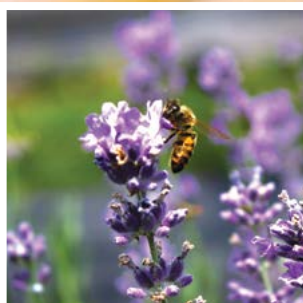


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5th Edition

The Real dirt on Farming

Helping you make informed choices with straight answers on food security, climate change, animal welfare, food safety and much more



Your Guide to Food & Farming in Canada



Table of contents

Ashley Colvin

4 Chapter 1: Canadian farms and farmers – who is growing our food?

- What does it mean to farm in Canada?
- Who is growing our food?
- Female and farming
- Indigenous agriculture
- Getting into farming
- Conventional and organic farming
- The corporate farm question
- The biggest change? Size
- Family is at the heart of Canada's farms
- Regional roundup

8 Chapter 2: Crops and plants

- A Canadian oil for the world: canola
- Grains, oilseeds and specialty crops
- Pulses
- Fruits, vegetables and fungi
- Growing crops indoors
- Medicinal and ceremonial crops
- Wine, beer and other craft beverages
- The ultimate Canadian crop: maple syrup

16 Chapter 3: Farm animals

- Turkeys and chickens
- Hens and eggs
- Dairy cattle
- Real deal about veal
- Beef cattle
- Pigs
- Sheep, goats and guardian animals
- Insects are farm animals too
- The buzz on honey
- What about fur farming?
- Fish farming

24 Chapter 4: Humane treatment of farm animals

- Why are most farm animals raised indoors in Canada?
- Keep farm animals healthy – practise biosecurity
- Why can't they have more space?
- Genetics and animal breeding
- Are there rules for raising farm animals?
- Livestock on the move
- Animal care practices
- Animal welfare and animal rights

30 Chapter 5: Food security, eating local and the cost of food

- The cost of food
- Food insecurity
- The luxury of choice
- Food labels and claims – What do they really mean?
- Plant-based proteins
- Buying organic
- Making healthy food choices
- What is supply management?
- Eating locally
- Imports and exports
- Working in agriculture
- Seasonal agricultural and temporary foreign farm workers

38 Chapter 6: Environment, climate change and sustainable farming

- Soil health and organic matter
- Growing crops sustainably
- Pollinators, bee health and neonics
- Farming and technology
- Greener energy on the farm
- Farming's carbon footprint
- Livestock as part of the solution
- Going the extra mile for wildlife
- Manure, fertilizers, phosphorus and water
- What about plastics and packaging?
- Food waste

48 Chapter 7: Healthy and safe food

- Food safety rules for farmers
- Traceability
- Keeping farm animals healthy
- When animal and human health meet
- Antibiotics and resistance
- Raw facts about raw milk
- DNA barcoding
- Hormones, livestock and meat
- What about pesticides?
- GMOs

58 Chapter 8: Food, farming and the future

- Mental health on the farm
- Changing consumer trends
- Facing the future

Farm photos in this book are all taken of Canadian farms, or of Canadian farmers.

Many were winning entries in Farm & Food Care's Farm Photo Contest. Photo credits are listed, where available.

Sources, where noted, are available in the online version of this publication at: www.RealDirtOnFarming.ca

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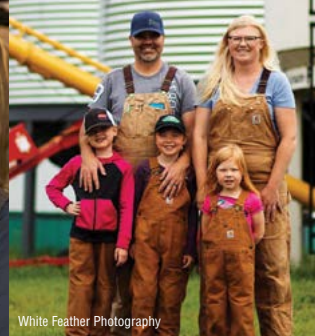
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White Feather Photography



Nancy French Photography

Our food has a story and it starts with Canadian farms.

We've heard from Canadians across the country that they want to know more about food production. We have also heard what's important to you when it comes to the food you eat: topics like food safety, the environment, and the humane treatment of farm animals.

Food is connected to many of the big issues facing our society, from the cost of living and energy, to climate change, and health care.

In this publication, we're tackling those issues head-on to answer your questions, and to show you what we are doing to feed you safely, nutritiously, and sustainably.

You'll notice a particular focus on science. COVID-19 changed our world, and we learned first-hand how important it is to have science available to guide decision-making, and to make sure that things are done safely.

It's no different when we're producing food. As farmers, we're the ones growing crops and raising livestock every day, but we know that we need the advice of experts in fields like animal welfare, pesticide use, and food safety, so that we can make the best possible decisions on our farms to produce the best food possible.

Canadian farming has an impressive story to tell, and we're pleased that you're interested to hear it.



Sincerely,
Canada's Farmers and Food Producers



Nancy French Photography



Amy Reymer



Anna Haupt



Jodie Aldred



BC Chicken Marketing Board



Nancy French Photography



Grieg Seafood BC



Nancy French Photography

Canadian farms and farmers – who is growing our food?

Sache Family

Food and farming are a big deal in Canada. Not only do Canadians depend on farmers to produce the food we eat, but agriculture and agri-food provide jobs for more than 2.3 million people¹. One in eight Canadian jobs is directly linked to the sector, which contributed \$142.7 billion² to our national economy in 2019, and is thus a major driver of economic growth.



What does it mean to farm in Canada?

That question and answer depend on where you live. Farmers from coast to coast to coast raise a variety of livestock and poultry, and grow many different crops according to the climate and soils in their regions.

Canadian farms come in all types and sizes, from small orchards and vineyards to large grain farms and cattle ranches, varying in their ability to produce food. A small piece of very fertile land can profitably grow specialty vegetables for a niche market, for example, whereas a large 5,000-acre farm in a cooler climate with poorer soil is better suited for grazing animals.

At a glance...

It's all about family: 97 per cent of Canada's farms are family owned³.

Farms are bigger than in the past⁴: the average Canadian farm was 820 acres in 2016, up from 779 acres in 2011, and 237 in 1941. Technology means that farmers can produce more food and manage larger farms than in the past.

There are fewer farms: Canada counted 193,492 farms in the last Canadian census (2016)⁴, as compared to 205,700 in 2011, and 276,500 in 1996.

Farms are diverse:⁵ Ontario has the most farms, but Saskatchewan's are the biggest, and British Columbia has the largest number of small farms (those producing less than \$10,000 in gross annual income). Canadian farms grow and raise everything from bison, alpacas, and mink, to lavender, grapes, greenhouse vegetables, and hazelnuts.

Canada feeds the world: we are the fifth largest exporter of agricultural and agri-food products in the world, including:

- 71 per cent of the world's maple products (maple syrup and maple sugar)⁶
- 40 per cent of the world's flaxseed⁷
- 31 per cent of the world's canola (world's leading producer)⁸
- 39 per cent of the world's pulses (world's leading producer of lentils and peas)⁹
- 52 per cent of the world's mustard¹⁰

Who is growing our food?

Fewer than two per cent of Canadians farm, and those that do are getting older. In fact, the average age of Canadian farmers reached 55 in 2016.

But for the first time in 25 years, we've also seen an increase in the number of young farmers in Canada (those under 35)¹¹. More than half of young farmers supplement their farm income with off-farm revenue, working in management, business, finance, trades, health, education, or natural resources and agriculture-related jobs. Their share of off-farm income varies significantly by farm type, which reflects the size and profitability of the farming operation, the seasonality of production, and opportunities to work off-farm.

Many farmers in Canada today have come here from another country to farm. For example, almost 60 per cent of Canadian immigrant farmers in fruit and tree nut production come from India, and Punjabi is now the third-most popular mother tongue of new Canadians who farm.

German and Dutch are the two largest language groups among Canada's immigrant farmers; that's because almost three quarters of Canada's immigrant dairy farmers come from the Netherlands and Switzerland¹².

Because there is a severe shortage of labour on Canadian farms, and there aren't enough willing domestic workers to fill all the available jobs, Canada also relies on many seasonal and temporary foreign farm workers.



Career Profile

Organic Grape Grower

Karnail Singh Sidhu

Karnail Singh Sidhu arrived in British Columbia in 1993 at the age of 25. While he trained as an electrical engineer in India, his qualifications weren't recognized in Canada. Instead, Sidhu landed a job at a local winery, where his work ethic attracted the attention of the vineyard owner, who eventually funded his studies in viticulture (grape growing for wine) at Okanagan College and promoted him to vineyard manager.

In 2008, Sidhu opened Kalala Organic Estate Winery, with his wife Narinder, in the beautiful Okanagan Valley. Their winery produces upwards of 72,000 bottles of wine annually, which are mostly sold throughout BC. His wife takes care of the business and administration; his brother helps in the vineyard, and his daughters, nieces, and nephews all help both in the vineyard and with bottling.

In 2020, he was named BC Viticulturist of the Year, partly due to his commitment to ongoing research and community involvement. He believes his mentors played an important role in his success, and pays it forward today with his family, staff and other viticulturists. "Everyone has a different way of thinking," said Sidhu, "I think we can learn a lot from sharing our views and our knowledge with others."

Photo courtesy of the BC Wine Institute

QUICK FACT

What is an acre?
It's an area of land about the size
of 696,960 sticky notes¹³!

Bruce Sargent

Female and farming

Although the majority of farmers are still men, more women are farming today than ever before. Just under 30 per cent of farmers are female, according to the last census, compared to 25 per cent in 1996¹⁴. One in five young female farmers study agriculture after high school, and overall, women in agriculture are two times more likely to have a university education now than they were 20 years ago.

Various women in agriculture, including female farmers, have been inducted into the Canadian Agricultural Hall of Fame for their outstanding contributions to their sectors.

JoAnne Buth, a former President of the Canola Council of Canada, helped oversee unprecedented growth for Canadian grains and oilseeds. She served two years in the Senate of Canada, and became the first female CEO of the Canadian International Grains Institute.



JoAnne Buth

Indigenous agriculture

Indigenous people have an important connection to the land, and harvested plants and animals for traditional medicines and foods long before settlers arrived to what is now called Canada. In addition to the challenges that all farmers face, Indigenous farmers can encounter obstacles associated with colonization, such as regulatory systems including the *Indian Act*, as well as natural and geographic factors¹⁵.

The number of Indigenous farmers in Canada has been on the rise, increasing by more than 50 per cent between 1996 and 2016¹⁶. Several factors may have contributed to the increase including changes in self-reported identification over time. Almost 80 per cent of Indigenous farmers identify as Métis, with the largest numbers farming in Alberta, Saskatchewan, and Manitoba. A little over a quarter self-identified as First Nations, with most farming in British Columbia, Ontario and Alberta.

- Many Métis farmers raise cattle, or are involved in specialty crops like hay, sugar beets, hemp, hops, herbs and spices.
- Indigenous farmers are more likely to be women, as compared with non-Indigenous farmers.
- First Nations people fostered the planting relationship known as the “Three Sisters”, where beans, corn and squash are planted side by side. The beans fix nitrogen to the soil; the corn stalks act as a trellis for beans; and the squash leaves provide ground cover that prevents weed growth and conserves moisture¹⁷.

The corporate farm question

Like many Canadian businesses, some farm families have opted to incorporate their businesses. This change means that they've chosen a business structure that can include both family members and paid employees—but it has nothing to do with how big or small a farm is, or how well animals or crops are cared for. According to the 2016 Census of Agriculture, 22.5 per cent of Canadian farms are incorporated as family corporations (only 2.7 per cent of incorporated farms are non-family corporations)¹⁸.

Getting into farming

Most Canadian farms are family businesses that are passed from one generation to the next. The cost of land in particular is high, making it difficult for young people to get into farming if there's no farm in the family to take over. That situation means that many have to get creative if they want to make their farming dream a reality.

Many new farmers start out by renting or buying small pieces of land, and getting help from friends, neighbours, or family, while also working outside the farm. Many look to specialty products, direct-to-consumer sales, or niche markets that they can supply on a small scale to differentiate themselves in the marketplace. Some farmers without a next generation to take over are building succession plans with young farmers that aren't part of their family, and others work out creative agreements to give young farmers a start.



Beth Wilson

More than one way to farm: conventional and organic farming

Farmers choose to farm in a variety of ways following different types of production practices such as conventional (non-organic) or organic production.

Organic food is grown in ways that support the principles of organic agriculture: health, ecology, fairness, and care¹⁹—many principles that also apply to conventional farmers.

Farmers producing organic food follow production rules around improved sustainability which can include a focus on crop rotation, improving soil health, natural pest control methods, humane livestock management practices, and traceability from farm to fork—although it should be noted that many

conventional farmers also follow these very same principles.

Some farmers grow both organic and conventional crops on their farms for different markets, but regardless of the type of farming, the key is sustainable production.

In Canada, demand for organic foods is on the rise. Canada's market for organic food items is worth over \$5 billion annually, increasing by 8.7 per cent every year²⁰. About 7,300 Canadian farms and 1,700 food processors are certified as organic.

For more information on organic food production, visit page 33.



The biggest change? Size.

Farms are bigger, and there are more tools and technologies to help farmers with their work. Smartphone apps and sensors can let a farmer know if a cow is sick even before she shows any symptoms; drones can detect crop pests and diseases in a field more quickly than a human; and GPS systems can help farmers pinpoint exactly where and how much fertilizer is needed in a field.

Most farmers today specialize in a specific type of farming, like greenhouse vegetables, mushrooms, dairy, or pork production. This specialization helps farms to be more efficient and produce more food, and makes it easier for farmers to learn and to adapt to challenges in their area of expertise.

A big challenge for today's farms is feeding Canadians sustainably. That means growing enough food in ways that are good for people, animals, and the planet—as well being financially viable and socially responsible—and all farms have a role to play in this process.

Family is at the heart of Canada's farms

In Canada, farming is still all about family. Many farms are handed down from one generation to the next in a process called succession. Parents and even grandparents often work together with sons, daughters, and grandchildren in the family's farming business. There are farms in Canada that have now been home to eight or nine generations of the same family.



Cassi Brunsveld



Career Profile

Potato Farmers

Jason, Harrison and Josh Hayden

Jason Hayden, a sixth-generation potato farmer on Prince Edward Island, is pleased to see his sons, Harrison and Josh, follow in his footsteps. "We feel very fortunate to have our next generation taking an interest in farming and not have to worry about the future of our farm." He added that working with family also makes day-to-day chores easier and more rewarding.

The family grows table potatoes, including white and russet, and operates a potato packaging warehouse on their farm. Potatoes grown on their own and neighbouring farms are packed and shipped across Canada and into the United States.

Harrison and Josh now run their own farms, growing a rotation of winter wheat, soybeans, and potatoes. "Making their own business decisions and having some ownership over how they farm is the best way to learn," said Hayden, but adds that he is always there for some helpful advice.

Regional roundup

Canada is a big country—and just as our geography and climate vary from coast to coast, so do our farms.

The key to Canada's farm and food success has always been diversity. Here's a snapshot of farming across the country²¹:

British Columbia produces 95 per cent of Canada's cherry crop²⁴.

Alberta leads Canada in beef production, and accounts for more than 40 per cent of all beef cattle in Canada.

Saskatchewan grows more field crops than any other province—such as canola, spring wheat and lentils.

Manitoba has the largest number of young farmers under 35 in Canada.

Ontario is the country's leading chicken producer, and is home to two-thirds of Canada's greenhouse vegetable production.

Quebec is a food and farming powerhouse, producing more dairy, maple syrup, pork, nuts, fruit and berries than any other province.

Prince Edward Island grows more potatoes than any other province in Canada.

New Brunswick's leading fruit/berry crop is blueberries.

Newfoundland & Labrador farms have the highest rate of leased and rented farmland in Canada²².

Nova Scotia has the highest proportion of female farmers in Atlantic Canada²³.

Crops and plants

Anna Haupt

Canadian farmers grow a diverse variety of crops across the country—crops that are used both here at home, and exported to countries around the world. You'll find everything from pulses, grains, and oilseeds, to fruits, vegetables, flowers, and specialty crops like herbs in Canada's fields, orchards and greenhouses.

A Canadian oil for the world

Canola is a "Made in Canada" crop that was developed through traditional plant breeding techniques, and is now the cooking oil of choice for billions of people around the world. Its name comes from a contraction of the words Canada and ola, meaning oil. Canola oil is prized for its heart-healthy properties, and contains the least amount of saturated fat of all common culinary oils. It is one of the most versatile and affordable oils, with many applications at home, in restaurants, and in food processing.

It is also a multi-purpose crop. Once the oil is extracted from the canola seed, a high-protein meal is produced from the remaining portion, which makes a great addition to livestock feed. It's also used as a replacement for petroleum, to make green plastics, and an environmentally-friendly fuel called biofuel. Canada exports more than 90 per cent of its canola as seed, oil, or meal, to approximately 50 markets around the world²⁵.



DID YOU KNOW?

Canola is a member of the *Brassicaceae* family – the same botanical family as broccoli, turnips, rutabaga, cabbage, cauliflower and mustard.



Career Profile

Canola Farmers

Stacey Sagon

Mark and Stacey Sagon and daughters Georgia and Jayla raise beef cattle and grow canola, wheat, barley, oats and pulse crops like peas and lentils on their farm in western Saskatchewan.

They're especially enthusiastic about growing canola. "We love the potential of the crop. It responds so well to our farming practices and its quality is amazing," Sagon said. She added that the crop also continues to get better. In the last ten years, genetic improvements have resulted in higher yields and greater oil content in the seeds.

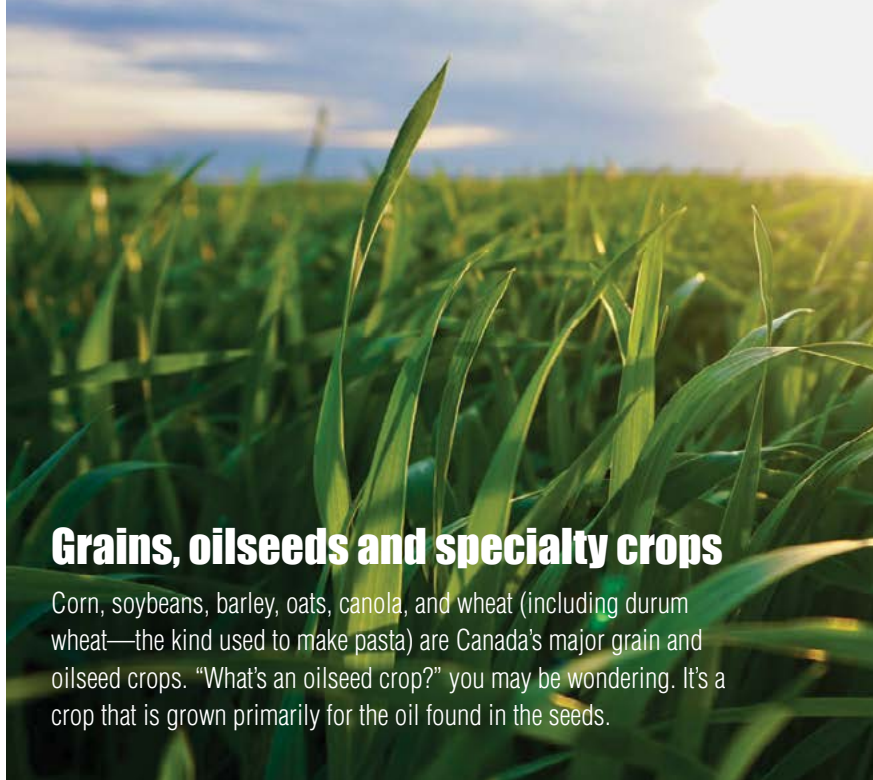
Sagon feels great pride when she sees canola oil on the shelf of her local grocery store. "There are so many choices in oils and I'm proud that canola oil, which is such a healthy choice, is right there and we're producing it on our farm."

Photo courtesy of Debra Marshall Photography



Donna Rogers

Stop! Crops like canola and sunflowers are beautiful when they are in bloom and they attract a lot of admirers. But it's easy to damage the crop while walking through it, even just to take a few photos. Always get permission from the farmer before entering a field.



Grains, oilseeds and specialty crops

Corn, soybeans, barley, oats, canola, and wheat (including durum wheat—the kind used to make pasta) are Canada’s major grain and oilseed crops. “What’s an oilseed crop?” you may be wondering. It’s a crop that is grown primarily for the oil found in the seeds.

Michaela Knechtel



DID YOU KNOW?

Farmers grow three main types of corn in Canada²⁶?

Grain corn is corn in which the kernels on the cob are used to feed livestock, and are used to make fuels like ethanol, and as a human food ingredient.

Silage corn involves the whole plant being harvested as feed for livestock.

Sweet corn is the type of corn that people eat fresh, canned or frozen.

Farmers will grow a variety of crops, depending on the soil and climate factors in their areas. Soybeans and grain corn are mainly grown in Ontario, Québec, and Manitoba, although farmers in Saskatchewan and the Maritimes also grow these crops. Canola, barley, oats, and durum wheat are grown primarily in the Prairie provinces. Other Canadian grain, oilseed, and speciality crops, also primarily grown in the Prairies, include rye, quinoa, flax, canary seed, mustard, sunflower, buckwheat, and camelina, as well as forages and industrial hemp.

Canadian grains and oilseeds are exported to many countries around the world. In 2019, for example, the EU, Iran and Bangladesh were major buyers of Canadian soybeans²⁷. China has traditionally been a major importer of Canadian soybeans. Canadian oats were in demand in the United States and Mexico²⁸.

Canada is a world leader in the production and export of mustard, with Saskatchewan responsible for two-thirds of the country’s production. In 2019, Prairie farmers grew just under 400,000 acres of the crop in three different types: yellow, brown, and oriental mustard²⁹.



Career Profile

Grain Farmer

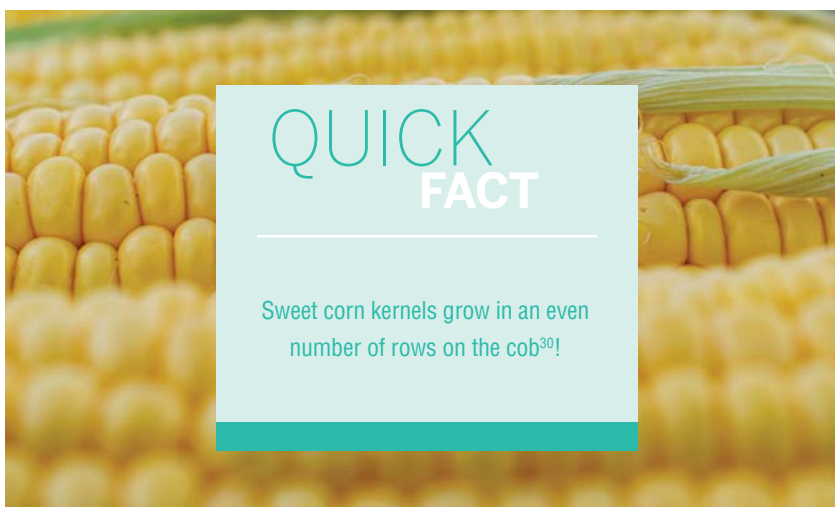
Lane Stockbrugger

The Stockbrugger family has been farming on land in east-central Saskatchewan for over 100 years. Today, Lane Stockbrugger farms with his brother Lance and their two families.

They grow a rotation of malt barley, wheat, oats, canary seed, canola and peas. “No two farms are exactly the same, but what remains consistent is the time and attention that is put into every decision that farmers make,” said Stockbrugger, “We’re lucky that we can work through these decisions together, but we’ll also draw on the expertise of others when needed, all to ensure we are making the right choices from a sustainability and safety perspective.”

Farming has changed significantly over the last century, and the brothers hope to continue to evolve and build a farm legacy that the next generation wants to be involved in.

Photo with permission from Country Guide/Photography: Richard Jenkins • Reflections by Richard



QUICK FACT

Sweet corn kernels grow in an even number of rows on the cob³⁰!



Career Profile

Pulse Farmers

Hailey and Cale Jeffries

High school sweethearts Hailey and Cale Jeffries are farmers and entrepreneurs. Together, they're behind the Prairie Fava business.

In 2015, they moved home to Glenboro, Manitoba, so Cale could take over his fifth-generation family seed farm, Jeffries Seeds. Hailey left behind a fast-paced corporate sales and marketing job, and was unsure how to apply that spirit to their new life.

After Hailey's mother was diagnosed with cancer, she found a renewed interest in health and healthy food in particular. With the family seed business, and Hailey's marketing know-how, she saw the perfect opportunity to address the growing consumer demand for plant-based proteins. In 2015, they established Prairie Fava and began processing fava beans two years later.

Fava beans are very neutral tasting, making them a versatile option to enhance the protein and fibre content of everyday foods without adversely affecting the taste, colour or aroma. Fava flour is also a Canadian-grown, higher protein alternative for gluten-free flour substitutes.

They now ship whole and split beans, as well as flour, across North America and to Japan, Vietnam and Belgium. Prairie Fava recently received the Start-Up of the Year Award at the 2019 Manitoba Chambers of Commerce Business Awards.

Pulses³¹

Pulses are the dry, edible seeds of certain plants in the legume family. Major pulse crops grown in Canada include chickpeas, lentils, dry or field peas, faba beans, and dry beans. Most pulse crops are grown in Western Canada, but farmers in Ontario and parts of Québec are significant growers of dry beans, including navy beans, black beans, red kidney, white kidney, cranberry, and adzuki beans.

Pulse crops are a low-fat, high-fibre protein powerhouse with high levels of minerals like iron, zinc, and phosphorus, as well as potassium, folate, and other B-vitamins. They've also been found to help lower bad types of cholesterol, and to help maintain healthy blood sugar levels.

Pulses are also a key part of sustainable food production. They are a "nitrogen-fixing crop"—meaning that they have the potential to work with soil bacteria to draw nitrogen from the air and store it, so farmers can reduce the amount of nitrogen fertilizer applied to their field. After harvest, pulses leave behind nitrogen-rich crop residue, which can further reduce the amount of fertilizer that farmers need to apply for the next crop too.

More than 85 per cent of Canada's pulse crops are exported annually³², and they end up in 125 different countries, with China being the largest buyer of Canadian peas³³.

QUICK FACT

Over 50 per cent of all lentils traded in the world come from Saskatchewan fields³⁴.



Ontario Bean Growers

Mushrooms all year long

Mushrooms are one of the few crops that can be grown in Canada year-round. Canadian farmers grow more than 145 million kilograms of mushrooms every year³⁵—mostly white button, followed by brown and Portobello. Demand for specialty mushrooms, such as Shiitake, Oyster, King Oyster, and Enoki, continues to grow. Oh, and the little black specks you sometimes see on mushrooms at the store? That's the very important compost mixture (called substrate) used to grow beds of mushrooms—just rinse or wipe it off before eating.



Jodie Aldred



Fruits and vegetables

More than 120 fruit and vegetable crops are grown in Canada, on approximately 14,000³⁶ farms. These include many long-time favourites from apples, peaches, pears, blueberries, strawberries, and grapes, to carrots, peppers, onions, lettuce, potatoes, asparagus, cabbage, cucumbers, and tomatoes, but also ginseng, cranberries, garlic, cauliflower, cherries, apricots, hazelnuts, Saskatoon berries, and many more.

British Columbia has the most fruit farms in Canada, and farmers in British Columbia, Québec, and Ontario grow 90 per cent of Canada's fruit crops³⁷. In the early 1990s, a chance seedling (a genetically unique plant that has been unintentionally bred) was discovered on an orchard in Cawston, BC, after the farmers noticed its unique and delicious apples. This variety was later named the Ambrosia Apple, meaning “food of the gods”.

Ontario is Canada's vegetable king: home to almost 70 per cent of Canada's production of greenhouse vegetables; the leader in field vegetable production (those that are grown outside in a field instead of in a greenhouse); and also the biggest producer of mushrooms in the country³⁸. Québec and British Columbia are Canada's other two big vegetable-producing provinces.



DID YOU KNOW?

Farmers and researchers in Ontario are experimenting with a crop called Tiger Nut? It's a small tuber, or root crop, that is the key ingredient in a popular Spanish drink called *Horchata de Chufa*.

QUICK FACT

Space spud – the first vegetable grown in space was a potato! NASA and the University of Wisconsin first tested seed potatoes in space aboard the Columbia space shuttle in 1995³⁹.

Career Profile

Fruit & Vegetable Farmer

Chris Oram

One of the biggest challenges of farming in Newfoundland is unpredictable weather, as fruit and vegetable farmer Chris Oram and his family can attest to. Spring can be late in coming and winter early in arriving which makes for a short growing season compared to other provinces. As such, “cole” crops (or cool season plants) like cabbage, rutabaga, carrots and potatoes are popular crops grown on the island. The family also grows “A to Z” – apples to zucchini and everything in between which they sell at their family's market and others in the area. Rutabaga is an island speciality. “Everyone says we have the sweetest rutabaga in the world because of our cold climate,” Oram noted.

After high school, he wasn't planning on farming with his parents Dick and Arlene. He attended university, playing on the varsity basketball team. But the longer he was away, the more he missed the family business. His wife Kayla also now works with them and they look forward to welcoming a third generation in the months ahead.



QUICK FACT

Greenhouses can grow 10 to 20 times the amount of vegetables on the same area as a field-based farm⁴⁰.



Bruce Sargent

Growing under glass

More and more of the fresh produce and flowers which Canadians enjoy are grown in greenhouses, under glass, rigid plastic or poly-film, practically year-round. Tomatoes, peppers, and cucumbers are Canada's biggest greenhouse crops, but farmers are also growing lettuce, green beans, eggplants, microgreens, and herbs, and increasingly, fruits like juicy, sweet strawberries indoors.

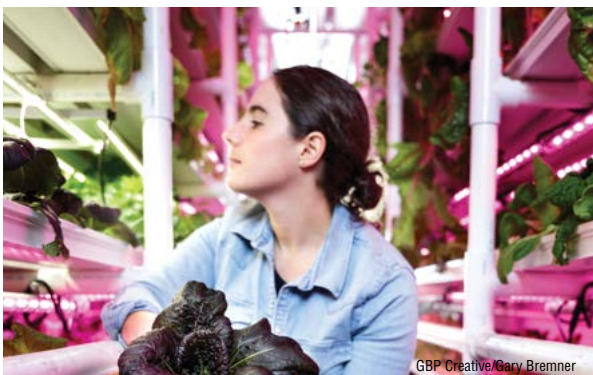
Southern Ontario has the highest concentration of greenhouses in North America, and the province has the most vegetable greenhouses in Canada, covering almost 3,100 acres – that's about 7,750 Canadian hockey rinks⁴¹!

Flowers and potted plants are also greenhouse crops in Canada, with farmers producing over one billion greenhouse flowers and plants in 2018⁴². Tulips, gerberas, chrysanthemums, snapdragons, and lilies are among

the most popular cut flowers grown in Canada, whereas outdoor geraniums, herbs, and hanging baskets, as well as tropical and green plants, are the leading potted plants.

Greenhouse growers typically use a soilless growing system, called hydroponics, where plants are grown in media such as rockwool or coconut fiber. Inside a greenhouse, farmers provide heat, water, nutrients, and sometimes extra light to boost natural levels of sunshine to nourish plants. They also use bugs, like bumblebees, to pollinate plants, and ladybugs to control harmful insects.

That consistent indoor climate means production 10 out of 12 months of the year⁴³. There's no worries about bad weather; and farmers can plan their production reliably to make sure that they have enough products to meet consumer demand.



GBP Creative/Gary Bremner

Other ways to farm indoors

Growing food indoors is becoming popular in ways other than by using a greenhouse, as people look to minimize risk from climate change, and to buy more of their food locally.

In **vertical farming**, plants like lettuce, herbs, and leafy greens are grown indoors in vertical stacks, instead of side by side the way they grow in a field. Farmers can provide the exact amounts of water, light, and nutrients that a crop needs—and because the crops are growing vertically, farmers can grow a lot of food in a small area.

Container farming is similar, but it uses smaller, self-contained units that often resemble a shipping container to grow lettuce, herbs, and leafy greens. They're an affordable way for people to grow their own food in areas like Canada's north, where it is too cold to grow vegetables most of the year. Even some farmers in southern Canada are using container farms so they can start offering consumers fresh local crops all year long.

Medicinal crops

Some farmers grow crops not as food, but as medicine. **Ginseng** is one such example—the root was traditionally used in Chinese and Indigenous medicine, but has now found wider use as a stress-reducer, and to promote overall well-being. Canada is a global leader in the production of North American ginseng (*Panax quinquefolius*), and more than two-thirds of the entire crop is grown in a small area of Southwestern Ontario. Ginseng beds are easily recognizable, as they're covered by shade cloth structures—that's because the plants must be grown in 70 - 80 per cent shade.

Cannabis is another crop that is now increasingly being grown in Canada, both for medicinal and recreational uses. Licensed growers grow the crop primarily in greenhouses, under very strict rules and regulations. In 2018, Canada became the second country in the world to legalize use of recreational marijuana, although health-related uses had been allowed for longer.

Ginseng

QUICK FACT

Ontario's ginseng industry began in 1704, when Jesuit priests first discovered the root growing in the wild. Ginseng was Canada's first trade with China⁴⁴.

Ontario Ginseng Growers Association

Growing for sacred ceremonies

Tobacco, cedar, sweet grass, and sage are the four sacred plants of Indigenous peoples. Tobacco plays a major role in every stage of life for some Indigenous cultures—the smoke is believed to be a pathway to the spirit world, carrying all thoughts, feelings, and prayers to the Creator⁴⁵. University of Saskatchewan has been conducting trials growing traditional *Nicotiana rustica* or ceremonial tobacco, harvesting its first crop in 2019, and sharing plants and seeds with local Indigenous populations⁴⁶.



Vineland Growers Co-operative

Cold Snap™ Pears

Canadian crops for the Canadian climate

Our climate varies across the country, but winters pretty much anywhere in Canada are cold, with plenty of snow, and we only have a few warm summer months. Our crops have to be strong enough to survive those extremes, and plants that grow well in warmer climates don't always produce well in Canada. That's why Canadian plant breeders work hard to develop new varieties that love Canadian weather in all parts of the country!

New corn and soybean varieties can now be grown in cooler regions of the country. Cold Snap™ Pear is a popular, winter-hardy new pear variety developed by Agriculture and Agri-Food Canada fruit breeders.

Radiance is a tasty sweet potato developed for Canadian farmers at the Vineland Research and Innovation Centre, where they're also breeding hardy, low maintenance, and disease-resistant Canadian roses.

What is old is new again

Some Canadian farmers are looking to the past to find new niche products, and are growing vegetable and fruit varieties, and raising livestock breeds that were common 50 or 100 years ago, but are no longer used in modern food production.

They are called **“heritage breeds”** or **“heirloom varieties”** and often have unique flavours and other traits, like disease resistance or drought tolerance. That's why they're popular with

chefs and food lovers, but also with plant and animal breeders who are looking for ways to make crops and livestock healthier and better able to withstand climate change.

One example is canary seed, a crop in development in Saskatchewan for human consumption under the name “alpiste”. It's a member of the same cereal grain family as wheat, oats, barley, and rye, and is gluten-free, nutrient dense, and high in protein.



DID YOU KNOW?

Ice wine is a dessert wine made from grapes that have naturally frozen on the vine before being harvested? Canada is known around the world for having some of the best ice wine, as well as being the largest producer of the sweet drink.

Mike Pohorly/Grape Growers of Ontario

Ice wine grapes on the vine

Wines, beers and other craft beverages

Some crops aren't just consumed as food; they make excellent drinks too! Canada's main wine-producing regions are in Ontario, British Columbia, Québec, and Nova Scotia, with over 600 wineries and growing⁴⁷.

Cider, a fermented beverage made from apple or pear juice, is quickly becoming popular with Canadians, and many of Canada's new craft cideries use North American apple varieties like McIntosh, Ida Red, Northern Spy, Gala and Russet in their products.

Craft beer is also popular, and there are farmers who grow specialty grain and hop varieties to help craft brewers to create unique types of local beer. In 2019, there were more breweries in Canada than ever before—and most are small, local businesses⁴⁸.

A growing number of Canadian distilleries are now making specialty spirits, and even using milk to make vodka! And non-alcoholic craft beverages are emerging too, like kombucha breweries in Atlantic Canada. Kombucha is a fizzy drink made using sweetened tea, fermented with bacteria and yeast, and contains antioxidants and probiotics, with potential health benefits⁴⁹.



Career Profile

Research Scientist

Dr. Alex Speers

The science behind the suds: Canada's craft brewing boom has vastly expanded available beer choices for consumers. A good brew doesn't happen by accident, however. In fact, it's often the result of research by someone like Dr. Alex Speers.

Speers is a professor at Dalhousie University and one of Canada's few scientists who specializes in brewing. In one of his current projects, he is piloting the suitability of different Canadian barley varieties to floor malting, the traditional and labour-intensive way barley was malted before the process became automated.

There is renewed interest in this ancient art from craft breweries and maltsters looking to create unique products, but according to Speers, there is little documented scientific information about the process, and how it impacts fermentation, product quality and safety.

"Many craft breweries want to specialize in local production, so they want to source and process their barley locally, but local craft floor malting operations are limited and don't have the resources or capacity that large maltsters do," he explains. "Our goal is to provide the information and resources that will help craft brewers and maltsters succeed."

Photo courtesy of Danny Abriel/Dalhousie University



DID YOU KNOW?

During the coronavirus pandemic, many of Canada's distilleries quickly switched to producing much-needed hand sanitizer for local hospitals, businesses and other organizations.



QUICK FACT

Cider was the first alcoholic beverage produced and consumed in North America, arriving with the first settlers in the 1600s⁵⁰.

Nancy French Photography

QUICK FACT

It takes almost 40 litres of raw maple sap to make one litre of maple syrup⁵¹.



Career Profile

Maple Syrup Producer

Jo-Anne Beaucage

"In life, or for work, where our farm is located is marvellous. We're so lucky!"

And for 40 years, Jo-Anne Beaucage has lived in that lucky location, 121 hectares of woodlands on the edge of La Vérendrye provincial park, a two-hour drive north of Ottawa. Originally from Montreal, Beaucage moved to the area with her husband to start maple syrup production at Sucrerie Beaubel.

Today the farm has 27,000 taps, including on crown land made available to Quebec's maple syrup producers to promote sylviculture (sustainable forest management) while increasing maple syrup production. That meant almost 40,000 litres of syrup in 2020 at Sucrerie Beaubel, one of the largest full-time maple syrup producers in the province.

Although most of the farm's syrup is sold commercially, Beaucage has started producing some certified organic syrup for sale at the markets in Ottawa through a program organized by Quebec's maple syrup producers' federation. "We work hard and like all entrepreneurs we always try to be efficient as possible, but quality is always important; we must have respect for the product," she says.

The ultimate Canadian crop

It doesn't get more Canadian than maple syrup! And Canada is a leader in the production of this golden goodness, supplying about 71 per cent of the world market. Québec is by far the biggest maple syrup producer in Canada—more than 90 per cent of Canada's maple syrup comes from that province⁵².

Indigenous people taught early Canadian settlers how to harvest sap, and boil it to make maple syrup. Maple sugar was the first kind of sugar produced in eastern North America, and remained the standard sweetener until 1875, when cane sugar became available⁵³.



DID YOU KNOW?

That the world has a Global Strategic Maple Syrup Reserve? Yup, and it's in Canada—a collection of warehouses that have stockpiled over 100 million pounds of maple syrup⁵⁴!

Farm animals

Jodie Aldred



Career Profile

Turkey Farmers

Lucas McCartney & Werda Saeed

Werda Saeed thought she knew what a farmer “looked like”, until she met her husband, Lucas McCartney, when they both attended McGill University. Growing up in Ottawa, Ontario, Saeed’s experience on farms was limited. “It never, ever, occurred to me that I could grow up and become a farmer,” admitted Saeed, but she now knows that farmers come in all shapes and sizes.

The newlyweds tackle every new challenge as a team, including taking over McCartney’s third generation family turkey farm located outside of Quebec City. It has been a total collaboration since the first flock that they raised together almost two years ago. They are open to trying new ideas, and treat each new flock as a carefully observed investigation, all with the objective of improving the health and comfort of the animals even further. This approach to farming is the result of their research backgrounds in plant science and engineering. McCartney holds a M.Sc. and Ph.D., with a focus in greenhouse ventilation and cooling technologies, which can be “surprisingly applicable to the systems we use in poultry barns to keep the birds comfortable,” said McCartney.

Photo courtesy of Marie Michelle Trudeau

Farmers across Canada raise a wide variety of livestock and poultry to produce meat, dairy, eggs, fibre, and many other products. Here’s a look at some of the main types for farm animals raised in Canada.

Turkeys and chickens

Turkeys and chickens raised for meat (those chickens are called “broilers”) live in modern barns where temperature, humidity, light, and ventilation are carefully monitored to ensure that the birds stay healthy. They roam freely around the barn on a floor that is covered with a soft bedding material of straw or wood shavings, and can help themselves to feed and water any time they want. Their feed consists of mixed grains and oilseeds, including corn, soybeans, wheat, barley, and canola, as well as minerals and nutrients.

Young chickens and turkeys arrive on the farm from a hatchery as chicks or poults, and grow to market weight with other birds as part of a flock. Once birds go to market, all the bedding and manure is taken out of the barn, and the building is thoroughly cleaned and disinfected before the next flock of birds arrives. This approach helps prevent disease, and keeps the flock healthy.



Hens and eggs

Egg-laying hens in Canada can live in five different types of barns:

- **Enriched**—Hens live in smaller, more natural sized groups with nest boxes, scratch pads, and perches that allow them to exhibit natural behaviour. This method will be the industry standard in Canada by 2036.
- **Free run**—Hens live in larger groups, and can move around freely on the entire barn floor, but don't go outside. They have scratch pads, and lay their eggs in nesting boxes.
- **Free range**—Hens in larger groups are raised in barns similar to free run, but can go outside when the weather is suitable for them to do so. They are able to scratch and lay their eggs in nesting boxes.
- **Aviary**—Larger groups of hens live in a barn with several levels for perching, eating, and drinking. They lay their eggs in nest boxes, and can go down to the barn floor to scratch.
- **Conventional**—Hens live in small groups with equal access to fresh food and water. Mesh floors allow the hens' waste to fall away, keeping the birds and eggs clean. Canadian egg farmers began eliminating this type of barn in 2014, and any new barns that are being built, or existing barns that are being renovated, must follow the new housing standards.

Each type of housing has pros and cons, but the focus is always on flock health. And research is ongoing in Canada and around the world continuously to develop the best housing solutions for birds, farmers and consumers.

Check out www.FarmFood360.ca to tour farms using the different types of hen housing, and to learn what the labels on your egg cartons mean.



Career Profile

Egg Farmers

David, Glen and Tyler Coburn

David Coburn and his sons, Glen and Tyler, are sixth and seventh generation farmers in Keswick Ridge, New Brunswick. Like many others in Eastern Canada, the Coburns have diversified their farm, which now includes laying hens, row crops, a feed mill, pumpkins and an apple orchard, as well as a small beef herd.

They like to think of their farm as a closed loop. Their in-vessel composting system, the first in Atlantic Canada, is used to compost organic waste including manure and apple pomace, which can then be applied to cropland to grow feed for the animals.

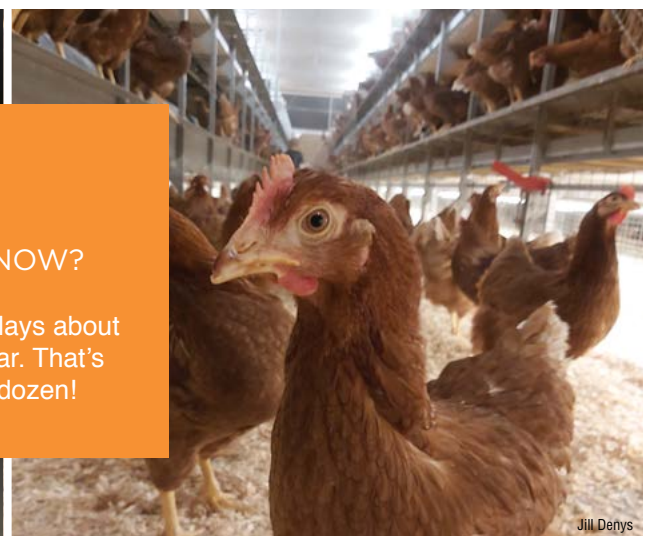
In 2018, they built an enriched housing barn for their hens – a project of the two brothers as they increasingly take over management from their father. Coburn is proud to see his sons take over the farm and make their own contributions to the Coburn family history.

Coburn has been working on creating an on-farm museum that details its 200-year-old history. The family proudly showcases the museum annually when they invite the local community to visit and tour the farm.

Photo courtesy of Egg Farmers of Canada



Enriched hen housing



Aviary free run hen housing



DID YOU KNOW?

The average hen lays about 340 eggs per year. That's more than 28 dozen!

Jill Denys

More than one stomach compartment

Unlike humans, some animals digest their food in more than one step. First, they eat the raw material, and then they regurgitate a partially-digested version of that feed, which is called cud, and chew it again. This process is called ruminating—and animals that digest their food this way are called **ruminants**.

Ruminants include cows, goats, sheep, llamas, bison, buffalo, elk, and deer; they each have four compartments in their stomachs (rumen, reticulum, omasum, and abomasum) to help them digest their food.

Dairy cows

Dairy cows—those raised to produce milk—are leaner than their beef cattle cousins, as they put their energy into making milk instead of gaining weight by building fat and muscle. Holsteins are the most popular milking cows in Canada, and are easily recognizable by their black and white spotted hides.

Other common dairy breeds in Canada are Jersey, Ayrshire, Brown Swiss, Guernsey, Milking Shorthorn, and Canadienne.

Did you know that more and more Canadian farmers are using robots to milk their cows? Cows move around freely inside the barn, and it's up to them to choose when and how often they go to a robot, where they are milked by an automatic machine. The robot keeps track of how many times a day each cow has been milked, how much milk she has produced, and can track how much feed she has eaten.

That means that the robot can let farmers know if a cow might be sick, if she isn't giving as much milk, or isn't coming to the robot to be milked as often.

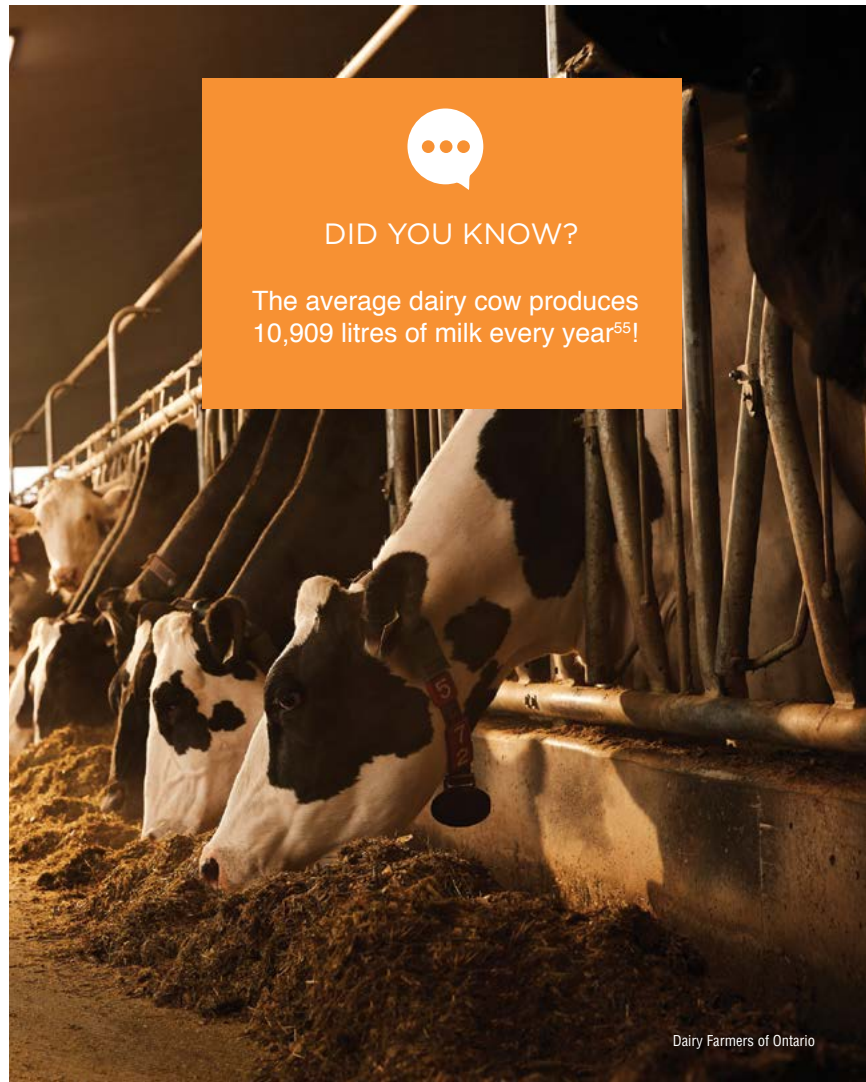
There are two other common barn styles used to house Canadian dairy cows:

Free-stall barns are open-concept where cows move around freely, and go to a central milking area, called a parlour, two or three times a day at a set time to be milked by farmers. To keep cows comfortable, many farmers have large fans and backscratching stations, and robots that travel the alleys pushing feed closer for the cows to eat.

Tie-stall barns have an individual stall for each cow, with bedding, and cows are milked in their stalls. The farmer brings feed to the cows in their stalls.

In all barns, milk flows through pipes into a large milk tank, called a bulk tank, where it is cooled and stored until the milk truck comes—every two days on most Canadian farms—to pick it up and take it to a dairy processing plant.

Some dairy farmers will let their cows out onto pastures in spring, summer and fall. When it rains or is too hot, though, cows generally prefer the comfort of a cool, well-ventilated barn.



DID YOU KNOW?

The average dairy cow produces 10,909 litres of milk every year⁵⁵!

QUICK FACT

Some cows naturally produce milk with the A2 version of beta-casein rather than A1. Some studies suggest that this A2 milk can have a beneficial impact on human gut health, making it popular with people who have gastrointestinal sensitivities to regular dairy milk on the market. A few dairies in Canada have started selling this type of milk to meet consumer demand.



Career Profile

Organic Dairy Farmer

Sarah Yoder

Ninety years ago, Bradner Farms, near Abbotsford, British Columbia, milked cows by hand, shipped milk in cans, and transported goods by horse and buggy. Today the farm, renamed Golden Gate Farms in 2014, is run by fourth generation farmers Sarah and Bud Yoder and utilizes robots to help milk and feed their herd. The farm has been certified organic since 1998 and was the first farm in western Canada to ship organic milk.

Each cow wears a high-tech tracker (sort of like a Fitbit) that monitors their activity, including rumination, how much they have eaten and how many steps they have taken. It is also synced with the robotic milker to record milk production and quality. All of this data can tell the Yoders how healthy each animal is, or alert them if one of the cows needs special care or attention.

“On an organic farm, we have fewer options if a cow was to get sick, so prevention is key,” said Yoder, “The robots tell us so much information about each animal’s health which allows us to always stay one step ahead.”

Veal cattle in group housing



Katelyn Thom

Female dairy calves in front of hutches

Calf hutches

On some farms, calves live in small white structures outside the barn called “hutches” in the first few weeks of life, while their immune systems aren’t yet fully developed. This separation is to protect them against bacteria and germs, and to make sure they get a strong, healthy start until they are big enough to move from the hutches into group housing with other calves. Once they’re old enough, the females will have calves of their own and become part of the farm’s milking herd.

The real deal about veal

The male offspring of dairy cows are called bull calves. They don’t produce milk, so many are raised for meat called veal. Ontario and Quebec are the largest Canadian producers of veal because they also have the greatest number of dairy farms. Holsteins are the most common breed of veal cattle. They grow quickly, are well-muscled, and very lean.

Grain-fed veal cattle are raised on a mainly milk-based diet until they’re six to eight weeks old, before transitioning to a balanced ration based on grain and pellets made of protein, vitamins, and minerals. They reach market weight around 348 kilograms (769 pounds).

Milk-fed veal cattle are raised mainly on a milk-based diet, with some grain and fibre included in the ration. They’re ready for market once they weigh approximately 250 kilograms (550 pounds).

Veal cattle are raised in group housing with other veal cattle of a similar age. They are housed in well-ventilated barns, and are bedded with straw or wood shavings so they stay clean, dry, and comfortable. Research is ongoing into many aspects of veal production, especially health and welfare of the animals.

In some parts of Canada, dairy steers (castrated bulls) are more commonly raised in feedlots for beef production.



Veal Farmers of Ontario



Farm Boy Productions

Beef feedlot

About beef cattle

Specific breeds of cattle that are raised for meat are called beef cattle. Canada's major beef cattle breeds include Aberdeen Angus, Charolais, Hereford, Simmental, Limousin, Maine-Anjou, Salers, Gelbvieh, and Shorthorn, and farmers choose which breed or breeds to raise based on the characteristics of each breed.

Beef cows and their calves typically live on pasture during spring, summer, and fall, eating mostly a grass diet. Their thick coat means that, with adequate shelter and a steady supply of feed and water, they can live outdoors comfortably all year long.

When beef cattle reach a weight of approximately 400 to 460 kilograms (about 900 to 1,000 pounds), they usually move from fields and ranges to open-air yards or barns called feedlots, where they can be managed more closely.

In feedlots, cattle are slowly moved from a diet of mainly forages (grasses and other plants) to a higher energy diet of grains (like barley or corn), hay silage (chopped and naturally fermented plants), minerals, and hay. This process helps make marbled, high quality grades of beef. Marbling is the existence of small white flecks of fat that run through lean meat, which contributes to its flavour and tenderness.



Rachel Chatten

Grass-fed or grain-fed

You may have heard or seen the terms “**grass-fed**” and “**grain-fed**” beef. These terms are related to what beef cattle eat before going to market. Grass-fed means that the cattle are raised on pasture, and supplemented with hay or silage in the winter, for their entire life. Grain-fed cattle are raised on pasture before being transitioned to a diet consisting primarily of corn or barley during the latter period of their life—this change is what helps give the meat its marbling. Both methods are used in Canada to raise beef cattle in a sustainable, environmentally-responsible manner. About 80 per cent of the feed that all beef cattle eat during their life is based on grass.

So, which is better for you?

Both! Beef from both grass-fed and grain-finished cattle contributes a wide variety of nutrients important to our health. Most studies agree that the nutritional differences between these two types of beef are small⁵⁶.

To read the profile of two beef farmers visit pages 41 and 45.



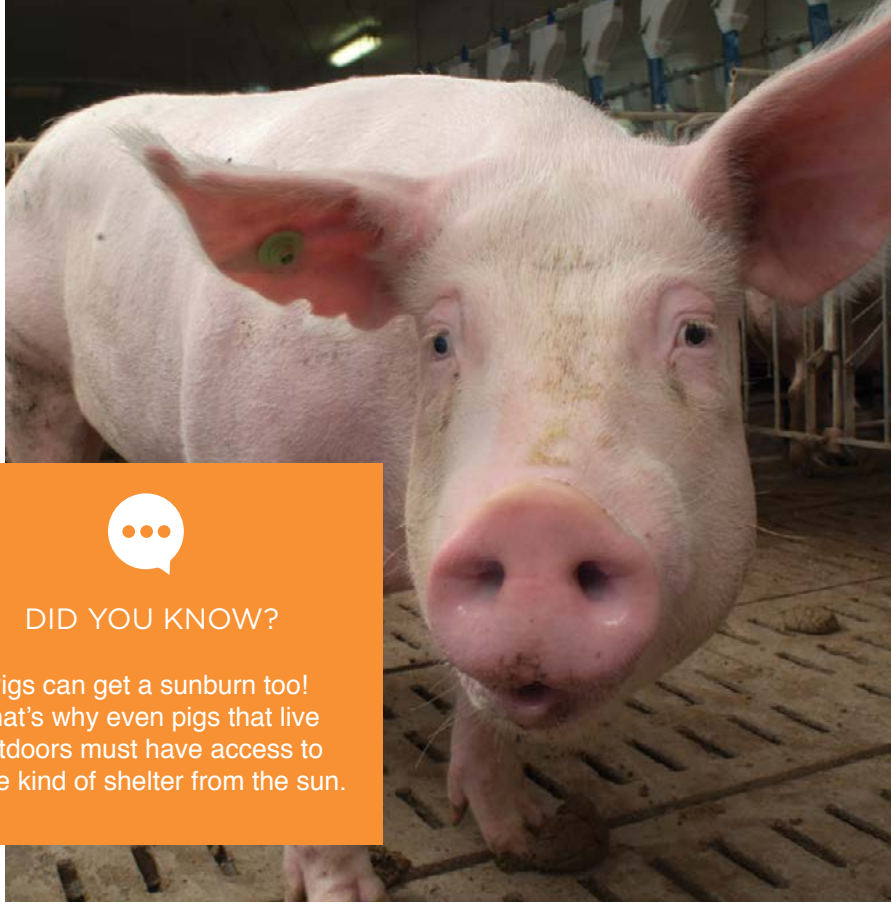
Career Profile

Pig Farmers

Paul and Micah Larsen

Paul Larsen and his son Micah raise pigs on their farm near Belfast, Prince Edward Island. They grow a rotation of barley, winter wheat and soybeans which are then used to make feed for the pigs in their on-farm feed mill. They make specialized recipes, called rations, depending on the needs of the animals at that age. The manure produced by the pigs is then used as a natural fertilizer for their crops.

Micah has been farming full time for three years. In 2019, he spearheaded a change to make the farm more cost efficient and environmentally-friendly by installing a high-efficiency biomass boiler to heat their barns. A biomass boiler uses renewable fuel to create energy. It can burn woodchips and sawdust from leftover waste such as tree tops and branches, shipping pallets and construction or furniture offcuts, as well as straw, corn husks and cherry pits to name a few.



DID YOU KNOW?

Pigs can get a sunburn too! That's why even pigs that live outdoors must have access to some kind of shelter from the sun.

Pigs

Pigs can be raised indoors or outside, but since most breeds don't have fur or wool coats to keep them warm in Canada's cold winter weather, it is difficult for them to live outdoors all year long. That's why most pigs in Canada live in specially-designed barns with fans—or "curtains" that can be opened—to keep a steady, comfortable climate indoors year-round, and to protect the animals against disease. For more information on biosecurity, visit page 24.

Sows and piglets

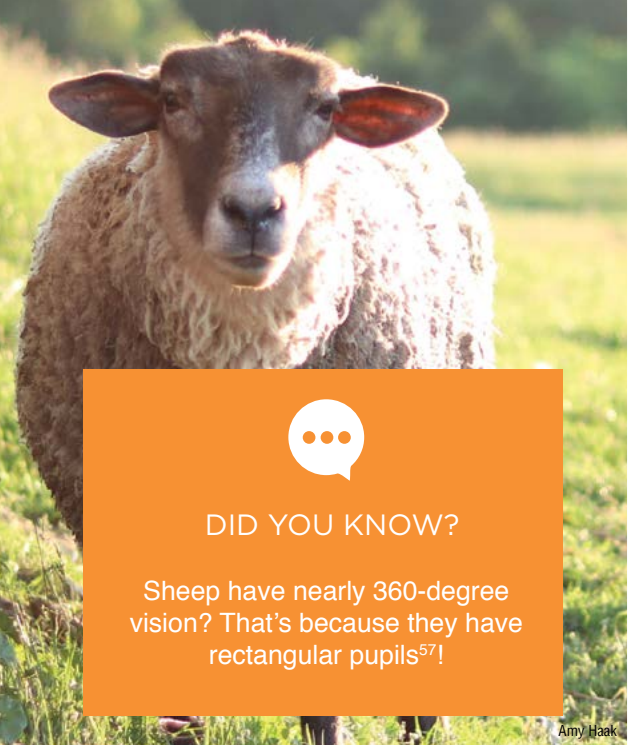
Sows are female pigs that "farrow" or give birth to a litter of piglets twice a year. Each litter usually includes 12 to 16 piglets.

Just before giving birth, most sows go into special enclosures called farrowing pens where they stay until they've finished nursing their piglets. They can lean against the bars of the pens as they lie down—that's to make sure they don't accidentally lie down on top of their piglets and crush them. The pens allow farmers to monitor the piglets and sows closely during this critical time, and also include a special area next to the sow where the piglets sleep, and can be kept warm with a heat lamp or a heating pad.

Once they are weaned from their mothers, piglets live in groups with other pigs the same size or age. In barns built after 2014, sows live in groups too, as individual stalls are being phased out in Canada. Farmers, researchers, and other welfare experts work continually to improve how pigs are raised, and research in pig health, behaviour and housing is ongoing in Canada and around the world.



Farrowing pens are used to protect piglets and the sow.



DID YOU KNOW?

Sheep have nearly 360-degree vision? That's because they have rectangular pupils⁵⁷!

Amy Haak

Sheep, goats and animal guardians

In Canada, some sheep live outside, on pastures, all year long, with farmers feeding them hay and grain in the winter. Other shepherds prefer to keep their flocks in the barn, but most farms use a mixture of both systems. Many sheep farmers use dogs to help with herding, and to guard and protect animals from predators like coyotes. Donkeys and llamas are also good guardian animals.

Goats can be raised for milk or meat production, just like cattle. And just like dairy cows, dairy goats live in barns and are milked regularly. Meat goats may live on pastures too, but still need protection against cold winter weather and predators.

Goat milk can be an excellent alternative for adults with allergies or intolerances to cow's milk—cheese, ice cream, yogurt, and curds are just some of the dairy goat products now widely available. It can also be suitable for children who can't drink cow's milk, pending consultation from a pediatrician.

Insects are farm animals too!

Some farmers in Canada and other countries are now raising insects. Crickets are a major source of protein for over two billion people from Mexico to Asia, and insect-based food products, from flour to nutrition bars and pasta sauces, are now available in Canadian grocery stores too. Insect protein is also a major ingredient in reptile and fish feed—it's a more natural and sustainable alternative to other protein sources in fish diets—and research is underway in various countries as to whether it might be suitable for livestock and poultry as well.

Honey

Honey bees are vital for pollinating fruit, vegetables, and other crops, like canola. Canada produces about 75 million pounds of honey every year. More than 80 per cent of Canada's honey is produced in Alberta, Saskatchewan, and Manitoba. About 9.3 million pounds of honey were produced in Canada in 2018, with 7.8 million pounds exported, mostly to the United States⁵⁸.



Danielle Carter

What about fur?

The fur trade has existed in Canada long before we were even a country. Mink is the most common animal raised for fur in Canada, followed by fox and chinchilla. Popular wild furs include muskrat, beaver, raccoon, coyote, and marten.

Just as with other farmed animals, farmers have to follow rules and regulations for raising fur-bearing animals, including a recently updated *Code of Practice for the Care and Handling of Farmed Mink (and Farmed Fox)*: www.nfacc.ca/codes-of-practice.

Sustainability is a big part of fur farming. Animals, like mink, help to reduce food waste by eating leftover eggs, cheese, fish, chicken, and other human food that has been discarded from grocery stores, restaurants, and other locations. Their bedding of straw or wood shavings and even the animal remains themselves are composted and recycled as a natural fertilizer, or used to make biodiesel, an environmentally-friendly fuel.



Mink



Career Profile

Salmon Farmer

Kirstyn Nygren

Not all farmers drive tractors or work in barns. In fact, salmon farmer Kirstyn Nygren spends more than half the year floating off the coast of remote Nootka Sound, British Columbia. But she doesn't mind the solitude. After all, she has as many as 700,000 Atlantic salmon to keep her occupied, not to mention a breathtaking view of the Pacific Ocean.

Nygren grew up fishing with her family, and loves spending time outdoors, which is essential to her job as the Assistant Manager of one of Grieg Seafood's open-net salmon farms. The ocean can be unpredictable, so you have to be able to "roll with the punches and adapt quickly," explained Nygren. She has a B.Sc. in Marine Biology and Oceanography, and especially enjoys environmental monitoring, like taking plankton samples and testing water conditions. Fish farmers come from all kinds of backgrounds, but the one thing they have in common is a "respect for the environment that they work and live in," says Nygren.

Bison, elk, rabbits, and more

Beyond the traditional farm animals to which we've just introduced you, Canadian farmers also raise many other types of animals on their farms, especially for consumers who are looking for more diverse food choices including deer, elk, bison, rabbit, and duck, for meat. Wool from alpacas and llamas is prized for its cashmere-like softness, and some farmers milk water buffalo to produce specialty cheeses like buffalo mozzarella.

Horses

In Canada, most horses are used for recreation, but many also work on ranches to help move and manage livestock. Horses eat grass, hay, oats, corn, and barley.



Atlantic salmon farm

Grieg Seafood BC

Fish farming

Canada has the world's longest coastline, the world's largest freshwater system, and the world's largest tidal range, so it's little surprise that aquaculture—also called fish farming—is a natural choice for our country.

Canadian fish farmers raise more than a dozen types of fish and shellfish. The main three species of finfish raised are salmon, rainbow trout, and arctic char; mussels and oysters are the most common types of shellfish farmed in Canada.

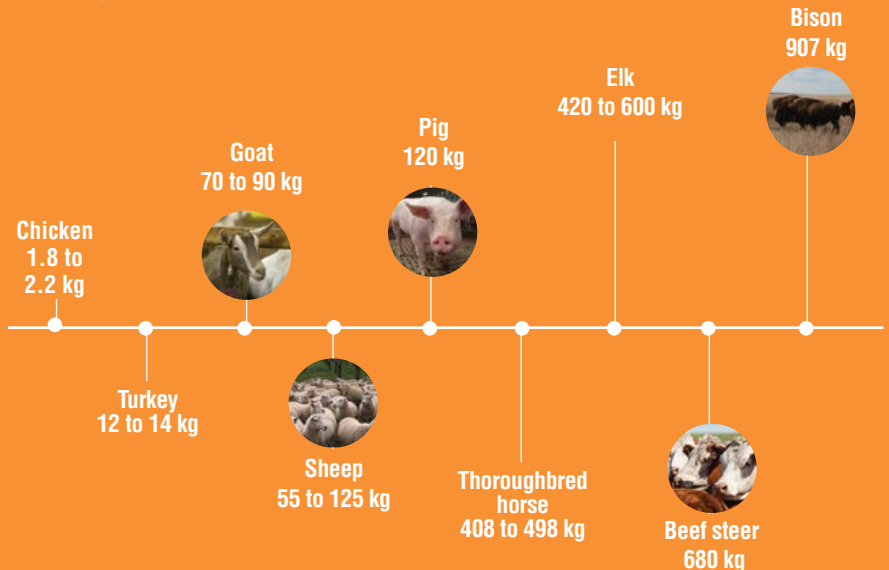
B.C.'s salmon industry supports approximately 7,000 jobs, and contributes about \$1.5 billion to the province's economy every year. Three-quarters of the salmon harvested in B.C. every year are raised on farms. Environmental and social sustainability are a priority, and the majority of B.C. salmon farms are certified, or are working towards certification, in independent, globally-recognized standards for salmon production⁵⁹.

Aqua-what? Growing plants with fish

Some vertical farms that grow plants indoors are also raising fish – and using the waste from the fish as fertilizer for the plants. It's an approach to sustainable, circular farming called aquaponics.

How big are animals really?

Here are some approximate weights of an average, fully-grown male of some common animal species:



Humane treatment of farm animals

Nancy French Photography

Caring for livestock properly, sustainably, and humanely is a matter of doing the right thing. Content, healthy animals and birds are more productive, and lead to safer and better quality food.

Farmers are also continually working to improve farm animal care based on new and verified science, and are investing in farm animal behaviour research to understand better the needs of livestock and poultry animals.

Why are most animals raised indoors in Canada?

Although some grazing animals like sheep, horses, and beef cattle can live outside all year, most Canadian farm animals, especially pigs and poultry, live in barns. There, they're protected from extreme weather and temperature, diseases, and predators, such as wolves and coyotes.

Another reason for indoor housing is better animal monitoring and care. It's much easier to ensure that each animal receives the right feed, clean water, and good animal care inside a barn. Many barns now have side walls with curtains that can be rolled up when the weather is warmer, letting in fresh air and sunlight, and some animals spend the summer months on outdoor pastures.



DID YOU KNOW?

Many barns have smart sensors that closely monitor key metrics, such as temperature and humidity levels in the barn, and will instantly text or notify the farmer the moment these conditions change.

Biosecurity

Most livestock farms have very strict rules in place to keep animals from getting sick. In farming, these rules are called **“biosecurity protocols”**, and they're designed to keep diseases from coming into barns.

Farmers keep a record of any visitors to their farms, and what they bring with them, from vehicles to equipment and feed. Visitors to the farm only go into a barn if they absolutely have to, and if they do, they

may be asked to put on protective footwear and clean overalls to keep outside germs from entering the barn. At some pig farms, anyone going into a barn has to take a shower before entering, and again when they leave, just to make sure no disease gets in that could make pigs sick.

As with people, it's always best not to get sick in the first place, than having to take medication to get better.



Not enough space?

Farmers know that giving animals enough space is good for their health and well-being. They work with experts like veterinarians and feed nutritionists to ensure that each animal has easy access to feed and water, and room to move and lie down. Science-based research on animal welfare recommends the appropriate amount of space needed for a certain number of animals—in the farming world, this concept is called “**stocking density**”.

And sometimes, no matter how much space animals are given, they like to be very close to each other for a greater sense of protection and warmth.

Research is ongoing into the best ways to raise healthy animals while producing safe food and recognizing environmental and economic realities.



Livestock monitoring on the go

Increasingly, farmers can control heat and electricity in their barns from their computers, tablets, or smart phones. The majority of farms also have generators to make sure that their barns have electricity if the power goes out. And a growing number of farms are installing sensors and smart systems to track everything from feed consumption to how many steps a day a cow takes—all in an effort to keep animals healthy.

Dairy Farmers of Ontario

QUICK FACT

An artificial intelligence system called *Ida* analyzes the behaviour of dairy cows to predict when an animal might become sick. This can help reduce antibiotic use and increase milk production.



Career Profile

Animal Care Researchers

Karen Schwean-Lardner and Bart Lardner

Karen Schwean-Lardner and Bart Lardner share many things including their children, grandchildren and granddogs to name a few. But they also share a passion for animal care and for passing their expertise onto others. Both earned Bachelor, Master and PhD degrees at the University of Saskatchewan before becoming faculty members.

Schwean-Lardner's work focuses on how good management practices impact the welfare and productivity of laying hens, chickens and turkeys. Her research helped to establish international lighting standards for poultry barns and develop the first enriched housing system for laying hens in North America. She is also passionate about teaching the next generation of poultry scientists.

Lardner's work focuses on applied research in everything from cattle nutrition to forage and pasture management. “I have always felt that I am an intermediary between the farmers and the research community,” said Lardner, “It's important that the research can be disseminated to farmers in a way that it can be put to use on their farms.”

Genetics and Animal Breeding

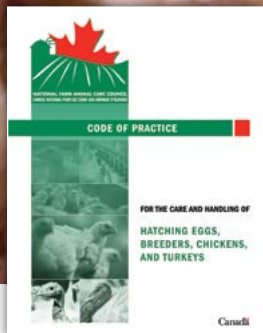
Farmers have been selectively breeding animals for years in attempts to build herds or flocks of animals that are healthier and more productive. This process involves selecting parents that have desirable traits, which offspring tend to inherit. Over time, more animals in the herd will be born with the desired trait(s).

Traits are passed from parents to offspring via one or more genes, which are segments of DNA. Animal geneticists have developed techniques, such as genomic selection, that identify and isolate genes to convey desirable traits such as milk production or disease resistance. These techniques provide animal breeders with the ability to identify and select animals with desirable genes more efficiently.

Some farmers breed their animals naturally, while others may choose a process called **artificial insemination (AI)**. In this case, semen from the male animal is collected and delivered to the female's reproductive tract, to create offspring. AI makes it possible to introduce the best traits available into a herd, even though males with those traits might not live nearby. AI also limits the transmission of disease, and increases safety for the animals and farmers⁶⁰. Farmers can more accurately predict the date that an animal will give birth, so they can provide better care for both the mother and offspring at that time.



Farm Boy Productions



Turkey poults

The rules for raising farm animals humanely

There are currently 16 Codes of Practice for the care and handling of different livestock and poultry species in Canada that spell out best practices for things like housing, feed and water, health care, humane euthanasia, transportation, and more.

The National Farm Animal Care Council oversees the development and updating of these codes based on the best science available and careful input and consideration by committees of farmers, veterinarians, animal welfare experts, and humane society representatives. To see all the codes, and for more information on how they are developed, please visit www.nfacc.ca.

Like all animal owners, farmers must follow laws for humane treatment. Each province in Canada has laws to protect animals from cruelty. Many provinces reference the Codes of Practice within their regulations.

Are controls in place to deal with farm animal abuse?

Absolutely! Animal neglect and abuse of any kind is a crime, and is not tolerated. Farmers and ranchers are responsible for caring for their animals properly and humanely, and must follow all laws and regulations, including the federal Criminal Code, and provincial animal care legislation.

Most farmers and ranchers do a great job caring for animals, but bad situations do happen—and they upset other farmers as much as everyone else.

That's why farm organizations in some provinces have developed their own peer services to help improve farm animal care. Ontario farmers created the first council dedicated to farm animal welfare in Canada over 30 years ago, and similar organizations now exist nationally, in other provinces and in the United States.

All farmers, veterinarians, and others who work in the field are encouraged to call for help or report any welfare problems immediately.

On-farm assessments

Most of Canada's livestock sectors have developed, or are developing, on-farm animal care assessment programs. They include ProAction for dairy farmers, Raised by a Canadian Farmer animal care program for chicken farmers, Canadian Pork Excellence, Egg Quality Assurance, Verified Beef Production Plus to name a few.

Auditing and assessments provide verification that a farm is following best practices, with the goal of finding problems quickly, and continually improving. Failure to follow audit requirements can result in fines, closure to market access, and potentially losing the legal right to produce a product altogether.



Farm Boy Productions

Animals on the move

Ensuring livestock and poultry are transported safely and ethically is just as important as caring for them properly on the farm, and is part of responsible animal care. Livestock sometimes move from farm to farm as they pass through their various stages of growth—once piglets born on one farm get big enough, they may move to another to grow to market weight and, of course, they leave the farm to go to market.

Canada is a big country, and sometimes distances between farms or to processing plants are long. The Canadian Food Inspection Agency

(CFIA) oversees animal transportation in Canada with regulations around weather, access to food and water, adequate space, maximum travel times, when animals are unfit for transport, and more. They've just updated those regulations for the first time in over 40 years to reflect changes in technology and consumer expectations.

For example, they've reduced the length of time animals can be in transit, and farmers now share responsibility for the animals' welfare with the transporter. CFIA inspectors make sure the rules are being followed.

Transport and technology

Transport Genie is new technology that monitors conditions inside livestock trailers affecting animal comfort and welfare, using a system of smart sensors that provides information to users along the supply chain. It can relay real-time data to the driver, so that actions to correct problems can be taken right away. The Canadian-developed technology is currently being tested in various locations, including with Switzerland's largest poultry producer.



Career Profile

Livestock Transporter

Sara Crawford

Sara Crawford might not look like what you would picture a livestock transporter to look like and she is used to having people look twice when she steps down out of her purple truck and trailer at a farm, processing plant or truck stop. She's been driving livestock trucks and trailers since she was 18 years old (the age when she could get her AZ licence), bought her first truck three years ago and now travels across Canada and the USA taking pigs and other animals to their destinations. Growing up, she wanted to be a heavy diesel mechanic but said that she was also curious about what it would be like to drive the trucks she was learning to fix in a high school co-op course. She took a course and knew she had found her career.

As a livestock transporter specializing in getting pigs from farms to market, Crawford and her colleagues must also be certified under the Transport Quality Assurance® program. The program helps transporters, farmers and handlers understand how to handle, move and transport pigs. Crawford is convinced that her colleagues are among the best truck drivers on the roads. Said Crawford, "Livestock truckers have got to be great drivers because we're carrying live animals who need to arrive at their final destination in good shape".



Career Profile

Hardware and Software Developer

Idris Soule

"The intersection between farming and technology is a no-brainer."

With experience working for tech-giants like Google and Blackberry, Idris Soule never imagined that he would work in agriculture. But that changed in 2017 when he joined Transport Genie, and helped to develop a real-time tracking system that protects farm animals' health during transport.

It's all about "transparency and accountability along the supply chain," says Soule. "It's gratifying to help give Canadians and people throughout the world the assurance that their food is safe and meets the highest standards of animal health and welfare."

To anyone considering a career in agri-tech, Soule says, "The world is changing quickly, and the tech sector is leading the charge. Agri-tech has the opportunity to transform the food system by bridging the gap between tried-and-true farming practices and technology to benefit all stakeholders, including farmers and consumers."



DID YOU KNOW?

It is illegal to do anything that causes suffering to an animal at any point during transport⁶¹.

Farm Boy Productions



A look at some livestock management practices

Sometimes procedures are done to enhance animal welfare and worker safety. Here are some examples:

Dehorning is the removal of horns from beef and dairy calves. This procedure is for the safety of both the animals and the people working with them. Research has shown that young calves suffer less pain and stress if dehorning is performed when the horns haven't yet developed. Pain control medication must be used when dehorning. Many types of cattle today are "polled"—they are breeds that genetically don't grow horns at all.

Beak trimming is done to prevent laying hens from hurting each another while establishing the "pecking order" of the flock. The proper procedure is to remove just the tip of the beak when the birds are very young. This is now done with a laser when the chick is first hatched and takes only seconds. Research continues into behaviour, nutrition, and genetics, to look for ways to eliminate the need for this procedure.

Tail docking is done in sheep to keep manure from collecting on their tails and hindquarters. That's to prevent flystrike, a condition that can occur when flies lay eggs in manure-soiled wool that hatch, and the larvae begin to eat the surrounding flesh. Tail docking can decrease the incidence of flystrike and reduce manure buildup on an animal, which also improves food safety, as there's less chance of contact between meat and bacteria during processing.



New ways of doing things

Research is always under way to find new, better ways to raise the livestock and poultry on our farms—and that's the same for farmers all around the world. An example of a problem in need of a better solution is that of male chicks in the egg laying industry. The females grow up to lay eggs, but males can't. They are from breeds not used for meat (they don't gain weight as quickly or have meat as tender), so there's no role for them to play on the farm, which means they end up having to be humanely euthanized to veterinary standards.

Canadian farmers are working on a solution to this problem. Hypereye is a light-based, non-invasive egg gender identifying technology developed at McGill University that can separate male eggs from female ones when they are laid, so that only female eggs are incubated and hatched into chicks. The innovation is starting to roll out in Canada in 2020.

Fire!

There is nothing more devastating to a livestock farmer as a barn fire and the loss of their animals. In most cases, the exact causes of barn fires are unknown, but many are thought to start with faulty barn electrical systems.

One tool farmers are using is heat-sensing cameras to determine if electronics are in good working condition, and to pinpoint potential hot spots. And wireless temperature monitors can send alerts directly to a farmer's cell phone in case barn temperatures climb too high.



Animal welfare and animal rights – what’s the difference?

Why do some groups talk about animal welfare while others talk about animal rights? The two terms have a lot in common, but are really different philosophies along a spectrum concerning all those who care about animals⁶².

Animal welfare: humans have a right to use animals, but also the responsibility to ensure the ethical treatment and wellbeing of animals in their care. This position is the one supported by most people, including farmers.

Animal rights: humans don’t have the right to use or confine animals for any reason, including food, medicine, domestication, education, clothing or entertainment.

It can be difficult to sort out the many positions and groups involved with animal care or animal use issues, and farmers are open to respectful discussion and transparency. They are interested in finding new, better ways to raise animals, and they invest a lot of time and money into animal welfare practices, education, and research to make that happen.

If you want to know more about how farmers care for their animals, please just ask—on social media, at farmers’ markets on farm tours or at other local events.

Tip: many farmers are on Facebook, Instagram or Twitter, and are more than happy to answer genuine questions about how they raise livestock, grow crops, or produce food. If you’re not comfortable asking your question in public, try a direct or private message on one of those platforms.



Farm trespassing and “undercover” operations

Increasingly, Canadian farmers have been faced with animal rights activists trespassing onto their farms, and in some cases, even entering into barns and interfering with animals. Not only does this action cause immense stress to both farmers and livestock; it exposes animals to possible diseases and threatens food safety.

Governments in several Canadian provinces have now introduced laws to protect farmers against this type of trespassing onto private property, and to keep livestock safe from interference during transport.

Another tactic is the release of undercover video footage showing alleged farm animal abuse. At times, individuals filming the undercover footage have been doing so for extended periods of time without taking action to stop abuse or questionable activity. This, too, is unacceptable and should be reported to the proper authorities immediately. Anyone with concerns about animal welfare should notify the appropriate authorities. These authorities have the powers to investigate suspected animal abuse, collect any relevant evidence, and file charges, and are appropriately trained in animal husbandry and handling, biosecurity protocols, collection of evidence, and adhere to a code of conduct.

It’s important to keep in mind that everything may not be what it seems—and just because something is on the internet doesn’t mean that it’s true. Misleading messaging and modified images or videos are often a part of anti-agricultural campaigns, and need to be approached with critical thinking in mind.

The bottom line:

There’s no benefit of any kind to anyone from mistreating animals. One extreme case is always one too many, but it is far from the norm and does not reflect the quality care that millions of farm animals all across Canada receive every day.

See for yourself!

Experience the many different types of Canadian farms with your home, office or mobile device at www.FarmFood360.ca and check out the many virtual farm and food tours available.



Food security, eating local and the cost of food

Farming is a critical part of Canada's national food security, ensuring that our country has enough to eat. But it takes more than farms to feed a country; we also depend on a whole supply chain of feed, fertilizer and equipment suppliers, veterinarians and crop specialists, transporters, processors, distributors, retailers, and delivery companies to get food to Canadians.

Every one of those links in the supply chain must be able to make money in order to stay in business, and that includes farmers. At the same time, food costs have to be kept affordable for consumers.

The cost of producing food

There are many things farmers have to pay for to produce food, like electricity, equipment, water, fertilizer, animal feed, seeds, and fuel, as well as workers to help them raise livestock and poultry and to grow crops.

As with many things, prices for these items continue to go up, so farmers always have to look for new ways to produce more food more efficiently so that they can stay in business. And there are things outside of a farmer's control that impact their business too, like transportation or processing strikes, trade agreements and political spats between countries, weather events, or global crises like the COVID-19 pandemic.

The cost of buying food

It might not seem that way to everyone, but most Canadians are lucky to spend less of their income on food than people in most other parts of the world. On average, we spend about 10 to 11 per cent, or \$0.10 to \$0.11 of each dollar of our disposable income, on food and non-alcoholic beverages⁶³, and by early February, the average Canadian has earned enough income to pay for their individual grocery bill for the entire year.

Compare that figure to Mexicans at 23.4 per cent, Ukrainians at 42.2 per cent, and Nigerians at 59 per cent⁶⁴ and imagine how different your life would be if you had to spend that much of your income on food.

QUICK FACT

On average in 2019, Canadian farmers spent 80 cents of every dollar they earned on expenses to grow food⁶⁵.



Food insecurity

Even though Canadian food in general is relatively inexpensive compared to other countries around the world, there are still many Canadians who struggle with affordability and accessibility—an issue called “**food insecurity**”. “Food deserts” are urban neighbourhoods, or even rural areas, where residents have little or no access to stores and restaurants that provide healthy, affordable foods, and where they may be forced to rely more frequently on convenience stores or fast food outlets⁶⁶.

In northern Canada in particular, fresh food is scarce, and the high cost of transporting food into those regions makes many products, particularly healthy food choices, very expensive.



QUICK FACT

The Global Seed Vault on a remote island in northern Norway is home to almost one million samples of food crop seeds, so we can preserve plant life through crises like war and climate change⁶⁸. It's a bit like storing your photos in the cloud or on a backup hard drive, so you'll still have them if you lose your phone!

NordGen

Milestone: In 2020, the Cherokee Nation became the first North American Indigenous tribe to donate heirloom seeds to the vault, including a sacred corn used in cultural events⁶⁹.

Foodbanks serving up food security⁷⁰

There's hunger and need even in a country as wealthy as Canada. Even before the COVID-19 pandemic hit, Canadians were making about 1.1 million visits per month to food banks. A variety of circumstances can lead to food insecurity, including unemployment. But even the number of full and part-time workers who require access to foodbanks is growing, with one in eight people who access these services being employed.

Farmers step up

About 40 per cent of food distributed by Canadian food banks is fresh, like milk, eggs, meat, and produce. A lot of that food is donated by Canadian farmers. Many provincial and national farm organizations have regular food bank donation programs, including grain, fruit, vegetable, egg, dairy, pork, beef, turkey and chicken farmers.



DID YOU KNOW?

In Nunavut, the cost of groceries can be three times the Canadian average, with some items costing up to ten times more. The Arctic Research Foundation has set up “grow pods” powered by wind and sun to grow fresh vegetables in the village of Gjoa Haven⁶⁷.



Career Profile

Container Farm

ColdAcre

In the far north of Canada where the climate isn't conducive to growing most crops, especially year round, ColdAcre Food Systems specializes in indoor all-season food production in the Yukon. They grow, harvest, and sell more than 30 varieties of leafy green vegetables, microgreens, edible flowers, herbs and mushrooms all year long. Since opening its second shipping container-style growing facility, ColdAcre provides weekly fresh-harvest products for retail, restaurants, and subscription box clients and are already planning expansion for 2021. “There is an enhanced interest and focus in northern markets around locally grown food,” said Carl Burgess, CEO of ColdAcre.

They also build customized growing systems and offer training to Northern communities and businesses seeking food security options and opportunities, including residential and commercial clients. “The technology changes quickly and soon these advances will help people to grow a broader array of food at a smaller scales. ColdAcre wants to help set families and communities up for success.” said Burgess. He also explained that young people are very interested in the technology and predicts that they will be a driving force behind indoor local food production in the future. It's harvesting in the north for the north.

Photo courtesy of GBP Creative/Gary Bremner

The luxury of choice

In general, we are lucky to have many different choices when it comes to the kinds of foods we can buy. Canadians have the freedom and opportunity to make food choices based not just on cost or availability, but they can also consider environmental concerns, health issues, or ethics.

We can always find whole foods grown and raised in Canada, or foods containing Canadian ingredients at a wide variety of prices, depending on each person's preference and resources. Regardless of the type of diet Canadians follow, or the amount of money they have available to spend on eating, there are farmers willing and able to grow food for them because of the many different types of farms and ways of farming we have in our country.

Looking at labels

Food labels can be vitally important if people have diagnosed dietary needs. However, marketing labels can add a “perceived value” and be misleading at times, so it pays to do a little research when making food choices.

“Natural” meat

All meat is natural since it comes from animals and is not manufactured. The only meat that can legally be labelled as “natural” is meat from animals raised without ANY human intervention of any kind, like wild game. Companies can, however, use the term “natural” to describe flavour⁷¹.

Raised without antibiotics

Meat with a “raised without antibiotics” label comes from animals that have not received any antibiotics at any time in their lives.

Gluten-free

Gluten is a natural protein found in wheat, barley, rye, triticale, and foods made with these grains. Products labelled “gluten-free” are not any healthier; they are just made with ingredients that don't include gluten⁷²— which is particularly important for the one per cent of Canadians with celiac disease, or those with gluten sensitivities⁷³.

Sometimes a product will be labelled as being “free” of something, like being gluten-free or GMO-free. However, sometimes that product doesn't actually contain gluten in the first place, or GMO versions of that product don't actually exist. These are called **absence labels**, and are used as a marketing tool to make one product look superior to another.

Plant-based proteins are becoming increasingly popular, as people look for alternative protein sources in their diets, or wish to follow a vegetarian or vegan diet, which means eating fewer or no animal products at all. And food producers are responding accordingly with products like plant-based burgers and “chik'n” strips made from pea, bean, or soy proteins, egg substitutes made from mung bean, and milk-style beverages made using oats, soy or nuts like almonds or cashews. Some producers and restaurants are offering “blended” products that contain a mixture of plant and meat proteins.

Another emerging field is **cellular agriculture**. This occurs where researchers are producing meat and dairy products in laboratories using only animal cells instead of the animals themselves, using tissue engineering technology that is used in regenerative medicine.



DID YOU KNOW?

In Canada, all chickens are raised without added hormones, so chicken products labelled “**raised without the use of added hormones**” are no different than chicken products without that label.



Why is organic food more expensive?

Organic farming poses unique challenges as some tools available to other farmers are not available to Canada's certified organic producers. Generally speaking, foods labelled as organic are grown or produced without the use of tools such as synthetic (man-made) fertilizers or pesticides, genetically modified organisms, growth hormones, or medications like antibiotics.

As a result, organic farming methods tend to be more labour-intensive, and organic food products are often grown, processed, and packaged at smaller volumes. Organic livestock production in particular has higher costs than conventional —organic feed isn't as readily available, so it costs more; housing is more expensive because the stocking density is lower in a barn, animals need access to the outdoors and there aren't as many organic dairies and abattoirs⁷⁴.

Organic production systems also generally yield less food than conventional production. While organic production may support ecological health on a local scale, there is debate around the idea that lower productivity could mean more land will be needed to produce the same amount of food. The argument is that this difference could actually cause greater global environmental impacts than conventional production⁷⁵.



This logo indicates a product meets Canada's organic standards

Why do people buy organic?

Many consumers associate organic food with a healthy lifestyle—and some studies have shown higher levels of beneficial omega-3 fatty acids in organic meat and milk, and more antioxidants in organic plant-based foods⁷⁶. All agricultural food products—meat, eggs, dairy, fruits, vegetables, and others—are rich in nutrients, though, and are part of *Canada's Food Guide*.

Whether organic or conventional (non-organic), all food in Canada must meet the same food safety standards. Organic farmers can in fact use naturally derived pesticides to control pests. Just as with crop protection products used by conventional farmers, however, these substances must be approved by the Pest Management Regulatory Agency, which is part of Health Canada. Canada has some of the strictest food safety regulations in the world, so regardless of how the food you choose has been grown, you can be confident that it is a good choice.

Trusting the organic food you're buying

All Canadian products using the *Canada Organic* logo have been certified by an independent auditor, who verifies that the farm meets the Canadian Organic Standard. These are the rules which organic farmers must follow, and they are regulated by the Canadian Food Inspection Agency. Organic farms are inspected annually to make sure that they're still meeting the standard.

For imported products to be sold and labelled as organic, they must meet "equivalency arrangements" by which the regulations and certification process of another country are deemed consistent with Canada's⁷⁷.



Career Profile

Registered Dietitian

Michelle Jaelin

Raised in the Greater Toronto Area, Registered Dietitian Michelle Jaelin said she grew up not knowing anything about agriculture or the potential of having a career in that industry. She'd never met a farmer and there certainly weren't any farms nearby.

She studied nutrition and food at Ryerson University. While there, she attended a food conference and met people working in the industry. Later, she was invited on a farm tour and said she was fascinated to learn how food was grown.

One of Jaelin's biggest frustrations is that while there is a lot of information out there, it's not all good or accurate. Sadly, it's also easier to sell fear than to sell reassurance. She said she often gets questions like, "Is this safe to eat?" "Is this healthy?" "What's the difference between organic and conventional?"

In her career, she uses a combination of social and traditional media and other communications tools to help people make more informed food choices. She said it's extra rewarding to do a TV segment and then get a nice follow up comment from a viewer. She says, "It's great to be able to give people information that helps them make their lives better and healthier through food".

How do I know what the right choice is?

There is no right or wrong answer for consumers when it comes to deciding what to eat. What's important is making an informed decision based on current, accurate facts. Unfortunately, there is a lot of misinformation out there that can make it difficult to know what's true and what isn't—so if you have questions about your diet, consult your doctor or a registered dietitian.

Dietitians work within hospitals, grocery stores, doctors' offices, and in private practices to provide personalized nutritional advice and practical solutions, without fads or gimmicks.

Eating yourself healthy

The link between food and health is well known. Foods rich in essential vitamins and minerals, fibre, antioxidants, omega-3 fatty acids, and other compounds, can help keep us healthy—and science is finding new ways to make good-for-you foods even better:

- A purple wheat variety from Saskatchewan called "AnthoGrain™ wheat" is high in anthocyanins, an antioxidant that aids in eye cell repair⁷⁸.
- Specialty canola varieties with higher levels of omega-3 fatty acids are in development. Omega-3 fatty acids are essential to brain, eye, and heart health, and inflammation management⁷⁹.
- To prevent stunted growth in children due to malnutrition, a rice variety high in zinc is now available in Indonesia⁸⁰.



Nancy French Photography

What is supply management?

To organize the production of eggs, chicken, turkey, and dairy products in Canada, farmers use a system called "supply management". It lets farmers across Canada match their production to Canadian demand, so consumers have a reliable supply of fresh, high quality food at a reasonable price, and farmers receive fair and stable returns for their work. Supply management does not set retail or restaurant prices for poultry, eggs, or dairy products, but it does ensure that farmers are paid enough to cover their costs of production.



Erika DeBrouwer

Loving local

Buying and eating local food is very popular in Canada. The definition of “local” varies, however, and can refer to a region, province, or even the entire country.

The local food movement has resulted in more farmers’ markets, local food stores, and food hubs in all parts of Canada, and “buy local” campaigns encourage Canadians to support farmers and food producers in their areas by eating the fruits, vegetables, meat, cheese and yogurt, jams, honeys, or other goods that they’ve produced.

Not only does that support jobs and businesses in local communities, it can also reduce food’s environmental footprint if a product comes from a farm 20 minutes away, as compared to being shipped thousands of kilometres.



Food imports and exports

Every crop is ready for harvest and eating at a different time of the year. In Canada, asparagus is one of the earliest-harvested vegetable crops in the spring, and peaches are a popular summer favourite.

You might not notice the seasonality of these crops though because today, we can buy imported strawberries, asparagus, or sweet corn at the grocery store all year long.

And there are other foods we love that we can’t grow here at all, like coffee, pineapples, cocoa, and avocados, so we import them from countries that are able to grow them.

We also produce much more of certain types of foods than we could possibly eat here at home—like pork, beef, lentils, peas, chickpeas, canola, soybeans, or wheat—so we export to other countries where they’re an important part of people’s diets.

Career Profile

Chef

Ilona Daniel

As a child of Hungarian and Armenian immigrants, meal time has always been important to Ilona Daniel. She can’t pinpoint exactly what inspired her love of food, but fondly remembers “sitting on the counter while my mother cooked a meal that was always too big for our family, and absorbing everything I was seeing.” She added, “It was almost as if I was learning to cook through osmosis.”

Daniel moved to Prince Edward Island twelve years ago to attend the Culinary Institute of Canada on a full scholarship. Now, an instructor there, her experience has come full circle. In addition to teaching, she runs a culinary consulting business and contributes regularly to print and television media.

Her love of PEI has only grown stronger over the years, and she attributes some of that to the more intimate connection that islanders have with their food. “Everywhere you look there is a constant reminder of how food is produced,” she said, “people who grow and produce our food are deeply passionate, and their expertise spans their lifetime. Connecting with them helps us understand just how important our role is as consumers.”



Canola Council of Canada

Canola seed



Donna Rogers/Dylan Wiens

Peach farmer cultivating between rows of peach trees

The farm labour challenge

A big part of the economics of producing food is labour. Just as with other businesses, farmers often need to hire extra people apart from family members to help get everything done. Technology and equipment are helping to make some work easier, but people are still the most important part of producing food on the farm.

Farm jobs aren't like most other jobs. Cows have to be milked every day, and crops have to be harvested when they are ripe, or else they'll lose their taste and quality, or even just rot in the field or on the vine. That means workers can't just stop working because it is the weekend, or because the weather is bad.



Career Profile

Agriculture Student

Oresta Hewryk

Oresta Hewryk was raised in New York City, but when it was time to go to university, studying in Canada was an easy choice because of her dual citizenship. She was initially interested in becoming a veterinarian, so she enrolled in the Ontario Agricultural College's Animal Science program.

Although Hewryk had little experience with farms or with farmers, she appreciated the sense of community and support she found with her fellow "Aggies". "Not many other programs have students that are so close-knit. We have so many opportunities to learn from each other and grow as a group," she said.

Hewryk is currently in her third year of the program's research stream, but shifted her focus to plant science after a rewarding summer job working in one of the University's research labs. She plans to pursue graduate studies in plant genetics. Her goal is to teach students like herself in the future with the hopes of inspiring them to explore all of what the agricultural sciences have to offer.



Myrna Stark Leader

Mechanical blueberry harvester

More than just a job

Working in agriculture is much more than growing crops or raising livestock, though. One in eight Canadian jobs is linked to agriculture⁶¹; from communications, engineering, and economics, to food and animal sciences, tourism and the environment, the career possibilities are endless.

There are many more jobs available in Canadian agriculture than people to fill them. There are currently more than 60,000 vacant jobs in the sector, and in ten years, the industry could be short 123,000 people⁶². The Ontario Agricultural College in Guelph, for example, estimates there are approximately four jobs for every one of its graduates going into the agri-food sector.

Agriculture in the Classroom Canada, and its provincial member organizations across the country are working to introduce these exciting career opportunities to students to support the long-term sustainability of the sector. You can also read the career profiles throughout this magazine to see a sampling of the diversity of options available.

A helping hand from away – seasonal and temporary foreign workers in Canada

Fruit and vegetable farmers in particular rely on many people to help them plant, manage, and harvest their crops; most bruise or damage easily, so they still need to be cultivated and picked by hand. Even though robots are being developed to harvest crops or scout for pests and diseases, those tools aren't readily available yet.

Canadian farmers who can't find enough local employees rely on guest workers from other countries to work on their farms. They come to Canada under various programs, like the **Seasonal Agricultural Workers' Program (SAWP)** and the **Temporary Foreign Worker Program (TFWP)** program. These programs are essential because on-farm agriculture has the highest job vacancy rate of any industry⁸³. This circumstance is largely due to the seasonal nature of the work, as well as the fact that most Canadians live in urban centres, far from the farms where workers are desperately needed.

The solution to these challenges has been, in part, the SAWP, which was established more than 50 years ago to bring workers from Mexico, Jamaica, Trinidad and Tobago, Barbados, and other Eastern Caribbean countries to work on Canadian fruit and vegetable farms. Workers stay for the growing season, and

go home to their families for the winter months.

Strict rules imposed by both the workers' home countries and the Canadian government must be followed by both farmers and workers in order to be part of SAWP. Workers on the program have the same workplace protections as Canadian workers, including minimum wage, health care, and workplace insurance coverage, and access to Employment Insurance, from the moment they arrive in Canada.

Many of these workers have been coming to the same farms for years and have become highly-skilled in these specialized tasks, and the money they earn helps take care of their families and support their communities. In some cases, they've been able to set up businesses at home that create local jobs and send their children to university. Without their help, many Canadian farmers wouldn't be able to grow the local fruits and vegetables that we love.

During the COVID-19 pandemic, many international workers were unable to get to Canada to work for the season. Although farmers tried to hire local workers to replace them, many crops were either not planted at all, or could not be harvested, as in the case of perennial crops like asparagus or strawberries.



Career Profile

Seasonal Agricultural Worker

Trinidad Vargas Sanchez

Trinidad Sanchez has been coming to Canada from Mexico as a Seasonal Agricultural Worker for 31 years, always returning to Holland Acres, a farm owned by the Van Luyk family in the Holland Marsh region of Ontario. He arrives each April, returns home in mid-November and now leads the team of employees that helps to grow the farm's crop of carrots, onions, parsnips and beets. He's now accompanied annually by his son Eddie and son-in-law Juan. He says that work in Canada has given his family a lot of opportunities. Even though he misses his family when he's away, he looks forward to returning to Canada each year.

TFWP employee harvesting mushrooms



Nancy French Photography

SAWP employee harvesting apples



Nancy French Photography

Environment, climate change and sustainable farming

Jamie Allport

Farmers are on the front line of our environment every day and they know first-hand how important healthy soil, air, and water are to growing crops and raising livestock successfully.

They're also among the first to experience and be forced to adapt to our changing climate from more frequent extreme weather events, drought and disease.

That's why, more than ever, sustainable farming is the name of the game—regardless of the type, size or style of farm.



Maria Ramirez Giraldo

Strip of pollinator-friendly flowering plants, including Phacelia, planted at the edge of a farm field as part of the Operation Pollinator program

Investing in change for the better

On their own, through farm organizations, and with government, Canadian farmers invest heavily in environmental research and sustainable farming practices.

Success story: the Environmental Farm Plan helps farmers across Canada to identify where environmental improvements can be made on their farms, and to set goals and deadlines to complete them, such as establishing buffer strips along water courses; reducing soil erosion by planting trees and cover crops and supporting pollinators by planting wild flower strips. The program has been so successful that some of its elements can now be found in processor and retailer food system sustainability plans.

How good were the “good old days” really?

Environmental degradation is not a phenomenon of “modern” farming. The dust bowl of the 1930s, for example, was caused by a combination of a lengthy drought, and working or tilling the land too much, which caused topsoil to be blown away by strong winds. Back then, fighting weeds and pests often involved plenty of tillage, and naturally occurring but toxic pest control substances like sulphur, mercury, and arsenic compounds were also commonly used.

Today's products are safer and much more tightly controlled and regulated by government, and we know so much more about soil health, pest and nutrient management, and sustainable crop production.

Where does soil come from?

There are 10 main soil orders in Canada, which are then divided into groups, families, and series, to cover hundreds of different soil types across the country. The Soils of Canada website, developed by a network of Canadian soil scientists, is a great place to learn more about soils across the country: www.soilsofcanada.ca.

All those different Canadian soil types are directly linked to how glaciers moved during the last Ice Age. About 12,000 years ago, glaciers slowly ground rocks into finer particles as they moved south, and when the glaciers retreated, they left that sand and gravel behind in the soil. Combined with climate, and annual cycles of plant and animal growth and decay over millions of years, that process has built Canada's soils into what they are today.

The type of soil found on a farm—and how farmers look after it—will influence what crops a farmer can grow, and how they'll be grown.



DID YOU KNOW?

Soil comes from nature, so farmers have to work with what they have. Soil isn't something they can just change if they don't like it.

Isn't soil the same as dirt?

In a word, no! Soil is a living environment that's ideal for growing crops. It's a complex mixture of small particles of sand, silt and clay, decaying plant residue, earthworms, bacteria, fungi, insects, and micro-organisms. In fact, there's a whole fascinating world under the ground that's just as important to producing food as what's above ground—and farmers, soil scientists, and others are just starting to learn about soil microbiology and how it influences the ways in which plants grow.

Dirt, by comparison, is simply dead soil. As such, the title of this magazine should maybe have been *The Real Soil on Farming!*

Listening to what the soil is saying

Farmers have long been sampling their soils to know how much fertilizer or manure they need to apply. But new soil sensing technology is providing a whole new picture of what's underground. SoilOptix^{®85} uses a sensor mounted to an ATV or a truck to measure gamma radiation emitted by the natural decay of soil. High resolution digital maps of each field show their chemical and physical properties. More information about what's not visible to the human eye means better soil health decision-making for farmers.



DID YOU KNOW?

It can take between 100 and 500 years to build two centimeters of topsoil. Sustainable tillage helps rebuild topsoil by slowly adding organic matter from the previous year's crop⁸⁴.

QUICK FACT

Soils have unique characteristics that can influence the flavour and character of grapes and wines. Wine lovers call this effect "terroir".

Why organic matter matters

Organic matter in the soil includes decaying plants, microbes, bacteria, and other microorganisms. It's a great nutrient source, a habitat for soil organisms, and improves the water-holding capacity of the soil. The more you have, the healthier your soil—and the healthier your soil, the more productive it will be for producing food.

Growing crops without working the land = win-win

Today, farmers widely use crop growing methods like conservation tillage (working the soil as little as possible), strip-till (only working a narrow strip where seeds will be planted) or no-till (not working the soil at all).

With strip-till and no-till, leftover material like roots and stalks from the harvested crop are left in the field, and the next crop is planted directly into that ground-covering material.

These types of tillage give the soil more structure and nutrients, prevent soil erosion, improve water conservation and flood management, and promote populations of beneficial insects and microorganisms.

Bonus: no-till isn't just good for the soil; it's also less work for farmers, and because they're using less fuel to prepare a field for planting, there are fewer greenhouse gas emissions too. By following these farming methods, farmers are actually taking greenhouse gases out of the environment, and putting them into the soil through a process called carbon sequestration. This process results in some areas of the Prairies now being net zero greenhouse gas emitters.

New crops that are tolerant to specific herbicides can have environmental benefits as well, because farmers growing these crops can use a spray to kill weeds, instead of having to churn up the soil to get rid of them.

QUICK FACT

Plant science innovations are reducing diesel fuel use by millions of litres every year just from farmers having to drive less over their fields⁸⁶.

Strip-tillage in a canola field

Mixing it up a little in the field

As part of sustainable farming, most farmers grow one type of crop in a field one year, a different one the next, and yet a different one again in the following year, instead of just growing the same crop in the same field year after year. That process is called **crop rotation**.

Every crop is affected by specific pests and diseases, and rotating crops reduces those risks. It also lets crops with different types of root structures pull nutrients and moisture from different soil depths, so the soil stays healthy and productive.

Farmers across Canada use different crop rotations, depending on where they farm. In Prince Edward Island, a typical rotation cycles potatoes, grain (such as wheat or barley) and forages (grasses to feed cattle). On the Prairies, by comparison, it's common to grow grain (oats, wheat, or barley), then oilseeds (canola, flax, or sunflowers) followed by legumes (field peas, beans, lentils, or chickpeas).

Working with nature to keep crops safe

Many farmers use a system called **Integrated Pest Management (IPM)** to suppress and manage diseases, insects, and weeds in an effective, economical, and environmentally sound manner. They closely watch fields and orchards to identify pests, and know when they need to take action to protect the crop. Farmers then make strategic use of a variety of biological, physical, cultural, mechanical, behavioural and chemical treatment tools, to reduce pest populations to acceptable levels. Equally important is evaluating the effectiveness of the treatments.

By using IPM, farmers use all the best available pest management strategies, including practices of good land management, using natural enemies, planting certified seed, and keeping pests at bay with physical barriers, such as screens or netting.

One popular IPM tool, particularly in greenhouse production, is biological control, which can also be described as using "good bugs to fight bad bugs".

Kelsey McDonald

Livestock are a part of healthy soil

Healthy, living soil is critical for growing productive crops in a sustainable way—and livestock play an important part. Farmers apply manure to the soil to put natural fertilizer back into the ground, and sheep or cattle graze grasses and cover crops. It's also common for farmers who don't have livestock of their own to buy manure from neighbouring farmers to put on their land.



A living ground cover

One way by which farmers keep their soil healthy is by growing **cover crops**—plants like clover, rye, sunflower, radish, and others that farmers plant in the field after they've harvested their main crop. Their job? Just as their name says: to keep the ground covered. This step reduces soil erosion, keeps moisture in the soil, and keeps nutrients from fertilizer and manure from being washed away into streams, lakes and rivers.

Some farmers use cover crops as animal feed by letting livestock graze in those fields in the fall.



Career Profile

Sheep & Beef Farmer

Stuart Chutter

Stuart Chutter knows the value of diversity both on and off the farm. As a gay man working in agriculture, he is aware of the stereotypes that are placed on farmers and rural communities. "Just like there is no one way to farm, there is no one way to be a farmer," said Chutter.

He raises sheep and cattle on his farm near Killaly, Saskatchewan, but if you ask him what he farms, he would tell you it's 'soil'. He practices regenerative agriculture, which focuses on soil health, something that Chutter believes is vital to raising healthy animals and producing high quality protein.

His animals graze a mix of forage species including oats, turnips, millet, radishes, clovers and sunflowers. But regenerative agriculture isn't about a specific set of rules says Chutter, "It's a way of thinking that focuses on soil health as a complex system, and how plant and livestock species have an important role to play in that system."

Chutter believes that diversity in agriculture will make it more resilient and better positioned to attract new people to the industry. "In my experience, rural people and farmers make world-class neighbours and allies."

Photo courtesy of Jenna Loveridge Photography

A long-term approach to soil health

Part of sustainable farming means leaving behind productive land for future generations. Some farmers have adopted an approach to soil health referred to as **regenerative agriculture**⁸⁷. Here, the emphasis is put on taking steps to improve soil health over time. Key principles include minimizing soil disturbance, integrating livestock to improve soil health, maximizing crop diversity and soil coverage to improve the water and mineral cycle, and reducing the impact of climate change through more **carbon sequestration**. During photosynthesis, plants release oxygen and remove carbon dioxide from the atmosphere. This captured carbon dioxide can be stored in organic matter in the soil—a process called carbon sequestration⁸⁸.

Planting radish in strips, also known as "biostrips", loosens the soil where crops will be planted next spring without using mechanical tillage.





Common question: pollinators, bee health and neonicotinoids

Honey bees, bumblebees, and many wild pollinators play a critical role in the production of fruits, vegetables, and other crops. They pollinate blossoms on plants, turning them into apples or pumpkins, for example.

Although data shows that the number of farmed beehives is on the rise in Canada⁸⁹, there is concern about higher than normal bee deaths in some parts of the country, as well as in Europe and the United States.

Many factors can impact bee colony health and cause bee death, such as long winters, cold temperatures, inadequate nutrition, or pests and diseases, such as a parasitic mite called *Varroa destructor*, which has been devastating to Canadian honey bee colonies⁹⁰.

A lot of attention has been focused on **neonicotinoids**, a class of insecticides used on corn, soybeans, and canola (often as a seed coating), as well as in pet flea collars and home garden products. In 2019, after an extensive re-evaluation of process, Health Canada determined continued registration of products containing neonicotinoids is acceptable with risk mitigation measures to help protect bees and other pollinators including cancelling some uses of these insecticides, and changing other conditions of their use such as restricting the timing of application⁹¹. But even before the required use amendments, farmers were already taking action to adapt their planting practices to protect bees and other pollinators—such as adding dust deflectors on their planters to minimize seed coating dust, and using new techniques to ensure that the pesticide coating stays on the seeds.

As wild spaces are lost to residential development, it's also great to see so many people including wildflowers and pollinator gardens at their homes. Farmers are using pieces of their land that cannot grow crops in order to create pollinator sanctuary spaces as well.



Career Profile

Entomologist

Dr. Jess Vickruck

Originally from the Niagara Region of Ontario, known for its abundance of orchards and vineyards, Dr. Jess Vickruck is no stranger to the important role that pollinators play in growing food.

“In the spring, I love to visit an orchard in bloom and listen to the hum of the trees that are alive with all of the different species of insects.”

She was interested in insects from a young age but it became a serious passion midway through university when she took her first entomology class. She went on to complete Masters and PhD degrees, and research wild bee species in Ontario and Alberta. Today, she is a research entomologist with Agriculture and Agri-food Canada in New Brunswick, where she lives with her husband and two young sons.

Her research looks at how farmers can manage their land in ways that promote biodiversity while reaping the pollination benefits of high wild bee populations. “We have only scratched the surface of what we know about bees,” she explained, “there are over 800 different species in Canada and we still know very little about the vast majority of them.”

QUICK FACT

A honey bee travels the equivalent of 80,000 km for one pound of honey, at an average flight speed of 24 km per hour⁹²!



DID YOU KNOW?

There are more than 800 different species of wild bees in Canada. They are often small (less than two centimeters) and can be blue, green, purple, black, yellow and red!



Solar panels on an egg barn

Farming sustainably with a technology tool box

As the climate changes, and extreme weather becomes more common, farming is becoming more challenging. Luckily, farmers can rely on technology to help them adapt to ever more sustainable food production:

- New and more rapid plant breeding methods are leading to crops that are more tolerant of pests, drought, heat, excess moisture, and frost.
- An air sampler placed in fields or vineyards captures fungal spores from the air, and gives farmers an early warning about possible fungal diseases, so they can take quick action to prevent damage to their crops⁹³.
- A smart irrigation system for potted greenhouse flowers only waters crops when the crops are thirsty, reducing water use, and resulting in stronger, more quickly growing plants.
- Smart imaging technology on sprayers can differentiate between crop plants and weeds, and applies pesticide only on the weeds instead of the entire field. This distinction can reduce pesticide use up to 90 per cent⁹⁴!
- Special maps show where a field “yields” the most, i.e. identifying which spots are most productive. That information is used to create a fertilizer prescription that helps farmers only to apply fertilizer where the map tells them the soil will use it best.
- Farmers are using drones and robots to help identify pest or disease problems or herd livestock.

Greener energy on the farm

Farmers are always looking for new ways to heat their barns and greenhouses, both affordably and sustainably. They're installing solar panels and wind turbines to generate electricity—even anaerobic digesters that make methane from organic material, including food waste. Some farmers use the electricity they generate for their own farms and homes; others sell it back to the grid to power homes, businesses, and industry, in urban areas.



Running farm equipment from space

Many Canadian farmers rely on precision agriculture technology to manage field work like planting, applying nutrients, spraying, and harvesting. Satellite-controlled GPS on tractors and equipment ensures that fertilizers and sprays are applied in the right amounts to the right places, and that crops are planted in straight, even rows. This precision reduces fuel consumption, and makes sure that nutrients, seeds and crop protection products aren't wasted.

Growing fields of fuel

Ethanol is a clean, renewable fuel made from plants (mostly corn) that is blended into gasoline. Biofuel is a diesel fuel substitute made from canola or soybean oil and blended with normal diesel. Both lower greenhouse gas emissions, and are just some of the many ways by which plants and plant residues are being used for more than just feeding people and animals.

Farming's carbon footprint

Greenhouse gases (GHGs), including carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), absorb radiation from the sun and trap heat in the atmosphere, effectively acting like a greenhouse or a layer of insulation for Earth. GHGs are part of the earth's natural processes, but human activities over the last several centuries have increased GHG levels far past where they should be. This change has very negative consequences for our climate, including increasing global temperatures, and more frequent episodes of severe weather.

CO₂ is produced by farm equipment. It's also released when soil is disturbed, or when plants decay. N₂O emissions are primarily a result of fertilizer use, including manure. Methane is a natural by-product of digestion in the stomachs of ruminants, as well as from manure from farm animals.

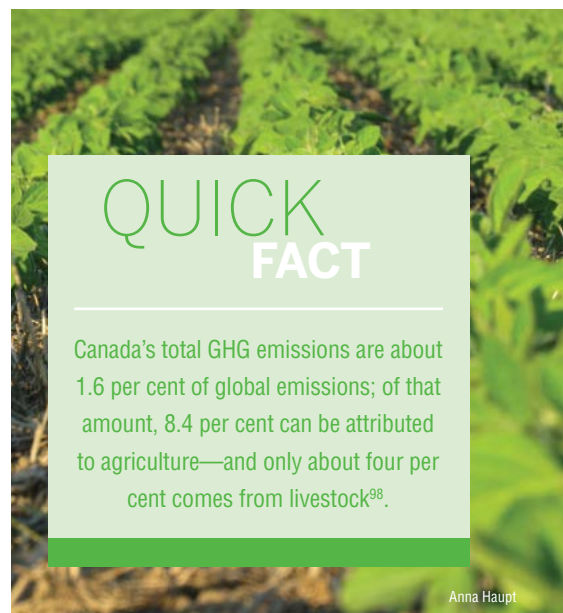
GHG emissions from Canadian agriculture have stayed about the same for the last

20 years⁹⁵, even though food production has increased dramatically. That status is mostly because farms have become more efficient—they're able to grow and raise more food while using less land, water, and fuel. This change also reflects the increased carbon sequestration in crop land. Canadian farmland, particularly in the Prairies, captures more carbon than it releases. That makes it a **carbon sink**⁹⁶.

The environmental impact of raising livestock can vary a lot. Feed quality, genetics, and the part of the world in which the animal is being raised, are just three factors. Modern advances in genetics, nutrition, and other areas of science have led to more environmentally-efficient animals, and farmers and scientists continue to work towards reducing the amount of methane produced by livestock.

Consider this fact: Today, every kilogram of Canadian beef is produced using 17

per cent less water, 24 per cent less land, and generates 15 per cent less greenhouse gases, than the same amount of beef produced 30 years ago⁹⁷.



Livestock as part of the solution

Sustainably-managed livestock populations are also very much part of the solution to the climate change challenge, and play a significant role in our ecosystems.

Less than eight per cent of Canada's land is used for agriculture. The rest has been developed as an urban landscape, is forest or shrubland, or is very difficult to impossible to grow crops on (think Arctic regions). But livestock can flourish on terrain that's too rocky, hilly, wet, or dry. That gives farmers the opportunity to produce food in places where crops can't grow.

Temperate grasslands, like those found in the southern parts of the Prairie provinces, are among some of the most endangered ecosystems in the world. They support biodiversity by providing widely ranging wildlife habitats, hold water during floods, and provide drinking water for people and wildlife. And because the land is not worked, the carbon captured by plants and put into the soil stays there as long as the land remains intact.

Unfortunately, less than 20 per cent of Canadian grasslands remain intact—most have been built over, or used for growing food⁹⁹. Once these grasslands are lost, it is nearly impossible to replicate them.



How cattle are saving our native grasslands

Many of the native grasslands that still exist in Canada are actively-grazed pastures, where cattle mimic the natural ecosystem processes required for the prairie to remain prairie. Grazing prevents over-growth of dominant plant species giving other important species a better chance to flourish. It also minimizes fire risk by reducing dry grasses and brush. The manure that livestock leave behind is also a valuable organic fertilizer that helps build organic matter and enrich the soil.

The Species at Risk Partnerships on Agricultural Lands (SARPAL) is an Environment and Climate Change Canada initiative, working with farmers to support the recovery of species at risk on agricultural land. In Manitoba, for example, the initiative has led to partnerships between beef farmers and conservation groups, in order to recover habitats for specific species at risk, including bird species like the ferruginous hawk, loggerhead shrike, and burrowing owl¹⁰⁰.

Other livestock are also raised on these habitats. Wildlife such as deer, ducks and pollinators utilize healthy grasslands for their life cycle too.



Ducks Unlimited Canada

Burrowing owl



Ashton Irwin



Career Profile

Beef Farmer

Ben Campbell

Grazed Right Ranch, owned by Ben Campbell and his family, sits on Alberta's native grasslands. Here, they produce high-quality beef by raising their cattle on pasture year round.

Grazing cattle can support the grasslands which provide a number of ecosystem services, such as carbon sequestration, flood mitigation and wildlife habitat. Campbell rotates the cattle onto new pasture regularly, spreading manure that helps build organic matter, and promoting the growth of important, but less competitive plants species. He's created buffer zones around ponds and sloughs that serve as a duck nesting habitat and filters surface runoff before it enters the water bodies. "We hope to pass the farm onto our children, which is why protecting it and the planet through sustainable agricultural practices is so important."

In the recently-released documentary *Guardians of the Grasslands*, Campbell explains how the grasslands sequester millions of tonnes of carbon. His ranch alone can store 39,000 tonnes of CO₂ equivalent, which roughly equals the emissions that 2,000 Canadians produce in a year.

And they don't keep the beauty of the Canadian grasslands all to themselves. Only a short drive from Calgary, the ranch is perfectly situated to reconnect customers with where their food comes from. "We are happy to invite our customers for a tour, by request, so they can see firsthand how the cattle are raised and the land is cared for," said Campbell.

Going the extra mile for wildlife

Many farmers plant native grasses as buffer zones around water bodies, to protect land and aquatic habitats. Seeding strips of flowering plants for pollinators is also common. And to ensure that soils remain fertile and covered with new plant growth, livestock farmers move their animals from pasture to pasture—a practice called **rotational grazing**.

Some farmers will also delay cutting hay crops to give nesting birds a chance to hatch their young safely. Others build habitats for snakes—called hibernacula—or install boxes for owls and bats on the farm. These and many other practices help sustain wildlife populations, protect species at risk, and promote biodiversity.

Manure, fertilizers, phosphorus and water

Manure is an excellent source of fertilizer for the soil, but nutrients like phosphorus can contaminate water if they're not applied and managed properly. Farmers have to follow a lot of rules when it comes to managing nutrients—from manure or fertilizers—on their farms. That diligence includes picking the right location for constructing new farm buildings away from neighbours, water, and wetlands. It's also important to have enough storage to store manure safely over the winter months; manure shouldn't be spread when the ground is frozen, because it's more likely to be washed away by rain and melting snow, instead of going into the soil.

4R Nutrient Stewardship is a program that's been developed to let the world know when food has been grown sustainably. It balances farmer, industry, and government goals to improve crop productivity and fertilizer efficiency, while also benefitting the environment. How? Through the "4Rs"—Right Source @ Right Rate, Right Time, Right Place[®]: putting the right type of fertilizer at the right amount in the right spot at the right time for it to be most effective¹⁰¹.



Tammy Fluttert

What about water?

There are many different ways to calculate how much water is used to make different food products—and a lot of them can be misleading, like the claim that it takes thousands of litres of water to make one burger patty.

Yes, beef production does use water, but most of that water actually ends up back in the environment through manure or water vapour. This process is known as the water cycle, and it means water is just being used and re-used, and not lost forever, as it merely goes back into rotation¹⁰².



Using water to grow crops

Some crops—most often fruits and vegetables—need more water to grow properly than just what they get from rain. The process of supplementing with more water is called irrigation, and there are a variety of technologies farmers use to make sure that their crops have enough water, and that they don't use more than they need. In greenhouses, water used for irrigation is collected and reused, ensuring sustainable use of this important resource. Irrigation supports 40 per cent of our global food supply; in Canada, it's only used by about 8.5 per cent of all farms¹⁰³.

Even though Canada is home to 20 per cent of the world's fresh water, its availability and quality are important issues for Canadians, especially as the climate continues to change. That's another reason why sustainable farming practices, and using water in balance with the environment, are becoming more and more important.

Irrigating strawberry plants

What about plastics and packaging?

There's no denying that a lot of single-use plastics are used across the food supply chain. But as awareness grows about their harmful environmental impacts, farmers and food producers are taking action to use less or different products and to recycle where they can.

Many farmers wrap hay bales in plastic wrapping to help preserve the crop, but figuring out what to do with the wrap once it's no longer needed has always been a challenge. Farmers in Northern Ontario, for example, are involved in a pilot project to recycle the material into light diesel fuel¹⁰⁴.

An organization called Cleanfarms has spearheaded the recycling of more than 126 million plastic agricultural containers into new products, instead of then going into landfills¹⁰⁵.

And the Canadian Produce Marketing Association has set up a plastics packaging working group to determine how to reduce the use of plastics without compromising produce quality or safety. Examples include biodegradable food wrappings, or moulded fiber punnets and trays for cucumbers, berries, mushrooms, and tomatoes¹⁰⁶.

Wrapping a greenhouse cucumber in film increases its sellable shelf life from around three days, to 15 to 17, because the film limits how the vegetable breathes and keeps it hydrated, thus reducing food waste.



Career Profile

Product Development Specialist
Sustainable Packaging

Luci Faas

Before moving to Ontario in 2008, Luci Faas lived and worked in many different places, including Japan and the USA. Faas studied environmental education in university and has carried that passion into her work as a Product Development Specialist with Nature Fresh Farms, a large greenhouse near Leamington, Ontario. "Environmental stewardship can be personal," said Faas, and that "making small choices in your daily life that are more sustainable can make a big impact." That's why developing a newly launched 100 per cent Home Compostable Cucumber Wrap has been such a passion project for her. The compostable wrap both prolongs the shelf life of the cucumbers, while reducing harmful plastic waste; it was recently announced as a finalist for The Sustainable Packaging Coalition's 2020 Innovation Awards.

Faas enjoys the unique challenge of collaborating with many other departments including marketing, operations and quality assurance to research and test new packaging concepts, with a special focus on finding more sustainable options. "It's rewarding to find a solution that is environmentally-friendly, and that doesn't compromise the quality or become too costly for the consumer."

Photo courtesy of Nature Fresh Farms

The food we waste

According to the United Nations, one-third of all the food we produce is lost or wasted each year¹⁰⁷. **Food loss** usually happens during food production, storage, processing, or distribution, whereas **food waste** happens at the end of the food chain, when food that is of good quality and fit for consumption is discarded.

A 2019 study estimated that 11.2 million metric tons of avoidable food loss or waste occurs across the food value chain in Canada—equivalent to a value of \$49.5 billion¹⁰⁸. The average Canadian household wastes about 140 kg of food annually, the equivalent of throwing out more than \$1,100 each year. That amounts to almost 2.2 million tons of edible food wasted each year, costing Canadians more than \$17 billion¹⁰⁹.

Farmers and food producers, particularly in the produce sector, are investing in solutions to help reduce food waste, like smart sensors and intelligent packaging that extend shelf-life.

They're also finding creative ways to find new uses for food waste, like producing environmentally friendly energy, using an extract from mushroom stems to create a natural preservative¹¹⁰, or using the high-in-antioxidants coffee cherries—the fruit whose pit is the coffee bean and is discarded once the bean is extracted—to make a type of tea. Livestock can be fed by-products of human food production, like distillers' grains (waste from brewing and ethanol production), canola, and soybean meal (what's left after the oil has been removed) or beet pulp that's leftover after sugar beets are processed to extract sugar.

Here are some things you can do at home to reduce food waste too:

- Ask for smaller portions
- Keep leftover food for another meal
- Buy "ugly" fruits and vegetables—they are just as good to eat as the pretty, regularly shaped ones!



DID YOU KNOW?

Almost half of all the fruits and vegetables produced in the world are never actually eaten—they're just wasted¹¹¹.

Healthy and safe food

Grain Farmers of Ontario

Safe, quality food choices are something most Canadians don't have to think about very often. The shelves in grocery stores and farmers' markets are rarely empty, and we don't have to worry about whether what we're eating is safe.

That's because there are regulations and safety systems throughout the Canadian food chain, and ultimately, safe food starts on the farm, with farmers.

Food safety rules for farmers

Just as with other food businesses, farmers follow the rules of food safety programs based on HACCP (Hazard Analysis Critical Control Point) that identify critical points on the farm where food safety could be at risk. That risk could occur when new animals come onto the farm, or when fresh produce is sorted and packed into bins.

Although every farm will have slightly different on-farm food safety programs, depending on what they grow or raise, each program includes:

- Evaluating what you're doing and how you're doing it
- Keeping detailed records
- Completing regular audits
- Knowing what to do if things go wrong

Others in the food supply chain, from livestock feed manufacturers to processing facilities and grocery stores, follow similar rules.



Goat with identification tag

Traceability

Being able to assure Canadians and consumers in other countries that the food we produce is safe is important. A big part of that is “**traceability**”. It means having checks and balances in place to assure customers that they're actually getting what they think they are getting—and that we can trace a product right back to its origin, in case something goes wrong.

For example, an IP “identity preserved” program for food grade soybeans tracks every step of production to prove to international buyers that the beans are authentically food grade, and have been produced to exacting standards.

RFID (radio-frequency identification) ear tags for livestock, and a national database of animal movement, mean that we know where animals are and where they've been—critical information to have in case of a disease outbreak or food safety problem¹¹².

A block what?

A **blockchain** is the latest traceability tool for food producers. It's an incorruptible digital ledger of all transactions in a supply chain: information is passed digitally along the chain instead of through a paper trail, and the permanent links between the blocks keep data safe. Pilot projects underway in different countries around the world are all designed to make it easier to do business; to know where food is coming from; and to reduce payment security risks.



Career Profile

Processing Plant Floor Manager

Lyane Cypres-Zepik

In 2008, one of Canada's leading pork producers, HyLife, acquired the processing plant known as Springhill Farms. This expansion resulted in hundreds of newly created jobs, many of which they were unable to fill with domestic workers.

Located in the rural area of Neepawa, Manitoba, which has a small population and low unemployment rate, they found that recruiting skilled workers from abroad, like Lyane Cypres-Zepik, is essential to filling positions that many Canadians are not interested in doing.

Cypres-Zepik was born in the Philippines, where her family raised pigs and ran a butcher shop. She studied food technology at the University of the Philippines and shortly after began working in quality assurance and production at one of the country's largest meat processors.

She moved to Canada in 2009 as part of the Manitoba Provincial Nominee Program, which seeks internationally trained and experienced workers who have the skills needed in the local labour market and nominates them to receive Canadian permanent resident visas to settle and work in Manitoba. In the Philippines, life and career advancement can be challenging, so being recruited by a Canadian company was an exciting opportunity to improve her family's quality of life.

Cypres-Zepik quickly moved from the production floor to management where she had worked as the QA Assistant Manager and now as the Cut Floor Manager. "I enjoy the opportunity to grow at my job. It makes you feel proud," Cypres-Zepik said. "Who would have thought that you would get to this position?"

The workforce at the HyLife has grown fivefold since 2008, bringing more diversity and opportunities to the area. "I am very grateful for the town of Neepawa for embracing us new immigrants and for helping us integrate and become part of the community."

Photo courtesy of HyLife



Keeping farm animals healthy

Healthy livestock and poultry are a priority for farmers and their veterinarians. A serious disease outbreak or health problem can make animals sick, and occasionally kill some or all the livestock or poultry on a farm. In extreme cases, a disease can affect more than just one species of animal.

That's why farmers use many strategies and tools to ensure that their animals are healthy, including providing a good living environment, ensuring good nutrition, and working with a veterinarian who is responsible for prescribing medications and vaccines.

It's Health Canada's job to evaluate the safety of animal health products, and to approve them for farmers to use. The Canadian Food Inspection Agency is responsible for ensuring the safety of animal vaccines and feed additives.

What is “One Health”?

Many of the same microbes that make animals sick can also infect humans. The World Health Organization and other organizations around the world have embraced the “One Health” approach, by which experts in animal, plant, and human health work together to prevent disease outbreaks and food safety problems¹¹³.

When animal and human health meet

New diseases are always emerging in animals and in people. The COVID-19 pandemic is the latest and most high-profile example of the impact a new disease can have on health and on the economy—and why it’s important to be prepared.

That’s why public health agencies and groups specializing in animal disease surveillance are always watching for and tracking new outbreaks. Canada’s food system has invested millions of dollars into disease research, prevention, and emergency preparedness, so that Canadians have the safest food and healthiest livestock possible.

Here are some livestock and poultry diseases of interest:

1. Influenza

Commonly called the flu, influenza makes many Canadians sick every year. Birds and pigs can also get the flu—you may have heard or read about “bird flu” or “swine flu”, but you can’t catch either of these from eating pork, eggs, chicken or turkey.

2. African Swine Fever

African Swine Fever is a devastating disease that affects pigs, but there is no human health or food safety risk as it doesn’t infect humans. There is currently no cure or vaccine for this virus, which kills virtually all the animals that become infected. China has been suffering from a major outbreak since 2018, but the disease is present in African, European, and other Asian countries as well. To date, it has never been found in North America, but since Canada is a major world producer of pork, the industry is working hard to keep the disease out.

3. Food-borne illnesses

Human and animal digestive systems are home to billions of bacteria, including some that can cause severe illness or even death if people consume contaminated food or water. *Escherichia coli* (*E. coli*), *Salmonella*, and *Listeria monocytogenes* are the three most common causes of food-borne illness. Canada’s food producers and processors use many different tools to keep food free from pathogens that cause food-borne illness. Consumers have a role to play too: cooking meats to proper temperatures; washing produce thoroughly; and washing hands regularly before handling food, after using the washroom, or after petting animals.



DID YOU KNOW?

Keeping our food safe, and our animals and plants healthy, are why you are asked about contact with farms and farm animals when you come back to Canada from another country.





Clara Sandum

Common question: antibiotics and resistance

Antibiotics are a type of antimicrobial medication used to fight bacterial infections in people and animals. **Antibiotic resistance** occurs when the bacteria change and develop the ability to survive exposure to the antibiotics used to treat them. As a result, the medication is no longer effective in killing or slowing the growth of a specific disease-causing organism. It's an important issue worldwide, because it makes it harder to fight human and animal infections caused by these resistant bacteria.

Antimicrobial resistance is a natural phenomenon¹¹⁴ which can be made worse by environmental contamination, misusing antibacterial cleaning products, and using antibiotics in human or animal medicine too much or incorrectly¹¹⁵.

Health Canada has established four categories of antimicrobials based on how they are used in human medicine, ranging from Category I (“very high importance”) to Category IV (“low importance”)¹¹⁶. The Canadian government tightened the rules on antimicrobial use in farm animals in 2018. For example, farmers now need a veterinary prescription to buy any Category I, II, and III products, and using any of these products to promote growth has been banned¹¹⁷. Advances in animal housing, nutrition, and biosecurity practices mean that fewer antibiotics are used today than in past decades.

The bottom line on antibiotics

Antibiotics are a valuable tool for treating sick people and animals, so it is important that everyone uses them responsibly. Resistance is a complex topic, and critically important research into resistance is happening around the world in both human and animal medicine.

What about drug residues?

Drug residues are traces of medication left over in meat, milk, or eggs, after an animal has been treated with a medication. Every animal health product (e.g. antimicrobials, vaccines, supplements) has what is called a “**withdrawal period**”—a specific amount of time a farmer must wait before sending a treated animal or its products to market¹¹⁸. This ensures that food is safe and free of residues. As an added layer of security, processing plants also test for drug residues to ensure food safety.



Career Profile

Veterinarian

Dr. Cali Lewis

With veterinarians for parents, it's no wonder that Dr. Cali Lewis would choose to become one herself. Lewis has been practicing in her hometown of Westlock, Alberta, since 2015. She practices both small and large animal veterinary medicine, meaning she works with pets, as well as livestock, such as horses, goats, sheep, and cattle.

She enjoys working closely with farmers on their animal care strategies. “The key is to focus on preventative measures like strong vaccination protocols, limiting stress and providing good nutrition. But antibiotics certainly have their place when needed.”

Lewis describes working with farms as a challenging yet gratifying puzzle. “In addition to caring for the individual animals, you also have to consider the health of the entire herd, as well as economical and production factors. It's definitely a big picture approach to veterinary care,” said Lewis.

In her free time, she can be found riding her horse, Sadie, hiking or paddle boarding with her dog, Steady, and partaking in all things outdoors.



Dairy Farmers of Ontario

Milk truck

Raw facts about raw milk

Raw milk has not been pasteurized, meaning it could still contain harmful bacteria and other pathogens that can cause severe, or in some cases fatal, illness¹¹⁹. It is illegal to sell raw milk or cream products in Canada (with the exception of certain raw milk cheeses), so all milk has to be pasteurized before being sold. The milk is heated to a high temperature, which kills any bacteria, but **pasteurization** does not affect milk quality.

Milk is sampled and tested at every farm before it's picked up by the milk truck, to ensure safety and quality. And every milk truckload is tested again at the processing plant, so if there's a problem, the entire load is rejected. It's something dairy farmers take very seriously.

The barcode reveals all

DNA barcoding is a Canadian innovation that helps identify plant and animal species, including pests. DNA from a species is extracted and sequenced for identification, similar to how a supermarket scanner reads a product bar code. Accurate identification is critical to choosing the right pest management strategy. Besides identifying pests, this University of Guelph technology also helps expose cases of food fraud—products being sold as something they're not. Mislabelling fish is common—for example, passing off cheaper tilapia or rockfish as red snapper, which is more expensive¹²⁰.



Grieg Seafood BC



DID YOU KNOW?

Using just your smart phone and a DNA testing kit, you can authenticate your food, identify the bug that bit you, or learn about bugs in your garden¹²¹?



Career Profile

Food Scientist

Sanjay Tandan

When Sanjay Tandan was young, he wanted to be a doctor. That dream didn't happen as he'd planned, exactly, but he sees a lot of similarities between his original goals and his role as an operations manager/food scientist for a dairy processing company because both rely on science. As a food scientist, he says there's a huge amount of responsibility and accountability to ensure that customers get a safe product. "In one way, I still look after the health of people through the food they consume on a daily basis by ensuring they get safe, healthy and nutritious products."

Nancy French Photography

Common question: hormones, livestock and meat

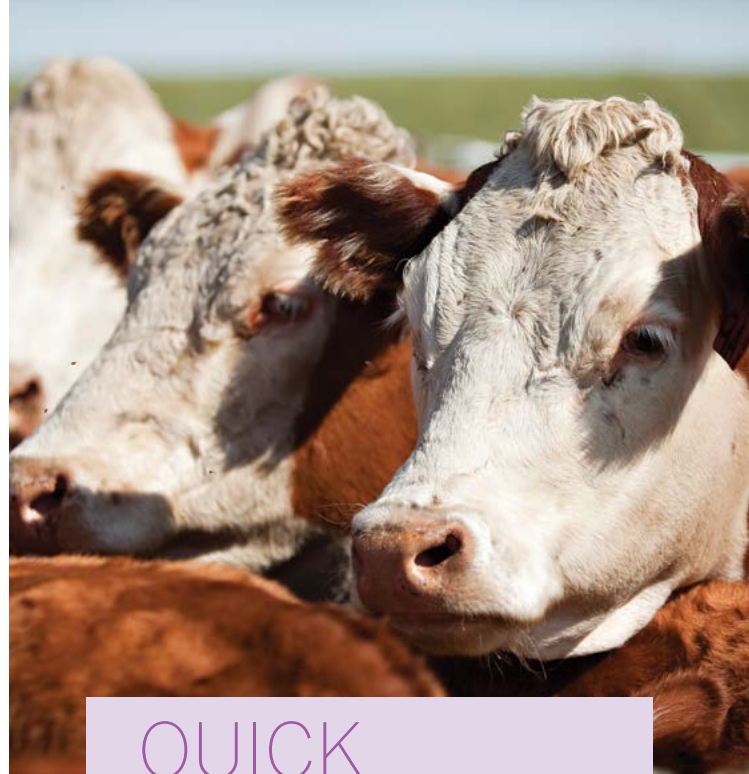
Fact: no food is hormone-free. Hormones occur naturally in plants and animals, meaning that there is no such thing as hormone-free food¹²².

Dairy cows, pigs, chickens, and turkeys in Canada are not given hormones for milk production or growth promotion. Some beef farmers may use government-approved hormones, however, in beef cattle, because it promotes efficient muscle growth, rather than fat¹²³. That application means leaner meat using less feed. It also helps keep food more affordable for Canadians.

Hormone levels from beef cattle that have received implants is virtually the same as the levels in beef from cattle not given growth promoters. There is more variation in the hormone levels of beef from male versus female cattle than between beef from cattle raised with and without hormones.

The bottom line

Worldwide, the use of hormones in cattle has been confirmed as safe, and as having no impact on human health by agencies including Health Canada, the World Health Organization, and the United Nations, and is based on ongoing research and monitoring¹²⁴.



QUICK FACT

Hormones are one of many methods farmers use to produce affordable, environmentally friendly, and high-quality beef for Canadians. The technology allows farmers and ranchers to use 10 per cent less land, seven per cent less fuel, and raise 12 per cent fewer animals to produce the same amount of food¹²⁵.





Sheri Mangin

Common question: What about pesticides?

Yes, there are rules for those too.

Pesticides, also called crop protection products, are one of the most effective tools available to farmers to keep insects, weeds, and diseases from damaging and destroying fruits, vegetables, and field crops. They also let farmers grow more food on less land, which helps preserve natural forests, wetlands, and other wildlife habitats, while ensuring we all have enough to eat.

Canadian farmers have to follow strict rules, and are only allowed to buy and use products that the government has found to be safe for people and the environment. That's the responsibility of the Pest Management Regulatory Agency (PMRA), a part of Health Canada, and products are only approved for use after years of review and testing have proven that they're both safe and effective. In some provinces, farmers must be tested and certified before using these products.

Farmers follow best practices when working with pesticides to make sure that the products are used safely. For example, they make sure they're not applying them on windy days, so that the spray doesn't "drift" away from weeds onto areas where it isn't supposed to be. Wearing personal protective equipment is another best practice to ensure worker safety.



Career Profile

Regulatory Affairs Manager

B Pratyusha Chennupati

B. Pratyusha Chennupati, a chemical engineer from India, moved to Canada in 2010 to pursue her master's degree in plant science at McGill University. Since then, she has worked as a plant scientist and regulatory specialist for companies that design products that help farmers protect their crops from pests and diseases.

Throughout the lengthy evaluation process for a new product, Chennupati works with the Pest Management Regulatory Agency to ensure they have all the necessary research and information to determine whether it meets the safety and efficacy requirements. "These are important tools for food production but must be evaluated at high levels to ensure that they are not only effective, but also to protect the health of Canadians and the environment."

In 2020, Chennupati was selected to sit on the Canadian Agricultural Youth Council. The council is a consultative body to the Canadian government that brings together young Canadians with a diverse set of perspectives and expertise and are engaged and passionate about the future of the agri-food sector.

About glyphosate

Glyphosate, the active ingredient in Roundup, is the most widely used weed control product in agriculture. It's one of many tools farmers use to control weeds in crops like canola, soybeans, and corn, or before planting other crops. To prevent weeds from becoming resistant to the product, and therefore uncontrollable, farmers will rotate pesticides or active ingredients (that's the main ingredient in a pesticide that actually controls the weeds).

After reviewing more than 1,300 studies, Health Canada has found that, when used according to the label directions, Roundup will not cause cancer or pose other risks to people or the environment¹²⁶.

Common question: residues and the “dirty dozen”

Every year, an environmental group in the United States releases a “dirty dozen” list of fruits and vegetables it says should be avoided due to high pesticide residue levels. It’s a clever tactic to garner attention, but scientists at the University of California, Davis, and elsewhere, have found the report to be misrepresentative of facts, and deceptive¹²⁷.

Scientific analysis has found that if residues are present, they’re almost always at extremely low levels that don’t cause harm. For example, a child would have to eat 7,240 servings of carrots per day before pesticide residues would be a concern¹²⁸! It’s all about dosage—consider that you likely won’t feel the impact of half a Tylenol tablet on your headache, but taking a whole bottle could be lethal.

There’s no such thing as “zero” when you’re looking for residues or controlling risks, but Health Canada sets the acceptable amount of pesticide allowed to remain on food—called **Maximum Residue Limits (MRL)**—far below the amount that could pose a health concern, just to be sure people and food are safe.

Today’s lab equipment and testing methods are so precise, that they can find amounts so tiny that they won’t cause harm, but are still detectable. That’s the case with recent findings of glyphosate

residues in breakfast cereals like Cheerios. The amounts found are so minute that a person could eat 2.3 kilograms of Cheerios every day, and still be completely safe from any glyphosate-related harm¹²⁹.

For perspective: we can now detect residues in parts per billion—and one part per billion is like one foot on a trip to the moon, or one second in 32 years!

The Canadian Food Inspection Agency surveys fruits and vegetables in Canada for pesticide residues each year. The test results consistently confirm that the overwhelming majority of foods on the market meets Canadian standards for food safety.

The bottom line:

You don’t have to worry about Canadian fruits and vegetables: they’re safe, although we still encourage you to wash your produce before eating.



QUICK FACT

It can take more than 10 years to develop, test, and bring a pesticide product to market.

Better science for more sustainable food

Growing food means using science. Every aspect of farming, from plant and animal genetics, soil management, and pest and disease control, to animal nutrition and housing, and even weather forecasting, has benefitted from science. For Canadians, science has brought us more abundant, nutritious, and affordable food that’s being grown more sustainably than ever before.





Melinda Baarda

Soybeans

Common question: GMOs

More than 10,000 years ago, the earliest plant breeders were knowingly and unknowingly selecting plants for propagation that had desirable traits, including a shorter growing season, higher yields, and larger seeds or fruits.

Conventional plant breeding is a very long and expensive process that involves crossbreeding two plants, growing new plants from the seeds produced, and painstakingly selecting the offspring with the desired combination of traits—over, and over, and over again. It can take many years to get the right combination of traits, and for new varieties to become available.

What's a GMO?

GMO stands for **genetically modified organism**. It's a term that technically could be applied to almost all plant-based food we eat today, as they've all been modified over time, but when people talk about GMOs, they're most often referring to genetic engineering.

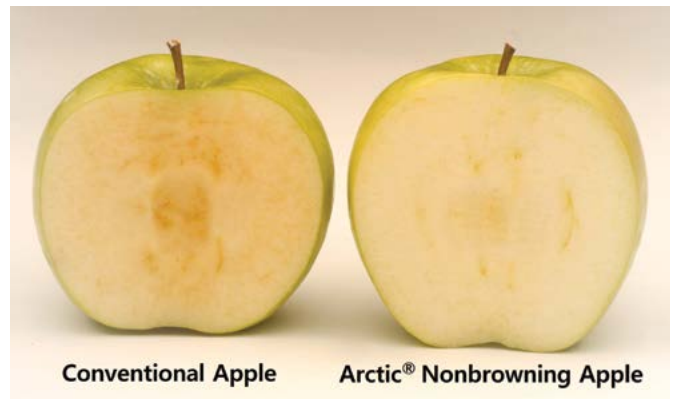
Genetic engineering is a form of biotechnology in which laboratory methods bring together genetic material from multiple sources—a form of genetic recombination. What distinguishes genetic engineering from conventional breeding is the use of recombinant DNA technology.

Here is an example: a gene from another species is added to a crop's DNA to make it more functional, such as corn that produces a toxin that is lethal to certain crop-killing bugs—meaning that farmers can reduce their insecticide use¹³⁰.

One form of genetic modification can result in “silencing” or turning off specific genes already inside a plant, which can be accomplished through a technique called RNA interference (RNAi)¹³¹. For example, the genes that cause bruising in the Innate[®] potato, and browning in the Arctic[®] Apple, have been turned off, which ultimately means that less food is wasted.

QUICK FACT

Apples are one of the most wasted food products on the planet—about 40 per cent are thrown out, much of it because they turn brown once they're cut, bitten or bruised. Arctic[®] Apples (which were created in Canada) won't do that because, with the help of genetic engineering, the enzyme that causes the browning has been turned off¹³².



Okanagan Specialty Fruits Inc.

Genome editing, by comparison, typically involves targeting and changing specific genes that are already there. To edit genes, scientists use a sort of molecular pair of scissors to cut DNA in a desired spot, and then make use of the plant's own natural repair mechanism. CRISPR-Cas9, the most well-known gene editing technology, is an example of this method. It could potentially be used to make milk, eggs, or peanuts safe for everyone to eat, saving people from allergies that could be life-threatening¹³⁴.

These new technologies build on conventional plant breeding, and will allow for more efficient development of crops with much-needed traits to make them more resistant to drought or other weather extremes, render them tastier, or even make them contain higher levels of healthy compounds.



DID YOU KNOW?

Eating a genetically modified crop will NOT affect a person's genes. The human body can't absorb DNA through digestion.

Using science to save foods we love

In the 1840s, a fungus known as blight repeatedly devastated potato crops in Ireland, causing widespread hunger and starvation. Today, farmers can use fungicides—fungus-specific pesticides—to protect potatoes and other crops from being wiped out.

In Bangladesh, genetic modification has saved up to 80 per cent of the eggplant or Brinjal crop from insect devastation, reducing pesticide use and lifting farmers out of poverty¹³⁵. Hawaiian papaya was saved from ringspot virus with a genetically modified (GM) variety resistant to the disease, and a GM banana is currently in the works that could protect the staple crop from a deadly fungus that is threatening the lives and livelihoods of thousands of farmers in Africa, Asia, and now South America¹³⁶.

There are only 11 GMO crops available today¹³³:



corn
(grain and sweet)



soybeans



cotton



squash



canola



alfalfa



sugar beets



eggplants



papaya



apples



potatoes



Debby J Smit

The bottom line on GMOs and your health:

GMOs do not cause cancer or any other health problems. In the more than 20 years that GMO crops have been grown in Canada, not a single case of illness has been attributed to them. Over 900 research studies from around the world have explored this topic, and these studies were analyzed by 15 scientific societies in 2016—with no evidence of risk to human health or the environment discovered¹³⁷.

Food, farming and the future

Rachel Renwick

The world is always changing, and that change includes how farmers grow food, and how it gets from the farm to our dinner tables.

Mental health on the farm¹³⁸

One of the aspects on which the sector has only recently started to focus is that of farmers' mental health. As you've read in this publication, farming is rewarding, but also can be incredibly challenging. The stresses of a changing climate, market uncertainty, evolving public perceptions, disease and pest threats, activist threats, and more, can take their toll on farmers' mental health.

Farmers often work long hours by themselves, and farms by their very nature are mostly located in rural, sometimes isolated areas. That feature makes it even easier to feel alone and without support.

Recent research conducted by the University of Guelph into the mental health of Canadian farmers showed some startling results:

- 35 per cent of farmers meet the criteria for depression;
- 45 per cent of farmers experience high stress;
- 58 per cent of farmers meet the criteria for anxiety.

And perhaps most sadly, 40 per cent reported that they would feel uneasy about getting professional help because of what other people might think.

Thankfully, though, things are starting to change. The Do More Agriculture Foundation (www.domore.ag) promotes awareness of farmer mental health, and breaking the stigma. Hundreds of farmers have participated in the organization's "Talk, Ask, Listen" workshops to date. The University of Guelph has created a mental health course specifically for the Canadian agriculture community called "In the Know" that they're hoping to roll out soon nation-wide and online.

Mental health professionals, researchers, farmers, and others, support the establishment of a Centre for Farmer Mental Health and Wellness to spearhead mental awareness, response, and support for the farming community.



Career Profile

Chicken Farmer

Amy VanderHeide

Amy VanderHeide runs a third generation chicken farm in Coldbrook, Nova Scotia, with her husband, in-laws, and three sons. Farming can be incredibly rewarding, but it's not without its challenges – all of which can take a toll. That is something that VanderHeide knows well.

She was diagnosed with Seasonal Affective Disorder three years ago. "Spring through fall is very busy, so there is less time to stop and think about it. Winter arrives and things slow down; meanwhile all of these emotions have been building up," described VanderHeide.

VanderHeide shared her story on social media, and was overwhelmed by the response from other farmers. "When you begin to open up, it's surprising to see how many people are feeling the same way," said VanderHeide, explaining that if her openness is able to help even one person feel less alone then it will all be worth it.

"We've come so far, but there is more to do. I hope that when my boys grow up and farm, that checking in on their mental health is just another part of the job."

Changing consumer trends

Research shows that a growing segment of the Canadian market is becoming aware and conscious of how their consumption is related to ethical questions around animal welfare and climate change. Younger consumers in particular are concerned about climate change as an issue that will affect them in their lifetime, and how they can make a difference¹³⁹.

For example, green eating is a movement by which food choices are based on sustainability principles, and a desire to reduce the environmental impact of eating and food production.

The products which consumers want, and the values that are important to them, are constantly evolving, and farmers and food producers will keep up with those changes. Different farmers will

meet different trends in different ways, and to do so, they'll continue to turn to innovation and technology to make things better, healthier, and more sustainable for people, animals, and the environment.

Many farmers and food producers are active on social media, so it's easier than ever to have your questions answered by someone who raises farm animals, grows crops or works in the agri-food sector. Try searching popular hashtags like #CdnAg or follow:

@RealDirtonFarming

@FacesBehindFood

@CdnFoodFocus

@FarmFoodCareON

@FarmFoodCareSK

@FarmFoodCarePEI



Facing the future

While much has changed and will continue to change when it comes to food and farming in Canada, one thing has not: farming begins with the commitment of farm families to the land, to animals, and to growing food.

All Canadians want affordable, safe, nutritious, and sustainably-produced food, and we're lucky to live in a country where how and what to eat are choices that Canadians can make for themselves.

Thank you for supporting Canadian food, and for being interested in how and what Canadian farmers do to produce it. Your trust is not something farmers take lightly—and by working together, we can continue to focus on a sustainable future for our planet and its people.

That's the real dirt.

Career Profile

Future Farmer

Ben McFarlane

Ben McFarlane, six, is a third generation beef and crop farmer-in-training. His family owns Windyvue Farms Ltd. outside of Guelph, ON. Farm life is fun and busy says McFarlane. He loves to spend time in the barn with his dad and ride in the combine during corn harvest. Staying safe around farm equipment and taking good care of the cows and land are among his important life lessons. He hopes to grow up and be a farmer like his father and grandfather before him. He is excited and looking forward to using new technology in the future including "bigger tractors and combines!"

Photo courtesy of Holly McFarlane

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Sources, where noted, are available in the online version of this publication at: www.RealDirtOnFarming.ca.

The Real dirt on Farming

About Us

Farm & Food Care cultivates appreciation for food and farming by connecting farm gates to our dinner plates. Farm & Food Care brings farmers, agricultural professionals, related businesses and other groups together with a mandate to provide credible information on food and farming in Canada.

If you have a question, we'd be pleased to answer it.

www.FarmFoodCare.org

www.RealDirtonFarming.ca

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Farm & Food Care Saskatchewan
RR #4, Box 277, Site 412
Saskatoon, Saskatchewan
Canada, S7K 3J7
www.FarmFoodCareSK.org

Farm & Food Care Ontario
660 Speedvale Avenue W, Unit 302
Guelph, Ontario
Canada, N1K 1E5
www.FarmFoodCareON.org

Farm & Food Care Prince Edward Island
420 University Avenue, Suite 110
Charlottetown, PEI
Canada, C1A 7Z5
www.FarmFoodCarePEI.org

