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FALL 2014
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Government, industry and University of Guelph partners ensure that Ontario farmers have the new plant varieties they need to remain competitive. Shown here are **Joanna Follings**, OMAFRA research analyst in Plant Production; **Quentin Martin** of Cribit Seeds; **Prof. Ali Navabi**, cereals breeder in the University's Department of Plant Agriculture; and **Jeff Reid**, general manager of SeCan. PHOTO: MARTIN SCHWALBE

Seeds of success

Many of Ontario agriculture's most enduring and important plant and crop varieties stem from the partnership between the University of Guelph, government, industry and farmers

Germplasm developed at the University of Guelph generates nearly $650 million annually in economic impact

Plant breeding at the University of Guelph is steeped in tradition, going back more than a century to the earliest days of the Ontario Agricultural College. Breeders in the Department of Plant Agriculture work in their labs and at research stations, supported through the partnership with the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and industry, to bring new varieties to market to meet producer and consumer demands.

But all the work pays dividends for breeders and impacts farmers, processors and consumers alike. Seed sales from plant varieties developed at the University are made available to industry through a number of licensees, including SeCan, and amount to more than $18 million a year. Royalties from those sales are returned to inventors and partners such as OMAFRA. The ministry re-invests those royalties into furthering research and development.

And when the crops grown from those seeds are processed, the economic impact is nearly $650 million annually in products and employment.

Plant breeders work with industry and government partners to develop new varieties to help farmers meet domestic and global demand. New varieties are better and have added value because they combine the best traits of established varieties and novel traits from sources such as seed banks. This efficient, well-developed plant breeding system provides a vital service throughout the agri-food value chain.

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CHANGING LIVES IMPROVING LIFE

The "granddad of malting barley" goes back more than a century
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Guelph-bred Yukon Gold potatoes now a household name
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OAC Bayfield: Ontario's most successful soybean ever
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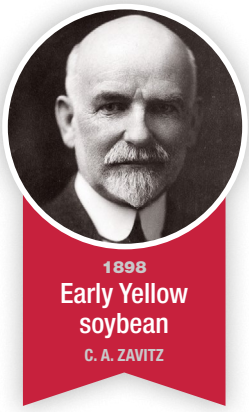
Through 12 decades, highlights from 500-plus plant varieties developed at Guelph

Early yellow soybean (1898)

Prof. Charles Zavitz began investigating soybeans in the early 1890s when their cultivation was virtually nonexistent in Canada. After rigorous experimentation with Japanese soybean lines, Zavitz narrowed down his selections to a few varieties well-suited to grow in Ontario. The most promising was the yellow variety.

The early yellow soybean was officially released by OAC in 1898 and set the standard for future advancements in soybean breeding. It also helped carve out the role that the University of Guelph continues playing in plant breeding, driving the agricultural industry forward.



Successive selections from crosses using the early yellow soybean have facilitated the transition of soybeans to an oilseed crop, leading to the emergence of Ontario's soybean seed industry.

OAC 21 barley (1910)

Canadian breweries have a major competitive advantage in both domestic and international markets for beer and whisky production, thanks to a supply of high-quality malting barley.

That supply began in earnest with OAC 21 barley, selected in 1910 by Prof. Charles Zavitz. Production expanded to western Canada, as well as abroad, and OAC 21 became popularly known as the "grandad of malting barley."

Most modern Canadian malting barley varieties—now standing at more than 90 in total—can be traced back to OAC 21. It possessed superior characteristics in terms of yield and malting quality, making it an ideal variety for farmers and brewers alike. Following its release, it soon became the principal variety grown in the province and was used in production for more than 50 years.

Victor sweet cherry (1925)

A major objective for cherry breeders is to develop cultivars with a range of maturities in the hope of prolonging the growing season and enhancing production.

The tree-fruit program at the Vineland Research Station made significant contributions to fruit breeding as part of the Horticultural Research Institute of Ontario before becoming part of the University in 1997. The Victor sweet cherry was the first tree fruit variety released. The mid-season cultivar was selected by breeder George Dickson in 1925.

Victor outperformed the standard cherries used in test orchards and was well suited to Ontario's climate and markets. In the years since and in partnership with the University of Guelph, Vineland has gone on to release 13 sweet cherry cultivars. The U of G - Vineland program has brought, in total, more than 150 new varieties of fruits, vegetables and ornamental plants to Ontario.

Canon Canada bluegrass (1944)

A pioneer turfgrass species, Canon was selected in 1944 by Prof. Oswald Murray McConkey of the Ontario Agricultural College for its leafiness and disease resistance. McConkey selected Canon from a large number of domestic and foreign varieties, and the breeder seeds were officially distributed in 1965.

Canon was largely self-pollinating and established itself earlier than other bluegrass species in terms of spring growth, flowering and maturity. Moreover, it offered excellent cold tolerance, making it highly suited for many North American climates.

Canon yielded more than the commercial standard at the time and enjoyed a long life in the marketplace. Commercial agreements ensured 60 years of success following its introduction.

L'Acadie blanc wine grape (1953)

L'Acadie blanc is a rich, full-bodied white wine and is considered Nova Scotia's equivalent to Chardonnay. But Ontario grape breeders should also get a nod when anyone toasts this product.

The grape behind it was a complex hybrid selected in 1953 by Oliver A. Bradt at the Horticultural Research Institute of Ontario in Vineland. The grape was superior to its predecessors in disease resistance and cold tolerance. L'Acadie has continued to flourish in the cool climates of Eastern Canada and remains a signature wine-grape variety today.

Bradt was the grape specialist at Vineland from 1938–1980. He helped to develop the cultural practices of production that made these new varieties so responsive to challenging environmental conditions. Close ties between the University's wine lab and Vineland's new variety trials have cultivated a number of improved grape varieties for winemaking in Ontario and beyond.

Maitland trefoil (1969)

Trefoil is a long-lived perennial legume that provides pasture greens with high-quality nutritional value and offers greater opportunities for summer production when grass growth slumps.

But trefoil can be slow to establish. So in the late 1960s, researchers at Guelph sought to produce faster-establishing seed that would be superior in seedling vigour, forage yield, and hardiness.

In 1969, Prof. Bruce Twamley of the Ontario Agricultural College selected Maitland trefoil for its improved seeding vigour and yields. Maitland is an erect, hay-type variety that can tolerate rotational grazing. The variety proved to be highly suited to Ontario's warm summers, and it helped expand the use of trefoil in long-term pastures.

The University of Guelph maintained basic stocks of Maitland until 1970, when the Seed Multiplication Division of the Canadian Seed Trade Association assumed responsibility.

Bruce barley (1978)

Bruce barley was developed primarily because farmers wanted a variety that would mature earlier and extend their growing season. As well, Bruce barley offered improved lodging and disease resistence. It is considered one of Guelph's most successful germplasms.

The efforts of Prof. Ernie Reinbergs of the Department of Crop Science have revolutionized traditional plant breeding methods in barley. Reinbergs selected this non-malting, mid-season cultivar. Bruce barley eventually became the first variety licensed for sale through SeCan Association. It was officially released in 1978 for further propagation and distribution.

Reinbergs' contributions have helped to streamline the selection of pure-breeding barley lines. Today, barley breeders are able to develop novel varieties faster thanks largely to Reinbergs' work. Improvements he made in biotechnology allow desired genes to be expressed in optimal combinations to suit individual farmers.

Yukon Gold potato (1980)

Now a household name across Canada and the United States, the Yukon Gold potato began its legacy in Guelph. It is the most recognized plant variety developed through the University of Guelph's breeding programs, when it comes to commercial success and longevity.

Developing yellow-fleshed potato varieties that would prosper in North American soil was a challenging task. Gary Johnston of Agriculture and Agri-Food Canada held the position of potato breeder at the University when in 1980, after years of experimentation, he crossbred a typical white North American potato with a wild, yellow variety from South America. The result was the Yukon Gold.

Domestically and internationally, the Yukon Gold experienced a steady increase in popularity. Many potato breeders still use the Yukon Gold as a standard for developing yellow-fleshed varieties.

OAC Bayfield soybean (1993)

Guelph's public soybean-breeding program has played a critical role in the cultivation and evolution of soy from a niche market crop to a major commodity.

The key variety was OAC Bayfield, developed in 1985 by Profs. Jack Tanner and Wallace Beversdorf. It thrived for more than 20 years and now stands as the most successful soybean variety in Ontario.

Because of its superior seed quality and slightly higher-than-average protein content, OAC Bayfield also offered a solid genetic foundation for future leading varieties. OAC Wallace, OAC Champion and OAC Kent all had OAC Bayfield as a parent.

1993
OAC Bayfield soybean
WALLACE BEVERSDORF

OAC Bayfield has contributed more than $750 million to Ontario's economy. Through partnership with SeCan, the University of Guelph has also received seed royalties of about $1 million, which has been re-invested in further research and development.

Guelph Millennium asparagus (1995)

Asparagus stalks can grow up to six inches in a single day, but it can take plant breeders up to 10 years to develop new varieties with such capabilities. University of Guelph professor Dave Wolyn of the Department of Plant Agriculture found a winning formula with Guelph Millennium asparagus.

Guelph Millennium is recognized widely for its sustained high yields and adaptation to Canadian growing conditions. The variety gives its producers an edge, as it accounts for more than three-quarters of the Ontario market.

Guelph Millennium has also gained popularity for traits Wolyn didn't initially select for. For example, it thrives in heavier soils, allowing producers to expand into land that was previously unsuitable for asparagus, avoiding the need to replant in exhausted soil.

This cool-climate asparagus has also become popular with producers as far away as Michigan, Washington State, and the United Kingdom.

OAC Rex white bean (2000)

Bacterial blight is one of the most common diseases for beans and affects both yield and quality. OAC Rex addresses those issues as the first white bean variety in Canada to express resistance to this disease.

This white-seeded bean was developed by Prof. Tom Michaels and technician Tom Smith. They used international genetic resources and innovative germplasm recovery techniques to transfer resistance genes from a wild gene relative and ensure high yields in both wide- and narrow-row production across Ontario.

OAC Rex has consistently out-yielded other common bean varieties. Its distinct plant architecture keeps its pods higher off the ground, making the variety more suitable for direct combining. It enjoyed strong market penetration only a few years following its introduction. OAC Rex has the distinction of being the first Canadian bean to have its entire genome sequenced. Prof. Peter Pauls of the Department of Plant Agriculture is investigating the bean's unique genetic background and providing insights into the value of genetic diversity in plant breeding.

2000
OAC Rex white bean
TOM MICHAELS AND TOM SMITH

DH 410 soybean (2004)

DH 410 is a high-yielding, yellow hilum soybean that has proven to be excellent for the production of soy food products. It has created a diverse value chain for Ontario growers and exporters, as well as multiple end users in Japan.

Dr. Gary Ablett and research technician Dennis Fischer at Ridgetown campus selected DH 410 in 2000. Its commercial success has mainly been due to its resistance to the soybean cyst nematode (SCN), recognized as a serious pest and a threat to soybean yields in southern Ontario. Guelph's soybean breeding program has aimed to introduce the SCN-resistance trait to all its lines, but the focus has been on food-grade soybeans in particular, such as DH 410.

DH 410's high levels of SCN resistance and protein content and its wide maturity range have provided major benefits for growers in eastern and southwestern Ontario. Its superior processing qualities for natto, tofu and soymilk products have contributed to its success in Japan.

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Published by the Office of Research, University Centre, University of Guelph, Guelph ON N1G 2W1
Phone: 519-824-4120, Ext. 53781
Compiled by Alexandra Sawatzky, SPARK · Editorial Coordination: Erin Skimson, Owen Roberts, Liz Snyder and Jason Tran
Project advisors and graphics support: Profs. Stephen Bowley and Peter Pauls
Photos: C. A. Zavitz courtesy of Archival and Special Collections, University of Guelph Library
L'Acadie Vineyards Nova Scotia by Gavin Langille
Design and Layout: Gareth Lind, LINDdesign.ca · Printed by Ampersand Printing, November, 2014