

The Real dirt on Farming



FREE
Take Me!

6th Edition

YOUR GUIDE TO FOOD & FARMING IN CANADA

Helping you make informed choices with straight answers on...



FOOD SAFETY
& SECURITY



ENVIRONMENTAL
SUSTAINABILITY



ANIMAL
WELFARE



ROBOTICS &
INNOVATION



Table of contents

Kelly De Bruyn

4 Chapter 1 : CANADIAN FARMS AND FARMERS – WHO IS GROWING OUR FOOD?

- At a glance
- Farming across Canada
- Who is growing our food?
- The essential work of farming
- Worker shortage and Canada's international farm workforce
- Farming and other careers in agriculture
- Mental health on the farm
- Indigenous agriculture
- The bottom line: feeding Canadians sustainably

12 Chapter 2 : FOOD COST, AVAILABILITY, AND EATING LOCAL

The economics of food

- What is food security?
- The drivers of food inflation
- The cost of producing food
- The cost of buying food
- Food insecurity and growing food in Canada's North
- The vital role of food banks
- Why some food products are more expensive than others

Food choices, labelling, and eating local

- The luxury of food choices
- Organic food in Canada
- Healthy eating
- Deciphering food labels
- Local food, imports, and food miles

20 Chapter 3 : SUSTAINABLE FARMING, CLIMATE CHANGE, AND INNOVATION

- Making sustainable farming practices even better
- Sustainable farming starts with soil
- Measuring how much carbon is in the soil
- Growing crops without working the land = win-win
- Regenerative agriculture
- Keeping soil healthy by rotating crops
- Livestock are part of healthy soil
- Manure, phosphorus, and water
- Let's talk about emissions
- Canada's endangered grasslands
- Going the extra mile for wildlife
- Common Question: What about pollinator health?
- Farming and water use
- Food waste
- What about plastics and packaging?
- Farming sustainably with a technology tool box

32 Chapter 4 : PRODUCING SAFE HEALTHY FOOD

- Food safety rules for farms
- Keeping farm animals healthy
- "One Health" — when animal and human health meet
- Antibiotics and resistance
- What are drug residues?
- Raw facts about raw milk
- Foodborne illnesses
- Hormones, livestock, and meat
- What about pesticides?
- Faster plant breeding for more sustainable food production
- GMOs, plant breeding, and genetic engineering

38 Chapter 5 : CROPS AND PLANTS

- Grains and oilseeds
- Pulses and plant-based proteins
- Mushrooms all year long
- Fruits and vegetables
- Growing crops indoors
- Medicinal crops and growing for sacred ceremonies
- Canadian crops for the Canadian climate
- Heirloom varieties and heritage breeds
- Wines, beers, and craft beverages
- Maple syrup — the ultimate Canadian crop

45 Chapter 6 : FARM ANIMALS

Livestock and poultry in Canada

- Turkeys and chickens
- Hens and eggs
- Dairy, veal, and beef cattle
- Pigs
- Bison, elk, rabbits, and more
- Sheep, goats, and animal guardians
- What about fur?
- Honey
- Insects are farm animals too!
- Fish farming
- Horses

Raising farm animals humanely

- Why is some Canadian livestock raised indoors?
- Biosecurity
- Monitoring livestock barns remotely
- Genetics and animal breeding
- The rules for raising farm animals humanely
- Finding better ways to raise livestock
- Dehorning, trimming, and docking
- Animals on the move
- Fires, accidents, and first response
- Animal welfare and animal rights — what's the difference?
- Farm trespassing

58 Chapter 7 : THE FUTURE OF FOOD AND FARMING

- Changing consumer trends
- Robotics, automation, and smart systems
- Electrifying farm equipment
- Producing your own fuel and fertilizer
- Growing meat in a bioreactor
- Curious to learn more?
- Facing our future, sustainably

Farm photos in this book are all taken of Canadian farms and farmers. Many of the images were winning entries in Farm & Food Care's 2023 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

Front cover: Samantha Kennedy, JoAnne Maurier

Back Cover: Hailey Rast, Lauren Miller, BC Ag Council





Dear reader,

Food is life. It's a common tie that binds all of us together regardless of age, where we come from or where we live across this country. From coast to coast to coast, Canadians feel strongly about their food and where it comes from, and we've heard from people right across Canada that it's something they want to know more about.

From food safety and the environment to the treatment of farm animals, Canadians are keen to learn more about how food gets from the farm to their plate.

At the same time, people care about the cost of food, climate change, sustainability, and health care. These are topics farmers care about too, and here we look at the big issues facing our society, and how they are connected to food and farming.

In this publication, we answer your questions about our food, where it comes from, and what we're doing to produce food that is sustainable, healthy and safe.

To do so, we rely on the knowledge and support of a wide range of professionals who are experts in animal welfare, plant health and safe food production. Together, we work to not only produce the best food possible but to constantly look for ways to do things even better.

We're proud of Canada's food and farming story and we appreciate your interest in learning more about it.

Sincerely,



Canada's Farmers and Food Producers





Lori Gasper

CANADIAN FARMS AND FARMERS – WHO IS GROWING OUR FOOD?



Lori Gasper

Food and farming are a big deal in Canada. To put it simply, farms give us food, fuel, fibre, flowers, and jobs.

Canadians depend on farmers to produce the food we eat, and the agriculture and agri-food industry provide jobs for more than 2.1 million people¹. One in nine Canadian jobs is directly linked to the sector, which contributed \$134.9 billion² to our national economy in 2021. This makes agriculture an important part of Canada's economic engine.

What farming looks like and what it means, though, depends on where in Canada you live. Farmers from coast to coast to coast raise various species of livestock and poultry, and grow many different crops – all depending on the climate and the soils in their regions.

A small piece of very fertile land in a region with a mild climate can profitably grow unique specialty vegetables, for example. However, a large 5,000 acre farm in a more northerly region with lower quality soil may be better suited for grazing animals.

That diversity means that Canadian farms come in all types and sizes, from small orchards and vineyards to large grain farms and cattle ranches, but all produce food, fuel, fibre, flowers, and more. Most farmers today are specialists in a specific type of farming, such as greenhouse vegetables, mushrooms, dairy, or egg production.

At a glance:



Farms are family: 97 per cent of Canada's farms are family owned and run³.



Farms are bigger than in the past: The average farm size has doubled in the last 50 years, as technology makes it easier for farmers to manage bigger farms⁴. In 2021, the average Canadian farm was 809 acres.



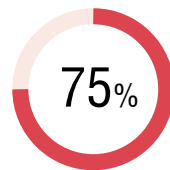
How big is an acre? 150 cars parked in a square, 16 tennis courts⁵, or 1,032 king size beds⁶

Farms are disappearing at a slower rate than before:

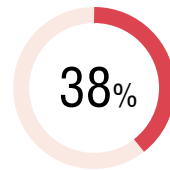
In the most recent census, the number of farms in Canada declined by only 1.9 per cent to 189,874⁷, as compared to 193,492 farms in 2016⁸. That's the smallest drop in 25 years.⁹

Farms are diverse¹⁰: 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 each). Canadian farms raise everything from cattle, poultry, and water buffalo, to grains, pulses, fruits, vegetables, nuts, herbs, flowers, and more.

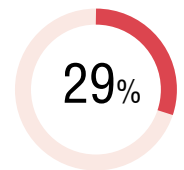
Farms from Canada feed the world: We are the fifth largest exporter of agri-food in the world¹¹, including:



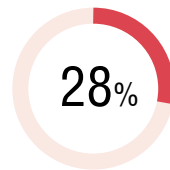
of the world's maple products (maple syrup and maple sugar)¹²



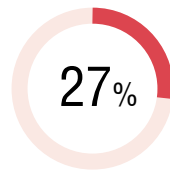
of the world's oats (world's largest exporter)¹³



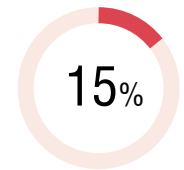
of the world's mustard (world's largest exporter)¹⁴



of the world's pulses (world's largest exporter of lentils and peas)¹⁵



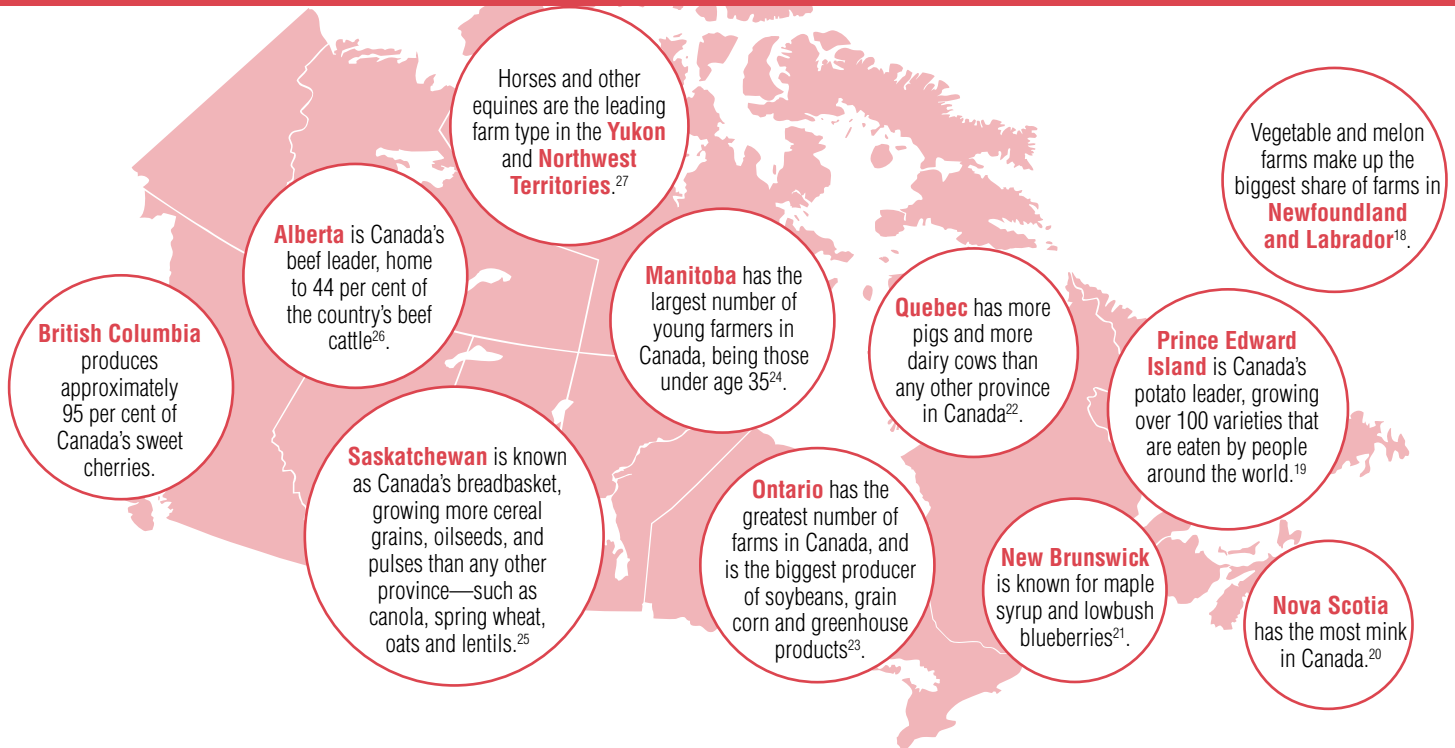
of the world's canola (world's largest exporter and producer)¹⁶



of the world's flaxseed (world's second largest exporter)¹⁷

Farming across Canada

The sheer diversity of Canadian agriculture is part of what makes Canada a global leader in food production. This is a big country – the second largest in the world – and the kinds of farms we have vary from coast to coast depending on our geography and climate. Here's a snapshot of what farming looks like across the country:



Every minute aspect of agriculture is important.

Career Profile



Emily Robb
Agro-ecology student,
University of Manitoba

Creating a sustainable, equitable food system

Farms need to be economically and environmentally sustainable in order to survive. Emily Robb, a University of Manitoba agro-ecology student and research assistant with Agriculture and Agri-Food Canada (AAFC), is helping farmers to ensure that their businesses will be viable in the long term.

"My grandparents were first and second-generation Canadians with a mixed cattle and grain farm near Brandon. That was my daycare. Their farm wasn't too far from where my family lived. I dabbled in different things like art and engineering, but didn't really realize it until maybe grade seven or eight what my interests truly were,"

says Robb, adding that her interest in agriculture really grew through participating in science fairs with 4-H.

"There are many definitions of agro-ecology. For me, it's about ethically distributing knowledge for farmers and ensuring [that] agriculture is economically and environmentally sound, and creating an environmentally, economically, and equitable sustainable food system."

Currently mid-way through her four-year degree program, Robb spends her summers helping AAFC researchers and farmers to identify, remedy, and prevent disease in crops. She also helps in the lab, analyzing crop and other material collected in the field. The job brings her to all parts of Manitoba, where she collects samples, scouts for problems in many different crops, and gathers data for a range of research projects.

"Something I look forward to is [that] every day is a new challenge. I'm collaborating and communicating with different producers. It's always a different field, situation, and enterprise, so I have to keep on my toes," she says.

"Every minute aspect of agriculture is important. It's not just farmers that make up agriculture. It's the food scientists, plant breeders, literally everything in between. I feel a lot of people don't know how diverse and varied agriculture really is, and how many jobs are related to agriculture in some way, shape, or form. We all work together in an interdependent network. That's what makes the wheels turn."



Lauren Miller

Who is growing our food?

Fewer than two per cent of Canadians farm, and those who do are getting older. In fact, the average age of Canadian farmers reached 56 in 2021²⁸. However, farms are also getting bigger, and technology makes it much easier to produce the same amount – or more – of food than in the past. You can read more about the technology used in farming today in chapter 7.

Young farmers in Canada are defined as those under the age of 35. Many young farmers supplement their farming activities with off-farm revenue, working in management, business, finance, trades, health, education, or natural resources and agriculture-related jobs. How much outside income they contribute to the farm business varies significantly by farm type, the size and profitability of the farm, the seasonality of production, and what types of opportunities they have in their region to work away from the farm.



Lori Gasper

Women who farm²⁹

In 2021, the number of female farmers in Canada increased for the first time in 30 years. According to the latest Census of Agriculture data, almost 80,000 — or about 30 per cent — of Canada's farmers are women. This compares to 28.7 per cent in 2016³⁰, and 25 per cent in 1996³¹, and is entirely because more women are deciding to farm on their own, instead of together with family or business partners,

with women in Alberta and Saskatchewan who raise cattle or grow grains and oilseeds leading the way.³² However, almost half of Canada's female farmers also work outside the farm to supplement their income, with 57.7 per cent of them spending 30 hours or more at an off-farm job.

Where are Canada's female farmers?

BC, Alberta, and Ontario have the highest numbers of female farmers³³, but it's in the North where women make up the highest proportion of farmers (43.3 per cent)³⁴. Sheep and goat farms are most likely to be run by female farmers³⁵. Various women in agriculture, including female farmers, have been inducted into the Canadian Agricultural Hall of Fame for their outstanding contributions to their sectors.

Canadian farms are defined by families

In Canada, farming is all about family. Many farms are handed down from generation to generation in a process called transition. Farm owners often work together with their children and grandchildren in their families' farming businesses — and there are farms in Canada that have now been home to nine generations or more of the same family.

Can a farm be a family farm and a corporation at the same time? Yes! As with many Canadian businesses, some farm families have opted to incorporate their farms. This entity is a business or ownership structure, 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 2021 Census of Agriculture, 22.8 per cent of Canadian farms are family corporations (only 2.4 per cent of incorporated farms are non-family corporations)³⁶.



Career Profile



Canadian Federation of Agriculture

Mary Robinson

Taking farming to the United Nations

The challenges facing food production are as multiple and diverse as farmers themselves, as well as the fuel, food, fibre and ornamental goods which they grow. Mary Robinson works with her family in their Prince Edward Island farm and multiple agricultural businesses, while also representing North America's farmers as Vice President of the World Farmers' Organization (WFO).

With members from across the globe, the mission of the WFO is to represent the farmers' voice on the world stage. It is a body that lends insights to policy makers on a wide array of issues, such as sustainability, nutrition, and the different challenges of farming in different parts of the world. The overall objective is to create the conditions for the adoption of policies and programs that could improve the economic environment and livelihood of farmers and rural communities, and thereby strengthen the contributions of agriculture in tackling common challenges.

Robinson found herself as a board member for the WFO after representing the agriculture community through other organizations, including as the first female President of the Canadian Federation of Agriculture.

"Ultimately I want to support the agriculture sector while still working in my family's agricultural businesses," says Robinson.

"One of the most important things I've seen through the WFO is how farmers in developing countries are managing challenges. Some of the biggest gains for those farmers, including some areas where they are [doing] subsistence farming, can be recognized by helping people embrace technology. It doesn't have to be fancy either — it could be as simple as improved seed handling, or improved fertilizer usage to help increase yields and quality. Things like that can make tangible and impactful improvements to people's quality of life."

Robinson reiterates that WFO has a global "farmers' driven approach", adding that she appreciates the privilege of being the WFO board member responsible for the relationships with the United Nations and UN Agencies in New York.

The essential work of farming

Labour is a big part of the economics of producing food, and just as with other businesses, farmers often need to hire extra people outside of their families 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; pigs, poultry and other farm animals need to be fed; and crops have to be harvested. Fruits and

vegetables in particular have to be harvested when they are ripe, or else they'll lose their taste and quality, or at worst, just rot in the field or on the vine.

That challenge means that farmers and farm employees don't work a traditional eight-hour work day. Like other essential workers in our society, they'll work evenings, nights, and weekends, in all kinds of weather conditions to make sure that their animals and crops are taken care of.



Career Profile



Chelsea Foley

Bringing agriculture careers to Newfoundland and Labrador schools

The majority of Canadians live in urban places, separate from farms, and are thus unaware as to how their food is produced. That's why Chelsea Foley, a member of the Newfoundland and Labrador Federation of Agriculture, and the province's Agriculture in the Classroom Coordinator, thinks it's vital to get informa-

tion about Canadian farming into school curricula.

Foley coordinates Agriculture in the Classroom in Canada's most easterly province; it is a country-wide program connecting youth to agriculture through hands-on and engaging education programs.

"I always knew I wanted to work with youth. I studied child development and psychology in school, which led me in the direction of community studies," says Foley.

"I've since developed a passion for agriculture, and find joy in sharing the food stories of the people that provide the food on our plates. Canada's agriculture sector has inspired me to be mindful of where my food comes from, and I know Agriculture in the Classroom programs have inspired students and teachers too."

Agriculture in the Classroom has programs from early Kindergarten levels to Grade 12. While programming for young children sees them learning about – and actually growing – different crops, older cohorts are shown the breadth and diversity of careers which the agriculture sector offers.

"Our Little Green Thumbs program for grade three to six students has them growing stuff like cucumbers,

tomatoes, and other crops indoors. Our Little Green Sprouts program for grades Kindergarten to two focuses on microgreens, sunflowers, buckwheat – things which grow a little faster," says Foley, adding that the idea is to provide a learning experience and a reinforcing feeling of accomplishment. Foley also has the unique opportunity to work with her mother, Maureen, on the program, which is now the largest in Canada.

Finding opportunities within the curriculum for older students can be more of a challenge. However, Foley says that Agriculture in the Classroom has had success pairing agriculture subjects within nutrition, science, and even social studies subjects.

"A lot of it tries to get people to think about agriculture, and learn about diverse and exciting opportunities in it. Soil scientists, plant scientists, veterinarians – we're building awareness and building the next generation of informed consumers."

Worker shortage and Canada's international farm workforce

As with many industries across the country, there is a severe shortage of workers on Canadian farms. Even though farmers try hard to fill their open farm jobs with local or Canadian workers, there simply aren't enough available workers to do so. That's why Canadian farmers also turn to seasonal and temporary foreign farm workers to help grow our food.

Although there are international farm workers on many types of Canadian farms, it is fruit and vegetable growers in particular who rely on these workers to help them plant, manage, and harvest their crops. Because many fruits and vegetables bruise or damage easily, they need to be planted, picked, and cared for by hand. Automated equipment is starting to become available for jobs like picking strawberries, harvesting mushrooms, and weeding or scouting for pests and diseases, but it's still quite expensive and not yet widely available.





Canada's international farm workforce

International farm workers (often called migrant workers) who come to Canada legally can work here through two government-regulated programs: the Seasonal Agricultural Worker Program (SAWP), or the agricultural stream of Canada's Temporary Foreign Worker (TFW) program. In 2022, over 70,000 workers came to Canada through these programs to work on Canadian farms³⁷.

The SAWP began in Canada in 1966 when 264 Jamaican workers arrived in Ontario to help with apple harvest. Today, the government-approved program is open to workers from Mexico, Jamaica, Trinidad & Tobago, Barbados, and the Eastern Caribbean islands; those who come to Canada work for a defined period of time before going home for the winter.

Workers who come to Canada under the TFW program's agricultural stream will stay year-round for up to two years, before either going home or applying to renew their work permits to stay in Canada longer. They come from many different countries, including Thailand, Vietnam, the Philippines, and Guatemala.

Regardless of which program brings them here, however, these workers have the same rights and privileges as Canadian workers do, and their employers have the same obligations and responsibilities to those workers as they

do for their Canadian employees. This duty includes minimum wage; workplace insurance coverage and safety protection; and access to healthcare, Employment Insurance, and the Canada Pension Plan.

It is common for many workers to return to the same farm year after year, where their experience and skills make them valued members of the farming business. With the money they earn in Canada, workers support their families and communities back home. There are many examples of workers who've been able to establish farms and businesses in their home countries, create local jobs, and pay for their children's education because of their jobs in Canada.

You can meet some of them at www.MoreThanAMigrantWorker.ca where they tell their stories in their own words.

Outside the strongly regulated SAWP and TFW programs, there is also a third segment of migrant workers who are undocumented, and thus don't have legal work permits. Their precarious status leaves them vulnerable to mistreatment, regardless of the sector in which they work. Governments at the federal and provincial level have made it a priority to prevent the exploitation of these undocumented people, a priority which has the full support of the farming sector.



Career Profile



Peta Gay Bennett
Seasonal Agricultural Worker

Working in Canada to support her family

Peta Gay Bennett has been coming to Canada from Jamaica for about five years now through the Seasonal Agricultural Worker Program. She first started in Nova Scotia in 2019 before moving to Ontario.

She grades and packs asparagus. She said that she came to Canada to make a better life for herself and her family. "I have two kids. They're back home with their grandma, their father and aunts. My daughter is five and my son is two. It's hard to leave them when they're this young still."

Daily, she communicates with her family by video calls. When asked what she'd like Canadians to know about her and her coworkers, Bennett said, "Canadians should know that we're hard working people. We're definitely hard working. Once we put our mind to something, we definitely can do it."



70,000
WORKERS



 **more than a
migrant worker**
www.MoreThanAMigrantWorker.ca

Farming and other careers in agriculture

Working in agriculture is much more than growing crops or raising livestock. One in nine Canadian jobs is linked to agriculture³⁸. From communications, engineering, and economics, to food and animal sciences, tourism, robotics, and the environment, the career possibilities are endless.

There are many more jobs available across the entire Canadian agriculture sector – not just on farms – than there are people to fill them. It is estimated that the industry could be short 123,000 workers by 2029³⁹.

Agriculture in the Classroom Canada and its provincial member organizations across the

country are working to introduce these diverse 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 options available.

Getting a start in farming

It can be difficult for people to get into agriculture if there isn't a farm business in the family to take over. The cost of land, equipment, and livestock is high, so new farmers must be creative if they want to live their farming dream. Many look to specialty products, local opportunities, direct-to-consumer sales, or niche markets they can supply, to differentiate themselves in the marketplace.

Most new farmers start out by renting or buying small pieces of land, and getting help from friends, neighbours, or family, while also working away from the farm. Some of them build unique partnerships with established farmers who don't have children who might want to take over the farm business, for example.

Special programs have also been established by government and businesses to help young people, women, new Canadians, and minorities start or grow farm businesses⁴⁰.



Mental health on the farm

Farming is rewarding, but also can be incredibly challenging. The stresses of weather, market uncertainty, evolving public perceptions, disease and pest threats, activist threats, and more, can take their toll on farmers' mental health.

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

Research into the mental health of Canadian farmers has shown that:

75 %
of farmers have
mid to high
stress levels

68 %
of farmers are more
susceptible to chronic
stress than the general
population

58 %
of farmers meet
the criteria for
anxiety⁴¹.

Luckily, awareness of the problem is increasing, thanks to groups like the Do More Ag Foundation, a national charity focused on mental health in agriculture across Canada. And the newly launched Canadian Centre for Agricultural Wellbeing⁴² is leading research, and developing programs and education to address farmer wellbeing nationwide.

Career Profile



Briana Hagen

Supporting farmer mental health

Farming can be a unique and rewarding occupation – but it can also be very stressful. Indeed, mental health data show anxiety, depression and other psychological afflictions being more common among farmers than in many other professions and demographics.

Resources to help farmers manage mental health have not always been available or effective, though. Epidemiology researcher Dr. Briana Hagen has been working to change that through the Canadian Centre for Agriculture Well-Being (www.ccaaw.ca).

"I have found people in agriculture are very determined and resilient, and I had a skill set which could really help in a place where there were not a lot of resources," she says.

"Whether for practical reasons, such as distance to counsellors or time availability, farmers have historically been unable to access help when they need it. When they seek help, too, the solutions provided to them often do not take into account how farm businesses operate. If a counsellor says 'I want you to take two weeks away from your dairy cows,' that's just not possible."

Hagen's organization develops mental health services tailored specifically around the culture and operational realities of Canada's farm community. To date, they have had a lot of success sharing mental health literacy training courses and educational resources, as well as expanding awareness of the importance of mental health.

"We're starting to see people take charge in their communities. Mental health literacy is also hitting the curriculum in agriculture colleges, which is a huge success," she says.

"Farming is a stressful occupation, and it's uniquely linked with a person's life. It's a business where there's not a lot of distinction between what you do and who you are. We need to create and deliver mental health services which are made for the people who are going to feed us."

Indigenous agriculture

Indigenous people have an important connection to the land, and have harvested plants and animals for traditional medicines and foods long before settlers arrived in what is now called Canada.

In addition to the challenges that all farmers face, Indigenous farmers encounter obstacles associated with colonization, such as regulatory systems including the *Indian Act*, as well as natural and geographic factors.

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, compared with non-Indigenous farmers.⁴³

The Canadian Agricultural Human Resource Council has established an Indigenous Agriculture Advisory Committee to help develop research and programming to promote Indigenous participation in all areas of agriculture.



“ To Indigenous people, agriculture is more than just producing food for consumption or export. Food is medicine. By taking ownership within the agriculture sector, our communities can reclaim important parts of our past, and improve food security, and strengthen the economic future of our people. ”

- Dale Worme, Chair, CARHC Indigenous Agriculture Advisory Committee



Did you know...that First Nations people foster a planting relationship known as the “Three Sisters”, in which beans, corn and squash are planted side by side? The beans fix nitrogen to the soil; the corn stalks act as a trellis for the beans; and the squash leaves provide ground cover that prevents weed growth and conserves moisture.

Career Profile



Jodi Robson

Sharing Indigenous food roots

Saskatchewan’s food history is long and diverse. Regina-based First Nations chef and food influencer Jodi Robson enjoys sharing her own cultural history by highlighting new takes on traditional Saskatchewan culinary traditions.

A member of the Okanese First Nation, Robson’s cooking style is described as both rustic and

experimental. She was a finalist in season three of CBC’s Great Canadian Baking Show; returned for the show’s holiday special in season five; and actively highlights her passion for food, family, and her Indigenous culture through social media.

“I wear a multitude of hats. I’m a local cook, a recipe developer and content provider for online resources. I’m also a co-host of an exploratory food show called ‘Big Heart, Small Town’, where I travel across the province with a former Saskatchewan wanderer visiting rural regions, learning about foraging, hunting and fishing,” says Robson.

“I’m a Nakota-Cree woman. I get to bring some of my own cultural knowledge to these communities. We cook a big meal to sit down, and share knowledge.”

Some of Robson’s favorite traditional foods and ingredients come from Saskatchewan’s boreal regions. But while duck eggs, mushrooms, berries, birchbark sap, wild rice, and many other products were traditionally harvested from wild landscapes, urban, industrial, and agricultural development

mean that Robson finds many such products from Saskatchewan’s farming community.

“I rely on local producers for a lot of these ingredients as communities grow and cities get larger. It makes it way easier for me in a lot of ways, and we’re still working with the more traditional foods we’re used to,” she says.

“I appreciate the extensive range of products available to me that would not have been prior. I really like to work with boreal heartland products like mushrooms and wild rice. They honour that traditional method of gathering and product treatment. They’re items that would be really time consuming to go and gather, but are fantastic to work with for any dish.”

When not cooking or sharing knowledge with followers and other communities, Robson enjoys spending time with her husband and two children. They actively follow the Saskatchewan Roughriders, love the outdoors, and even run “Sask & Destroy” – Saskatchewan’s official fan chapter for heavy metal giant Metallica.



Anthony Dreaver Johnston

Anthony Blair Dreaver Johnson with Katherine Finn, project manager for Bridge to Land Water Sky

Living lab inspiring next generation of Indigenous agricultural producers

Living labs operate in real-life settings, bringing together farmers, scientists and others to develop and test innovative practices and technologies that address agri-environmental issues.

The Bridge to Land Water Sky living lab project is the first Indigenous-led living lab in Canada, led by the Mistawasis Nēhiyawak in Saskatchewan in collaboration with the Muskeg Lake Cree Nation NGO, institutional and government partners. The “bridge” refers to relationship building – both with people, and with land, water and sky.

Anthony Blair Dreaver Johnston is a member of the Mistawasis Nēhiyawak, and acts as a special advisor for his Nation. He said that the living lab’s goal is to inspire a more resilient agriculture industry and the next wave of Indigenous agricultural producers who can learn to be farmers as their grandfathers once were.

Johnston explained, “My ancestors were buffalo people, people of the plains. But they knew that they needed to find a new way to provide for the people

because buffalo were going extinct. Agriculture was a new way to provide. Our ancestors became very successful farmers who had intimate relationships with land, with water, and with sky. I grew up knowing that both my grandfathers were good farmers.”

Unfortunately, said Johnston, “That wasn’t sustained. We’re no longer farmers. We are no longer producers. We’ve lost a lot of our land.”

The project involves training, education and engagement with youth; inspiring them to become a future farmer, a combine driver, a greenhouse grower – anything to do with agriculture. Said Johnston, “We know that all of our members won’t want to do the same thing. One size won’t fit all. It’s about looking at food sovereignty for our people and our nation. We want those opportunities for our young people, and we want to combine the values of our ancestors with the ways of the 21st century.”

To learn more visit: www.BridgetoLandWaterSky.ca

The bottom line: feeding Canadians sustainably

Farms are bigger today than even 20 years ago, and farmers have access to more tools and technologies than ever before to help them with their work, and to do it in ways that are better for animals, plants, people, and the planet. Here are some examples:



Digital sensors can let a farmer know if an animal is sick even before it shows any symptoms, which means that the farmer can take steps to prevent disease instead of having to help a sick animal get better.



Tractor-mounted cameras can help farmers predict when their crop will be ready for harvest, and how big that harvest will be, which ultimately means less food is wasted.



Special soil analyses can help farmers pinpoint exactly how much fertilizer they need to apply in different areas of a field, so that they’re only giving the soil and the crops the exact nutrients needed to thrive.

This work is all part of what farmers do to feed Canadians sustainably – making sure we have enough food while also reducing impacts on the environment, and ensuring that farms are both socially responsible, and earning enough money to stay in business.





FOOD COST, AVAILABILITY, AND EATING LOCAL

The economics of food



Turkey, Farmers of Ontario

Food is top-of-mind for Canadians. Food cost and availability, in particular, are leading concerns for consumers – and these are issues farmers care about too.

Canadians across the country are challenged with food costs that have been increasing much more rapidly than in the past. This is called food inflation. As food gets more expensive, it means many Canadians have to make tougher choices at the grocery store. It's not just food prices that have gone up, though. What it costs to produce food has also increased substantially.

Let's start at the farm and take a look at what factors influence the price and availability of our food – and what we can do to support local food production.



What is food security?

Farming is a critical part of Canada's national food security. According to the Food and Agriculture Organization (FAO), food security exists when people have access to enough affordable, safe and nutritious food for an active and healthy life⁴⁵.

Farms are where it all begins, but it takes more than farms to feed a country.

We also depend on a whole supply chain of animal feed, fertilizer and equipment suppliers; veterinarians and crop specialists; transporters; processors; distributors; retailers, and delivery companies to grow, produce and get food to Canadians.



Farms are where it all begins, but it takes more than farms to feed a country.



The drivers of food inflation

So what part of that supply chain is behind high food prices? There's no single or simple answer to that question. Canada's food system is a complex network and the balance between managing food inflation and farmers and other businesses along the supply chain staying profitable is a delicate one.



Turkey Farmers of Ontario

Weather emergencies and our changing climate

A key reason why food prices can increase is the weather. Droughts, flooding, extreme heat or cold and storms of all kinds can damage or even destroy crops, or cause livestock to produce less meat, milk or eggs. In severe cases, weather emergencies can also kill livestock and poultry. This is devastating for the farmers involved, but it also means they'll have less food available to send to market – and when there is less supply, prices often spike.

A spring frost that kills fruit blossoms will dramatically decrease how many peaches, cherries or apples will be harvested that year. An unexpected heat wave, such as the western Canada heat dome in 2021, will still impact the health and growth of poultry and livestock months after the event.

The weather also impacts our ability to transport food quickly and reliably, such as the devastating floods in British Columbia in the fall of 2021 that closed key roads and rail lines for days and in some cases weeks or months.

It's not just weather in Canada that can cause shortages or price spikes. There are crops we can't grow at all – like citrus – or crops we can't grow outdoors in the winter, like lettuce. A flood or a cold snap in California means a shortage of Romaine lettuce in Canada, for example.

Weather has always been a concern for farmers, but recent years have produced more extreme weather. You can read more about farming and the changing climate on page 20.

Plant and animal diseases

We've all just come through the COVID-19 pandemic, where we've learned first-hand how disease can impact everything about our daily lives. In farming, diseases and pests can also affect plants and animals. Avian Influenza, for example, is not a threat to food safety but is a risk for Canada's poultry flocks and has killed millions of turkeys, chickens and laying hens in Canada. The industry works hard to mitigate any potential impacts on the production of chicken, turkey and eggs.

Global events

It can be hard to relate to events that happen far from home, but we still feel their impacts both directly and indirectly. That's because Canada is part of a global economy and many of the products we buy or the ingredients we use come from other countries.

Russia, for example, has long been one of the world's leading producers of fertilizer, so the war between Russia and Ukraine has dramatically driven up fertilizer prices and caused supply shortages.

Energy and fuel prices are also heavily affected by global events, and for the past several years, the food supply chain has grappled with shortages of everything from shipping containers to cardboard packaging material because of turmoil caused by the pandemic.

Most of these cost increases come because of situations beyond our control here in Canada, but still ultimately contribute to higher prices at the grocery store.



The cost of producing food

There are many items farmers have to pay for to raise livestock and grow crops, like electricity, equipment, water, fertilizer, animal feed, seeds, and fuel, as well as employees to help them get all the work done on the farm.

Even though food prices have been going up at the grocery store, this doesn't mean most farmers are being paid more for what they sell. Many fruit and vegetable growers, for example, are still receiving the same prices – and in some cases less – for their produce as they were several years ago.

That means that 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 businesses too, such as transportation or processing strikes, new trade agreements and political spats between countries, weather events, or global crises like the COVID-19 pandemic.



The cost of buying food

The current state of food inflation is not limited to just Canada. In fact, it's a global phenomenon and it impacts some parts of the world more strongly than others. Even though our food prices have increased considerably, Canadians overall spent approximately 11 per cent or \$0.11 of each dollar of their disposable income on food in 2022.

Not every Canadian has the same experience, though, when it comes to paying for food. Canadians with the lowest income spent 23.1 per cent of their disposable income on food, compared to only 5.2% for the highest income Canadians⁴⁶.

Compare that figure to Mexico at 26.2 per cent, India at 32.1%, and Nigeria at 59 per cent⁴⁷ and imagine how different your life would be if you had to spend that much of your income on food.

Canada is known around the world as a leading food-producing nation. Our size, our climate and our natural resources make Canada ideally suited to agriculture and we are lucky enough to be able to produce much more of some foods than we can consume.

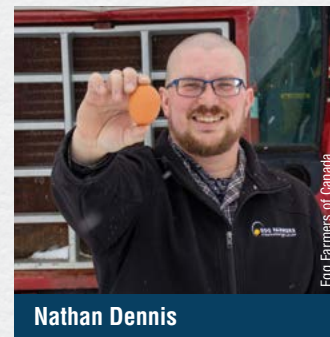
We are a major exporter of staple crops like canola, wheat and pulses but also of beef and pork, for example, supplying countries who aren't as self-sufficient as we are when it comes to food production.



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 farmers receive sufficient compensation that considers the average cost of production.

Career Profile



Nathan Dennis

One of Newfoundland and Labrador's newest egg farmers, Nathan Dennis, got his start as a poultry farmer at a young age — with two hens and a rooster in the fifth grade.

A first-generation farmer, Dennis said that his passion started as a childhood hobby, and after high school, he gradually built up his farm. Over time, he diversified to growing root crops, forages (grasses), raising sheep, beef cattle, and a small flock of chickens. “I’ve always had an interest in poultry,” said this father of two, “and I always wanted to have a bigger poultry farm.” In 2016, he got that opportunity when he applied to a program that supported new farmers wanting to enter the egg farming industry — called the Egg Farmers of Newfoundland and Labrador New Entrant Program. In 2017, he began producing free run eggs — the first farm of its kind in the province.

With room to grow, Dennis's priority is to modernize and automate. “I'd like to make some upgrades to the barn, make improvements to make things more efficient... adapt new technology, and from an environmental perspective, be more sustainable.”

Nathan has also taken part in Egg Farmers of Canada's national young farmer program, which has given him the chance to meet and learn from other Canadian egg farmers. “Talking to other farmers, you can bounce ideas back and forth, and learn about how they are furthering sustainability on their egg farms,” he says.

Food insecurity and growing food in Canada's north



Despite the large amount of food we produce, and the relative affordability of our food compared with other countries, many Canadians struggle with affordability and accessibility—an issue called “food insecurity”.

Based on the latest data from Statistics Canada's Canadian Income Survey, 5.8 million Canadians, including 1.4 million children, lived in food insecure households in 2021⁴⁸. Much of this is caused by issues like food inflation, but there are other reasons Canadians experience food insecurity.

In remote and northern communities 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.

Growing food in Canada's North

Many efforts are underway to help people in northern Canada grow or produce more of their food locally. Some examples include:

The Tr'ondëk Hwëch'in Farm (TH Farm) just outside of Dawson City, Yukon is one of the only First Nations working farms in the region and is trying to fill some of the need for local food⁵⁰.

AgriTech North in Dryden is the first wholesale-scale grower of fresh produce of its kind in northwestern Ontario with a goal of providing year-round access to fresh produce for Far North Indigenous communities⁵¹.

Gjoa Haven, Nunavut is home to Canada's northernmost vertical farming project, growing fresh produce in a controlled environment shipping container⁵².

Green Iglu is a not-for-profit that launched its first growing dome greenhouses in Nauyaat, Nunavut in 2015, with other locations added in northern Quebec, British Columbia and Newfoundland & Labrador⁵³.

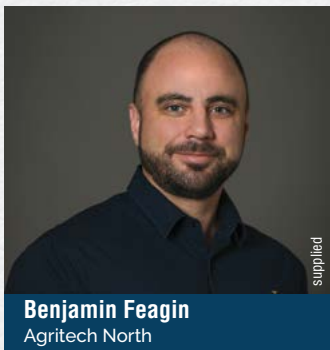


Did you know...

In Nunavut, the cost of groceries can be three times the Canadian average, with some items costing up to 10 times more⁴⁹.



Career Profile



Benjamin Feagin
Agritech North

Fresh food grown for – and by – remote communities

Fresh produce is difficult to come by and very expensive in Canada's remote northern communities. Benjamin Feagin Jr. is working to change that with AgriTech North – a community-driven vertical farm business based in Dryden, Ontario.

AgriTech North produces 70 varieties of leafy greens, herbs, and small fruiting crops. They're grown indoors year-round, and shipped to over 50 remote and fly-in communities. Feagin, the company's chief executive officer, hopes to expand access to fresh, lower-cost produce to 600 different communities.

"We currently serve Kenora, Dryden, Sioux Lookout, and everywhere in between. Our operational area is very spread apart and works in places with very little infrastructure. If we want to move our product, we have to come up with the distribution network," says Feagin.

They are working with Grand Council Treaty #3 and have initiatives in a number of the communities to advance Treaty #3's food sovereignty mandate.

"We provide a solution for year-round food access that has real potential to expand into all 28 Treaty #3 communities, reducing fresh food costs by 25 per cent," Feagin says. "It's spearheading regional food system change and the establishment of infrastructure to serve all of our communities."

Aside from delivering produce, Feagin and his colleagues are also enabling individual communities to operate their own vertical farms, and generate their own parts using 3D printing.

"We expect 3D printers to eventually be commonplace. The intention is to enable remote communities to print replacement parts and not rely on long supply chains, or poor-quality parts, in order to operate."





The vital role of food banks

There's hunger and need even in a country as wealthy as Canada, with Canadians making more than 1.4 million food bank visits every month⁵⁴. Various circumstances can lead people to turn to food banks, including inflation and unemployment, but even the number of full and part-time workers who require access to food banks is growing, with one in seven people who access these services being employed⁵⁵.

Farmers donate generously to food banks

About 40 per cent of food distributed by Canadian food banks is fresh, such as milk, eggs, meat, and produce⁵⁶. Much 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.



Why some food products are more expensive than others

Some food products, such as heirloom produce or livestock and certain poultry species grown to serve the needs of niche markets are more expensive than standard food products. That's because they grow more slowly, yield less or are more labour-intensive to produce because they require more specialized care.

Certified organic products are also generally more expensive. Organic farming methods tend to be more labour-intensive and organic food products are grown, processed, and packaged at smaller volumes, which increases costs. Organic meat, dairy and eggs can be more expensive than conventional products because farmers must feed only certified organic feed, for example, and must use certified organic dairies and abattoirs for processing⁵⁷. You can read more about organic farming on page 17.



Career Profile



Kim Wilhelm
Food Banks Canada

Supporting communities with healthy food

Kim Wilhelm and her colleagues at The Food Bank of Waterloo Region help those in need access high-quality, nutritious food – and they often work with farmers to do it.

With over 120 community and agency partners, The Food Bank of Waterloo Region is one of the larger Food Bank chapters in Ontario. For Wilhelm, this gives them an opportunity to help other Food Bank locations better manage and distribute donations.

"Think of the Waterloo Food Bank as a distribution centre. Our responsibility is to acquire, store and distribute the food to our agency partners and programs. It's those partners and programs that directly provide food to the community," says Wilhelm.

"We also work with many food banks in Southwestern Ontario, including some smaller ones that simply don't have the space or staffing to store and distribute large amounts of food. If they receive a phone call from a corporate partner with a significant amount of product to donate, they simply can't absorb it. We help them manage that."

The corporate partners Wilhelm refers to often includes farm organizations. For example, she and her team are currently working with Dairy Farmers of Ontario to provide milk to their wider community network.

"Good food leads to good health. If we ensure people in the community are getting better nutrition in their diets, it will help in other aspects of life."

The Waterloo Food Bank also works with individual farmers. Indeed, large donations of fruits, vegetables, eggs, meat, and other food products are common.

"A few years ago, we had an abundance of squash donated by a grower. We had teams of volunteers wash, peel, top and vacuum seal it for distribution well beyond the time we would have been able to distribute full squash," says Wilhelm.

"We're also building perishable hampers with donations of fresh vegetables. We add a protein and milk or eggs if we can, then distribute them as a package to individuals and families in need of assistance. The packages always look different – it just depends on what has been donated."

Food choices, labelling and eating local

The luxury of food choices

Thanks to the bounty of Canada's food system, many Canadians can make food choices based not just on cost or availability. When they're deciding what to eat, they can also consider nutrition, health or production methods, for example. That's because there are many types of farms in Canada. Broadly speaking, if there's a market for a certain type of food, there are likely to be Canadian farmers that will be able to provide it.

Organic food in Canada

Farmers grow their crops and raise their farm animals in a variety of ways, following different production practices, such as conventional (non-organic) or certified organic production.

Certified organic food is grown in ways that support the principles of organic agriculture by focusing on health, ecology, fairness, and care to protect the health and well-being of current and future generations and the environment⁵⁸. Farmers producing certified organic food must follow and document strict production rules around crop rotation, soil health improvement, natural fertilizers and pest control methods, certain additional humane livestock management practices, and traceability from farm to fork.

Most farmers who aren't certified organic producers also follow these principles – the big difference is that farmers who are certified organic producers must document and prove that they are following the rules set out in the Canadian Organic Standards.

In Canada, third party certification organizations that have been approved by the Canadian Food Inspection Agency look after certifying organic farms. Some farmers grow both certified organic and conventional crops on their farms, but regardless of the type of farming, the key is sustainable production.

Canada's market for organic food items is worth over \$7 billion annually⁵⁹. About 7,900 Canadian farms are certified organic, with the largest share of those farms located in Quebec. Approximately 1,800 food processors also have certified organic status – most are in Quebec, followed by Ontario and British Columbia⁶⁰.

At a glance:



3.1 million acres of land is in certified organic production - or about two per cent of Canada's farmland.



60% of Canada's certified organic food is imported from the United States.



27% increase in the number of certified organic livestock farmers since 2015.

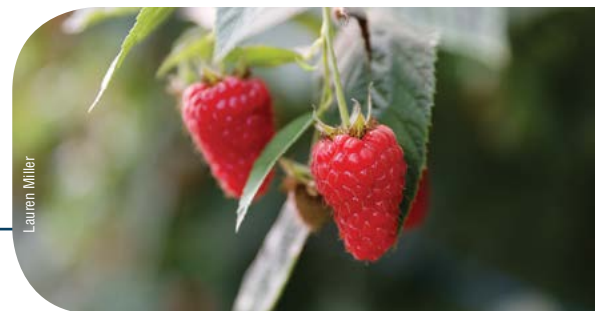
Why some consumers prefer organic foods

Many consumers associate organic food with a healthy lifestyle. However, all agricultural food products — meat, eggs, dairy, fruits, vegetables, and others — are rich in nutrients, and are part of *Canada's Food Guide*. (<https://food-guide.canada.ca/en/>)

Regardless of how it is produced, all food in Canada must meet the same food safety standards. 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's⁶¹.

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. You can read more about food safety on page 32.



Lauren Miller

Healthy eating

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 support good health — and science is finding new ways to make good-for-you foods even better. Here are a few examples:

A new wheat that can be used to make bread suitable for Celiac Disease sufferers⁶²;

Specialty canola varieties with higher levels of the omega-3 fatty acid Docosahexaenoic Acid (DHA). DHA has been shown to play an important role in brain development and function⁶³;

A “golden banana” with higher beta carotene and iron levels to prevent malnutrition in Africa⁶⁴.



Donna Rogers



Did you know...

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

Deciphering food labels

Food labels are critically important for people with diagnosed dietary needs, in order for them to know that what they are eating is safe to consume. However, marketing labels can add a “perceived value” and be misleading, 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 flavour⁶⁵.

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. It is important to remember that all animal proteins found in the grocery store are free of antibiotics due to testing done by the Canadian Food Inspection Agency. To learn more about the use of antibiotics in livestock production, visit page 34.

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 gluten⁶⁶— which is particularly important for the one per cent of Canadians with celiac disease, or those with gluten sensitivities⁶⁷.

Absence labels

Sometimes a product will be labelled as being “free” of something, such as 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 a marketing tool to make one product look superior to another.



Career Profile



Patricia Chuey
Registered Dietitian

Understanding the context around food and nutrition

Registered Dietitian Patricia Chuey has been in the nutrition business for a long time. Over the last 35 years, she has worked as a nutrition counsellor, sports dietitian, speaker, author, cooking instructor, recipe developer, food product inventor, mentor, and more. Chuey knows how challenging it can be to make healthy food choices, when information about food products is diverse, voluminous, not necessarily correct — and often contradictory. That's why she helps people who are trying to eat and feel better in order to focus on context, and to determine how science can help determine what foods can help rather than hinder.

"Just not eating certain things isn't the whole answer. If [they are] trying to feel better and live healthier lives, I highlight what to eat more of. It is positive nutrition versus negative nutrition," says Chuey.

"People are trying to do one thing, and they may get different advice from their doctor, from influencers, in the news, their own social groups. But everyone is different, and what works for one person may not work for someone else. As dietitians, we know there is no one-size-fits-all. We look at who you are, what you want or need to manage, your goals, and help people stay well-nourished in a consistently doable way."

Chuey adds she is a "huge supporter" of Canada's diverse food system — both the communities it supports, and the nutritional solutions it can offer to people experiencing different problems, and with different goals.

"We need to be grateful for the access we have to good food and such a wide range of choices. I encourage everyone to learn about where their food comes from, to grow and share food, to cook, and to support local as much as possible."



Local food, imports, and food miles

Buying and eating local food is very popular in Canada. It has led to 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 they've produced.

Not only does that direction 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, compared with being shipped thousands of kilometres.

The definition of "local" varies, however, and can refer to a region, province, or even the entire country.



Food imports and food miles

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. That means that at certain times of the year, the food miles or distance a popular food item has to travel to get from farm to market is much higher than usual.

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.



SUSTAINABLE FARMING, CLIMATE CHANGE, AND INNOVATION

Climate change is increasingly impacting many aspects of our daily lives, and we know it's a top-of-mind concern for Canadians.

It's a big deal for farmers too, as they're on the front line of our environment every day, and they know first-hand how important healthy soil, air, and water are to growing plentiful crops, and raising healthy livestock in a sustainable way.

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

That's why, now more than ever, sustainable farming is a key focus on farms of all types, sizes, and styles. This pathway includes environmental, social, and economic sustainability, and farmers more than ever are making all three priorities their farm businesses, for the next generation of farmers, and for the future of the world as a whole through their practices and the adoption of innovation.

For example, many of them are following in the footsteps of their parents or grandparents who farmed the same land before them, and are now committed to making sure their children can continue to farm that land for decades to come.



Making sustainable farming practices even better

On their own, through farm organizations, collaborations with the supply chain, and with federal and provincial governments, Canadian farmers invest heavily in environmental research, and are focused on making responsible and sustainable farming practices even better.

We know so much more about soil health, pest and nutrient management, and sustainable crop production than we did decades ago — and we're also getting better at measuring the positive impacts of changes we've

already made, and of newer and better practices which we're using today.

A coalition of agricultural government and industry partners is currently developing Canada's National Index on Agri-Food Performance that will provide a comprehensive picture of the sustainability of Canada's food system from farm to retail. Once it's released — expected in 2024 — the index will measure a suite of 20 metrics and 130 environmental, economic, food integrity, and societal well-being indicators⁶⁸.

Sustainable farming starts with soil

There are 10 main soil orders in Canada, which are 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.

The last Ice Age, combined with climate cycles and plant and animal growth and decay over millions of years, has built Canada's soils into what they are today. The type of soil found on a farm — and how farmers look after it — influences what crops a farmer can grow and how to best grow them.

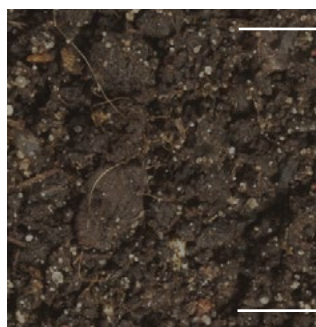
Why organic matter matters

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

Quick fact:

Soils have unique characteristics that can influence the flavour and character of grapes and wines and other crops like ginseng.

Wine lovers call this effect "terroir".



Did you know...

It can take between 100 and 500 years to build two centimetres of topsoil. Sustainable soil management helps rebuild topsoil by slowly adding organic matter from the previous year's crop⁶⁹.



Melinda Baarda

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 still have a lot to learn about soil microbiology and how it influences the way 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 nutrients (like nitrogen or phosphorus) they need to apply. But new technology is providing a whole new picture of what's underground.

New sensor systems can measure gamma radiation emitted by the natural decay of soil, or the wavelengths that nutrients reflect. This imaging helps to create high-resolution digital maps of each farm field, showing their chemical and physical properties that aren't visible to the human eye. This reading in turn helps farmers to make better decisions when it comes to managing and improving their soil health.

Measuring how much carbon is in the soil

The soil's ability to sequester carbon is one way to minimize the impacts of climate change, but there's been no way to quantify soil carbon concentration in an affordable, accessible way. New technology, developed in part by a Québec-based start-up called Chrysalabs, is changing that problem, and could expand market opportunities for farmers to receive payment for their efforts to sequester carbon in the soil⁷¹.

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-tilling (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 can give the soil improved structure and nutrients, prevent soil erosion, improve water conservation and flood management, and promote populations of beneficial insects and micro-organisms.

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

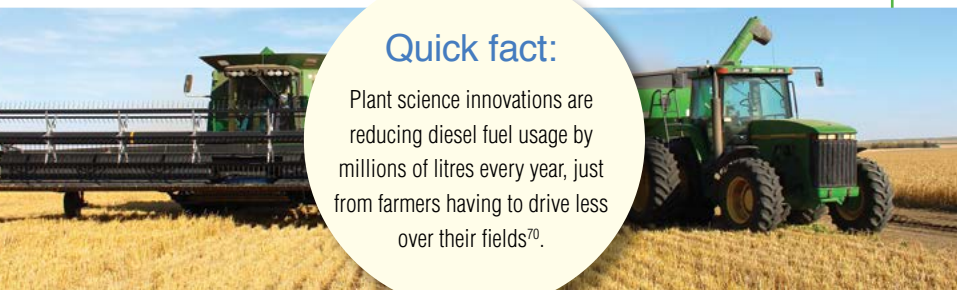
results in some areas of the Prairies now being net zero greenhouse gas emitters.

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. And the most modern sprayers now use smart systems with cameras to identify weeds in the field, and only to apply the herbicide to the weeds, instead of the entire crop.



Did you know...

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 — also part of carbon sequestration.



Quick fact:

Plant science innovations are reducing diesel fuel usage by millions of litres every year, just from farmers having to drive less over their fields⁷⁰.

Regenerative agriculture

Part of sustainable farming means leaving the land productive for future generations — an approach to soil health called **regenerative agriculture**. It's a new term for something that farmers have been doing for decades: putting emphasis on improving soil health over time.

Key principles include disturbing the soil as little as possible; using livestock and their manure to improve soil health; growing diverse crops from year to year; and making sure the soil is covered at all times. All of these techniques improve the water and mineral cycle, and reduce the impact of climate change by sequestering or keeping carbon in the soil.

Keeping soil healthy by rotating crops

As part of sustainable farming, many farmers grow one type of crop in a given 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 add diversity to the soil, and to pull nutrients and moisture from different soil depths, so that 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, canary seed, flax, or sunflowers), followed by legumes (field peas, beans, lentils, or chickpeas).



Makayla Clavanagh

A living ground cover

Another 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. The plants' job? Just as their name says: to keep the ground covered. This step reduces soil erosion, holds moisture in the soil, and keeps nutrients from fertilizer and manure from being washed away into streams, lakes, and rivers.

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

Using nature to protect crops against pests

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, orchards and vineyards to identify pests, and to 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".



Agriculture in the Classroom SK

Livestock are part of healthy soils

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



Agriculture in the Classroom SK

Career Profile



PH: Federation of Agriculture

Keisha Rose
PEI Farmer

Being part of Canada's food system

Keisha Rose has had a long affinity for farming on Prince Edward Island. The decision to come back to the farm after going to university, however, was not immediate.

"I grew up just up the road from our farm, watching my Dad, Uncle, and Grandfather farm my whole life. Since we were very young my sisters and I loved a drive in the tractor or a field visit. After high school and while in university I would work in the spring to help with planting, and a few summers I would stay to work the entire time," says Rose. Her decision to return to the family potato farm came after attaining a business degree, and working for an agricultural insurance company for two seasons.

"I've been on the farm full-time since 2015. Our farm, R.A. Rose and Sons, is in North Lake, PEI. We grow potatoes for the fresh market and we also grow cover crops. We also operate a packing facility, East Point Potato, where we pack all of our own potatoes, as well as those from my cousins' potato farms and a number of other Island growers."

Rose's favourite thing about farming is the variety of jobs in which she engages on any given day. From planting or harvesting potatoes to managing finances and employee paperwork, every day — and every season — brings different challenges.

"The 'jack (or jane) of all trades, master of none' saying rings true to me, I feel. I am always willing to try something or learn about something. I think most farmers would say this occupation requires [that] we have that in our skill set," says Rose.

Understanding where food comes from, and how much work goes into getting it to the shelf and table, is something Keisha hopes more people will learn about — particularly given how sustainable Canadian farming systems can be.

"I think people should take value in supporting their Canadian farmers. As a kid, my Dad would say 'farmers are feeding the world,' and I remember rolling my eyes at him, like no one would notice if we just didn't grow food anymore. I now see what he meant. It's so important that primary agriculture producers continue to produce. We are all part of a system."



The Real Dirt on Farming



Manure, phosphorus, and water

Manure is an excellent source of fertilizer for the soil, but nutrients that it contains — 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 fertilizers, such as manure 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 space 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.

Banking on seeds

To ensure that future generations of people will still have enough to eat, even if the climate continues to change, the Global Seed Vault was established on a remote island in northern Norway. The vault is home to more than 1.1 million samples of food crop seeds from almost every country in the world, so that plant life can be preserved through crises like war and climate change⁷². 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!



Did you know...

Canada's seed vault is called the National Seed Centre of Canada. Located in Fredericton, New Brunswick, it holds millions of Canadian seeds. The Centre has launched a program to work with Canadian Indigenous communities to identify and collect seeds from species that are culturally important to them⁷³.

Career Profile



Darren Yungmann
Canary Seed

Diversifying food grains

Darren Yungmann, a Saskatchewan grain farmer, is trying to show more Canadians the value of canary seed — a specialty grain commonly consumed abroad, but one still relatively unknown in Canada.

Canary seed (also called alpiste) is a nutritious, high-protein specialty grain. Originating from the Canary Islands, the crop is used both as bird feed as well as an ingredient in health food products. Canada is the world's largest producer of canary seed. Most of it is exported to countries such as Mexico, the United States, Belgium, and Spain, but its popularity for Canadian food products has remained comparatively small.

"Seven years ago, canary seed was approved as a food product in Canada. It was one of the first new food products registered for a long time," says Yungmann.

"It's one of the highest protein grain crops, has a healthy oil profile, and also doesn't contain gluten. There's a tremendous amount of potential."

Through the Saskatchewan Canary Seed Development Commission, Yungmann and other farmers and researchers are trying to develop new domestic markets for canary seed, as well as new varieties of the crop. One of the research projects being supported by the Development Commission, for example, focuses on creating canary seed varieties that produce a brighter, more yellow colour.

"Canary seed has a nice flavour, and an interesting and nutty texture," says Yungmann. "Yellow flour would probably make a better-looking product, compared to the more brown flour from our current varieties."

BC Agriculture Council



Let's talk about emissions

Greenhouse gases (GHGs), including carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), absorb radiation from the sun, and trap heat in the atmosphere, acting like a greenhouse or a layer of insulation for Earth.

GHGs are parts of the earth's natural processes, but human activities over the last few 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.

Carbon dioxide is produced by farm equipment. It's also released when soil is disturbed, or when plants decay.

Methane from cattle is part of a natural carbon cycle. Released into the air through belches, methane goes into the atmosphere for a period of approximately 12 years until it breaks down. During photosynthesis, plants capture this carbon and store it until an animal grazer comes along, digesting it and releasing the carbon as methane for the cycle to continue. It can also come from livestock manure, food waste and grasses.

Nitrous oxide primarily comes from fertilizer. When plants can't use all the nutrients that they're given, the excess fertilizer can be lost into the air through de-nitrification as nitrous oxide, a greenhouse gas estimated to be 300 times more potent than carbon dioxide⁷⁴.

Overall, GHG emissions from Canadian agriculture have stayed about the same for the last 20 years⁷⁶, even though the quantity of food production has increased dramatically. That outcome 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 cropland.

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 benefiting 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 effective⁷⁷.

It's already been in use in Canada for the last 15 years, making Canadian farmers already among the most sustainable growers in the world⁷⁸. The 4Rs principle is one of many best management practices that can help agriculture to reduce its greenhouse gas emissions from fertilizer use even further.

4R Nutrient Stewardship



Right Source @
Right Rate, Right Time, Right Place



Did you know...

That microbes found in the soil can help cereal crops like corn or wheat to create their own nitrogen fertilizer? They can naturally convert nitrogen from the atmosphere into a form that these crops can use as nutrition. This aspect is called biological nitrogen⁷⁵.



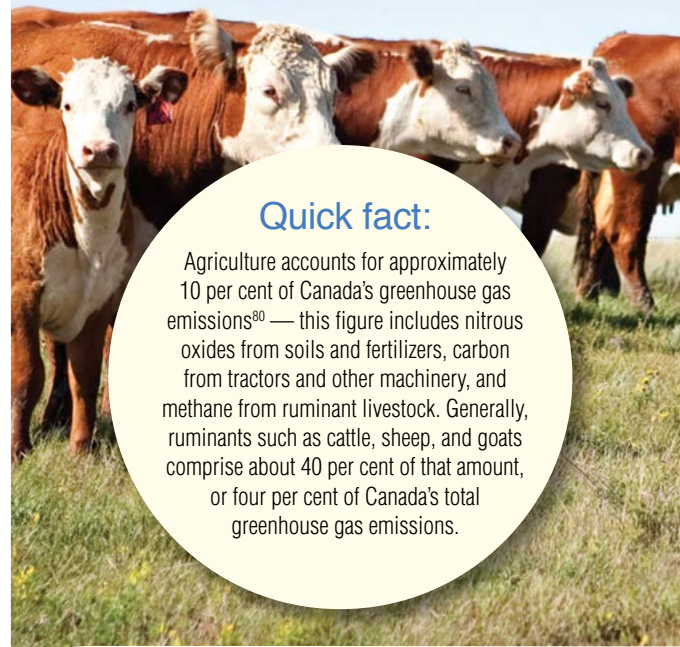
Livestock are part of the climate change solution

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

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 ago⁷⁹.

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 shrub land, or is very difficult to impossible to grow crops on (think of Arctic regions). But livestock can flourish on terrain that's too rocky, hilly, wet or dry for growing crops, and on grasslands which have been developed with grazing. That process gives farmers the opportunity to produce food in places where crops can't grow.



Quick fact:

Agriculture accounts for approximately 10 per cent of Canada's greenhouse gas emissions⁸⁰ — this figure includes nitrous oxides from soils and fertilizers, carbon from tractors and other machinery, and methane from ruminant livestock. Generally, ruminants such as cattle, sheep, and goats comprise about 40 per cent of that amount, or four per cent of Canada's total greenhouse gas emissions.



In 2020, for example, farm animals comprised approximately 4.3 per cent Canada's total greenhouse gas emissions⁸¹.

Canada's endangered grasslands

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, holding water during floods, and helping to filter 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 food⁸². Once these grasslands are lost, it is nearly impossible to replicate them.



Guardians of the Grasslands

Guardians of the Grasslands is a short documentary produced by a group of dedicated conservationists, ranchers and Canadian filmmakers. The film explores the current state of one of the world's most endangered ecosystems, the Great Plains grasslands, and the role that cattle play in its survival. A new video game has also been added to accompany the documentary, giving participants the challenge of managing their land with cattle so that the ecosystem is healthy and so that wildlife flourishes.

Visit www.GuardiansoftheGrasslands.ca

Career Profile



Mabel Hamilton

Connecting with the public

Canadian agriculture has a great story to tell — as well as an enormous and diverse range of career opportunities. Mabel Hamilton, an Alberta teacher and beef farmer, has spent decades helping members of Canada's farming community engage the wider public on both points.

A teacher by training, Hamilton has been involved with organizations within Canada's beef sector for 40 years. She was an early proponent of showing the wider public how food makes it from the farm to their table, at a time when many did not think that doing so was important.

"Because I was a school teacher, I saw there was a lack of understanding on what farmers did," she says. One of her first forays into public outreach was

starting an agricultural program for grade school students, and later, in-store events in which producers from Alberta's beef sector could connect directly with people buying groceries. Many other programs and initiatives have followed since. Hamilton was inducted into the Canadian Agricultural Hall of Fame in 2022, in part because of her lifelong commitment to public engagement and education.

Hamilton continues to be involved in public outreach. Now a board member for Olds College, an agriculture-focused post-secondary institution, she's focused on highlighting the job opportunities available in Canada's farm and food sector.

"I want to encourage young people, whether urban or rural, to know there's a huge number of jobs in our industry."

How cattle are saving our native grasslands

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

Other livestock are also raised in these habitats. Wildlife, such as deer, ducks and pollinators, cohabit with cattle, making use of healthy grasslands for their life cycles too.



Going the extra mile for wildlife

Many farmers create buffer zones around water bodies, to protect land and aquatic habitats. Seeding strips of flowering plants, to serve as habitats and sanctuary spaces for pollinators, is also common. And to ensure that soils remain fertile and covered with new plant growth, and that plants continue to have a healthy root system, many livestock farmers move their animals from pasture to pasture to create rest periods — 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 to sustain wildlife populations, to protect species at risk, and to promote biodiversity.



Career Profile



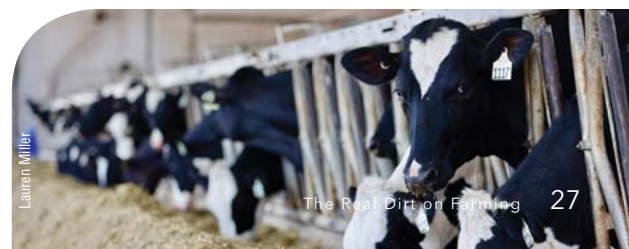
Connie McLellan

Blending love of cows with environmental sustainability

Connie McLellan grew up on a dairy farm in Nova Scotia, farming with her parents and brothers. Eight years ago, though, she made the big decision to move to her partner's dairy farm near Québec City, where they milk 100 cows using a robotic system that enables cows to choose when they're milked.

She has a degree from Dalhousie University in Environmental Horticulture, and said that from the time she was young, she has always had a passion for preserving the environment. "I love being outside. I love hiking and scuba diving and everything about nature. Knowing how it works and how to preserve it is important to me."

So when she saw a job posting by Ducks Unlimited (DU) for a dairy lead, she knew it was the perfect opportunity to combine her two passions: dairy cows and the environment. DU is funding initiatives across Canada that help dairy farmers to enhance and protect biodiversity. Dairy Farmers of Canada has a goal of the sector reaching net-zero greenhouse gas emissions by the year 2050, and this work will help with achieving that target. Projects include wetland restoration, grazing of animals on marginal land, and providing alternate solutions to wastewater coming from milk houses.



Common question: what about pollinator health?

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

Although data show that the number of live honey bee colonies is increasing in Canada⁸³, ongoing high levels of bee deaths in some parts of the country are a concern.

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 colonies.



Agriculture in the Classroom SK

Farming and water use


There are many different ways to calculate how much water is being 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, raising beef cattle 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 that water is just being used and reused, and not lost forever, as it merely goes back into rotation⁸⁴.

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.



beef vs people?

 beef steer only drink about 10 gallons (about 38 litres)⁸⁴

 average person in Canada uses about 59 gallons (223 litres) per day for consumption and hygiene.



Career Profile



Jonny deMatos

Queen Bee breeding in Canada

Spending four years in the military really made Jonny deMatos appreciate his farming background. He'd moved to Western Canada when he was in the military, met his wife Sydney from British Columbia, and he wanted to get back into agriculture. But the price of land and the costs associated with starting from scratch meant that the dream was initially out of their reach.

He took his first beekeeping course in British Columbia in 2016. They started with a few hives — and quickly became acquainted with the local wildlife when a bear took out most of their hives in search of the honey!

When they moved to Ontario, they expanded their business to about 200 hives, and then got into the business of breeding queen bees. They produce about 100 queen bees per week, and send them to beekeepers across Canada. Just as with what is being done with other livestock types, they're trying to produce queen bees that have better genetics than the generations before them which, in turn, make for healthier populations in the hives.

Jonny's favourite thing is to check a mating hive after a couple of weeks, and see that a queen within has mated properly and is surrounded by a healthy batch of eggs. He said, "That's always a little bit like Christmas!"



Food waste

According to the United Nations, 14 per cent of the world's food is lost or wasted after it is harvested, and before it makes it to store shelves, and a further 17 per cent is wasted in retail stores and by consumers, especially in households⁸⁵. That wastage is enough to feed 1.26 billion hungry people every year⁸⁶.

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.

The average Canadian household wastes about 140 kg of food annually, the equivalent of throwing out more than \$1,300 each year. That amounts to almost 2.3 million tons of edible food wasted each year, costing Canadians \$20 billion a year⁸⁷. And 63 per cent of that food is still perfectly edible.

That means that in 2022, Canadians wasted the equivalent of 450,000 eggs, one million cups of milk, and 2.4 million potatoes every single day⁸⁸.

Businesses are also helping to rescue food by using Second Harvest's FoodRescue.ca website. When a business has surplus food available for donation, they create a post on the website indicating the type and amount of food that they have, and a time for pick-up. Interested organizations can claim the donation and go directly to the donor for pick-up. Through services like this one, food programs operated by social service organizations and schools receive greater access to fresh, nutritious food.

The carbon footprint of our food waste

Not only are we throwing out perfectly good food, but Canada's food waste comes with its own carbon footprint, too. The 2.3 million tons of food we waste every year emits as much carbon dioxide into the atmosphere as 2.1 million cars on the road! Rotting food in our landfills emits methane gas, which is a greenhouse gas that's 25 times more potent than carbon dioxide⁸⁹.

Getting our food waste problem under control will save us time, money and energy, as well as benefit the environment by lowering our carbon footprint.

Giving new life to food waste

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:

- upcycling used café and brewery ingredients into flours, baking mixes and sustainable oils⁹⁰
- repurposing apple pomace — what's left of the fruit after juice production — into a thickening agent for food production that's also an added source of fibre⁹¹
- turning spent lobster shells from seafood processing into functional, sustainable packaging that extends shelf-life⁹²
- processing cranberry seeds into a healthy oil⁹³

What's a circular economy?

A circular economy is a different way of doing business. It's about thinking of waste as a resource instead of a cost, and finding ways to reuse, repair, refurbish, recycle or repurpose products and material, so that as little as possible truly becomes waste.



Waste from a fruit processor going to feed sheep.



Lauren Miller

On the farm, livestock can be fed the by-products of human food production, like distillers' grains (waste from brewing and ethanol production); canola; soybean meal (what's left after the oil has been removed); and beet pulp that's left over after sugar beets are processed to extract sugar. Cattle are also being fed whole produce that isn't appealing to consumers, such as crooked carrots, cull potatoes, etc.

Farmers are also using leftover carrot peelings, and fruit rinds from food processing plants, to feed their animals, providing them with nutritional feed, while keeping the products out of landfills.



How you can help fight food waste

Canada's Food Waste Reduction Challenge

In 2021, the Canadian government launched its Food Waste Reduction Challenge⁹⁴, inviting companies to submit their innovative ideas for reducing food waste for a chance to win a \$1 million grand prize.

Six finalists are now perfecting their innovations for the 2024 challenge finale. Here's what they're working on⁹⁵:

- 1 using an extract from mushroom stems to make a natural preservative
- 2 creating an alternative to polyester, by re-engineering food waste
- 3 turning processed vegetable and fruit waste into sustainable, compostable menstrual pads and tampons
- 4 converting food waste into a stable form of biocarbon that sequesters atmospheric carbon dioxide
- 5 transforming food waste into compostable bioplastics
- 6 developing a solution to control mildew and micro-organism growth in fruits and vegetables before they are harvested

What about plastics and packaging?

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 to use different products, and to recycle where possible.

As Canada continues phasing out single use plastic, agriculture will also need to find replacements for everything from bale wrap and silage bags, to plant pots, and more. A research team at the University of Guelph, led by Dr. Erica Pensini, is working on finding those alternatives using a corn protein, a component found in tomato and grape peels and vegetable oils⁹⁶.

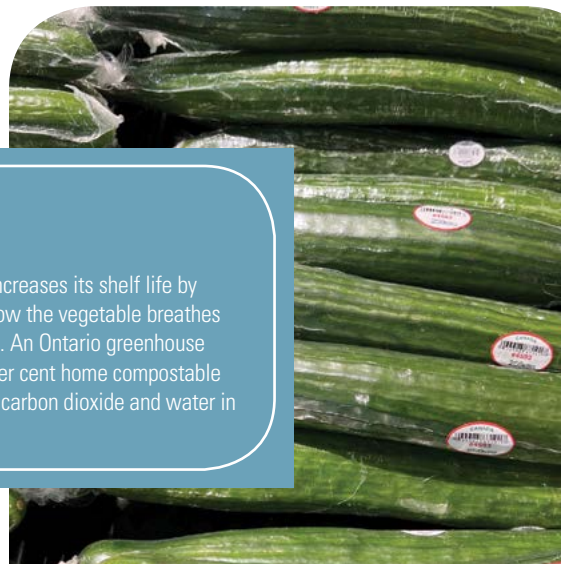
An organization called Cleanfarms leads the collection and recycling of empty pesticide, fertilizer and seed containers. In 2021, the organization collected more than 6.2 million empty jugs, and approximately 473,000 kilograms of empty grain bags nationwide. Empty grain bags collected in

Saskatchewan, for example, are repurposed into plastic pellets in Alberta, and then re-used to make new plastic products⁹⁷ — another circular economy example!

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 tomatoes⁹⁸.

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!
- Shop the “near expiry” racks for meat and produce to stock up on savings, as well as to reduce food waste.



Did you know...

Wrapping a greenhouse cucumber in film increases its shelf life by three days. That's because the film limits how the vegetable breathes and keeps it hydrated, reducing food waste. An Ontario greenhouse has developed and launched the first 100 per cent home compostable cucumber wrap that fully breaks down into carbon dioxide and water in a home compost bin⁹⁹.



Lynn Leavitt

Beef Farmers of Ontario

Promoting recycling of agricultural plastics

Eastern Ontario beef farmer Lynn Leavitt can go to bed each night with relative peace of mind, knowing that he is doing his part to help farmers properly manage an agricultural by-product — long considered a nuisance — while at the same time benefitting the environment.

Leavitt has developed a system for collecting, compacting, and wrapping agricultural plastics — bale wrap, silage bags and plastic twine — so that these materials can be neatly and economically trucked to a plastic recycler.

Farmers aren't getting paid for recycling this used plastic, but Leavitt says that there is considerable value in knowing that this material is being repurposed, rather than being burned (which is illegal) or buried in a landfill.

In 2016, Leavitt designed and built what was later to be called the Pac-It compactor. It is a relatively low cost but effective way to handle used plastic so that it can be recycled.

His efforts in developing the Pac-It compactor, and promoting agriculture plastic recycling over the years, earned him recognition as the Beef Farmers of Ontario's 2023 nominee for The Environmental Stewardship Award (TESA).

Farmers bring their bundled plastic to the Leavitt farm. Over the years, Leavitt says that the plastic recycling system to date has sent about 225,000 pounds of plastic to the recycling plant, and of that, about 30,000 pounds has come from the Leavitt farm.

"It is great to see this plastic being recycled and repurposed into other plastic products, but I believe where the idea will really gain traction is when the used plastic is converted to biofuel, and that can be done," he says. "Then we will have a system that goes full circle. The used plastic is made into biofuel, the biofuel is used to power the farm tractor that is putting up feed into plastic bags and tubes, and then that used plastic will be used again to produce more biofuel. It will be one more way to reduce the carbon footprint of agriculture."

Condensed from a story by Lee Hart. For the full story visit: <https://cancattle.wixsite.com/mysite/post/celebrating-environmental-stewardship-leavitt-s-black-angus-beef-ontario>



Agriculture in the Classroom SK

Farming sustainably with a technology tool box

As the climate changes, farming is becoming more challenging. Increasingly, farmers are turning to technology and innovation to help them adapt to ever-more sustainable and resilient food production:

- New and faster plant breeding methods are leading to crops that are better able to resist pests, drought, heat, excess moisture, and frost.
- Smart irrigation systems only water crops when the plants 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 method can reduce pesticide use up to 90 per cent¹⁰⁰!
- Farmers are using drones and robots to help identify pest or disease problems in the field, or to monitor livestock.

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.

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 as a fuel source 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 in order to power homes, businesses, and industry, in urban areas.

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.

According to the 2021 Census of Agriculture, more than twice as many farms report that they're producing renewable energy production, as compared to the last census. Solar energy remains the number one source of renewable energy produced on-farm, having increased by 66.5 per cent from 2016 to 2021¹⁰¹.



Wes Klages



Healthy and safe food

Lauren Miller

Safe, good quality food options are something most Canadians don't have to think about very often. That's because there are regulations and safety systems throughout the Canadian food system, and ultimately, safe food starts on the farm, with farmers.

Food safety rules for farms

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

Although every farm has a slightly different on-farm food safety program to follow, 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.



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 assurance is "traceability", which 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.

For example, Grain Discovery, an Ontario-based start-up, recently introduced the first "plant to pint" commercial traceability system. From the barley field to the beer glass, every input, movement, process, and touchpoint by farmers, maltsters, brewers, and others, is electronically tracked, creating a digital passport for the product¹⁰².

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, right back to the farm on which they were born. This information is critical to have in case of a disease outbreak or food safety issue¹⁰³.



Keeping farm animals healthy

Healthy livestock and poultry are a priority for farmers and veterinarians — and the goal is always to prevent illness from happening in the first place. A serious disease outbreak or health problem can make animals sick, and occasionally can cause livestock deaths to increase. 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 stay healthy, such as providing a good living environment, ensuring balanced nutrition for livestock, and working with veterinarians who support animal health management, and are responsible for prescribing animal health products, like medications and vaccines.

It's Health Canada's job to evaluate the safety of livestock medications, vitamins, probiotics, essential oils and treatments, and to approve their use by farmers and veterinarians. The Canadian Food Inspection Agency is responsible for ensuring the safety of animal vaccines and feed additives.



“One Health” — when animal and human health meet

Many of the same microbes that make animals sick can also infect humans. That's why 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 problems¹⁰⁴.

Approximately 60 per cent of emerging infectious diseases in people originally come from animals as zoonotic disease, so close collaboration between human and animal health practitioners is extremely important¹⁰⁵.

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



Livestock and poultry diseases of interest

Two livestock and poultry diseases that are currently capturing attention include:

1. Influenza

Commonly called the flu, influenza makes many Canadians sick every year. Birds and pigs can also get the flu (avian influenza has impacted millions of poultry in the Canadian outbreak that started in 2022) but you can't catch this sickness 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, since 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, and the disease is spreading in Asia, Europe, and the Caribbean. So far, it has never been found in North America, and since Canada is a major world producer of pork, the industry is working hard to keep the disease out.





Antibiotics and resistance

Antibiotics are a type of antimicrobial medication used to fight or prevent bacterial infections in people and animals. Antimicrobial resistance develops when the bacteria develop the ability to survive exposure to the antibiotics used to treat infections caused by them. This problem makes the medication ineffective in stopping or slowing the growth of a specific disease-causing organism. It's an important issue worldwide — resistant bacteria make it harder to fight human and animal infections effectively.

Antimicrobial resistance is a natural phenomenon¹⁰⁶ which can be made worse by environmental contamination, misusing antibacterial cleaning products, and using antibiotics in human or animal medicine too much or incorrectly¹⁰⁷.

Health Canada has established four categories of antimicrobials, based on their importance to human medicine. They range from Category I (“very high importance”) to Category IV (“low importance”)¹⁰⁸. Farmers need a veterinary prescription to buy any Category I, II, and III products to use in livestock or poultry, and using any of these products to promote growth is banned¹⁰⁹.

Better animal housing, nutrition, and health, mean that fewer antibiotics are used on farms today than in the past.

The bottom line:

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 are drug residues?

Drug residues are traces of medication left over in meat, milk, or eggs, after an animal has been treated. Every animal health product, like antimicrobials, vaccines or 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 market¹¹⁰. This buffer ensures that food is safe and free of residues. As an added layer of security, government staff working at processing plants also test the foodstuffs for these residues to ensure food safety.

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: proper storage temperatures; cooking meats to proper temperatures; washing produce thoroughly; and washing hands regularly before handling food, after using the washroom, or after petting animals.



Raw facts about raw milk

Milk that is raw has not been pasteurized, meaning that it could still contain harmful bacteria and other pathogens that can cause severe, or in some cases, fatal illness. It is illegal to sell raw milk or cream products in Canada (except for certain raw milk cheeses). All milk has to be pasteurized before being sold. Pasteurization means that the milk is heated to a high temperature, which kills bacteria, but does not affect its high quality.

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

Hormones, livestock, and meat

Fact: Hormones occur naturally in plants and animals, so there is no such thing as hormone-free food¹¹². Scientifically, it just isn't possible.

Dairy cows, veal cattle, pigs, chickens, and turkeys in Canada are not given hormones for milk production or growth promotion — that's been illegal for about 60 years. Government-approved hormone growth promoters are tools used in raising beef cattle to improve the animal's ability to gain muscle and deposit less fat. This process helps farmers and ranchers to produce more beef with less feed and fewer greenhouse gases.

Hormone levels from beef cattle that have received implants are virtually the same as the levels in beef from cattle without the implants. There is more natural 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 being safe and without impact on human health, by agencies including Health Canada, the World Health Organization, and the United Nations, and this conclusion is based on ongoing research and monitoring¹¹³.



Quick fact:

Hormones are one of many methods which farmers use to keep beef a high-quality, environmentally friendly, and accessible food for Canadians.



What about pesticides?

There are rules for those, too.

Pesticides are substances used by farmers to control different types of pests, and include herbicides for weed control, insecticides for insect control, and fungicides to manage fungal diseases.

Pesticides are one of the most effective tools which farmers have to keep insects, weeds, and diseases from damaging and destroying fruits, vegetables, and field crops. They also allow farms to be more sustainable by growing more food on less land. This influence helps to preserve natural forests, wetlands, and other wildlife habitats, while ensuring that we all have enough to eat.

You'll find more information about other pest management approaches, like Integrated Pest Management, on page 23 (in Chapter 3).

Canadian farmers who use pesticides 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, which only approves products for use after years of review and testing have proven that they're both safe and effective. The PMRA's approaches are risk-based, and seen as the

gold standard in terms of pesticide regulation globally. In some provinces, farmers must be tested and certified before being allowed to buy and use these products.

Farmers make sure that they're using pesticide products safely. For example, they make sure that 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 by which to ensure worker safety.



Did you know...

Organic farmers use pesticides too. They're allowed to use specific variants of natural pesticides that are either farmed from natural sources, or mined from the ground, like vinegars, saps, or sulphurs. Using synthetic or man-made pesticide products is not permitted in organic production¹¹⁴.



Lauren Miller



Callum Kylienen

Pesticide residues

The Canadian Food Inspection Agency inspects 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.

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 that people and food are safe.

Today's lab equipment and testing methods are so precise that they can find amounts that are still detectable, but are so tiny that they won't cause harm. For perspective: we can

now detect residues in parts per billion, which is the equivalent of one second in 32 years!

Every year, a US-based environmental group releases a "dirty dozen" list of fruits and vegetables which it says should be avoided due to high pesticide residue levels. Scientific analysis has found that if residues are present, they're almost always at extremely low levels that don't cause harm. A child would have to eat 7,240 servings of carrots per day before pesticide residues would be a concern¹¹⁶!

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.

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 rotate crops that use different 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, glyphosate will not cause cancer or pose other risks to people or the environment¹¹⁵.

Faster plant-breeding for more sustainable food production

Modern technologies build on conventional plant breeding, allowing for faster and more efficient development of new crops and plants. These crops and plants have 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.

The latest tools are part of the "-omics" family. Genomics, for example, is all about the DNA — or the written instruction book — of an organism. Scientists study the genomes of plants to look for desirable traits, and then use genetic markers to identify where on a specific DNA sequence they are located, speeding up the plant breeding process.

The use of metabolomics is an emerging field that can help plant breeders to understand how and why a plant reacts the way it does to specific conditions.

Researchers at the Vineland Research and Innovation Centre, for example, are using metabolomics as a way to develop new pest management tools for flower growers — by feeding chrysanthemums less fertilizer, they could reduce the populations of a common flower pest called thrips by 30 to 50 per cent, because the plant itself becomes a less appealing food source for the bug¹¹⁷.



GMOs, plant breeding and genetic engineering

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

Traditional plant breeding is a very long and expensive process that involves cross breeding 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 organisms**. 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, or genetic modification, is a form of biotechnology in which laboratory methods bring together genetic material from multiple sources. What distinguishes genetic engineering from conventional breeding is the use of recombinant DNA technology.

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 use.

Genome editing, by comparison, typically involves targeting and changing specific genes within a plant. 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 DNA 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-threatening. Gene editing is able to leverage the breakthroughs in genome sequencing that have occurred in the last decade, which provide a better understanding of what genes do what and enable targeting specific edits to get the desired result.

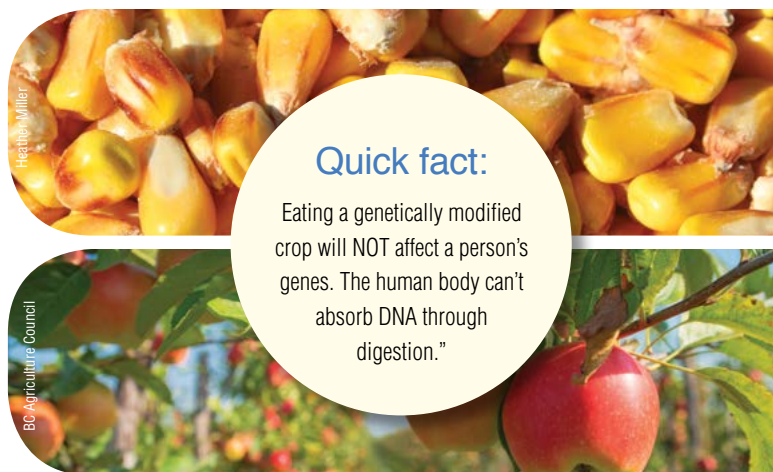
Six GMO crops are commercially grown in Canada:



A further eight are grown in other parts of the world, including apples, cotton, eggplant, papaya, pink pineapple, squash, wheat and sugarcane.

The bottom line:

GMO crops have been grown in Canada for over 25 years. New crops produced using modern biotechnology methods have the potential to help reduce food waste, improve flavour, be more disease resistant, and much more.



CROPS AND PLANTS



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

Grains and oilseeds

Canola — a made-in-Canada crop

Canola is one of the most common and iconic Canadian crops, particularly across the Prairies, where it is widely grown. It was developed by Saskatchewan and Manitoba plant breeders in the 1970s, and given its name by combining the words Canada and ola, an acronym meaning oil. Canola is primarily grown as an oilseed, which is a crop that produces seeds with high oil content. It's very popular for cooking because of its flavour, high burn temperature, and low amount of saturated fat.

Canola meal (what's left behind after oil is pressed out of the seeds) can be used for many things, such as feed for livestock, environmentally-friendly fuels, or converted into replacements for petroleum-based products. Canada exports more than 90 per cent of its canola to approximately 50 markets around the world, as whole seed, oil, or meal¹¹⁸.



Did you know...

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



Don't enter the field! Crops like canola and sunflowers are beautiful when in bloom, and they attract a lot of admirers and people wanting to capture that perfect photograph. 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.



Corn, soybeans and cereals

Corn and soybeans are two very common Canadian crops with many different uses. Canada produces enormous quantities of these crops each year for both domestic and international markets.



Did you know...
Farmers grow three main types of corn in Canada¹¹⁹:



Grain corn

Kernels on the cob are used to feed livestock, to make fuels like ethanol, or used as an ingredient in the production of other foods.

Silage corn

The whole plant is harvested as feed for livestock.

Sweet corn

This is the type of corn we eat in various forms, including fresh, canned or frozen.

Farmers will often grow a variety of crops for different markets. Which ones they choose to grow depends on many things, such as the soil and climate in their areas.

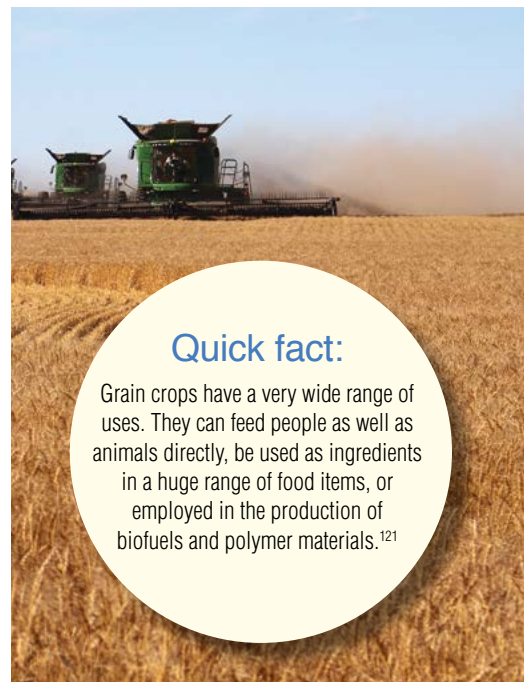
Soybeans and grain corn are mainly grown in Ontario, Québec, and Manitoba, although farmers in Saskatchewan and the Maritimes also grow these crops. Canola, barley, oats, and wheat are grown primarily in the Prairie Provinces. Other Canadian grain, oilseed, and specialty crops are also widely grown in the Prairies. These types 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. China, for example, has long been a major importer of Canadian soybeans. Canada is also a world leader in the production and export of mustard; Prairie farmers grow three different types: yellow, brown, and oriental mustard¹²⁰.

Pulses and plant-based proteins¹²²

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 many farmers in Ontario and parts of Québec grow dry beans, including navy, black, red kidney, white kidney, cranberry, and adzuki beans.

More than 80 per cent of Canada's pulse crops are exported each year¹²³, ending up in 125 different countries. China is the largest buyer of Canadian peas¹²⁴. Pulse growers are looking to expand export markets even further, particularly to countries in the Indo-Pacific¹²⁵.



Quick fact:

Grain crops have a very wide range of uses. They can feed people as well as animals directly, be used as ingredients in a huge range of food items, or employed in the production of biofuels and polymer materials.¹²¹



Quick fact:

Over 50 per cent of all lentils traded in the world come from Saskatchewan fields¹²⁶.



Agriculture In the Classroom SK

Supporting sustainable food production

Pulses can be 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. This property means that farmers can reduce the amount of nitrogen fertilizer applied to their field. After harvest, pulses leave behind nitrogen-rich crop residue, again helping to reduce the amount of fertilizer that farmers need to apply for the next crop too. This approach is an example of how growing different types of crops in the same field (an ancient practice called crop rotation, mentioned earlier in this booklet) can help the environment, as well as farmers’ businesses.

Plant-based proteins

Plant-based proteins have become 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.

That push has led to a growth in new food products, such as plant-based burgers; seafood alternatives; and “chik’n” strips made from pea, bean, or soy proteins; egg substitutes made from mung bean; and plant-based beverages made using oats, for example.

It’s estimated that the global plant-based food market will reach \$250 billion in sales by 2035, and that Canada can supply the ingredients for 10 per cent of the world’s plant-based food and beverage products¹²⁷. Over the last five years, Protein Industries Canada alone has supported the creation of more than 380 new products, as well as over 170 new processes for extracting, refining, and processing plant-based products¹²⁸.



Did you know...

Peat moss, the medium in which mushroom farmers grow their crop, is also a popular organic fertilizer for farmers growing field crops.

Mushrooms all year long

Mushrooms are grown indoors on trays filled with naturally-pasteurized substrate, topped with a layer of peat moss. They are one of the few crops that can be grown in Canada year-round, with Canadian mushroom growers selling 153,321 metric tonnes of mushrooms in 2022 — mostly white button mushrooms, followed by brown and Portobello. Demand for specialty mushrooms, such as Shiitake, Oyster, King Oyster, and Enoki, continues to grow.

The first mushroom crop can be harvested 30 days after new seedstock (known as mushroom “spawn”) is planted. This is followed by one or two more harvests from the same growing beds, over the next two weeks.

Mushrooms have a wide array of uses in the kitchen. The little black specks which you sometimes see on mushrooms are remnants of the peat moss. Just brush or rinse mushrooms before eating to get rid of the specks.



Did you know...

Mushrooms can double in size every 24 hours!¹³⁰

Fruits and vegetables

More than 120 fruit and vegetable crops are grown in Canada, on approximately 14,200 farms¹³¹. 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.

The list certainly doesn’t end there, though. Ginseng, cranberries, garlic, cauliflower, cherries, apricots, hazelnuts, saskatoon and haskap berries, and many more crops, are grown across the country.

British Columbia has the most fruit farms in Canada. Farmers in British Columbia, Québec, and Ontario grow 90 per cent of Canada’s fruit crops¹³².

Ontario is Canada’s vegetable king; it is 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), as well as being the biggest producer of mushrooms in the country¹³³. Québec and British Columbia are Canada’s other two big vegetable-producing provinces.



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 1995¹³⁴.



Mandy and Brian Dewit
Cranberries

Showcasing cranberry harvest

Mandy and Brian Dewit of Fort Langley, British Columbia, have been around agriculture for a long time. While Brian's family primarily worked with livestock, the couple were intrigued when Brian's parents joined the Ocean Spray Cooperative, and incorporated cranberries into their farm business. Although still working full time elsewhere, Mandy and Brian established their own cranberry farm in 2010.

Called Riverside Cranberry Farm, or "The Bog," Mandy and Brian now work on the farm full-time, supplying fruit for wholesale markets, and growing their own independent, direct-to-consumer brand of cranberries and cranberry products. From cider and jellies, to sauces and raw berries, the family's products are sold in their on-farm shop as well as at local markets and grocery stores across British Columbia.

"Going independent is pretty rare here and a bit of a gamble on our part," says Mandy. "We really enjoy setting up the farm. It's a ton of trial and error. I think maybe that's farming in general. There's not one tried and true method of doing anything, and we talk, research and get ideas from other farmers."

"Harvest in the fall is the best time. It's insane, and we work long hours, but you finally see the fruits of your labour. There's still plenty to do the rest of the year, but it's just not as intense."

Mandy and her family enjoy connecting with the public, too. Despite the busy fall harvest season, they open The Bog to the wider community for several weeks each year, and have previously partnered with organizers at Fort Langley's annual Cranberry Festival to showcase how cranberries are grown.

"We really want people to understand what it takes to grow food. A lot of people think cranberries grow in water year-round, but they don't... There was no real agricultural connection with the festival at all, so we reached out to see if we could help make that connection," Mandy says. "Now, people attending the festival have an opportunity to take a bus tour to The Bog and see cranberry harvest in action."

"Everybody wants the experience. It's partially to educate the public, and we try to time our harvest to weekends so people can see what we do."



Lauren Miller

Growing crops indoors

More and more of the fresh produce is grown in greenhouses, sometimes 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 such as juicy, sweet strawberries, indoors.

Canadian greenhouses also produce flowers and potted plants — \$2.7 billion worth in 2021 to be specific¹³⁵. 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. Like field crops, greenhouse vegetables and flowers are grown for both export and for Canadian markets.

Southern Ontario has the highest concentration of greenhouses in North America. The province also has the most vegetable greenhouses in Canada, with 755 farms covering 14,163,728 square metres — that's nearly 3500 acres — as of 2021¹³⁶.

Greenhouse growers typically don't grow crops in soil. Instead, they use hydroponic systems, where plants grow within materials like mineral wool or coconut fibre. Inside the greenhouse, growers provide heat, water, nutrients and extra light to nourish plants. They also use bugs like bumblebees to pollinate plants, and ladybugs to control harmful insects. That consistent indoor climate means no worries about bad weather, and production during 10 out of 12 months of the year¹³⁷.

Other ways to farm inside

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 such as 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 each crop needs — and because the crops are

growing vertically, a lot of food can be grown 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. This method can be an affordable way for people to grow their own food in areas like Canada's North, where it's too cold to grow vegetables most of the year. Container and vertical farms are also being used in urban environments.





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 which 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 farms¹³⁸.

Medicinal crops and growing for sacred ceremonies

Some farmers grow crops for medicine rather than food. **Ginseng** is one such example. The root was traditionally used in Chinese and Indigenous medicine, but is now used to treat a range of ailments. Canada is a global leader in the production of North American ginseng, with more than two-thirds of the entire crop grown in a small area of Southwestern Ontario. Most is exported to markets in Asia. Ginseng beds are easily recognizable, as they're covered by shade cloth structures — that's because the plants must be grown in 70 to 80 per cent shade.

Cannabis is another crop that is 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 cannabis, although health-related uses had been allowed for longer.

Growing for sacred ceremonies

Tobacco, cedar, sweet grass, and sage are the four sacred plants of Canada's First Nations. 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 Creator¹³⁹. The 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 populations¹⁴⁰.



Ginseng

Ginseng grown in Canada for 300 years

Ginseng has been part of traditional Chinese medicine for over 2,000 years, and is sought after for its medicinal properties. The First Nations and Chinese cultures have long revered ginseng as the miracle "man-root" — known as such because the root shape resembles a human, and is believed to be beneficial for every part of one's being.

Panax quinquefolious ginseng (a.k.a. North American ginseng, or NAG) is native to Canada, and cultivating it is one of the country's oldest trades. Ginseng was found growing in the early 1700s near Montréal by a Jesuit Priest, and has been used as a valued crop for 300 years.

The majority of Canadian product goes to China, Hong Kong, Taiwan, Singapore, and increasingly, to Vietnam. Ginseng is a high-risk crop to grow for a number of reasons. Firstly, farmers do not have access to insurance programs on which to rely in case of a catastrophic weather event or crop failure. It's also a very labour intensive crop because it grows under thick black netted shades that mimic a forest's canopy. These structures are both expensive to erect and to maintain. Finally, it is generally a four to five-year process from the time a field is prepared and the crop is planted, to when it's harvested.

Today, most of Canada's ginseng is grown in Ontario by about 160 farmers. The sandy soils and climate of southwestern Ontario are ideal for ginseng growth because they most closely mimic conditions where wild ginseng thrives.

To learn more visit: www.ginsengontario.com



Ginseng roots

Canadian crops for the Canadian climate

The climate varies across the country, but winters pretty much anywhere in Canada are cold and snowy, and there are only a few warm summer months. Crops have to be strong enough to survive those extremes. 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 suited for Canadian climates.

New corn and soybean varieties, for example, can now be grown in cooler regions of the country. New asparagus varieties, which are both cold-hardy and resistant to specific crop diseases, have been developed. The same goes for new varieties of pears, sweet potatoes, and even roses.

Heirloom varieties and heritage breeds

Some Canadian farmers are looking to the past to find new niche products, growing vegetable and fruit varieties and raising livestock breeds that were more common 50 or 100 years ago. These are called “heritage breeds” or “heirloom varieties”.

They often have unique flavours, making them popular with chefs and food lovers, and other traits, like disease resistance or drought-tolerance, that make them of interest to plant and animal breeders who are looking for ways to make improvements to more modern and productive varieties. However, heirloom plants and heritage breed animals can also be slower or more challenging to produce in other ways. This obstacle can make them more expensive.

Quick fact:

Cider was the first alcoholic beverage produced and consumed in North America, arriving with the first European settlers in the 1600s¹⁴⁴.

Wines, beers, and 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 more added every year¹⁴¹.

Cider, a fermented beverage made from apple or pear juice, has been consumed in North America for centuries. In recent years it has again become quite popular in Canada. 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 very popular. 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 businesses¹⁴³.

A growing number of Canadian distilleries are now making specialty spirits, and even using milk to make vodka! Non-alcoholic craft beverages are emerging too. This range includes kombucha — an antioxidant, probiotic-rich fizzy drink made by fermenting sweetened tea.



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 very high-quality ice wine, as well as being the largest producer of the sweet drink. To make ice wine, grapes must be naturally frozen on the vine, harvested, and processed while the air temperature remains at or below -8 degrees Celsius¹⁴².

Career Profile



Travis Banks
Vineland Research & Innovation
Centre

Crops for Canadian tastes

Did you know that many, if not most, of the fruits and vegetables we eat were developed outside Canada? It's not a bad thing, but it can mean that those crops are harder to grow here and might potentially not be optimally suited for the flavours and textures which Canadians enjoy. Travis Banks, Director of Plant Variety Development at the Vineland Research and Innovation Centre in Ontario's Niagara region, is trying to change that aspect.

Banks and his colleagues work with companies and other groups to develop and trial new crops. The results of those trials help inform as to whether the crop in question will be a commercial success in Ontario, and Canada more generally.

“The companies we've partnered with have Vineland trial their commercial or non-released material, and we see which ones do well in Canada,” says Banks, identifying unique disease pressures, and shorter or colder growing seasons, as primary hurdles faced by those growing crops developed outside Canada.

Greenhouse tomatoes offer an example of a crop which could be improved to match local weather conditions.

“The vast majority of greenhouse vegetable varieties are all bred in The Netherlands. The climate conditions in Europe are not what we see in Ontario. We get a lot more sunlight every year, and in the summer, it just doesn't cool off at night. We don't have that nice daytime-nighttime temperature difference which most current tomato varieties want.”

Researchers at Vineland also breed their own crop varieties, currently focusing on apples, tomatoes, and roses. Along with making them more resilient in the field or greenhouse, however, consumer preference research is also included in all Vineland's breeding programs. This involves analysts identifying and describing a range of flavours, aromas and textures — sort of like a wine sommelier — and testing different crop varieties with consumers.

“For example, we take different apples to consumers — usually in Toronto because of the diversity of people and food preferences — and they can really tell us if they like something. We can take those two data sets and then understand why consumers prefer one variety over another,” Banks says, adding “texture is often the big one. Nobody likes a mealy apple.”

“It's really about creating something people are going to use and enjoy.”



Stumbling on a new apple

The McIntosh apple has been one of the most successful apple varieties in history — but it was originally discovered by accident.

In 1811, while clearing trees on his farm in Eastern Ontario, John McIntosh discovered small unknown apple trees amongst the yet-to-be cleared brush. He nursed and propagated the seedlings into his home garden. All but one eventually died — but the surviving tree eventually bore the fruit which we know today.

Subsequent generations of McIntosh's family have perpetuated the species. It was no small feat, since the production of

apples trees, unlike other crops, requires growers to graft seedlings or stems onto another tree trunk. Just planting the seeds found within the fruit itself results in crab apple trees, not the variety from which the seeds were originally taken.

John's son Allan learned to bud and graft fruit trees, handing them out as he travelled as a minister. A small nursery was also established. Allan's son expanded the nursery into a commercial enterprise, marketing thousands of seedlings throughout the province. Over time, McIntosh apple trees were shipped around the world.

The McIntosh apple is still a bit of a mystery, too.

Apples as we know them today did not exist in North America before the arrival of Europeans. It's likely the apple seedlings found by John McIntosh had been naturally cross-pollinated with one of these European varieties. The exact one, however, is still debated¹⁴⁵.

John McIntosh helped propel an otherwise inconspicuous, unlikely fruit from a small Ontario woodlot to a globe-spanning staple. He was posthumously inducted into the Ontario Agricultural Hall of Fame in 1984.



Maple syrup - the ultimate Canadian crop

Canada is a leader in the production of maple syrup, 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 province¹⁴⁶.

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 available¹⁴⁷.



Did you hear...

About the Great Canadian Maple Syrup Heist? In 2011 and 2012, thieves siphoned over \$18 million worth of maple syrup from the world's Global Strategic Maple Syrup Reserve facility, located in Québec. The perpetrators were eventually caught, and the majority of stolen syrup recovered¹⁴⁸.

Quick fact:

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



Career Profile



David Hall and family

Over a century of syrup

David Hall's family has been producing maple syrup for a long time. Well before the turn of the 20th century, in fact. With the help of modern equipment, the family annually harvests approximately 345,600 litres of sap from more than 23,000 maple trees on their farm near Cowansville, Quebec — enough sap to produce 8,640 (32,700 litres) gallons of maple syrup.

"We've been farming in the area since the 1830s. We've progressed over time. My great grandfather bought another farm, and in 2016 my kids bought another farm," says Hall. "We've pretty much always done maple syrup. Right now, we also have 300 sheep."

Hall's wife Sandra and son Andrew work on the farm, or within their own supporting farm business full time. Other members of the immediate family hold off-farm jobs, but also make time to help on the farm during busy parts of the year, including when the maple sap is flowing in late winter and early spring. Even then, sometimes extra help is required.

"We'll hire two or three additional people... We've invested a lot of money in the tubing system in the woods, which has helped us be more productive and lowered our labour costs. Plus, it's easier to maintain a new system as opposed to an old system."

Hall is also a sitting director for the Quebec Maple Syrup Producers' association. He and his association colleagues work to address issues facing maple syrup farmers, and maintain the world's only Strategic Reserve of maple syrup. Located in Laurierville, Quebec, the reserve facility is designed to hold 55 million pounds of maple syrup, to be accessed when weather or other factors lead to a drop in maple syrup production. This ensures a constant supply for consumers regardless of how successful harvest is in a given year, while also stabilizing prices for the farmers themselves.

"Through the Maple Syrup Producers' Association, we get a relatively guaranteed price. It doesn't have big swings like it used to," says Hall. "You can actually build a financial plan now."



Alicia Maria Intimate Portraits

FARM ANIMALS

Livestock and poultry in Canada



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 of farm animals raised in Canada.

Turkeys and chickens

Turkeys and chickens raised for meat live in modern barns where temperature, humidity, light, and ventilation are carefully monitored to ensure the birds stay healthy. They roam freely around the barn on a floor covered with a soft bedding material (straw or wood shavings). Birds have free access to water and feed. Generally speaking, poultry are fed a mix of grains and oilseeds including corn, soybeans, wheat, barley, and canola, as well as minerals and other nutrients.

Once birds go to market, all the bedding and manure is taken out of the barn, and the building is thoroughly cleaned before the next flock of birds arrives. This helps prevent disease and keeps the flock healthy.

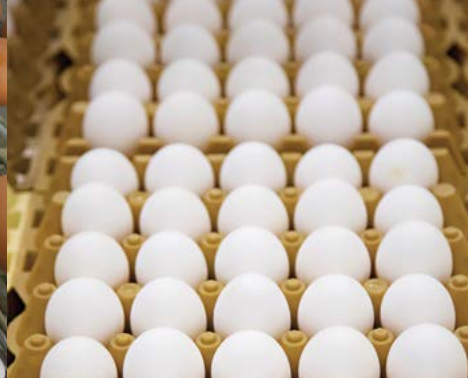
Meat chickens are called “broilers.” There are three steps for raising broilers, with most chicken farms specializing in one of these steps.

First are **broiler-breeder farms** – that is, a farm where breeding hens and roosters live together, producing the fertilized eggs that will hatch into broiler chickens. Fertilized eggs are then sent to a hatchery, which incubates and hatches the eggs. The hatched chicks (or “poults” in the case of turkeys) then move to a **broiler farm** where they will stay until they reach market weight.

You can tour all types of poultry farms at www.FarmFood360.ca

FARM FOOD 360°





Hens and eggs

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

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 can 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.

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.

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. Any new barns being built, or existing barns that are being renovated, must follow the new housing standard.



Each type of housing has pros and cons. For farmers, the focus is always on flock health. Researchers in Canada and around the world are continuously investigating what works best for birds, farmers and consumers.

Check out www.FarmFood360.ca to see the five different types of hen housing (and many other types of farms), and to learn what the labels on your egg cartons mean.

Did you know...

The average hen lays about 340 eggs, or 28 dozen, each year.



FARM FOOD 360°

More than one stomach compartment

Unlike humans, some animals digest their food in more than one step. Animals like cattle, goats, sheep, llamas, bison, buffalo, elk and deer have a four-chambered stomach. They eat raw plant material, then regurgitate a partially-digested version of that feed (called cud) to chew it again. This process is called ruminating and helps to digest high fiber feed that humans can't. Animals that digest their food this way are called ruminants.



Dairy, veal, and beef cattle

Dairy cows

Dairy cows—female cattle raised to produce milk—are leaner than their beef cattle cousins. This is because they put their energy into making milk instead of 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 dairy breeds in Canada are Jersey, Ayrshire, Brown Swiss, Guernsey, Milking Shorthorn, and Canadienne.

Canadian dairy cows can be raised on pasture, and in three styles of barn:

Free-stall barns are open-concept where cows move around freely, and go to a central area to be milked, two or three times a day. To keep cows comfortable, many farmers have large fans and back scratching 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.

Pack barns don't have designated stalls but large open areas filled with sand for

a soft and comfortable place to lay down when the cow chooses. Similar to free-stall systems, cows move freely inside the barn, and go to a central milking area to be milked.

The central milking area is either a parlour system where cows go to be milked by the farmer two to three times a day at scheduled times or a robotic milking system where the cow is milked by robotics on-demand whenever she wants. It also records how many times a day each cow has been milked, how much milk she has produced and how much feed she has eaten. This lets farmers track the productivity and overall health of each animal.

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 arrives—every two days on most Canadian farms—to 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 year¹⁴⁹!

How many are there?

There are a lot of cattle in Canada – 12.3 million beef cattle and 1.4 million dairy cattle as of summer 2022.¹⁵⁰

Calf housing

Calves are housed separately from the herd in small white structures outside of the barn called “hutches” or in single pens in a calf barn. They are moved into this housing during the first few weeks of life, to keep them safe and healthy while their immune systems are developing. 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 old enough, the females will have calves of their own and become part of the farm's milking herd.





Veal cattle

Veal is the meat of male dairy animals. A dairy cow must have a calf in order to produce milk. Female calves, called heifers, are raised to have their own calves and produce milk themselves when they are mature. Male calves, called bulls, are not able to produce milk so they are raised for meat instead, similar to beef cattle. Raising veal cattle is one way farmers contribute to sustainable food production and a circular food economy – making sure everything that is produced has a purpose to reduce waste as much as possible.

Grain-fed veal cattle are raised on a mainly milk-based diet until they're around eight weeks old, before transitioning to a balanced ration based on grain and pellets made of protein, vitamins and minerals and a small amount of fibre. They reach market weight around 340 kilograms (750 pounds). Professional livestock nutritionists work with farmers to make sure their veal cattle are fed a healthy, balanced diet.

All veal cattle are raised in group housing with others 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. Ontario and Quebec are the largest Canadian producers of veal cattle because they also have the greatest number of dairy farms. Milk-fed veal cattle are also raised in some parts of Canada.

Holsteins are the most common breed of veal cattle. They grow quickly, are well-muscled, and very lean.



Did you know...

That milk replacer (used to feed young veal cattle) is also part of the circular economy? It's made from by-products of dairy processing, such as cheese-making for example, helping the industry be more sustainable and reduce food waste.



About beef cattle

Specific breeds of cattle that are raised for meat are called beef cattle. Canada's major beef cattle breeds include Angus, Charolais, Hereford, Simmental, Limousin, Maine-Anjou, Galloway, 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 or range land during spring, summer, and fall, eating mostly a grass diet.

Their thick hide and coat means that, with adequate shelter and free access to feed and water, they can live outdoors comfortably all year long.

When beef cattle reach a weight of 362 to 453 kg (about 800 to 1000 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 switched from a high forage diet (grasses and other

plants) to a higher energy diet of grains (like barley or corn), minerals, and hay. This process helps to gradually adjust the microorganisms in the rumen and create the marbled, high-quality grades of beef that Canadians and other global markets expect. Marbling is the existence of small white flecks of fat that run through lean meat, which contributes to juiciness, flavour and tenderness.

Grass-fed or grain-fed

You may have heard 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, 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, barley or wheat during the later period of their life.

Cattle eat “locally”, using the feeds grown in the region. This diet change is what promotes marbling in the meat. Both methods are used in Canada. Approximately 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 meat are small¹⁵¹ and make little impact on human health in the context of a whole diet.



Pigs

Pigs can be raised indoors or outside, but since most breeds don't have fur or woolly 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 heating and fans—or “curtains” that can be opened—to keep a steady, comfortable climate indoors year-round, and to protect the animals against disease.

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. After 2029, sows will be living 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.

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.

Career Profile



Brian Arnold

Meeting demand for bison

As a young kid, Brian Arnold raised some cattle and always thought that someday, he'd like to do that again. He and his wife bought a property north of Toronto in 2015 and got their first bison soon after.

Said Arnold, “In my opinion, bison are just about the coolest animal on the planet. They've been unchanged for hundreds – maybe even thousands of years. What they look like now is what they looked like back then!”

In Canada there are two species, the Plains bison which is smaller in size and with a more rounded hump, and the Wood bison - the larger of the two with a taller, square hump. Arnold raises Plains bison.

Arnold said that the demand for bison meat is growing significantly because it's a very nutrient-dense protein. There are currently about 990 bison farmers in Canada with the biggest populations being in Alberta (472 farms) and Saskatchewan (308). The Arnolds sell the meat from their farm store and also to local restaurants. One of their most unique relationships is with the Toronto Maple Leafs. The farm provides bison meat for the team's meals. They have also hosted many of the players to their farm.



Sheep, goats and animal guardians

Sheep and goats are raised on farms and ranches all across the country. 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 many farms use a mixture of both systems. It is common for sheep farmers to use dogs to help with herding, and to guard and protect animals from predators like coyotes. Donkeys and llamas are also good examples of 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 cheese, ice cream, yogurt, and curds are just some of the dairy goat products now widely available.



Did you know...

Sheep have nearly 360-degree vision? That's because they have rectangular pupils! This allows them to see behind them without moving their heads.¹⁵²

What about fur?

The fur trade has existed in Canada for a very long time. Indigenous people – and later Europeans – have long harvested fur from a wide range of animal species, most famously the beaver. Now, mink is the most common animal raised for fur in Canada, followed by fox and chinchilla. Beaver, muskrat, raccoon, coyote, and marten remain popular wild furs as well.

Just as with other farmed animals, farmers have to follow standards (as well regulations) for raising fur-bearing animals, including a recently amended *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 food processors. 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.

Honey

Honey bees are vital for pollinating fruit, vegetables, and other crops, like canola. Canada produces about 75 million pounds of honey every year.¹⁵⁴ More than 80 per cent of Canada's honey is produced in Alberta, Saskatchewan, and Manitoba.



Did you know...

that Canadian honey bee populations aren't actually in decline? In 2021, Canadian beekeepers grew the number of honey bee colonies to a record high of over 810,000?¹⁵⁵



Sam Knechtel

Career Profile



Doug Chiasson

Canada's fur trade

The fur trade has been an important business in Canada for a very long time. By supporting today's trappers, ranchers, processors, artisans, retailers, and others working with wild and farmed fur, The Fur Institute of Canada is helping ensure its long-standing cultural and economic value continues in the modern era.

"The story of fur is the story of Canada in a lot of ways. It goes back to the beginning, and before the beginning, long before European contact," says Doug Chiasson, the Institute's executive director. For Chiasson, one of the most important things the Fur Institute of Canada does is work to protect market access for Canadian fur products.

"The fur trade has evolved significantly over the centuries, particularly with the emergence of ranch fur, fox and mink. But it really is an unbroken trail between early fur traders through today. It's all a part of one integrated and globalized industry. We're amplifying the voice of Indigenous partners and the communities who are involved in fur for economic as well as cultural reasons."

In addition to its long history, Chiasson says the passion of those working with fur is one of the reasons he enjoys working in the sector.

"Fur is often an intergenerational activity. If you're talking to a trapper, they'll often point out that their parents and grandparents or even further operated the same trap line. The same goes for furriers – that fur shop may have been there for 130 or 140 years," he says.

"It really is an industry where people recognize that history and heritage. They believe in this industry. The people are involved because they are deeply passionate, and for reasons which go beyond economics to heritage, culture and community."

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; 148,710 tonnes of fish were produced in 2021. Mussels and oysters are the most common types of shellfish farmed in Canada.

British Columbia produces the most fish and is particularly known for both farmed and wild salmon. Prince Edward Island is home to the most shellfish farms.

Canada's first-ever Code of Practice for the care and handling of farmed salmonids was released in 2021 and can also be found at www.nfacc.ca.



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 has long been used as reptile and fish feed. More recently, insect proteins have become a valuable feed ingredient for farm animals like pigs and poultry¹⁵³.



Agriculture in the Classroom SK

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.

Career Profile



Sam Tomkinson

Navigating the regulatory seas

Aquaculture is a highly regulated industry. Sam Tomkinson, a member of the regulatory affairs team at Grieg Seafood BC – a Norwegian salmon company with branches in British Columbia – wishes more people knew just how complex navigating those regulations can be.

Tomkinson grew up in Ontario but moved to British Columbia to work in aquaculture after acquiring a certificate in the industry, as well as degrees in biology and physical geography. Her schooling and first job gave her hands-on experience with salmon production. This provided a solid base for her current position.

"My job is non-stop – in a good way," says Tomkinson. "We are regulated by multiple different government agencies. I get to work with every division, helping our team to keep in regulatory compliance. One day I'm in the office, the next I'm out on the water at farms."

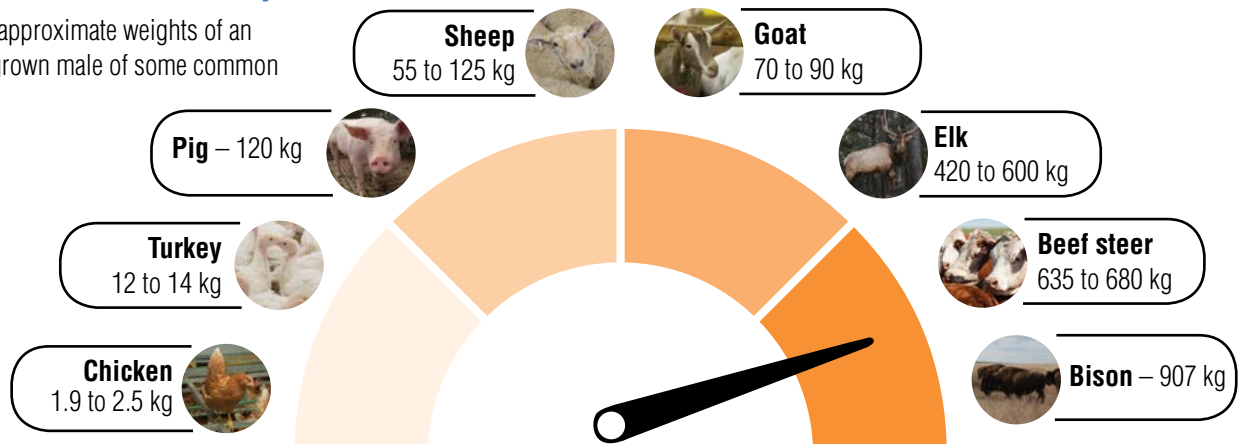
"A lot of time the misconceptions people have about our industry we plain and simple can't do in the first place."

Tomkinson is also the co-director of Young Salmon Farmers of BC, an organization for people under 35 who work in salmon farming.

"We're young professionals who want to see positive dialogue and better education around salmon farming by connecting with people and being active on social media," Tomkinson says. "We try to educate, inform and show the faces of our industry. But also have some fun with it."

How big are animals really?

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





Raising farm animals humanely

Caring for livestock humanely and sustainably is a critical part of raising farm animals. It's the right thing to do for animals themselves, and supports farmers as well. Content, healthy animals 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 better understand the needs of livestock and poultry animals.

Why is some Canadian livestock raised indoors?

Grazing animals like sheep, horses, and beef cattle are herd animals, and can live outside together comfortably year round on pasture, rangeland, or in feedlots, as is their nature, with access to shelter for protection from weather elements. This versatility allows for natural behaviours, and works well to maintain the health of the herd.

Others might spend the summer months, or some part of the year, on outdoor pastures. Many Canadian farm animals, especially pigs and poultry, cannot survive the harsh winter months outside, and live primarily in barns. In the barn, they're protected from extreme weather and temperatures, diseases, and predators such as coyotes and ravens.

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



Space in the barn

Farmers know that giving animals enough space is good for the animals' health and well-being. The farmers work with experts like veterinarians, animal welfare specialists, and feed nutritionists, to ensure that each animal has easy access to feed and water, room to move and to lie down, and to interact with other animals in the barn.

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". Animal health and safety, food safety, as well as environmental and economic realities, are all part of housing research.



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 notify the farmer the moment these conditions change, so that the farmer can take action.

Career Profile



Andrea Elias

A passion for animal care

Coming from a mixed grain and livestock farm in Southern Manitoba, Andrea Elias always gravitated to working with her family's cattle and pig herd. Indeed, caring for animals was an early passion, and one she turned into a successful career.

"I went to Lakeland College in Alberta to be an Animal Health Technician – what people also call a Veterinary Technician. It was a natural progression for me because taking care of animals was always my favorite part of farming," says Elias.

"My absolute favorite part is farrowing — looking after the pregnant sows and piglets."

Elias currently works as a manager at a Manitoba pig farm about 100 kilometres away from where she grew up. She had previously spent time in a variety of other positions within the livestock sector, generally working directly with animals, and is a district advisor

for Manitoba Pork — the organization representing pig farmers in her province. She is also a teacher.

"Educating our younger generation about the swine industry is another passion of mine," says Elias. "I have taught an annual class for University of Manitoba agriculture students, shared information during a couple of virtual 4-H meetings, and participated in making a video for the Agriculture in the Classroom program on YouTube."

While the animals are the primary draw and driver of Elias's work, she also appreciates her colleagues in the pork business. When not at work, she raises a small laying hen flock, pets, and two children, with her husband on a small rural acreage.

"Manitoba's pork sector is a really big business, but it's still very personal. Every day is a little bit different. There's always something interesting happening," she says.



Chicken Farmers of Ontario

Biosecurity

Biosecurity is very important in farming. Most livestock and poultry farms have very strict rules in place to keep animals from getting sick. These rules are called "biosecurity protocols," and they're designed to keep diseases from coming into barns or on farms. They can take the form of specific practices on the farm, as well as more general country-wide biosecurity policies. It's always best to stay healthy in the first place, rather than having to treat and recover from sickness.

Many farmers keep a log 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, for example, anyone going into a barn has to take a shower before entering, and again when they leave, just to make sure that no pathogens get in which could make pigs sick.

Biosecurity is a serious business, and requires cooperation from farmers, farm organizations, government, and the general public. Since 2022, avian influenza has led to the death and culling of millions of birds on farms worldwide, including within Canada. Without the farm community taking the right biosecurity measures, the problem would have been much worse¹⁵⁶.



Quick fact:

Have you ever been asked to report if you have been on a farm while traveling abroad? If so, you have encountered a common question designed to help keep disease from spreading to farms from other countries.



Monitoring livestock barns remotely

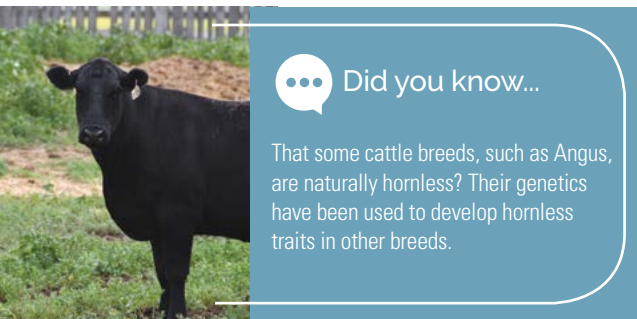
Increasingly, farmers can control heat and electricity in their barns from their computers, tablets, or smartphones. Most farms also have generators to make sure that their barns have electricity if the power goes out. A growing number of farms are installing sensors and smart systems to track everything, from feed consumption, to how many steps an animal takes each day — all in an effort to keep animals healthy and to ensure their optimal welfare. Even facial recognition technology is being studied to see if it can have applications in raising farm animals.

Genetics and animal breeding

Farmers have been trying to build healthier, more productive animal herds through selectively breeding animals for thousands of years. This process involves selecting parents with desirable traits, which offspring could inherit. Over time, more animals in the herd will tend to be born with the desired trait(s).

Traits are passed from parents to offspring via one or more genes, which contain DNA. Animal geneticists have developed techniques, such as genomic selection, that identify and isolate genes to pass along desirable traits, such as milk production or disease resistance, and even “good mothering” characteristics can be important, especially with beef cattle. These techniques provide animal breeders with the ability to identify and select animals with desirable genes more efficiently. Examples of modern breeding programs include efforts to improve resistance to specific livestock diseases, and cattle that are polled, which means born without horns.

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, frozen, and eventually 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 farmers, as mature males of many species can be unpredictable¹⁵⁷. Farmers can also more accurately predict the date that an animal will give birth, so that they can provide better care for both the mother and offspring at that time.



Quick fact:

Having the right gender of animal is important in milk production. For dairy farmers, sexed semen can be used in artificial insemination to virtually guarantee that dairy cows will give birth to female calves.

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. These Codes of Practice spell out requirements and recommended practices for things like housing, feed and water, health care, euthanasia, transportation, and more.

The National Farm Animal Care Council oversees the development and updating of these codes informed by the best science available. Input and consideration by committees of farmers, veterinarians, animal welfare experts, and humane society representatives contribute to what is included. 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.



Career Profile



Dr. Michael Lohuis
Semex

Better genes bring less greenhouse gas

Methane emitted by cattle is a problem greenhouse gas — and some cattle emit more than others. By building new herds through selecting animals which emit less methane, though, greenhouse gas emissions from cattle farms can be significantly reduced.

That’s what Dr. Michael Lohuis, vice president of research and innovation for Canadian genetics company Semex, is trying to help Canada’s dairy farmers do. By partnering with university researchers and others from another Canadian dairy company (Lactanet), Lohuis and his colleagues can now rank animals for their genetic ability to reduce methane emissions.

This starts with predicting how much methane individual cows emit by analyzing their milk with mid-infrared spectroscopy. It’s a much cheaper and easier way of measuring methane emissions from livestock, compared to the use of specialized methane measuring equipment, and gives farmers the opportunity to build their herd with cows genetically disposed to producing lower methane emissions.

“Just by adding this one trait, we could have a significant impact over time. It will just be a breeding goal choice,” says Lohuis. “With continued emphasis, we can eventually reduce methane emissions by 20 to 30 per cent by 2050.”

Countries like Canada, the United States, and many European nations, already have very efficient dairy sectors. While incorporating methane emissions into breeding programs will make them even better environmentally, the potential for genetically based emission reductions could have a particularly large impact in countries where dairy consumption is on the rise, but where the dairy industry is less advanced.

“Dairy production is growing rapidly in India, Asia, and Africa, but they are not as efficient and produce a lot more methane per litre of milk. We need solutions. We can start improving our systems here; then those technologies can be expanded elsewhere.”





Career Profile



Hans Kristensen

On-farm animal care 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; and Verified Beef Production Plus; to name a few. These programs also cover biosecurity, food safety, environmental sustainability, and more.

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

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 welfare legislation.

Most farmers and ranchers do a great job caring for animals, but bad situations sometimes 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 over 30 years ago dedicated to farm animal welfare in Canada, 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 if they need it, or immediately report any welfare problems that they observe.

Finding better ways to raise livestock

Research to find better ways to raise livestock and poultry is constant. An example of a problem in need of a better solution is the situation of male chicks in the egg laying sector. The females grow up to lay eggs, but males can't. They're not bred for meat production either, as they don't gain weight as quickly, and produce tougher meat. Since there is no practical role for them on the farm, male chicks are euthanized immediately after hatching, according to standards detailed in the poultry codes of practice.

Now, however, Canadian hatcheries have access to egg-sexing technology — technology that can identify the gender of a chicken in individual eggs just days after being laid. This eliminates the need to incubate and hatch eggs that will not produce female chicks, and subsequently, the need to euthanize male chicks.

Hans Kristensen is a pork and poultry farmer in Maritime Canada, managing farms in both New Brunswick and Nova Scotia. Six years ago, he was pleased to be invited to serve as a board member to the National Farm Animal Care Council (NFACC). "I had always had a lot of respect for NFACC and what they did, but until I got more involved, I realized I'd only known about 10 per cent of their work — really, just the tip of the iceberg," he said.

NFACC is the national lead for farm animal care and welfare in Canada. Made up of a broad cross-section of shareholders including farmers, government, animal welfare organizations, researchers, restaurant operators, veterinarians, retailers, transporters, and processors, it is tasked with overseeing the process by which the national Codes of Practice for the care and handling of farm animals are reviewed and updated.

There are currently 14 Codes of Practice for various species of livestock developed through NFACC. They provide critical guidance for the care and handling of farm animals, and serve as a base of national understanding of animal care requirements and recommended practices.

Kristensen, now NFACC's chair, said, "A lot of times in society, the stakeholders working together on NFACC committees might be more inclined to be on opposing sides of a discussion. But we've all got more in common than we might initially realize. Everyone at the table is an animal welfarist. We all have the same goal — to continue to move animal welfare practices forward. And if we can change confrontation to consensus, the entire industry benefits."

Once a Code is developed, it is reviewed every five years, and then goes through a significant update every ten years. "I view them as living documents," said Kristensen. "Just because it's signed off on by all participants and put in a binder doesn't mean it's finished. As new technologies emerges, new viewpoints come forward and new science is learned, [and] it all goes into the Code process. We're always looking to improve animal welfare practices across Canada."

"There is no other organization on earth like NFACC," Kristensen concluded. "I am exceptionally proud of that because what we do is different. There will always be challenges and different viewpoints on how to care for animals, but through communications and relationship building, we're making a big difference in the care of animals in Canada."

To learn more about NFACC's work, visit www.nfacc.ca.

Dehorning, trimming, and docking

Sometimes procedures are performed to enhance animal welfare and worker safety. Here are three examples and what they mean:

Dehorning is the removal of horns from beef and dairy calves, in breeds which grow horns. This procedure is undertaken for the safety of both the animals and the people working with them. Calves suffer less pain and stress if dehorning is performed when the horns haven't yet developed.

Beak trimming is done to prevent laying hens from hurting each other while they establish dominance in the flock (also referred to as "pecking order"). The proper procedure is to remove the tip of the beak when the birds are very young. This is 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 involves shortening a sheep's tail to a length specified in the national Sheep Code of Practice. This is done to keep manure from collecting on their tails and hindquarters, helping to prevent a condition called "flystrike", in which flies lay eggs in manure-soiled wool, and the larvae then 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.



Ontario Pork

Animals on the move

Livestock are sometimes moved from farm to farm as they pass through their various stages of growth. Once the piglets that are born on one farm get big enough, for example, they are moved to another, where they are raised to market weight. They are then shipped from the farm to market. Ensuring that livestock and poultry are transported safely and humanely is just as important as caring for them properly on the farm, and is a big part of responsible animal care.

Canada is a big country, and sometimes distances between destinations 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, instances when animals are unfit for transport, and more.

Updated regulations for the transportation of livestock were implemented in 2022 to reflect changes in technology and public expectations. For example, the length of time that animals can be in transit has been reduced, and farmers now share responsibility for the animals' welfare with the transporter. CFIA inspectors make sure the rules are being followed.



Ontario Pork



Did you know...

It is illegal to do anything that causes suffering to an animal at any point during transport¹⁵⁹.

Transport technology and logistics

Transportation systems and the logistics of moving animals have changed as well. Many new livestock trailer designs include things like non-slip floors, more ventilation, and misting lines to help cool animals in hot weather¹⁵⁸. There are also rest areas designed specifically for livestock. Facilities in the Thunder Bay area of Ontario, for example, are strategically located for animals — and truck drivers — making the long journey between western and eastern parts of the country easier in which to take a break.

As in livestock barns, monitoring technologies have also made their way into livestock transportation. This approach includes systems such as Transport Genie, which monitors those conditions inside livestock trailers affecting animal comfort and welfare through a system of smart sensors. Information generated by these sensors is available to people through the supply chain, while real-time data is sent to the driver to help prevent problems. The Canadian-developed technology is currently being tested in various locations, including with Switzerland's largest poultry producer.



Trevor Currie

Caring for livestock on the road

There's a lot more to transporting livestock than driving a truck. For Trevor Currie, engaging the public is a big part of the job.

Currie has been working for Gateway Carriers, a livestock transportation company based in Taber, Alberta, since the company began in 1998. He started as a semi-truck driver before moving into dispatching, then eventually became a part owner. In his current role, he also serves as a coordinator for a livestock alert line set up by Alberta Farm Animal Care — a multi-species livestock welfare organization working in Alberta's agriculture sector.

The Alert Line is a service which farmers and other members of the public can call if they are concerned that there might be an animal welfare issue. While serious issues, such as barn collapses or stray animals, are reported, Currie says that many people calling in may not have experience with farm animals. By consequence, sometimes the reports which they describe are not actually a concern for the animals and farmers involved.

"Sometimes it's just [that] somebody saw some cattle with snow on their backs, and doesn't know that's okay," says Currie.

"Them calling is an opportunity to sit down and share knowledge with one person. You don't get help the masses but you do get to help one-on-one. There's gratification in helping people who have genuine concerns, and who are looking for information, for help, and a resolution."

Currie also takes satisfaction in helping other members of his community to learn new skills in an industry critically important to the local area. This aspect includes hiring.

"We can take someone with no experience, bring them into the shop, then move them to a truck as a driver, and eventually helping them own their own truck. We try to provide real world experience and help people develop," he says, adding that he hopes that more people will learn how much care goes into moving livestock.

"How much we care about the animals we're hauling is the big thing. The drivers take it personally if things go wrong. They do everything in their power to make sure things go right."

Fires, accidents, and first response

Barn fires and the loss of their animals are devastating to livestock farmers. The exact cause of barn fires can be hard to determine, although many are thought to start because of problems in electrical systems. For this reason, it's important for farmers (or any home and business owner) to ensure that their buildings are safe and in good working condition.

Aside from keeping barns clean and in good working order, farmers can also use tools like heat-sensing cameras to determine if electronics are in good working condition, or to pinpoint potential hot spots. Wireless temperature monitors can also send alerts directly to a farmer's cell phone in case barn temperatures climb too high.

Traffic accidents involving livestock can also be devastating, as well as dangerous for both animals and people. Managing livestock that are stressed from a collision, or even trapped in a trailer, presents difficult situations for first responders and livestock handlers. Programs to train first-responders about what to do in these situations — how to move livestock, understand animal behaviour, cut into overturned trailers, and so on — are ongoing across the country.



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 animals¹⁶⁰.

Animal welfare: Humans have a right to use animals and animal products, but also the responsibility to ensure the ethical treatment and wellbeing of animals in their care.

Animal rights: Humans don't have the right to use or confine animals for any reason, including for 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.

Farm trespassing

Canadian farmers have been increasingly faced with animal rights activists trespassing onto their farms, and in some cases, even entering barns to release or seize animals. Not only does this action cause immense stress to both farmers and livestock, but it can also expose animals to harmful pathogens and other safety risks, like road traffic.

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.



Callum Kyllonen

FACING THE FUTURE OF FOOD AND FARMING



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

Farming and food production has changed a lot even just in the last decade as more technology and innovation are used to help make farming easier, grow better crops, raise healthier livestock, and support a more sustainable environment.

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 climate change and sustainable farming. 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 difference¹⁶¹.

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.

Robotics, automation, and smart systems

Some of the things you've learned in this book are that farming is hard work, that it's a 365-day-a-year job, and that it can be hard for farmers to find people to work on farms. That's why the agriculture industry is increasingly looking to robots and automated, smart solutions both to ease their workload, and to help farmers make better decisions on the farm.

Nexus Robotics of Nova Scotia, for example, has developed a robot that can weed vegetable fields on its own 24 hours a day, thanks to its camera and artificial intelligence system that helps it identify which plants in the field are weeds and which ones aren't¹⁶².



Lauren Miller

Electrifying farm equipment

Just as many Canadians are turning to electric cars to reduce their dependence on fossil-fuel-powered vehicles, farmers are also looking to electricity to power their farm equipment. There is still a lot of work to be done to develop tractors, sprayers, combines, and other farm equipment that will run on electricity as long and as well as they do using conventional fuel, but farmers are keen to experiment with new technology.



Did you know...

In Ontario, farmers are participating in a pilot project to test how well the world's first fully electric utility tractor will perform on Canadian farms¹⁶³.



Growing meat in a bioreactor

An emerging field in Canada is that of cellular food. Often popularly called “lab-grown” or “animal-free”, cellular food production uses animal cell cultures, tissue engineering, or precision fermentation-based techniques to create products that have until now always come from livestock production.

A recent report identified cellular food as a \$12.5 billion a year opportunity in Canada, as people look for foods that taste like the traditional animal-based products to which they’re accustomed.

Cellular foods could include flavouring, pigments, fermented foods, and product ingredients, as well as poultry or seafood-style foods that include cellular-based ingredients¹⁶⁷.

Producing your own fuel and fertilizer

As part of continually improving the sustainability of farming, technology is now being developed that would let farmers produce their own clean and green fertilizer or fuel, right on the farm — using only water, air, and electricity. A farm in Manitoba is home to the first commercial test site of this new system¹⁶⁶.

Facing our future, sustainably

Canadians across the country are dealing with the big issues that are affecting people around the world as well: the cost of food, sustainable farming, and our changing climate.

As farmers, we face these issues too. All of us want affordable, safe, and healthy food that is produced in a sustainable way that respects people, animals, and the planet. As farmers, that’s been our focus for generations, and will continue to be our priority and our commitment for decades to come.

Thank you for supporting Canadian food, and for being interested in how and what Canadian farmers do to produce it. We value your trust in us — and by working together, we can continue to focus on a sustainable future for our planet and its people.

That’s the real dirt.



Lynsey Berry



Lori Gasper

Curious to learn more?

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
- @FarmFoodCareON
- @FarmFoodCareSK
- @FarmFoodCarePEI
- @FacesBehindFood
- @CdnFoodFocus

2023 edition updates by Lilian Schaer, Agri-Food Project Services Ltd., and Matt McIntosh
Design by: Lynn Schoupe, Studio8699.
Project Managers: Kelly Daynard and Rachel Coles
Editor: Dr. Paul Ling
Published by Farm & Food Care, 2023.

www.FarmFoodCare.org

This booklet was made possible with the generous support of farmers, farm organizations, and agri-businesses across Canada. For a complete list of partners, visit www.RealDirtonFarming.ca.

Permission to reproduce this document is given, provided credit is made to “Farm & Food Care”.

Photos in this book were all taken on Canadian farms, or of Canadian farmers. Many were winning entries in the Farm & Food Care 2023 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.

1. <https://agriculture.canada.ca/en/sector/overview>
2. <https://agriculture.canada.ca/en/sector/overview>
3. https://www.statcan.gc.ca/en/subjects-start/agriculture_and_food
4. <https://agriculture.canada.ca/en/sector/overview>
5. <https://www.thecalculatorsite.com/articles/units/how-big-is-an-acre.php>
6. <https://projectperfecthome.com/how-big-is-one-acre/>
7. <https://www150.statcan.gc.ca/n1/daily-quotidien/220511/dq220511a-eng.htm>
8. <https://www150.statcan.gc.ca/n1/daily-quotidien/170510/cg-a001-eng.htm>
9. <https://www150.statcan.gc.ca/n1/daily-quotidien/220511/dq220511a-eng.htm>
10. <https://www.science.gc.ca/>
11. <https://agriculture.canada.ca/en/sector/overview>
12. <https://agriculture.canada.ca/en/sector/horticulture/reports/statistical-overview-canadian-maple-industry-2021>
13. <https://www.fao.org/faostat/en/#home> and <https://www.globaltradetracker.com/>
14. <https://www.fao.org/faostat/en/#home> and <https://www.globaltradetracker.com/>
15. <https://www.fao.org/faostat/en/#home> and <https://www.globaltradetracker.com/>
16. <https://www.fao.org/faostat/en/#home> and <https://www.globaltradetracker.com/>
17. <https://www.fao.org/faostat/en/#home> and <https://www.globaltradetracker.com/>
18. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00001-eng.htm>
19. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00002-eng.htm>
20. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00003-eng.htm>
21. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00004-eng.htm>
22. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00005-eng.htm>
23. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00006-eng.htm>
24. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00007-eng.htm>
25. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00008-eng.htm>
26. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00009-eng.htm>
27. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00011-eng.htm>
28. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00012-eng.htm>
29. <https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2022053-eng.htm>
30. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00013-eng.htm>
31. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2017001/article/54925-eng.htm>
32. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00013-eng.htm>
33. <https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2022053-eng.htm>
34. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00013-eng.htm> and <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00011-eng.htm>
35. <https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2022053-eng.htm>
36. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210023501>
37. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210023501>
38. <https://agriculture.canada.ca/en/sector/overview>
39. https://cahrc-ccrha.ca/sites/default/files/2021-11/factsheet_NAT_E_web.pdf
40. <https://www.fcc-fac.ca/en/financing/agriculture/women-entrepreneur-program.html>; <https://agriculture.canada.ca/en/youth>; <https://agriculture.canada.ca/en/programs/agridiversity>
41. <https://news.uoguelph.ca/2016/06/farmers-need-want-mental-health-help-survey/>
42. <https://www.farms.com/ag-industry-news/new-canadian-organization-supporting-farmer-mental-health-133.aspx>
43. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2019001/article/00001-eng.htm>
44. <https://cahrc-ccrha.ca/cahrc/news-releases/indigenous-agriculture-advisory-committee-members-announced>
45. https://www.fao.org/fileadmin/templates/faoitay/documents/pdf/pdf_Food_Security_Cocept_Note.pdf
46. <https://www.cfa-fca.ca/2023/02/09/food-freedom-day-is-february-9-2023/>
47. <https://www.ers.usda.gov/topics/international-markets-u-s-trade/international-consumer-and-food-industry-trends/>
48. <https://proof.utoronto.ca/>
49. <https://medium.com/@peytonverhoeven/is-this-even-real-a-food-crisis-within-canada-265e6bad3b40>
50. <https://modernfarmer.com/2021/06/how-canadas-north-is-trying-to-grow-local-food-production/>
51. <https://agritech-north.ca/>
52. <https://www.greenhousecanada.com/northern-growth-project-continues-to-thrive/>
53. <https://growingspaces.com/green-iglu/>
54. <https://foodbankscanada.ca/>
55. <https://foodbankscanada.ca/hunger-in-canada/>
56. <https://foodbankscanada.ca/at-the-core-of-food-banks-fresh-food/>
57. <https://aitc-canada.ca/en-ca/learn-about-agriculture>
58. <https://aitc-canada.ca/Portals/0/adam/snapAG/jtFfrvPIB0eRuL98nAU52A/Link/Organic%20Food%20ENG.pdf>
59. https://drive.google.com/file/d/1-QtFhnti_HeWkTP3rz66fpEoZX6reTDs/view
60. https://drive.google.com/file/d/1-QtFhnti_HeWkTP3rz66fpEoZX6reTDs/view
61. <https://inspection.canada.ca/organic-products/equivalence-arrangements/eng/1311987562418/1311987760268>
62. <https://www.newscientist.com/article/2148596-genetically-modified-wheat-used-to-make-coeliac-friendly-bread/>
63. <https://www.vitafoodsinsights.com/omega-3/bioengineered-dha-rich-canola-oil-improves-omega-3-levels>
64. <https://allianceforscience.org/blog/2018/06/unfairly-demonstrated-gmo-crops-can-help-fight-malnutrition/#:~:text=These%20biofortified%20crops%20allow%20people,alleviate%20malnutrition%20in%20the%20world>
65. <https://inspection.canada.ca/food-labels/labelling/industry/meat-and-poultry-products/eng/1632494849908/1632495277194>
66. <https://www.health.harvard.edu/staying-healthy/ditch-the-gluten-improve-your-health>
67. <https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/food-allergies-intolerances/ceeliac-disease.html>
68. <https://www.agrifoodindex.ca/national-index#metrics>
69. <https://aitc-canada.ca/en-ca/learn-about-agriculture/sheet/conservation-tillage>
70. https://croplife.ca/wp-content/uploads/The-Value-of-Plant-Science-Innovations-to-Canadians_RIAS-Inc.pdf
71. <https://farmtario.com/crops/low-cost-real-time-soil-carbon-quantification-could-be-a-game-changer/>
72. <https://www.croptrust.org/work/svalbard-global-seed-vault/>
73. <https://www.cbc.ca/news/canada/new-brunswick/nation-tree-seed-centre-indigenous-communities-1.6400008>
74. <https://ca.pivotbio.com/en-ca/press-releases/pivot-bio-launches-canadian-business-operations>
75. <https://ca.pivotbio.com/en-ca/our-science>
76. https://aitc-canada.ca/Portals/0/adam/snapAG/8L6bAqjF6kasPTR_OKbVg/Link/Agriculture%20&%20Greenhouse%20Gases%20ENG.pdf
77. <https://fertilizercanada.ca/our-focus/stewardship/>
78. <https://fertilizercanada.ca/our-focus/stewardship/emissions-reduction-initiative/>
79. <https://www.beefresearch.ca/topics/environmental-footprint-of-beef-production/>
80. <https://agriculture.canada.ca/en/environment/greenhouse-gases>
81. <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2022.html#toc5>
82. <https://aitc-canada.ca/en-ca/learn-about-agriculture/sheet/beef-protein-and-the-environment>
83. <https://www.statcan.gc.ca/o1/en/plus/1562-bee-list-honey-heres-some-data-across-canadian-pollination>
84. <https://www.beefresearch.ca/blog/cattle-feed-water-use/>
85. <https://www.fao.org/newsroom/detail/FAO-UNEP-agriculture-environment-food-loss-waste-day-2022/en>
86. <https://www.fao.org/newsroom/detail/FAO-UNEP-agriculture-environment-food-loss-waste-day-2022/en>
87. <https://seeds.ca/schoolfoodgardens/food-waste-in-canada-3/#:~:text=The%20average%20sized%20family%20in,lost%20of%20%2420%20billion%20yearly>
88. <https://seeds.ca/schoolfoodgardens/food-waste-in-canada-3/#:~:text=The%20average%20sized%20family%20in,lost%20of%20%2420%20billion%20yearly>
89. <https://seeds.ca/schoolfoodgardens/food-waste-in-canada-3/#:~:text=The%20average%20sized%20family%20in,lost%20of%20%2420%20billion%20yearly>
90. <https://bioenterprise.ca/success-stories/groundup-ecoventures/>
91. <https://www.vinelandresearch.com/wp-content/uploads/2022/12/The-2022-23-Innovation-Report-interactive.pdf - page 11 & 12>
92. <https://www.foodincanada.com/features/turning-seafood-waste-into-sustainable-packaging/>

Information Sources.... continued

93. <https://fruitdor.ca/en/fruitdor-nutraceuticals/>
94. <https://impact.canada.ca/en/challenges/food-waste-reduction-challenge-novel-tech-finalists>
95. <https://impact.canada.ca/en/challenges/food-waste-reduction-challenge-novel-tech-finalists>
96. https://livestockresearch.ca/article/ug_looking_for_alternatives_to_agricultural_plastics
97. <https://www.theglobeandmail.com/business/adv/article-moving-toward-a-circular-economy-with-agricultural-recycling-programs/>
98. <https://www.greenhousecanada.com/fresh-produce-industry-takes-steps-away-from-plastic-33064/>
99. <https://www.naturefresh.ca/wrapped-responsibly-100-home-compostable-cucumber-wrap/>
100. <https://www.country-guide.ca/guide-business/artificial-intelligence-offering-a-brave-new-world-of-how-youll-farm-and-eat/>
101. <https://www150.statcan.gc.ca/n1/daily-quotidien/220511/dq220511a-eng.htm>
102. <https://farmtario.com/news/network-supports-agricultural-automation-innovation/>
103. <https://www.canadaid.ca/>
104. <https://www.who.int/news-room/questions-and-answers/item/one-health>
105. <https://livestockresearch.ca/uploads/assets/files/OneHealth.pdf>
106. <http://www.ub.edu/senesciencia/noticia/antibiotic-resistance/>
107. <https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/factsheets-faq/your-information-antimicrobial-resistance.html>
108. <https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance/categorization-antimicrobial-drugs-based-importance-human-medicine.html>
109. <https://www.canada.ca/en/public-health/services/antibiotic-antimicrobial-resistance/animals/actions/responsible-use-antimicrobials.html>
110. <https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/maximum-residue-limits-mrls/setting-standards-maximum-residue-limits-mrls-veterinary-drugs-used-food-producing-animals.html>
111. <https://www.canada.ca/en/health-canada/services/milk-infant-formula/raw-or-unpasteurized-milk.html>
112. <https://www.unlockfood.ca/en/Articles/Farming-Food-production/Hormones-and-antibiotics-in-food-production.aspx>
113. <https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/factsheets-faq/hormonal-growth-promoters.html>
114. <https://organicalberta.org/article/pesticides-glyphosate/>
115. <https://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/ForestsCrownLands/health-canada-statement-glyphosate-e.pdf>
116. <https://croplife.ca/debunking-dirty-dozen/>
117. <https://www.vinelandresearch.com/wp-content/uploads/2022/12/The-2022-23-Innovation-Report-interactive.pdf> - Vineland Innovation report, page 20.
118. <https://www.canolacouncil.org/policy-advocacy/market-access/>
119. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2014001/article/11913-eng.htm>
120. <https://publications.saskatchewan.ca/api/v1/products/103821/formats/115207/download> - Page 10
121. <https://www.statcan.gc.ca/o1/en/plus/1526-corn-sweet-corn> | <https://education.nationalgeographic.org/resource/grain/>
122. <https://pulsecanada.com/index.php?p=pulse/what-is-a-pulse>
123. <https://pulsecanada.com/industry/market-access>
124. <https://www.fcc-fac.ca/fcc/resources/trade-rankings-report-2019-e.pdf> and <https://pulsecanada.com/index.php?p=industry>
125. <https://pulsecanada.com/industry/market-access>
126. <https://publications.saskatchewan.ca/api/v1/products/107051/formats/119926/download> ?
127. <https://www.proteinindustriescanada.ca/opportunity>
128. <https://www.proteinindustriescanada.ca/opportunity>
129. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210035601>
130. <https://www.americanmushroom.org/main/mushroom-facts/>
131. <https://fvgc.ca/about-us/>
132. https://agriculture.canada.ca/sites/default/files/legacy/pack/pdf/fruit_report_2019-eng.pdf
133. <https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00006-eng.htm>
134. <https://www.foodrepublic.com/1294946/things-you-didnt-know-about-potatoes/>
135. <https://agriculture.canada.ca/en/sector/horticulture/reports/statistical-overview-canadian-ornamental-industry-2021#overview>
136. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210036001&pickMembers%5B0%5D=1.1049>
137. <https://bcgreenhouse.ca/growers/quick-facts/>
138. <https://aitc-canada.ca/en-ca/learn-about-agriculture/sheet/irrigation>
139. <https://ginsengontario.com/about/>
140. <https://www.ictinc.ca/blog/indigenous-sacred-plants-tobacco>
141. <https://thestarphoenix.com/news/local-news/university-of-saskatchewan-harvests-first-crop-of-ceremonial-tobacco>
142. <https://winesofcanada.ca/>
143. <https://winecountryontario.ca/icewine/#:~:text=VQA%20Requirements%20for%20Icewine&text=The%20grapes%20must%20be%20naturally,be%20indicated%20on%20the%20label>
144. <https://industry.beercanada.com/statistics>
145. <https://ontariocraftcider.com/ontariocider/>
146. <https://www.thecanadianencyclopedia.ca/en/article/mcintosh-apple>
147. <https://www.thecanadianencyclopedia.ca/en/article/maple-sugar-industry>
148. <https://www5.agr.gc.ca/resources/prod/Internet-Internet/MISB-DGSIM/CB-MC/PD-F/4689-eng.pdf>
149. <https://www.theguardian.com/business/2014/dec/22/maple-syrup-heist-quebec-canada>
150. <https://agriculture.canada.ca/en/sector/animal-industry/canadian-dairy-information-centre>
151. <https://www150.statcan.gc.ca/n1/dai-quo/ssi/homepage/rel-com/theme32-eng.htm>
152. <https://aitc-canada.ca/en-ca/learn-about-agriculture/sheet/grass-fed-and-grain-finished-beef>
153. <https://modernfarmer.com/2017/12/6-facts-sheep-might-not-know/>
154. <https://inspection.canada.ca/animal-health/livestock-feeds/consultations/registration-requirements/eng/1557837434904/1557837435158>
155. <https://www150.statcan.gc.ca/n1/daily-quotidien/221214/dq221214f-eng.htm>
156. <https://agriculture.canada.ca/en/sector/horticulture/reports/statistical-overview-canadian-honey-and-bee-industry-2021>
157. <https://farmtario.com/news/non-supply-managed-poultry-sector-gets-avian-influenza-support/> and <https://www.cbc.ca/news/health/bird-flu-outbreaks-threat-1.6684560>
158. <https://www.canadianveterinarians.net/related-resources/artificial-insemination-in-cows/>
159. <https://www.producer.com/livestock/improved-trailers-good-for-livestock/>
160. <https://aitc-canada.ca/en-ca/learn-about-agriculture/sheet/transporting-farm-animals>
161. <https://www.albertaanimalhealthsource.ca/content/animal-welfare-vs-animal-rights>
162. <https://www.canadianpoultrymag.com/the-plant-based-protein-question/>
163. <https://nexusrobotics.ca/>
164. <https://farmtario.com/news/showcase-gives-stage-to-ag-innovators/>
165. <https://farmtario.com/livestock/quebec-leads-the-way-in-artificial-intelligence/>
166. <https://www.truevsolutions.com/>
167. <https://farmtario.com/news/ontario-technology-lets-farmers-produce-their-own-inputs/>
168. https://livestockresearch.ca/article/growing_bacon_in_a_bioreactor_instead_of_a_barn_



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
- www.CanadianFoodFocus.org
- www.FarmFood360.ca



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
 159 Sherwood Road, Suite 100
 Charlottetown, PEI
 Canada, C1A 0E5
www.FarmFoodCarePEI.org

