

Blocking innovation: How Canada's novel plant-breeding rules hinder progress in food production

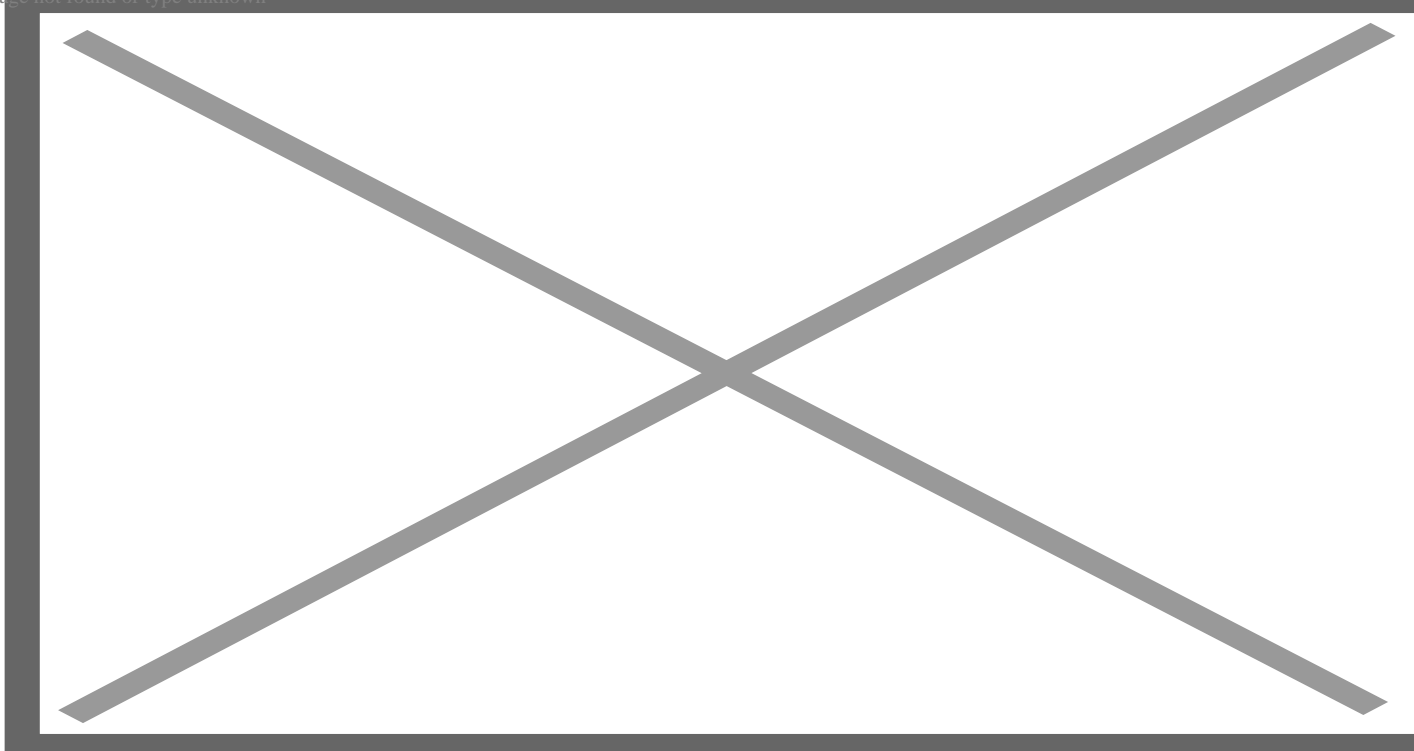


ou've heard it before on SAIFood: Canada's plant breeding sector is facing [regulatory barriers](#) to innovation. Today's blog provides further evidence.

Why are plant breeding and crop regulations important for Canadians?

Canada is a large nation with its agricultural land comprised of different eco-zones based on soil, terrain and climate. We have hundreds of crop varieties that are capable of being grown across the country, and others that are regionally specific. Wheat and barley are grown from coast to coast, but our orchard crops are most commonly found in specific climates, like those in the Okanagan, Niagara and Maritime regions. Ontario and Quebec have historically been leading corn and soy producers, yet new varieties of both crops have witnessed production increases in the prairie provinces in the past few decades.

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Niagara vineyard. Credit: Elenathewise/Fotolia

So what does this have to do with you? As Canadian's, we benefit from crop production. As the climate changes, Canada needs to ensure that production levels remain high and innovative new crop varieties will be required to achieve this. To ensure this occurs, Canada's regulatory system needs to reflect current scientific techniques. In 2016, the agriculture and food system [accounted for 6.7% of Canada's GDP](#), with one in eight jobs being in the agriculture sector. This is partially possible due to plant breeders, who

provide excellent crop, fruit and vegetable varieties so that farm production provides the inputs for Canada's food and agricultural processing. Canadian plant breeders work hard to offer gains for yield increases, environmental sustainability, improved nutrition, and industrial demands. All of this benefits the Canadian economy. However, after having a regulatory system that has changed little since first implemented 25 years ago, are regulations creating barriers to capturing the full benefit potentially from plant breeding programs?

Canadian plant breeders familiarity with the regulations

In 2018, CropLife Canada commissioned research from Dr. Stuart Smyth & the team (me included) to survey Canada's plant breeders on the technologies used to develop new varieties, familiarity with regulation, and views on commercialization processes. In total, 430 plant breeders were identified in Canada and invited to participate of which, 93 completed our survey (22% response rate). Of the responses, 42% identified as private sector breeders and 58% from the public sector, with three-quarters having more than 10 years of experience. In a 2020 [Frontiers in Genome Editing article](#) our team assessed whether Canadian plant breeders viewed the regulatory framework for plants with novel traits (PNTs) as a barrier to innovation. The first thing needed was to ensure that the plant breeders were familiar with current regulations. We found 84% were familiar with the regulations, and we were confident in the breeders' perceptions of possible barriers to innovation.

Gauging the current regulations

Plant breeders have to comply with regulations that fall under the mandates of the Canadian Food Inspection Agency (CFIA) and Health Canada. Respondents to our survey indicated that 28% believe the regulations are clear and 26% felt they were somewhat unclear. To better gauge breeders' perceptions of how regulations affect their research or act as a barrier to innovation, we asked a series of agree/disagree statements. Twenty-seven percent reported either conducting or have considered conducting, field research outside of Canada to avoid PNT regulation. Thirty-two percent agree that Canada's science-based regulations provide a competitive advantage. Most significantly, 77% felt the regulatory framework needs to be updated to reflect current scientific plant breeding techniques.

The impacts of PNT regulation shown in the table below identify that research proposals have been turned down due to uncertainty about the novelty of the variety being developed. Twenty-two percent identify research proposals were rejected due to the uncertainty the product would be novel (Table 1). While 29% saw a project turned down due to the uncertainty of costs to market the novelty, and 30% due to the public acceptance of GM products.

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Table 1 PNT regulation impacts on research proposals (N = 93)
Credit: Front. Genome Ed., 20 October 2020

Although plant breeder uncertainty is not a majority, the number is still high and is resulting in innovation being stifled. To determine if these uncertainties become barriers to innovation, we asked plant breeders whether they altered their research so the variety wouldn't be considered novel. One-third indicated they decided not to undertake a research proposal or develop an innovation because they self-determined the innovation would be considered novel. Also, 21% stated they conducted extra research (Table 2) to provide regulators with evidence of not being novel, 19% altered the breeding objective to avoid being reviewed as novel, and 18% experienced delays due to novelty. All of which drive up the cost of commercialization.

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Table 2 Respondents' decisions to alter or extend research due to Canadian regulation barriers (N = 93). Credit: Front. Genome Ed., 20 October 2020

A system that is a barrier to future gains

As a developed nation, Canada is taking action to support science, innovation, and sustainable practices. We are seeing this with policies, taxation, and support of innovative solutions to reduce our carbon impact. Canada's federal and provincial governments are also working tirelessly to support medical research for COVID and provide regulations that protect our well-being. Yet, when it comes to the PNT systems, it

seems like our policymakers are failing to see the urgency or the gains that can be made by supporting and updating regulations. If we consider how vulnerable our crops are to climate, pest and environmental issues, we need to protect our crops, environment, food supply, and commerce.

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While we couldn't see COVID coming, we can see the future risks of our crops, and so why wouldn't our PNT system be designed to protect and prevent a similar impact on our crops? The current regulations are not helping to accelerate the adoption of novelty traits in research labs. As a result, various crops across the nation may not be meeting the possible potentials they could reach under different regulations. If this continues unchanged, that means we are leaving profits, nutritional gains, environmental benefits, and economic growth back in the research labs of plant breeders who are constrained by outdated regulation which itself is no longer novel.

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