04] Ontario Soybean variety trials.



Min Seok Chae and Vincent Sy have developed a soy-based feed for tropical fish that provides the same nutritional assets as commercial feed. Their efforts won them first place and a prize of \$2,500 in Project SOY.

From the field to the pharmacy

Human health benefits accrue from more Vitamin E

ENHANCED VITAMIN E CONTENT IN SOYBEANS could increase the potential for nutraceutical applications and add value to the already-versatile crop.

University of Guelph Prof. Istvan Rajcan, Department of Plant Agriculture, is studying ways to raise the levels of tocopherols — known as Vitamin E — through genetics.

“The genetics of tocopherols have never been studied in soybeans,” says Rajcan. “Once we determine the number of genes that are involved we need to develop a strategy to incorporate those genes into another variety.”

Tocopherols help prevent tissue damage from stress and aging. As well, their antioxidant

properties contribute to oil stability and shelf life, so Rajcan’s research will benefit the oil crushing industry, too.

A challenge facing the research team is identifying ways to include Vitamin E genes without compromising valuable traits such as high yield and resistance to disease.

Rajcan hopes a soybean variety with increased Vitamin E levels will be available to farmers in five years.

“This is one of the most exciting research projects that we’ve worked on,” says Rajcan. “We are hoping that the added profit for nutraceutical and oil applications will trickle back to the farmers.”

Windfall predicted for soybean producers

A \$24-million-a-year windfall is predicted for Canadian farmers by 2020, thanks to value-added opportunities and new markets for soybeans. It’s being driven by a convergence of Guelph-based soybean-related business, government and academia called Soy 20/20, a joint venture between the Ontario Soybean Growers, the University of Guelph, Agriculture and Agri-Food Canada and the Ontario Ministry of Agriculture and Food. The objective is to focus on research and development of innovative markets for Canadian soybeans, such as domestic use of soy protein in food, fuels and materials.



First Line Seeds President Peter Hannam worked closely with former Project SOY co-ordinator Erinn White, who was also a contestant in 1999/2000, to oversee the innovation competition.

Student innovation yields big results with Project SOY

A soy-savvy contest at the University of Guelph is tapping into the creative energies of students to develop new products and marketing strategies for soybeans.

Project SOY (Soybean Opportunities for Youth) is an annual contest launched in 1996 to increase public awareness about Ontario’s soybean industry, and to help the industry identify new and innovative uses for the lucrative bean. The competition sees students working with faculty mentors to develop their ideas, and allows participants to showcase their ingenuity and gain practical research experience.

Past winning entries have included soy udder balm, edible packaging and coffee-like beverages. The competition is open to all University of Guelph students, and there are cash rewards for the top three entries in two categories — diploma and undergraduate/graduate degree.

Project SOY is sponsored by First Line Seeds, Agriculture and Agri-Food Canada, Maple Leaf Foods International, Ontario Ministry of Agriculture and Food, Ontario Soybean Growers and the University of Guelph. For more information about Project SOY visit, <http://www.uoguelph.ca/research/projectsoy/>.

Using their beans

Soybean utilization fund drives innovative research

EFFORTS TO MAXIMIZE SOYBEANS' POTENTIAL HAVE sparked a variety of innovative research projects at the University of Guelph. Support for these initiatives is provided by a unique \$1-million fund that promotes the development of new and efficient uses for soy.

The Hannam Soybean Utilization Fund (HSUF) was created in 2000 from a gift from the Hannam family of Guelph. Peter Hannam, Director of First Line Seeds and OAC alumnus says the fund's goal is to encourage researchers to explore novel uses of soy that could benefit the industry.

"The versatility of soybeans amazes me and it is rewarding to support U of G's faculty and students in their pursuit of soybean innovation," says Hannam.

The HSUF is used to award four annual research grants for advanced soybean research. The fund is administered by a 10-member advisory board chaired by the OAC dean. U of G faculty from the Departments of Food Science and Plant Agriculture, the School of Engineering and the Office of Research sit on

the board as well as industry professionals.

The inaugural recipients, awarded in 2001, were U of G Profs. Bruce Holub, Human Biology and Nutritional Sciences, Peter Pauls, Plant Agriculture and Kemptville College faculty members Allen Hills and Dean Donaldson.

Holub is studying the therapeutic effects of soyasaponin B — a component found in soybeans — which may be helpful in treating polycystic kidney disease. Pauls is conducting research to develop soybean varieties with a less "beany" taste for soymilk. Hills and Donaldson are studying marketing strategies for soy bio-diesel fuel, an organic renewable alternative to fossil fuels.

Food Science Prof. Rickey Yada, a member of the HSUF advisory board, says we need to look at the soybean as a value-added product rather than a commodity.

"Those willing to be creative and take risks, like Peter Hannam, will help take soy research to the next level," says Yada. "And the HSUF will help provide that extra push."

Tastier soymilk gets closer to marketplace

TASTE AND PALATABILITY REMAINS A BARRIER BETWEEN soybeans and consumers, but researchers are working to make inroads into the food-grade market.

Microbiologists and plant breeding experts at the University of Guelph are joining forces to reduce the "beany" taste in products made from soy. Specifically, they're working to reduce linolenic acid and lipoxygenase components — a decomposing enzyme present in soy oil and protein that produces off flavours — that are prone to oxidation and cause a distinctly "beany" flavour.

To decrease the levels of these detrimental components, researchers are combining desirable varieties (which are low in these

components) into a germplasm for breeders to use as a foundation for new varieties.

"This research will help put together desirable soybean characteristics that will promote soy-based food production without having to hide the taste," says U of G plant agriculture Prof. Peter Pauls, project leader.

This research is funded by the Hannam Soybean Utilization Fund and the Ontario Soybean Growers. Collaborators include Vaino Poysa and Kangfu Yu of Agriculture and Agri-Food Canada, U of G plant agriculture prof. Istvan Rajcan, Gary Ablett of Ridgeway College, and graduate students Yarmilla Reinprecht and Shun Y'an Luk.

Other HSUF-awarded projects:

Peter Purslow and Massimo Marcone, *Department of Food Science*
Using soy protein isolates to develop a controlled-released delivery system for pharmaceuticals and herbicides.

Eugene Mohareb, *School of Engineering*
Developing a biodegradable soy-based replacement for polystyrene in food packaging. This could help reduce the amount of petroleum products required by the food industry, which contributes about one-third of all landfill waste.

Milena Corredig and Douglas Dalgleish, *Department of Food Science*
Studying new methods of introducing soy protein into dairy foods to maximize the health benefits of soy.



Milena Corredig

Dominique Bureau, *Department of Animal and Poultry Science*
Developing soy-based fish food for rainbow trout. Soy is low in environment-damaging phosphorus, and increasing the soy that fish eat could result in less phosphorus being excreted, helping preserve their habitat.

Ralph Brown, *School of Engineering*, and Robert Peden of *UPI, Inc. Guelph*
Developing soy-derived biodiesel — a renewable resource with fewer pollution effects than normal diesel — for home heating.

Yukio Kakuda and Amy Proulx, *Department of Food Science*
Utilizing soy as an inexpensive source of heme iron (a form of iron easily absorbed by humans but available predominantly through animal products) to create iron supplements.