

Game-Changing Solutions for Agriculture

Ontario Genomics is driving innovation to solve agricultural challenges and bolster economic growth.

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Canada's agriculture and agri-food sector is strong and growing. However, the challenges the sector is faced with are also growing. Climate change, rising costs, increasing global competition, and international trade deals such as the United States-Mexico-Canada Agreement (USMCA), demand innovation to help make the industry more efficient and competitive.

Ontario Genomics has risen to the challenge. By connecting scientists and partner organizations to collaboratively develop and apply genomics-based solutions for industry-identified challenges, new technologies are beginning to revolutionize the sector.

"Advancements in genomics can provide game-changing, sustainable solutions for farmers now, and into the future. For example, the dairy industry was one of the first to introduce genomics selection, which has enabled the industry to triple milk production over the last decade," says Dr. Bettina Hamelin, President and CEO of Ontario Genomics. "By using genomics in breeding efforts, we can also reduce pesticides and fungicides in growing plants and the use of antibiotics in livestock."



More choice, more flavour

Tomatoes are Canada's biggest fresh vegetable export, generating more than half a billion dollars in annual farm gate sales. Rising production costs and increased competition are putting pressure on Canadian producers to innovate in order to offer a differentiated product that will give them a competitive edge. With the support of Ontario Genomics, work is underway at Vineland Research and Innovation Centre to address these challenges.

"Rather than pursuing one trait after another like a bigger or tastier tomato, and then wait for the next generation of plants to introduce a more disease-resistant tomato, genomics tools allow us to enhance multiple traits at the same time," says Dr. Hamelin. "Accelerating how we introduce these desirable traits has a huge impact on agricultural economic development."

The payoff for the agri-food industry goes farther than the variety offered on supermarket shelves. "Growers also get paid for yield so they should see a bump in marketable production while spending less on disease control because of improved disease resistance," says Dr. Daryl J. Somers, Director of Applied Genomics at Vineland Research and Innovation Centre.



Higher, more efficient crop yields

The canola industry accounts for nearly a third of the gross production value of all Canadian crops, generating \$19.3 billion and nearly 250,000 jobs across Canada. The industry has set a goal of increasing yield by 53 percent in the next 10 years. Traditional breeding techniques are not sufficient to meet this goal; new technologies are needed. Through an Ontario Genomics partnership program, Saturn Agrosiences, a subsidiary of Benson Hill Biosystems, has teamed up with researchers at the University of Guelph to help meet the challenge by producing game-changing varieties of canola that benefit farmers and consumers. Having identified the genetic links to desirable traits, the team is using Benson Hill's CropOS cloud computing platform to develop higher-yielding plants with increased photosynthetic efficiency, enhanced nutritional profiles and healthier oil content. These innovations will significantly increase crop yields and carbon capture, and reduce greenhouse gas emissions.

"There's often plenty of fuel there, so if you can make the process more efficient using the machinery that's already in the plant, then, ideally, the grower can produce more with less, without having to use extra water and fertilizer," says Matthew Crisp, CEO of Benson Hill Biosystems. "We're seeing terrific results strongly suggesting that an increase in photosynthetic efficiency and capacity is actually giving us more productivity and a more sustainable crop. We're excited to discover what other plants might show similar outcomes."

Projects like these underline the enormous opportunity genomics can provide for the sector as findings can be applied to many other plants and field crops. In addition to benefiting farmers and suppliers, genomics innovations are contributing

to the creation of new jobs, healthier foods and a much more sustainable, globally competitive agricultural sector for Ontario — and we have only begun to scratch the surface.

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