

# Changing the face of Canada's soybean industry

SoyaGen provides roadmap for better short-season variety development

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~ François Belzile,  
Professor of plant genomics  
Université Laval



### François Belzile imagines a lot more soybean acres in Canada, particularly in Western Canada.

“The agricultural land in the West is so huge,” says Belzile, professor of plant genomics at Université Laval in Québec City. “Even if only a fraction of the land within the main grain growing areas could grow soy, it would be a huge expansion for the crop.”

It's not as far-fetched as it sounds. Belzile and his colleague, Richard Bélanger, are leading a project called SoyaGen, which aims to decipher the entire genetic code of short-season soybeans. Their goal is to identify genetic markers that influence maturity, disease resistance and yield in order to provide plant breeders with a better road map so they can develop new, improved varieties quicker.

SoyaGen is part of the \$5 million investment that WGRF has made to three applied genomics projects under the Genome Canada umbrella (the other two focus on lentil and wheat). It's crucial, long-term, large-scale applied research that will drive Canada's agricultural sector forward and help it stay competitive.

### Developing soybeans for shorter growing seasons

Belzile says SoyaGen has three main areas of focus. First: identify the genes that control crop maturity so that soybeans can be produced in the shorter growing seasons of the West. And it's not just about finding the genes and markers, he says. “We want to know how the different genes that control maturity act as you move westward, so we can tell the breeders what will work best when they develop new varieties.”

The second focus is on disease resistance, specifically phytophthora root rot, soybean cyst nematode and sclerotinia stem rot – three diseases that have increased in importance as soybean acres have expanded. “I think this is where farmers will see the first benefits of the research,” says Belzile. “We're lucky in soy because we do have the resistance genes, but we don't know which one to deploy in the field.”

It comes down to the incredible diversity of fungal pathogens, where one disease can express itself through many races or strains, so knowing which gene confers resistance to, say phytophthora, isn't enough. You have to know which strain of the disease you're dealing with in a region, then breeders can develop varieties carrying

resistance genes that are effective against that strain.

“We're sequencing the complete genome of these fungal strains so we know this gene is unique to this strain,” says Belzile. This information will be critical for breeders developing resistant varieties, but it's also going to be critical for growers choosing seed. “About one year from now, we're hoping to have a diagnostic kit, where farmers can send in a soil sample and know what race of the disease they're dealing with,” he says. “Then they will know what they need to look for when they buy seed.”

### Ensuring successful adoption and returns for western farmers

The third focus is something you might not expect from an applied genomics project: grower adaptation. “Soybean has to make economic and agronomic sense for growers,” says Belzile.

Effective crop diversification to high-value crops is one thing. Who wouldn't want a profitable crop that adds N to the soil, fits perfectly into a grain-canola rotation, grows well and has ready markets? It sounds great, but if you don't know how to grow it, where those markets are, and if you need specialized equipment, or whether the grain delivery and transportation system can handle it, then what?

“If we're going to add something else to the rotation that isn't processed here, it all has to be considered,” says Belzile. From infrastructure to policy to agronomic know-how – SoyaGen is looking at what mechanisms need to be in place to ensure successful adoption and returns for western farmers.

And that's important because Canada's current soy industry generates annual revenue of \$2.5 billion. It's our third most important field crop – and that's before the kind of western expansion SoyaGen is aiming for.

Belzile started this work in 2013. “Back then, we never hoped to have this much knowledge,” he says. “We used to struggle to get hundreds of markers and now we can get tens of thousands of them. We are able to do things that are ahead of the curve in many ways. So to us, it's tremendously meaningful that growers are taking dollars out of their pockets to fund research like this. It's a testament to their vision and foresight because, to compete globally, investments need to be made now to ensure the long-term competitiveness of the sector.”

