

The Real **DIRT** on **Farming**

**You asked.
We answered.**
How your **food**
is grown.

Wondering about
**hormones, GMOs,
pesticides and
antibiotics?**

**Canadian
Farming**
Coast to Coast

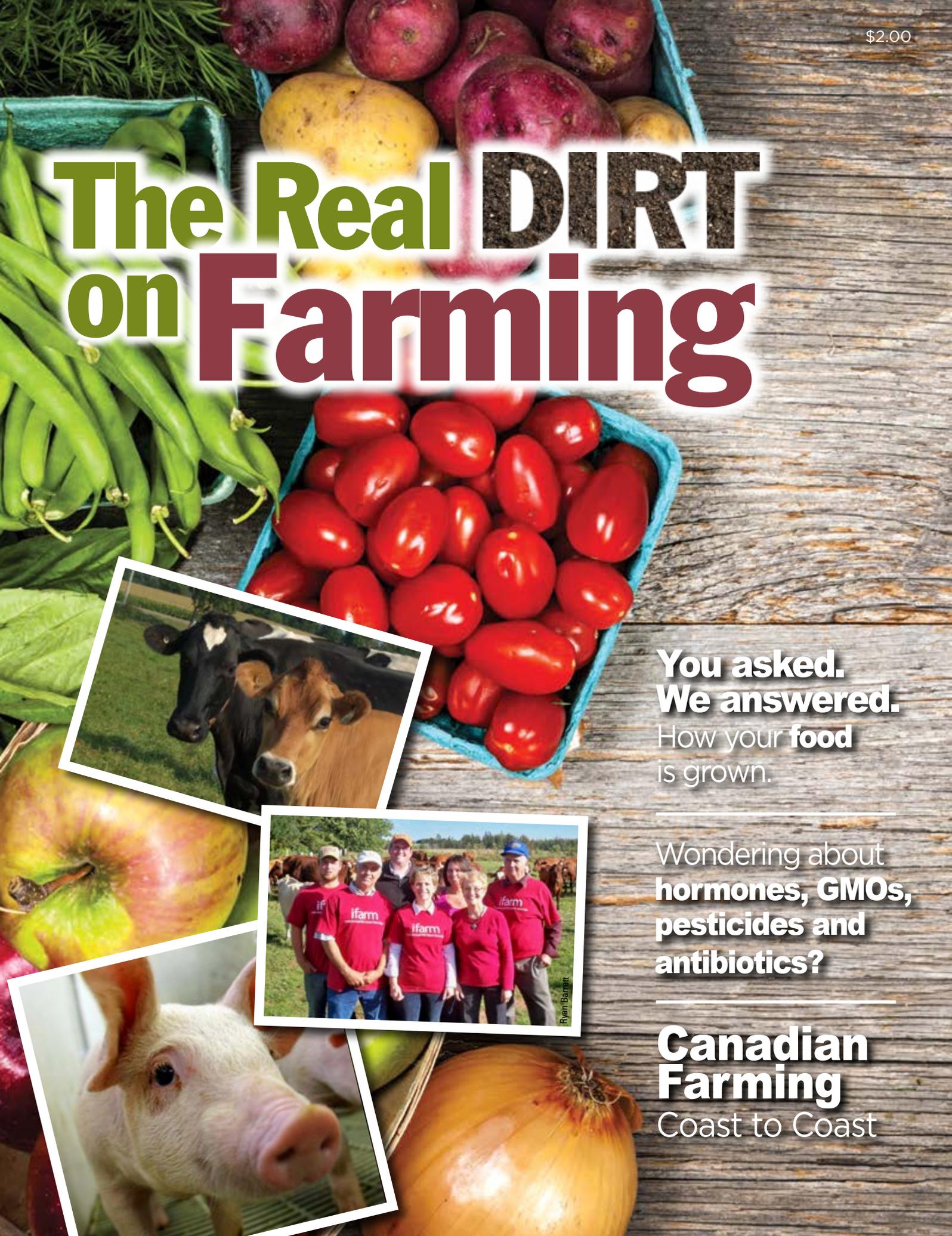


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Know your farmers. Know your food.



We all eat, yet how many of us think about where our food actually comes from, what is in it and who produces it?

One hundred years ago, when over half of Canada's population farmed, there was no need for a publication to explain the ins and outs of farming. Today, however, less than two per cent of Canadians are farmers. In 1931, one in three Canadians lived on a farm; today, it's only one in 50 – so it's no wonder that so many people want to know more about food and farming.

We asked 1,200 Canadians what they would like to know about food and farming and went to fellow farmers and experts in the field to find the answers and real Canadian examples. We hope to answer your questions and address your concerns, as well as debunk some myths about food and farming. We also hope to wow and impress you with some of the cool and funky things happening in agriculture and food today – and in doing so, reconnect you with your food and the people who produce it for you.

It all begins on the farm and ends with the incredible food choices we enjoy in Canada, with so many good people and stories in the middle. Although our farms may look different today, we still work hard and have the same values, care and commitment to our animals and the land as the generations who farmed before us.

We're Canada's farmers and we're proud of what we do. This book is a good start for connecting with us and providing some facts on food and farming. Our goal is to help you make informed food choices, whatever they may be. Let's keep the conversation going, online and in person, anytime. Get to know us – after all, to know us is to know your food.

Yours in food and farming,
Canada's Farmers

Krystle VanRoboys

Rose Hill

Milton Young

Tiffany Mayer

Leeta St. Aubin

Alberta Milk

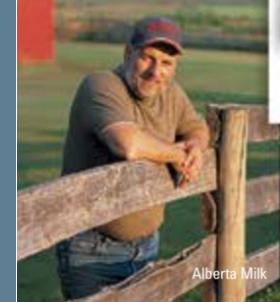
Marsha Shoeman

Farm Animal Council of Saskatchewan

Photos in this book are all taken on Canadian farms or of Canadian farmers. Many were winning entries in Farm & Food Care Canada's Farm Photo Contest. Photo credits are listed, where available.

Sources, where noted, are available in the online version of this publication at

www.RealDirtonFarming.ca



1

Canadian farming - the big picture



Hanna DeVos

There's no such thing as a typical Canadian farm. No two farms are the same and farmers from Newfoundland to British Columbia raise many different kinds of livestock and grow a wide range of crops.

Farming is unique. It's both a business and a way of life. In Canada, agriculture and food is a big deal, providing one in eight jobs, employing 2.1 million people¹ and contributing \$103.5 billion to Canada's economy in 2012².

A QUICK SNAPSHOT:

- Farming is still a family business — over 97 per cent of Canada's farms are family owned.
- In 1900, 50 cents of every dollar earned was spent on food. Today Canadians spend just over 10 cents of every dollar we earn on food, and mark "Food Freedom Day" — the day the average Canadian has earned enough money to pay for a whole year's worth of food — in early February. By comparison, "Tax Freedom Day" happens sometime in June (but that's a topic for another book!).



WHAT'S GOING UP?

- We're producing more food per acre on less land, and using less water, fertilizer and other resources to do so. In 1900, one farmer produced enough food for 10 people. Today, that same farmer feeds more than 120 people. The use of new technology and modern, efficient equipment to farm with plays a big role in this.

WHAT'S GOING DOWN?

- We continue to have fewer farms than ever before. Statistics Canada counted 205,730 farms in its 2011 census, which is down 10 per cent from 2006^[1]. Compare that to 1931, when 728,623 farms were recorded, and you can see that this downward trend is nothing new in Canadian agriculture.
- Since 1941, Canadian farms have grown from an average of 237 acres to 778 acres (about 2.9 square kilometres) in 2011^[2], an increase of 228 per cent. Farm sizes differ significantly from province to province. Farms in Newfoundland and Labrador are about 152 acres on average compared to the average farm in Saskatchewan, which is 1,668 acres^[3]. Across Canada, there was 160,155,748 million acres of land being farmed in 2011 — 20 million more than in 1921.

A DIVERSITY OF PRODUCTS

- Canada is the fifth largest agricultural exporter in the world. We produce about 85 per cent of the world's maple syrup and we're the world's largest grower and exporter of flax seed, canola, pulses (like peas, beans and lentils) and durum wheat (the kind used to make pasta).
- Due to the different climate zones across the country, we also grow and raise everything from bison, alpacas and rabbits to lavender, grapes, greenhouse vegetables and hazelnuts.

FARMER DEMOGRAPHICS

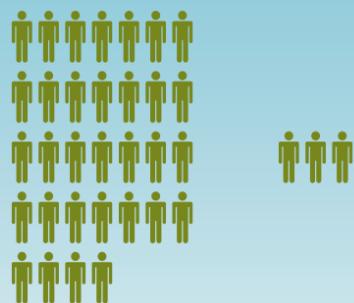
- The average age of a Canadian farmer is 54. Almost half of all farmers are aged 55 and older, with only 8.2 per cent of farmers under age 35³. However, an increasing proportion of farms are being operated solely by young farmers 18 to 39 years of age, who have an average of 11 years of farming experience⁴.
- 46.9 per cent of Canadian farmers work off the farm to earn additional income for their families⁵.
- Just over half of all farmers have some form of post-secondary education⁶.
- 72.5 per cent of Canadian farmers are male and 27.5 are female⁷.
- More than 97 per cent of Canadian farms remain family-owned and operated.

MORE THAN A CENTURY OF CHANGES TO CANADIAN FARMING

Over the past 110 years, there have been big changes in farming in Canada. Today, a decreasing number of farmers are working on fewer, larger farms to produce more food for a growing Canadian population.

FEWER FARMERS

Number of Farmers (Millions)



3.2
1901

▼ 91%

0.3
2011

FEWER FARMS

Number of Farms (1,000s)



511
1901

▼ 60%

206
2011

LARGER FARMS

Average Farm Size (Acres)



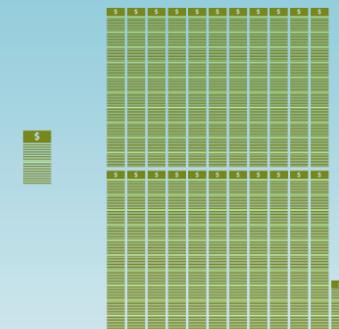
237
1941

▲ 228%

778
2011

HIGHER VALUED FARMLAND

Value of 1 Acre of Farmland (\$)*



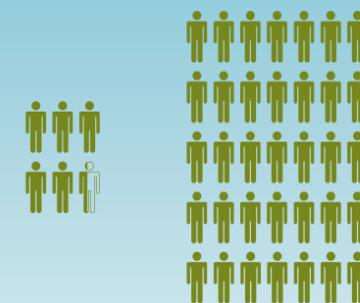
17
1941

▲ 13,000%

2,227
2013

MORE PEOPLE TO FEED

Canada's Population (Millions)



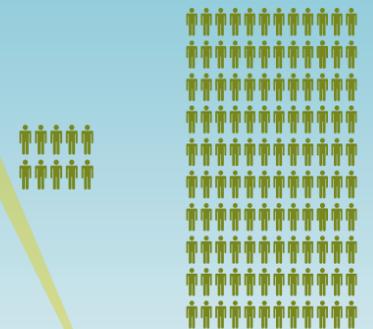
5.4
1901

▲ 548%

35
2014

FEEDING MORE PEOPLE

People Fed By One Farmer



10
1901

▲ 1,100%

120+
2011



Source: Statistics Canada, www.statcan.gc.ca

* Using current dollar values, not accounting for inflation



Who's a typical farmer?

Quick – picture a farmer. What images come to mind? We can bet there might be a few that look like that. Our bigger wager would be that you might be surprised to learn who is farming today in Canada.

It's difficult to describe a "typical" farm or farmer or ranch or rancher in Canada because every one of them is unique. Many of today's farms have little in common with the images of Old MacDonald that you may remember from the popular children's song. The important connection across all types of farms and farmers that spans the generations is the care and commitment needed for the animals and the land, 365 days a year.

Have big corporations taken over farm ownership? Absolutely not. More than 97 per cent of Canadian farms remain family-owned and operated, and are often handed down from generation to generation. From the very young to the young at heart, sometimes four generations work together on one farm.

Yes, there are still animals and crops and barns and yes, there are still farmers who look after them. Like every business, we now have more tools and technologies at our disposal which helps us feed more people with less land and water than ever before. Our grandparents couldn't imagine a smartphone that could help us check the temperature in our barns or know what part of the field needed more fertilizer.

HERE ARE A FEW EXAMPLES OF HOW FAMILY FARMS WORK:

- Some are managed by families with one or more members having a job outside the farm to ensure adequate family income.
- Some are "retirement" farms or acreages, which means they've been bought by people who have moved to the country after they've retired and now rent the land out to other farms to grow crops.
- Some are structured like a corporation but have several family members working on them as well as additional paid employees. These larger farms are still family-owned and operated. In fact, less than one fifth of Canada's farms are incorporated, and of those, over 87 per cent are family corporations.
- Family farming is the main form of farming and food production around the world in both developed and developing countries. There are an estimated 500 million family farms globally, according to the Food and Agriculture Organization of the United Nations, which declared 2014 the International Year of Family Farming.

“Nothing comes closer to the sustainable food production than family farming. The preservation of natural resources is rooted in their productive logic; and the highly diversified nature of their agricultural activities gives them a central role in promoting the sustainability of our food systems and ensuring food security.”

José Graziano da Silva,
Director General,
Food and Agriculture Organization⁹

Regional roundup

Canada has one of the most diverse farming sectors in the world. This table shows the number of farms in each province as well as their dominant farm types.

PROV. / REGION	FARMS ^{10[1]}	DOMINANT FARM TYPES ^{11[2]}
Prince Edward Island	1495	Horticulture, dairy
Nova Scotia	3905	Horticulture, dairy
Newfoundland and Labrador	510	Dairy, poultry
New Brunswick	2611	Horticulture, dairy
Quebec	29437	Dairy, pork
Ontario	51950	Grains and oilseeds, dairy
Manitoba	15877	Grains and oilseeds, pork
Saskatchewan	36952	Grains and oilseeds, beef
Alberta	43234	Beef, grains and oilseeds
British Columbia	19759	Horticulture, dairy

CAN WE RETURN TO SMALLER FARMS?

The beautiful thing about farming in Canada is you can choose to have five acres or 5,000 acres. With only two per cent of the population feeding everyone else, it would be impossible to go back to many small farms and still ensure that people have enough food.

Farms shouldn't be judged by size, but by productivity, environmental sustainability and the number of people they can feed. For example, that five acre piece of land could be very fertile and grow specialty vegetables or fruit for a certain market and be quite profitable. In contrast, the 5,000 acres maybe mostly contains trees and rocks in a colder climate with very little potential for growing food.

Farms, like many businesses, have grown in size. There are often efficiencies to be gained from specializing in one aspect of food production, such as a greenhouse or a dairy farm. There are also economic realities of trying to support your family or several families from one farm. The majority of the income of many of Canada's small farmers comes from off-farm jobs and not actually from the farm itself⁹.

People may feel nostalgic for the imagery of farms of yesteryear—but the people who lived and worked on them are rarely nostalgic for the reality of that challenging way of life. The farms' low productivity supported much smaller populations, environmental awareness was much lower, and food quality and quantity were highly unpredictable or food was simply not available at certain times of the year. Research, innovation and a lifelong commitment to learning has meant continual progress in how we care for our land and animals and help us reach our goal to produce larger quantities of safe food.

The challenge we wholeheartedly share today is to feed our country sustainably, in a way which is good for people, animals and the planet. For this unprecedented challenge, together with the increasing global population, the past can't provide the answers, but rather the solid foundation on which to improve. We need farms of all shapes and sizes, from your backyard or community garden to the largest most professional farms and food growers.

WHAT ABOUT "FACTORY FARMS"?

Factory farm is an inflammatory term created by anti-farming activists and is not one that is used by farmers. There are farms of all shapes and sizes - and they are all farms, not factories. In Canada, the vast majority of farms are still owned and run by families. The type and size of farm isn't as important as the care and commitment the people who live and work there demonstrate for their land, animals, and the environment.



WHAT DOES SUSTAINABLE FARMING MEAN TO YOU?

Earlier we mentioned a poll of 1,200 Canadians that helped to shape the content of this booklet. Those same respondents were asked to rank the five principles of sustainable food: food safety, human health, economics and food affordability, environment and animal welfare. What do you think?

The answer:

All five principles are important and must be given fair and practical consideration in balance. For example, if a farmer is considering converting an egg barn from conventional cages for his or her hens to a free run (cage free) barn, all five principles should come into play – starting with the health and safety of the people who work in the barn; the safety and quality of the eggs; the health and welfare of the birds; the environmental footprint of the new barn; the economic viability of the farm and supply chain, and of course, the cost of the eggs to you and your family.

Using these five principles to guide the subject areas of this booklet, we hope to answer many of your questions about Canadian food and farming.



Farm animals 101



Alberta Turkey Producers

Astrid Stephenson

FARMER PROFILE:

Astrid Stephenson grew up on her parents' dairy farm in Alberta and loved learning about agriculture and animal care. She completed her Animal Health Technician Diploma and, after working away from home, decided to buy a turkey farm. Astrid's farm raises about 52,000 birds each year. Family support has been hugely important to her success. Her parents and brother live close by and help out when needed. Astrid loves the challenge of raising a new flock of birds and working to improve each new flock. She is constantly looking for innovative ways to ensure her birds are healthy and strong.

Courtesy of Alberta Turkey Producers

In Canada, thousands of farmers care for a wide variety of farm animals everyday. You'll learn more about the science of animal welfare and the care of these animals and birds in Chapter 6, but for now, here are some basics on many of the main types of livestock and poultry raised in this country.

About turkeys and chickens

Turkeys and chickens raised for meat never live in cages and can move freely around the barn. The birds tend to stake out their own territories in small groups which are generally a few square metres in size. They are housed in modern chicken and turkey barns where temperature, humidity, light and ventilation are carefully monitored. The barn floor is covered with a soft bedding material of straw or wood shavings. Water and pelleted feeds made of grains like wheat, corn and soybeans (similar in appearance to hamster food, for example) are always available.

Most poultry farmers put all their new birds into the barn at the same time. This makes sense from both a logistical and disease prevention perspective as the entire flock will be shipped to market on one day. Then the barns are cleaned out and all bedding and manure is removed to get ready for the next flock. This helps keep the birds healthy. Disease prevention is always preferred over disease treatment.



A two-storey barn for broiler (meat) chickens



Market weight turkeys

Laying hens

In Canada, laying hens – the ones who lay the eggs we eat – are housed in a variety of ways. Farmers continue to invest money in hen housing research to evaluate what best suits the birds and to continually upgrade hens' accommodation. Many hens are raised in enriched or conventional housing systems. Why? Modern laying hens are descended from jungle fowl that live in small groups under tree roots. This means it is natural for hens to want to live closely together with other birds, and in small, enclosed spaces – reminiscent of those ancient tree roots that made them feel safe and protected.



Hens housed in enriched housing with nesting boxes and perches

Birds can be quite aggressive to each other – the expression “pecking order” came from the poultry world for a reason. The strongest birds dominate or bully the weaker ones by pecking them and control access to food and water. In enriched and conventional housing, the pecking order is determined quickly, all birds in the group get equal access to feed and water and don't have to fight for their chance to eat and drink.

There are many options for enriched environments, where housing systems are furnished with items like dust baths, nesting boxes and perches. While space is limited, each unit houses the number of birds that mimics those natural groups and with mesh floors, their wastes fall away, keeping the birds and eggs clean. It's a practical and clean housing system that offers benefits to the birds and farmers, and affordable eggs for us.

Check out www.virtualfarmtours.ca to see five different types of hen housing and find out what the labels on the egg cartons mean.

Did you know...

...that an average chicken weighing 2.2 kilograms at market weight will have eaten four kilograms of a completely nutritionally balanced feed during its life? Chickens and turkeys are usually fed “free choice,” which means they can help themselves to the food or water anytime, buffet style.

No chickens, turkeys or egg-laying hens in Canada are ever fed hormones.



Chicken Farmers of Canada

Alain Bazinet and his family

FARMER PROFILE:

Alain Bazinet is a second-generation chicken farmer in Quebec who farms with his wife Carole and their three children. His father began the farm in 1966, with Alain taking over 25 years ago. Alain hopes that eventually he can pass along the farm to his three young sons as his father did for him. The farm is a family effort with Alain's father still helping out where needed. Their passion for chicken farming continues to grow. They're proud of their 600-acre farm and the legacy it will provide to future generations.

Courtesy of Chicken Farmers of Canada

Hens housed in a aviary (free run) egg barn





Hens housed in conventional housing

RESEARCH PROFILE:

Dr. Tina Widowski is the Director of the Campbell Centre for the Study of Animal Welfare, the Egg Farmers of Canada Poultry Welfare Research Chair and the Colonel K.L. Campbell University Chair in Animal Welfare at the University of Guelph. She is world-renowned for her work in farm animal behaviour and welfare, with a particular focus on pigs and poultry.

Dr. Widowski's research focuses on the health and welfare of laying hens, including studying different types of housing systems. One of her current projects examines the ways that different types of housing systems for pullets (young hens) affect hens' behaviour, bone health and egg production.

Her team is also working on many projects such as studying different breeds of laying hens in cage-free systems, and new types of enriched housing systems that provide hens with more space, nest boxes, perches and scratch areas. This work is all instrumental in many areas, including helping us understand the benefits and challenges of each type of housing system and working with egg farmers to continue to make changes to improve animal welfare.



Dr. Tina Widowski

Typically, free range eggs are defined as being from hens raised in large hen houses with access to outdoor runs (when weather allows). Free run eggs are from hens raised in an open barn or layer house where they can roam freely indoors, but can't go outside.

It is interesting to note that in some European countries, where public pressure for egg production without the use of conventional housing has led to legislation on different kinds of hen housing systems, old hen housing problems, which conventional housing had eliminated are starting to come back: higher levels of dust and ammonia in the hens' lungs, cannibalism among the birds, feather-pecking, and predators (including foxes) in or near the hen house.

It's a delicate housing and production system that continues to be studied for the right balance - for the birds, the eggs and the farmers.

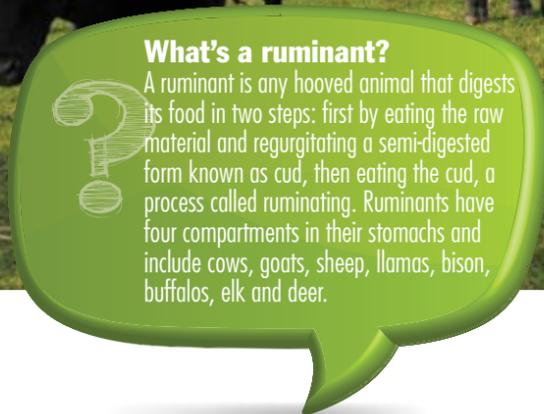
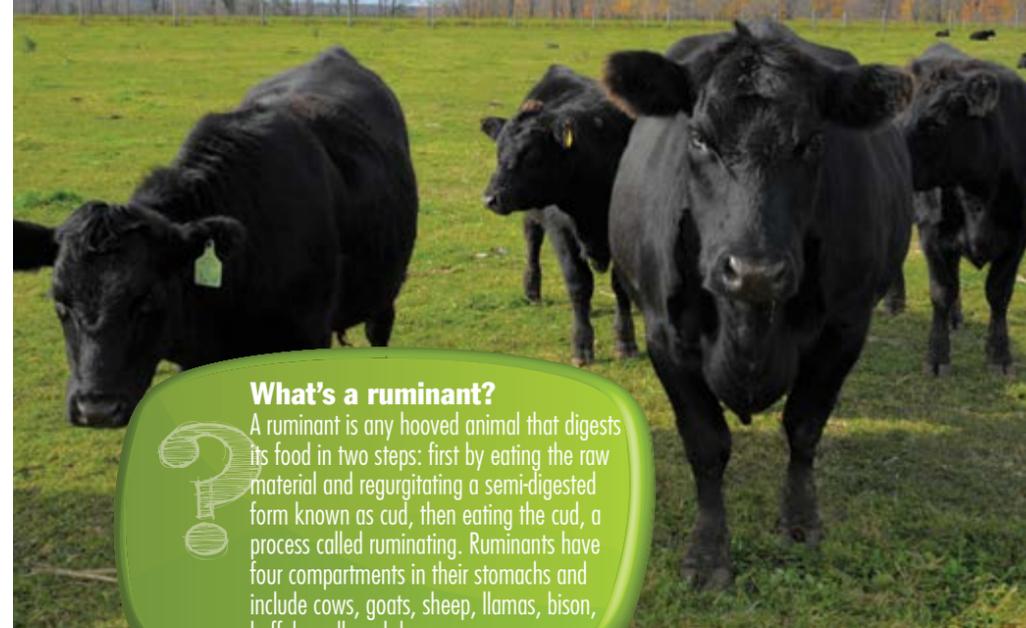
EGGS TO FIGHT DISEASE?

Some fertile chicken eggs (not the kind you eat) are specifically produced to help "hatch" vaccines in Canadian labs for people and animals.

To give you an idea, here's a small sampling of the vaccine types produced using this method:

- Eastern Equine
- Rabies
- Influenza
- Mumps
- Canine Distemper
- Yellow Fever

vaccine



Beef cows and their calves on pasture

About beef cattle

Beef cattle are specific breeds of cows that are raised for meat. Beef cows and calves typically live on pasture in spring, summer and fall, with a diet of mostly grasses. Beef cattle typically have a thick coat of fur and can live outdoors year-round comfortably as long as they have a good supply of food, water and adequate shelter.

Beef cattle are moved from fields and ranges to penned yards or barns called feedlots when they are approximately 900 to 1,000 lbs for the final months before they go to market. The feedlots are specially designed open pens or barns that provide ample space for the animals, protection from weather elements, good air flow, safe and comfortable footings and full access to feed and clean water. In the feedlot, the cattle are gradually switched from a diet of mainly forages and grasses to a high-energy diet of grains, corn or hay silage or hay. The consistent, high quality feed brings them to market weight faster than on grass alone. This feed also gives their meat a greater level of marbling, which is what helps give beef its consistent flavour and tenderness.



...that cows come in different shapes and sizes or breeds? Think of it this way - a Poodle is very different than a German Shepherd, just like a Holstein dairy cow is different from an Aberdeen Angus beef cow.

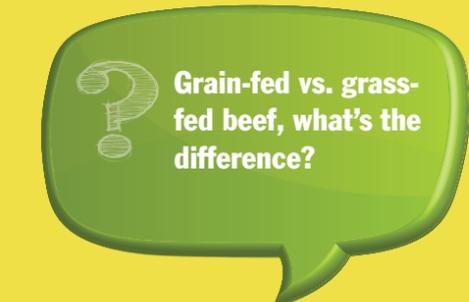
Beef breeds are more muscular and only produce enough milk for one calf each year (or occasionally twins). Major breeds of beef cattle in Canada include Aberdeen Angus, Charolais, Hereford, Simmental, Limousin, Maine-Anjou, Salers, Gelbvieh, and Shorthorn. Some beef farmers raise purebreds, but most have herds consisting of crossbred animals (combinations of more than one breed) to combine the best qualities of each breed.

COW TIPPING — MYTH OR REALITY?

A researcher at the University of British Columbia concluded it would take five people to push a cow over, and that's if the cow was willing to be tipped. Most cows do not sleep standing up and are startled easily by noise and strangers. So please, leave the poor cow alone!



Beef cattle in a feedlot



The difference in grain-fed and grass-fed beef is simply how the cattle are fed or "finished" before they are sent to market.

Grain-fed beef is the conventional method of beef farming, explained at left, where the animals are sent to a feedlot and they are fed a grain-based diet in the months before going to market.

Some farms choose to keep cattle in the fields until they reach market weight, which is then labelled 'grass-fed beef'.

Both grain-fed and grass-fed beef are healthy, nutritious options, though there will be differences in taste and marbling.

FARMER PROFILE:

Jason, Brad and Trevor Kornelius

Kornelius are three brothers who farm together in Saskatchewan. On their free-stall dairy farm, each of the brothers has his area of expertise. Trevor is in charge of cow herd health; Jason manages their feeding and cropping programs while Brad looks after the business aspects including finances and hiring additional help when needed. Animal care is the top priority on their farm. Their cows' feed is formulated and reviewed regularly by a specially-trained dairy nutritionist to ensure that they are getting the best nutrition possible. The brothers are proud of their family-run farm and the care they put into producing healthy, nutritious milk.



Farm & Food Care Saskatchewan



Dairy calf in a hutch

Dairy cows

Dairy cows are specific breeds of cattle that are raised for producing milk, such as Holstein or Jersey. Dairy cattle have thin coats of hair so couldn't withstand Canadian winters outside.

Dairy breeds are leaner with less muscling than beef breeds, as they put all their energy into making milk. There are six common dairy breeds: Holstein, Jersey, Ayrshire, Brown Swiss, Guernsey and Milking Shorthorn. Holsteins are the most commonly used breed in Canada and are often the most recognizable with their black and white colouring.

Dairy cows live in barns that use one of three systems:

- A traditional **tie-stall barn** gives each cow its own stall with bedding and free access to food and water in a manger in front. Farmers milk their cows by machine in their stalls and the milk flows into a pipeline that goes directly into a milk tank.
- A **free-stall barn** has large areas where cows move around freely and go to a central milking parlour area two or three times a day.
- A **robotic barn** is similar to a freestall barn except that cows go to a milking station where they will be milked and fed automatically whenever they want. The station or "robot" keeps track of how many times a day they've been milked and how much feed they have eaten.



Pam Mackenzie

A milking parlour in a freestall barn



Dairy cows in a freestall barn

Some dairy farmers let cows out to go to pasture in nice weather. However, when it rains or is too warm, cows generally prefer the comfort of a well-ventilated barn.



...Canada's dairy industry provides more than 218,000 jobs annually. It takes almost 2.1 million Canadians or one out of every eight jobs¹² – farmers, suppliers, processors, transporters, grocers and restaurant workers – to bring food to tables in Canada and around the world.

COW IGLOOS AND GIANT MARSHMALLOWS?

Have you ever driven past a farm and noticed calves living in what looks like an igloo? These are called calf hutches. Veterinarians will recommend that farmers house their calves in a hutch. Hutches allow calves to be fed individually and reduce contact with other animals and 'bugs' that could be in the barn. Farmers give calves extra milk and/or feed and bedding in cold weather too.

Sometimes in the summer you'll also see what look like giant white marshmallows sitting in fields. They are actually hay (plants such as clover and alfalfa) that has been cut and rolled into giant round bales and then wrapped in white plastic wrap. Wrapping lets farmers make hay bales even when the hay isn't totally dry yet, which means they can work to get their important hay crop for feed finished even if Mother Nature isn't co-operating.

The real deal about veal

Veal calves are generally dairy bull calves – male offspring of dairy cows - that can't be raised to produce milk. They live in one of three housing types: hutches, group pens, or individual stalls. Veal housing is well-lit, insulated, and ventilated, protecting the calves from predators, parasites, and weather.

Farmers raise veal calves two ways: by feeding a grain-based or milk-based diet. Milk-fed veal calves are raised on a diet that contains all of the essential nutrients for animal health and they're sent to market when they weigh about 450 pounds (178 kg). Grain-fed calves are fed a milk-based diet for the first six to eight weeks of their lives, after which they're gradually introduced to a diet of corn and protein. Grain-fed veal calves grow to be about 700 pounds (275 kg).

One of the biggest misconceptions about veal is that it is meat that comes from a very young and small calf, but 450 - 700 pounds is not small.

To tour two Canadian veal farms virtually, go to www.virtualfarmtours.ca.

Sheep, goats and the dogs that help

Sheep can be raised indoors and out. Some are kept out on pasture year-round, with the help of supplied hay and grain during winter. Other shepherds prefer to keep flocks in the barn year-round so they can keep a close eye on lambs and keep predators at bay. Most farms use a mix of both systems.

Working farm dogs play an important role on many Canadian sheep farms by helping farmers with herding and protecting the animals from predators like coyotes.



Dwane Morvik

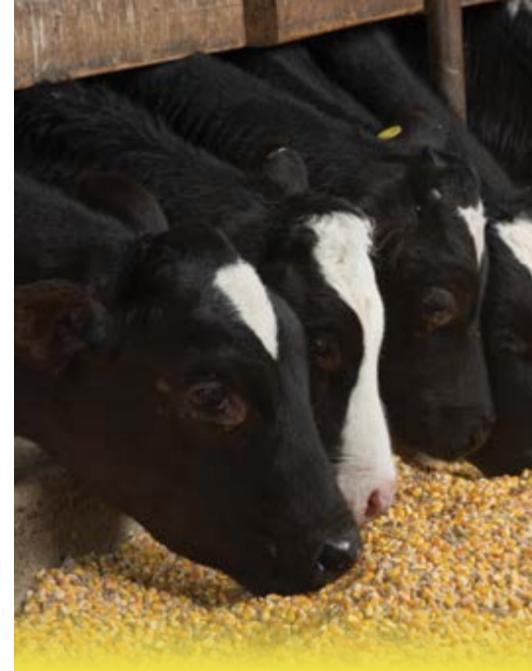
This Maremma sheepdog guards his flock from coyotes, wolves and bears.

GOATS

Like cattle, goats can be raised for meat or for milk production. Dairy goats are housed indoors and cared for like dairy cows with a regular milking routine. One goat will produce about three litres of milk per day and it takes 10 goats to produce the same amount of milk as one dairy cow. Other breeds of goats raised for meat may be on pasture, but still need protection from temperature extremes and predators.

There are people who have to avoid cow milk and dairy products in their diets because of allergies or intolerances, and many are turning to goat milk. According to Statistics Canada, there are approximately 225,000 goats on almost 6,000 farms in Canada¹⁴, with the largest number in Ontario.

Quick fact:
Did you know that the pupil of a goat's eye is rectangular, unlike humans who have round pupils¹³?



VEAL CALVES GET BULLIED TOO

A lot of terms that we use in the English language have their basis in farming. We already mentioned the "pecking" order. "Bullying" is another. Traditionally, milk-fed veal calves (bull calves) have been raised in stalls to provide them with individual care and allow them to drink their milk without the fear of "bullying" from other calves. However, with today's technology, some milk-fed veal farmers are raising their calves in group pens where the calves drink from an automated milk dispenser (almost like a giant milk shake machine). This allows calves to drink whenever they want and with less competition. On a grain-fed veal farm, the calves are weaned off of milk between six and eight weeks of age.



Chris Grab



Pigs

Most pigs live in specially designed barns with fans or 'curtain-sided barns' that can open if needed to help control humidity and extreme temperatures. To keep the animals disease-free, most barns have strict sanitation standards and animal health rules, or biosecurity protocols, in place.

Sows are female pigs that usually birth eight to 12 piglets in a litter and give birth — farmers call it farrowing — twice a year. Sows are put in special pens called "farrowing pens," just before giving birth and while they nurse their piglets. This is to provide the best environment for both the large sow and the small piglets — the pen's bars give the sow something to lean against when she lies down, and the piglets have a safe area to stay out of harm's way so the sow won't lie down on top of them. The area where the piglets sleep can be kept warm with a heat lamp or heating pad.

Like with hens, there are many options for housing pigs with no perfect solutions. For example, in pig housing, we often trade off free pen space for individual pens. Sows are omnivores and can be aggressive animals when they compete for food, so many pig farms choose to house sows in individual stalls.

Millions of dollars have been, and continue to be, invested in pig housing research around the world. There is no easy answer, but from this research we have learned that it is too simplistic to look at just one issue in isolation. There are many factors to be considered, including animal health and welfare, human health and safety, environmental impacts, food safety and economics.



A sow and her piglets in a farrowing pen



Sweat like a pig? It's not likely!

Forget what you've heard about that expression. Pigs like to keep clean and they can't sweat to cool off. Barns provide a clean environment and some even have sprinklers to keep the animals cool in the summer.

Did you know...

...the expression "sweat like a pig" actually comes from the smelting process of iron? After the iron has cooled off, it resembles piglets and a sow, and as it cools, beads of moisture — like sweat — form on its surface. This means it has cooled enough to be moved safely.

A farmer feeds sows housed in individual stalls

Beyond traditional farm animals

Canada's growing ethnic communities and a desire by consumers for more diverse food means farmers are also raising less traditional livestock, particularly in Western Canada. Saskatchewan, for example, has the most wild boars in Canada and the second largest numbers of bison, elk and deer after Alberta¹⁵. These animals are mainly raised for meat, but antler velvet from elk and deer is also an ingredient in holistic medicines, which are produced in North America for export to Pacific Rim countries. Llamas and alpacas are raised for their wool, which many consider comparable to cashmere in softness.

FARMING FISH?

Aquaculture or "fish farming" is the aquatic form of agriculture. Aquaculture is a natural choice for Canada. Not only does Canada have the world's longest coastline — but it also has the largest freshwater system and the world's largest tidal range.

Aquaculture contributes to the economies of all Canadian provinces — as well as in the Yukon. In Canada, aquaculture generates about \$2 billion in economic activity and creates over 14,500 jobs for Canadians throughout the food production value chain. Two-thirds of all workers are under the age of 35. Canada sustainably farms approximately 174,000 tonnes of seafood a year.

Canadian fish farmers raise more than a dozen types of fish and shellfish. The main three species of finfish raised are salmon, rainbow trout (steelhead) and arctic char. When it comes to shellfish, mussels and oysters are the most common while clams and scallops are also farmed in smaller amounts.

What about fur farming?

The fur trade has been around since before Canada was even a country and exists, to this day, as an important part of the economy. The fur trade contributes \$800 million to the Canadian economy and provides important income for over 65,000 Canadians, including many aboriginal and other people in remote and rural regions. The industry consists of 60,000 trappers, 2,000 people in fur farming, 2,500 people in manufacturing and processing, 2,500 people in retailing, and 1,000 people in related services.

Canada's total fur exports have increased by one-third in the past six years. Canada's main export markets for fur are China, the United States, Russia and the European Union.

Almost three million fur pelts are produced annually in Canada (two million of those on farms). On fur farms, the most common animal raised in Canada is mink. Other farmed furs are fox and chinchilla. Main Canadian wild furs include muskrat, beaver, raccoon, coyote and marten.¹⁶

Horses

Horses are not ruminants, like cows or deer. However, they do have a special stomach that allows them to thrive on a diet of grasses, hay, oats, corn or barley. If the need arises, they can also exist on dry grass and scrub brush and trees. Most horses in Canada are used for recreation purposes, but there are still many working horses on ranches which still play a very valuable role in assisting with ranch work and helping ranchers check and move cattle today.



Dwane Morvik



Open net pens for a trout farm
Northern Ontario Aquaculture Association

TIPPING THE SCALES

We get asked a lot of questions like: How big is a horse? How much do pigs weigh when they go to market? Here's a chart of the approximate weight of an average male (females weigh a bit less):





Let's talk crops

Canadian farms provide a diverse range of crops for domestic and international markets. There are literally hundreds of crops being grown in fields and greenhouses across the country - from more traditional crops like corn, wheat and soybean to pulses, fruits and vegetables, flowers and specialty crops. Here are some basics on the more common ones.

Corn, wheat, soybeans, canola (aka grains and oilseeds)

Canada's principal grain and oilseed crops are corn, wheat, soybeans and canola. Corn and wheat are widely grown across the country. Soybeans are found mostly in Ontario, Quebec and Manitoba, while canola is grown mostly in Western Canada.

Quick fact:
One acre of soybeans can produce 82,368 crayons¹⁷.



Pat Vandenbogaard



Canola was developed in the 1970s by Canadian plant scientists and is now the oil of choice for millions around the world. Canola is a cool season crop. It grows particularly well on the prairies, where cool nights and hot days allow it to develop its unique fatty acid profile. Canola seeds are about 43 per cent oil – an oil that is low in saturated fat. The oil from canola is used for cooking and baking at home, restaurants and in food processing plants. Canola oil also has non-food uses - for example biodiesel and bio-plastics. Canola meal, the part left over after the seeds are crushed and the oil extracted, is used for animal feed, pet food and fertilizer.

FARMER PROFILE:

Manitoba canola farmer Curtis McRae's earliest memories include riding in the tractor with his dad. Annually, he participates in Agricultural Literacy week where he and other farmers go into classrooms and talk to students about where their food comes from. Curtis is a strong believer that farmers have to be good environmental stewards. "I have to look after the land, so that my children can run an even better farm than I have."

Quick fact:

Did you know that Chris Hadfield, the first Canadian to command the International Space Station, was raised on a grain farm near Milton, Ontario? He credits farming with teaching him how machinery worked long before he got his first degree in mechanical engineering.²²

Pulses and special crops

Canada is the world's largest exporter of pulses. The eight major pulse and special crops are: peas, lentils, beans, chickpeas, mustard, sunflowers, canary seed and buckwheat¹⁸. In 2010, Canada exported a record 4.3 million tonnes of pulses worth more than \$2.1 billion. These crops contain important nutrients including protein, fiber, folate, iron and other minerals. Canadian production of the eight major pulse and special crops increased from about 1,000,000 tonnes in the early 1990s to 5.7 million tonnes in 2010, a fivefold increase in 20 years.

Canada is a world leader in the production and export of mustard and Saskatchewan is responsible for 75 per cent of the country's production¹⁹. In fact, more than one quarter of world mustard exports in 2014 originated in Saskatchewan where farmers grew 268,000 acres of the crop. Saskatchewan produces three different types of mustard: yellow, brown and oriental. Canadian mustard is exported all over the world to countries such as the United States, Germany, Belgium, Japan, South Korea, Australia, the UK, and Thailand.

Quebec and Ontario produce bean crops (a wide array of coloured beans as well as the white navy bean). Manitoba produces white and coloured beans, as well as peas and lentils. Saskatchewan is the largest producer of peas, lentils and chickpeas and has a small bean industry, and Alberta produces beans under irrigation as well as peas, lentils and chickpeas.

Quick fact:
2016 has been designated International Year of the Pulses by the United Nations.

Fruits and vegetables

Over 125 different fruit and vegetable crops are grown in Canada from coast to coast to coast. This includes apples, pears, peaches, cherries, cranberries, blueberries, grapes, ginseng, garlic, onions, carrots, peppers, asparagus, potatoes, cauliflower, cucumbers, cabbage, broccoli and so much more.

Farmers in Ontario and Quebec account for more than 80 per cent of vegetable sales and the vast majority of fruit sales came from British Columbia (37.7 per cent), Ontario (27.0 per cent) and Quebec (23.1 per cent)²⁰.



Quick fact:
Canada produces about 10 billion pounds of potatoes per year. PEI is the largest producer of potatoes, producing approx. 2.5 billion pounds of potatoes in 2013.

A field of mustard in Saskatchewan
SK Mustard Growers Association



PEI Potato Board

Becky Townsend and her father Peter

FARMER PROFILE:

Becky Townsend is an eighth generation farmer on Prince Edward Island who farms with her parents Peter and Lynn. They primarily grow potatoes (of the Russet Burbank variety for the french fry market) but are continually diversifying and now grow carrots, soybeans, and low-bush blueberries. As a potato farmer, Becky is passionate about environmental stewardship and bettering the quality of her farm's land. As one example, she works closely with a trained crop scout to ensure she is staying ahead of any weeds or pests that might cause damage to her crops.



BC Cranberry Growers' Association

FARMER PROFILE:

Grant Keefer is a third generation farmer who grows cranberries with his wife and young children in British Columbia. For many cranberry farmers, their product goes directly to a receiving station in Richmond or Langley. Approximately 95% of the 80 cranberry farmers in British Columbia grow for the company Ocean Spray which is a grower cooperative that is owned by farmers. In 2012, B.C. farmers produced 94 million pounds of cranberries on 6,500 acres of bogs. Grant believes that cranberry farming in B.C. has a strong future for his family and the rest of B.C.'s cranberry farm families.



...cranberries are one of only three indigenous, commercially grown berries in North America (the other two are blueberries and concord grapes). Early settlers called cranberries "crane berry" because the shape of the blossom resembles the head of a crane.

GROWING CROPS ON MARS?

If humans ever get to Mars, they'll need to be able to grow their own food — transporting enough food for the long voyage to Mars and back would be both too expensive and take up too much space. Canadian plant scientist Dr. Mike Dixon of the University of Guelph has developed a greenhouse system that would allow future astronauts to grow vegetables in space — and he's testing his concepts in a greenhouse in the Canadian Arctic where the harsh climate is similar to what could be expected on the Red Planet.

TOMATOES ARE OUT OF THIS WORLD... LITERALLY

Tomatosphere is part of science class for students in more than 16,000 Canadian and U.S. classrooms. Participating teachers receive two packets of seeds — one that has been to space and one that hasn't — and students learn how to conduct a scientific experiment by watching both sets of seeds germinate and grow into tomato plants. In 2014, the project will use 600,000 seeds that were taken to the International Space Station on the last U.S. shuttle mission in July 2011 and returned to earth with Commander Chris Hadfield in May of 2013, after spending about 22 months in outer space²¹.

Greenhouses bloom year-round

More and more of the fresh vegetables and flowers we enjoy year round are grown in greenhouses. Greenhouse expansion continued from 2006 to 2011, bringing the total greenhouse area to 249.3 million square feet. More than half of that is dedicated to vegetable production.

Ontario has more greenhouses than any other province, followed by British Columbia and Quebec²³. Ontario, with 2,398 acres of greenhouse vegetable production, is the largest greenhouse production sector in all of North America — over 70 per cent of Ontario's greenhouse vegetable crops are exported to the United States²⁴. Vegetable greenhouses grow primarily peppers, cucumbers and tomatoes.

There are more than 1,900 flower growers across Canada. The floral sector employs over 20,000 and includes growers of cut flowers, potted plants, bedding plants and/or propagation material. Tulips, gerbera, lilies, daffodils and roses are among the most produced cut flowers in Canada.

Almost 99% of Canada's floral industry exports are to the United States.



New Canadians = new crops

People of Asian heritage make up more than 60 per cent of all of Canada's immigrants today. Chinese and South Asians (from India, Pakistan, Bangladesh and Sri Lanka) are now Canada's two largest ethnic communities and it is predicted that they will number close to four million by 2017. New Canadians are actively looking for produce that they are familiar with from their native countries, so some farmers have begun growing crops that aren't traditional in Canada — crops like bok choy, nappa (Chinese cabbage), okra, Indian and Asian eggplants, yard long beans and Indian red carrot.



...that carrots come in many colours? Yes, they're not just orange but also grown in varieties that are purple, yellow and white.

LOOKING TO THE PAST = HERITAGE VARIETIES

Sometimes what is old is new again. Some farmers are actively growing and marketing vegetable varieties that were common 50 or 100 years ago, but are no longer used in modern food production. We call these "heritage varieties". Foods from these types of produce are known for their unique flavours and are prized by chefs and discerning consumers alike. They are mostly sold as specialty products and farmers receive higher prices for them because raising them is a slower, more labour-intensive process than regular, modern crops.

TO EVERYTHING THERE'S A SEASON



...we couldn't always get plums, grapes and sweet corn at the grocery store all year round? Every crop is ready for harvest — and eating — at a different time of year. Asparagus, for example, is one of the earliest vegetable crops, usually available by May. Summer means cherries, peaches, garlic and potatoes, and fall brings apples, pumpkins, squash, carrots, onions and much more. Refrigeration and improved preservation, technology and transport have all contributed to extended availability and more widely available fruits and vegetables.



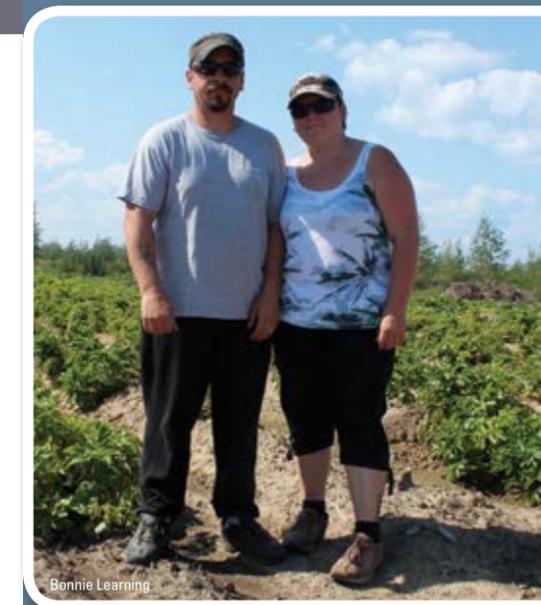
A BERRY LONG SEASON



...that you can get fresh strawberries and raspberries outside the traditional picking season? Traditionally, strawberry season has lasted only a few weeks in the spring, usually in June. Berry farms are now growing day-neutral (ever-bearing) strawberries and fall-bearing raspberries, which means we can get locally grown fruit from May until October.



Ethnic vegetables
(Vineland Research and Innovation Centre)



Bonnie Learning
Janet and Lorne Patey

FARMER PROFILE:

Janet and Lorne Patey are growing lettuce in a hydroponic greenhouse, the first of its kind in Newfoundland and Labrador. Despite harsh winter weather, the Pateys are able to grow 1,200 heads of lettuce weekly on a year-round basis which goes to restaurants and grocery stores in their area. Due to the hydroponic method, the lettuce grows faster than through the traditional soil method. It is also fresher and lasts longer.

4

Food affordability and the economics of farming



The economics of food

Farming is a way of life for Canada's farmers — and it's essential to food security, which means ensuring you, our country and the world's population has enough to eat. But farms are also businesses and they must be able to make money if they want to keep producing food and providing jobs. It takes more than farms to feed a country. We need a whole supply chain that is also economically viable to make our food happen, including suppliers such as feed or fertilizer, equipment, processors and transporters.

Let's take a look at the dollars and cents of food and farming in Canada.

IT TAKES MONEY TO MAKE MONEY

We all need to make money to stay in business — not just farmers

In 2012, for every dollar we earned in gross sales, Canadian farmers paid out approximately \$0.75 in operating expenses²⁵. As the price of fuel, fertilizer and other inputs — items used to grow crops and raise livestock — continues to increase, farmers have had to become even more productive and efficient to stay in business.

For example, for every one cent per litre increase in fuel prices, Canadian farmers' annual machinery fuel bill increases by about \$27 million. For fertilizer, every ten dollar per tonne increase in the price adds about \$71 million to their collective annual fertilizer bill²⁶. And even though farmers have to pay these higher prices for energy, labour, fertilizer, fuel and other inputs, it doesn't mean that the prices we get for our products go up at the same rate.

Food Freedom Day



...that in Canada, we mark Food Freedom Day in early February? This is the calendar date when the average Canadian has earned enough income to pay his or her individual grocery bill for the whole year. Canadians enjoy one of the lowest-cost "food baskets" in the world, spending only about \$0.10 of every dollar on food — compared to almost \$0.25 in Mexico and approximately \$0.31 in Russia²⁷.



Farmers take a thin share of the food dollar

In Western Canada, for example, research shows that out of every dollar spent on food, only approximately 33 cents goes back to the farmer²⁸ and even when consumer food prices go up, the amount that goes back to the farm doesn't change.

The 2012 study also showed that²⁹:

- Consumers paid an average of **\$5.38** for one pound each of carrots, onions and potatoes and 759 grams of peas — but the farmer's share was only **\$1.53**.
- One kilogram of oats, 675 grams of bread and 540 grams of cereal cost consumers an average of **\$8.71**, of which the farmer received only **\$0.58**.
- Four litres of milk, 650 grams of yogurt and one kilogram of cheese that cost you an average of **\$19.03** at the grocery store in turn paid only **\$9.42** to the farmer who produced them.
- Livestock farmers received only \$19.04 or 33 per cent of the **\$57.25** consumers paid at the store for one kilogram each of beef, turkey, chicken breast and pork, a dozen large eggs and 398 milliliters of beans.
- According to Chicken Farmers of Canada, the average cost of a quarter chicken dinner at Swiss Chalet is **\$10.19** (or \$13.24 if you add in taxes and a gratuity) — of which the farmer's share is **\$1.06** — or 10.4 per cent of the cost*.

* Farmers Share of Meal is derived from the 'Cost of Menu Item' and is based on a live price of \$1.70/kg³⁰.



Generally speaking, foods sold as organic are those grown or produced without the use of synthetic (or man-made) fertilizers and pesticides, genetically modified organisms, growth hormones or medications like antibiotics.

To be labelled and marketed as certified organic, food must be produced by farmers who are certified as organic producers under Canada's Organic Products Regulations, which came into effect in 2009 after much work was done by the Canadian Organic Growers. This made the Canadian Organic Standard mandatory. Products sold internationally or exported to other Canadian provinces must adhere to this national standard, and organic farmers must renew their certification every year³².

Organic farming isn't easy and has its own unique challenges, but there can also be significant rewards. Farmers need to have a lot of information, available skilled labour, and time to grow crops or raise livestock organically. Yields often tend to be lower or less reliable, and the work of organic growing is more labour-intensive than with non-organic techniques. Third-party auditing and extensive record-keeping is required to ensure standards are being met. All of these things combine to generally make organic food and products more expensive than those that aren't.



Food choices abound

We are lucky to live in a country like Canada, where we have a wide variety of food available to us — and there has always been plenty of it. Even during the Great Depression of the 1930s, when some people in Canada went hungry, it was because they couldn't afford to buy food, not because there wasn't enough available. We have the land, the water and the farmers here to produce enough food not only for ourselves, but also to feed people in other areas around the world.

All of this means we have a wide choice when it comes to the kinds of foods we can buy, and we have the freedom and opportunity to support different types of farming or production systems. This isn't always the case in other parts of the world, where food shortages exist or food is so expensive that it is out of the reach of many people.

Quick fact:
Of all the eggs bought in Canadian grocery stores, 87.3 per cent are "regular", 8.2 per cent are omega-3, and 4.5 per cent are other specialty types (such as free range, organic).
(Neilson data, May 2014)

ORGANIC

160% INCREASE

\$1 billion to \$2.6 billion



There's no doubt that organic represents a steadily growing market. From 2006 to 2010, the Canadian organic consumer market increased 160 per cent from \$1 billion to \$2.6 billion, making Canada the fifth largest organic market in the world. Farmers, processors and others in the food and farming industry are working hard to meet that demand: organic farm numbers grew by 66.5 per cent from 2001 to 2011, even though overall farm numbers in Canada declined. There are approximately 3,700 certified organic farms in Canada³³.

Quick fact: did you know the world's population is growing by 75 million people every year? That's like adding cities the size of Ottawa and Vancouver every week³⁵!



Are organically produced foods healthier or safer?

There is no evidence that organically produced food is healthier or safer than food that isn't certified organic. All food must meet the same inspection and food safety standards. Organics serve a market of consumers interested in those standards and willing to pay a premium for it. Some farmers are benefiting from this niche by receiving higher prices for their products, although it's important to remember that their cost to grow and produce organic products is also significantly higher.

All agricultural food products (raised organically or not) — meat, eggs, dairy, fruits, vegetables and others — are rich in nutrients and part of *Eating Well with Canada's Food Guide*, regardless of how they are produced. Learn more about healthy, balanced diets in Canada's Food Guide at www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php.

Organic production is not intended to become the only way we produce food. Not only would most of the world's population not be able to afford organic food because it costs more to produce, but with our global population still growing, we simply don't have the land, water and other natural resources available to grow the amount of food that we will need organically. It is estimated that in 40 years, we will need 100 per cent more food than we produce today³⁴.

did you know...

...worldwide, we lose a soccer field of farm land every second, while adding two more people to the world's population?³⁶

Food labels — what do they really mean?

The beauty of our Canadian food system is the amazing variety of food options we have to choose from. It's up to you to decide what you want to buy — but sometimes it pays to do a little research when it comes to food labels and what their claims really mean. For example:

1. What is "natural" meat?

All meat is natural in the sense that it comes from animals. According to government definitions, the only meat that can legally be labelled "natural" is meat raised without ANY human intervention of any kind. This means only meat from animals raised or living in the wild (like deer, moose, bear and other wild game) can be referred to as "natural".

2. What about beef free of hormones?

There is no such thing as hormone-free beef. All animals produce hormones naturally, so even meat from organically-raised cattle will contain hormones.

3. What does gluten-free mean?

Gluten is a protein that's found in wheat, barley, rye, triticale and foods made with these grains. Gluten must be avoided by 1% of Canadians who have Celiac disease, and those with gluten intolerance (maybe 5%) or wheat allergy (less than 1%). Otherwise, despite much media hype, gluten is not problematic for the rest of the population. In grocery stores, products labelled "gluten-free" are not any healthier; they are just made with alternative ingredients that don't include gluten. But read the label. They often have more salt, fat or sugar to add flavour — so it is buyer beware.

EATING LOCALLY AND FEEDING THE WORLD

Over the last few years, the idea of buying and eating local has really taken off in Canada. The definition of local can vary and range from your region, to your province to your country.

The local food movement has resulted in more farmers' markets and local food stores, the birth of local food hubs, and many different "buy local" campaigns and programs right across Canada that encourage Canadians to support farmers in their own areas by eating the produce, meat, cheese and yogurt, jams, honeys and baked goods they've produced.

But not all Canadian farmers can produce for local markets. Our Canadian climate means we can't grow food year-round and there are many foods we have in our diets that we simply cannot grow here at all — think of coffee, tropical fruits or rice, for example.

We're also a large country with fertile soils that allow us to grow much more of some products than we can eat and use - and there is a global need for farmers in countries like ours to grow staple crops like pulses (such as dried peas, edible beans, lentils and chickpeas), canola, corn, wheat and soybeans.

WASTE NOT

According to the United Nations, approximately one third of all food produced doesn't make it from the farm to the table. A new study by the World Resources Institute and the United Nations Environment Programme has found that one out of every four calories produced by the global agricultural system is lost or wasted³⁷. Closer to home, a 2010 study by the Value Chain Management Centre estimated that \$27 billion worth of food is wasted annually in Canada³⁸.

Investing in strategies to help prevent food waste, from your kitchen right through to the biggest food producers, is something we all need to support.

Quick fact: Every year, consumers in rich countries waste almost as much food (222 million tonnes) as the entire net food production of sub-Saharan Africa (230 million tonnes)³⁹.

Farm labour

Farmers increasingly need to hire additional people (besides family members) to help them with the work that needs to be done, especially as farms keep growing. Technology and equipment help, but people are still the most important component of every farm.

Fruit and vegetable farmers in particular rely on many people to help them plant, manage and harvest their crops when there are no machines to do these jobs. Since 1966, workers have been coming from Mexico, Jamaica and countries in the Eastern Caribbean to work on Canadian fruit and vegetable farms through the Seasonal Agricultural Workers' Program (SAWP). It's a perfect match between Canadian farmers who have plenty of seasonal jobs and not enough workers to fill them and workers from countries where there's a shortage of employment.



Planting a field of vegetables



FARMER PROFILE:

Jamaican native **Donald Dyer** started working on a southwestern Ontario vegetable farm when he was just 29 years old. Now 58, he has spent most of his adult life helping with harvest in Canada. Like many seasonal workers, Dyer arrives on the farm in late spring and remains throughout the growing season -- about six to seven months each year.

Working in Canada has allowed Dyer to put his three daughters and one son through school and to buy a better home — and says he makes 10 times more money in Canada than he could ever make back in Jamaica. Even though he misses his family, he looks forward to returning to Canada every year.

Dyer is one of the program's many success stories. Approximately 20,000 people come to work in Canada through seasonal worker program every year and many have been coming for decades. Close relationships develop between many workers and the farm families they work for, and many workers also become involved in their adopted communities through volunteering and joining local service clubs and church groups. For more information, visit www.farmsontario.ca



Safe food starts on the farm



“There is no love sincerer than the love of food.” - George Bernard Shaw

Food and water are basic necessities for life. Access to safe, high quality and affordable food choices are something that many of us in Canada thankfully don't have to think about very often. Our grocery stores and farmers' markets are never empty. We rarely worry about the safety of our food because we expect it to be safe.

While food security and nutrition are out of scope for this booklet, let's look at what happens behind the scenes to get safe food from our farms to your forks. Farmers take their commitment to providing you with safe food very seriously. We eat the same food you do, and know that our livelihood depends on producing safe high quality food.

A food safety scare or recall is alarming to Canadians - including farmers and those responsible for getting food to your table. We know how important producing safe, high quality food is and are committed to continuously making it better.

When it comes to food, we are lucky to live where we do. Canada is respected around the world for the quality and safety of our food. Regulations and safety systems in place throughout the food production process are the checks and balances to ensure that safe food starts on the farm and gets to you.

That's why food and farming groups, farmers and government have developed best management practices and practical protocols like HACCP (Hazard Analysis Critical Control Point) to help farmers produce safe food, while minimizing risks and problems.

On-farm food safety programs identify critical points where food safety could be at risk, like when a new animal is brought on-farm or when fresh produce is packed into bins. These same principles are also applied throughout the food chain, including mills that prepare animal feed, food processing facilities and even at your local grocery store.

Participating in these programs means farmers evaluate their practices, keeping records of what is done on the farm and having those records – and their farm – verified or assessed regularly by an auditor or third party. Part of the program includes what to do if problems do arise, and how to take steps to confine it to just one farm, for example.

While each program is different, depending on farm type and type of assessments required, the principles of producing safe food responsibility are the same.

“Raising healthy chickens in a humane way is as important to farmers like us as it is to you. Our farm follows a government recognized, national food safety and animal care program that puts a priority on health, cleanliness, and safety so that Canadians can have confidence in the food that they are buying for their families – just like we look to provide for ours.”

Chris & Nella Kloot, Rosedale, BC

Did you know...

...that milk is identified and sampled from every farm before it's put in the milk truck? This is to ensure each tank of milk meets strict government quality standards. In addition to farm samples, every milk truckload is tested at the processing plant. If there's a problem with the milk, the entire load is rejected and the farmer deemed responsible can be fined.

What makes the news about food?

Unfortunately, information about food portrayed in traditional and social media can be misleading or even false, so many of us are left to form opinions and make food choices with mixed or confusing messages. This confusion is particularly rampant around hot topics such as the use of animal medicines or pesticides. Rarely has a news headline or an internet search captured how or why farmers use technology to raise animals or grow crops to produce more abundant, healthier food with less impact on the environment; instead they often focus on common misconceptions or myths. Here are a few common questions that we're often asked.

WHAT ABOUT HORMONES?

The very word 'hormones' conjures up a lot of concern for many people. Hormones occur naturally in people, plants and animals. Here are some important facts and examples for you to consider.

1. Are there hormones in poultry or pork?

No chickens, turkeys, egg-laying hens or pigs are ever fed hormones. Today's farm animals grow faster because we've learned how to feed them exactly what they need and through choosing animals for their good genetics over many generations.

2. Are there growth hormones used in milk production?

Not in Canada. In the U.S., a product called rBST (recombinant bovine somatotropin) has been approved for use in dairy cows for the last 20 years to increase how much milk they produce. It's a hormone which occurs naturally in the pituitary glands of all cattle that can be given to cows to boost their milk production. This product is not licensed for sale in our country.

3. Why are hormones sometimes used in beef cattle?

First, it is important to mention that there is no such thing as hormone-free beef. Hormones occur naturally in all animals, people and plants. There are, however, both natural and synthetic versions of natural hormones approved by Health Canada for safe use in beef, and some beef farmers will choose to use them. You may be wondering why they do that and what that means for you and the beef you eat. Here's the scoop:

- Hormones help cattle convert the food they eat into muscle more quickly and easily. This means they will develop more lean meat. It also means that cattle can be raised using fewer resources – less feed and water with less manure produced.
- Farmers that use hormones must follow strict withdrawal times before treated animals go to market.
- Organic beef and beef from animals raised conventionally have similar levels of hormones.
- The level of hormones in beef from cattle who have received the growth supplements is virtually the same in beef from cattle not given the supplements. Hormone levels are measured in nanograms (one nanogram is one billionth of a gram, or a very tiny amount). The estrogen in a serving of beef is very low, especially when we compare it to the amount of hormones we produce naturally in our own bodies.
- The safety of hormone use has been confirmed, worldwide, by agencies including Health Canada, the WHO and the Food and Agriculture Organization of the United Nations.



Shannon Steen



Item	Estrogen (in nanograms)
Birth control pills (per pill)	20,000 – 50,000
Soybean oil (15 ml)	28,773**
Cabbage (100 g)	2,381
Beef from cattle not given hormonal growth promotants (100 g)	1.5
Beef from cattle given hormonal growth promotants (100 g)	2.2

**estrogen equivalent activity (i.e. in the form of phytoestrogens) Information courtesy of Canada Beef www.beefinfo.org

Did you know...

...without the use of hormones in the production of beef, we would need 12% more cattle, 10% more land, 11% more feed and 4% more water to produce the same amount of beef. This in turn would require 7% more fuel and fertilizer.⁴⁰



Tim May

What about antibiotic resistance in people?

Antibiotics are a go-to tool in modern medicine. Resistance is a natural phenomenon due to use and misuse of antibiotics in both human and animal medicine. Some strains of bacteria may survive exposure to an antibiotic and become resistant to treatment. This is why it is important that antibiotics be used prudently, so we have the ability to continue to treat humans and animals successfully for many years to come.

Antimicrobial resistance is a concern for everyone. Some people point the finger at agriculture, but it's important to remember that as humans, we have a major role to play here as well. We should only take antibiotics for conditions or problems where antibiotics will actually help — and we must be sure to follow instructions on dose and usage very precisely. Farmers apply those same principles to using these products for their livestock. This is a complex topic, and critically important research into resistance is ongoing in both human and animal medicine.

LET'S TALK ABOUT ANTIBIOTIC USE

Keeping animals healthy is a top priority for farmers and veterinarians. A serious health problem can wipe out a farm's or even a whole industry's animals, in addition to causing animals to suffer. Prevention, through use of vaccines, is always preferred over treatment. Think of your own pet. You feed it the right foods, and take it to the vet to keep it healthy. Farmers want their animals to be healthy too. Good housing, hygiene, nutrition and biosecurity are all common strategies farmers use to maintain and improve their animals' health.

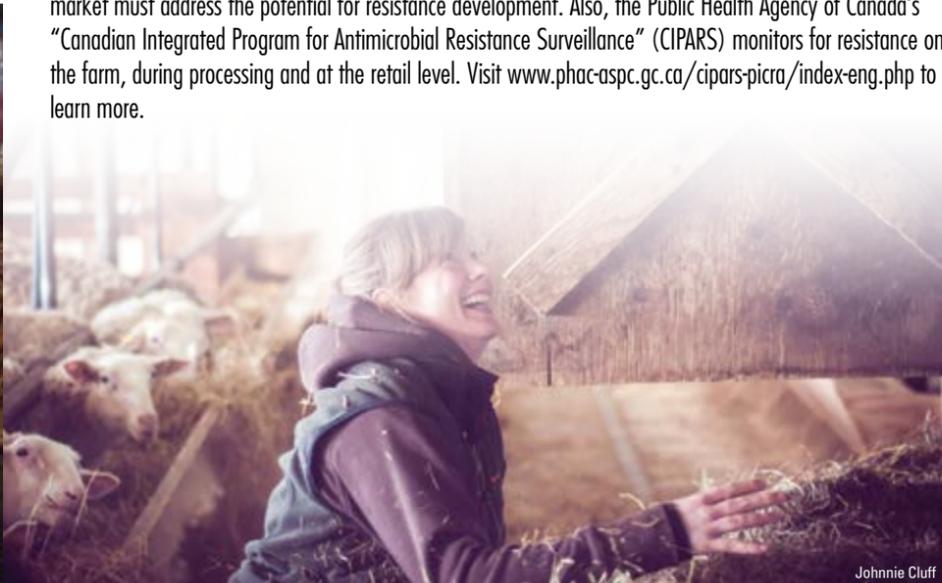
Antimicrobials are medications that fight bacterial infections in humans and animals. Antibiotics are just one type of antimicrobial. We use antibiotics in farming to:

- 1. Treat** livestock and poultry for illness when a disease breaks out, both in individual animals and in entire herds and flocks.
- 2. Prevent** typical and recurring diseases, especially during stressful times of an animal's life. For pigs, for example, this can be during weaning when piglets are weaned from the female sows or when pigs from different groups or farms come together in a pen and can be exposed to many different diseases.
- 3. Control disease** antibiotics help reduce the spread of disease to other animals.
- 4. Promote** overall health and growth — antibiotics can be used in animals to improve the ecosystem of their intestinal tract, allowing them to more efficiently absorb nutrients.

Earlier this year, Health Canada and the manufacturers of animal medications agreed to remove growth promotion label claims from medically important drugs used in feed and water. Additionally, veterinary oversight of these products will be required in the future.

Farmers are careful in their use of these products, most of which require veterinary supervision to be used on farm. Antimicrobials are expensive and farmers try to minimize their use wherever possible. When they're used, they're given in small doses to individual animals or incorporated directly into their feed or water. Researchers are also exploring alternative treatment options.

Any product for use with farm animals must meet Health Canada's strict standards for human and animal safety. A major component of research studies required to support new animal health products coming to market must address the potential for resistance development. Also, the Public Health Agency of Canada's "Canadian Integrated Program for Antimicrobial Resistance Surveillance" (CIPARS) monitors for resistance on the farm, during processing and at the retail level. Visit www.phac-aspc.gc.ca/cipars-picra/index-eng.php to learn more.



Johnnie Cluff

ANIMAL AND HUMAN HEALTH ISSUES IN THE SPOTLIGHT

Animal and human health issues like influenza, E.coli and mad cow disease are things we take very seriously. The food and farming industries have invested millions of dollars into research, prevention and emergency preparedness for issues like these — and continue to do so to ensure Canadians have the safest food and the healthiest animals possible.

1 Influenza

Influenza — commonly called the "flu" — makes many of us sick every year. Birds and pigs can also be affected by influenza, often called "bird flu" or "swine flu" in the media. You can't catch bird or swine flu from eating pork, eggs, chicken or turkey. You should always, however, follow safe food handling practices and cook meats thoroughly for many other reasons.

There is a strain of bird or avian flu that makes headlines from time to time called H5N1. It is a particularly aggressive strain, but for it to infect a person, he/she would have to be in very close contact with infected birds. In some parts of Asia, where humans first contracted this strain of bird flu, it's common for humans to live in close contact with their chickens. It's also part of the culture to purchase chickens at "live markets." Note though, that even under these circumstances, it is extremely rare to contract bird flu.

Public health agencies track incidences of these diseases and are always on the watch for them in Canada. This is a key reason why you must always report contact with farms and farm animals when returning into Canada from another country.

2 E. coli

The digestive systems of all animals, including humans, are home to billions of essential bacteria. Escherichia coli (or E. coli) are one group of naturally-occurring bacteria in our intestine; most types don't make healthy people sick and some actually help in the production of vitamins. But some, like E.coli O157:H7, can cause severe illness or even death. This strain is found naturally in wildlife, cattle and other farm animals, and enters the environment through their manure.

Canada's meat processors use a number of techniques, including pasteurizing the surface of a carcass with steam or hot water and applying organic acid solutions, to keep E.coli bacteria from growing but without affecting meat quality¹.

Everyone can play a part in preventing the risk of illness due to E.coli O157:H7 by ensuring meats are cooked to their proper temperatures, by washing our produce thoroughly, by cleaning our hands regularly with soap and water after using the washroom or petting animals, and before handling food.

For more information on E.coli visit <http://www.phac-aspc.gc.ca/fs-sa/fs-fi/ecoli-eng.php>.

For more information on safe internal cooking temperatures for meat, visit www.healthycanadians.gc.ca.

SCANNING A COW OR A PIG?



RFID tag in a beef cattle's ear

As part of food safety efforts, both dairy and beef farmers must identify each of their animals with individualized radio frequency identification (RFID) ear tags through the Canadian Cattle Identification Agency. These electronic tags link to a database that stores information about each animal, such as its date of birth, farm of origin and identification numbers, and help farmers and meat processors maintain and promote food safety and traceability.

Sheep farmers must also follow a mandatory tagging program for their animals, and a similar program is being developed for goat farmers. Livestock identification allows the origins of any serious disease to be traced very rapidly so that its spread can be limited as much, and as soon, as possible. For more info, visit www.canadaid.ca.

Beginning in 2014, movement for all pigs that go to market nationally and abroad will also be able to be traced back to the Canadian farm of origin. This is an important step towards building a successful system that responds quickly to disease outbreaks or food safety emergencies.

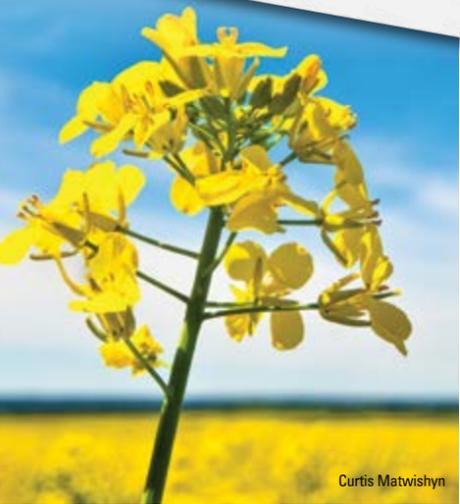


WHAT'S THE DEAL WITH RAW MILK?

Raw milk is milk that has not been pasteurized. For those of us who grew up on dairy farms, it was very common to drink milk from our own cows. Today, government health and safety standards require all milk that is sold to be pasteurized, which means heating it to a high temperature then cooling it rapidly. This is to destroy any pathogens, like salmonella or E.coli, which might be in the milk. These pathogens can make people sick and even cause death. In 2013, for example, there was an incident in Canada where people died from eating unpasteurized cheese. Pasteurization also extends the shelf-life of milk and dairy products, making them safer for people to consume over time.

It is illegal to sell or give away raw milk or cream products in Canada, with the exception of certain raw milk cheeses. For more information, check out <http://www.milk.org/corporate/view.aspx?content=FaQ/Pasteurization>.

Quick fact: if Canadian farmers stopped using crop protection products and plant biotechnology, we'd need to turn 37 million more acres into farm land to grow the same amount of food we do today – that's about as much land as is farmed in all of Saskatchewan. Thanks to plant science tools, farmers are protecting valuable forests, wetlands and other wildlife habitats⁴².



Curtis Matwishyn

3 Bovine Spongiform Encephalopathy (Mad Cow Disease)

Bovine spongiform encephalopathy (BSE) — more commonly known as mad cow disease — is a rare but fatal disease of the central nervous system of cattle.

Canada's food safety system protects the safety of Canadian beef and ensures Canadians are not exposed to BSE. In Canada, BSE is a low risk for humans. One of the causes of BSE is believed to have been an increase in the use of meat and bone meal in cattle feed, a practice which was banned in Canada in the late 1990s. The Government of Canada continues to increase its safeguards to stop the potential spread of this disease to other animals and to the human food chain. For more information on BSE, see www.bseinfo.ca or www.inspection.gc.ca

4 Porcine Epidemic Diarrhea (PED)

PED is a devastating disease that affects pigs. It doesn't have any impact on human health or on the quality of pork. It is usually fatal to piglets, but older pigs normally recover if they get sick. The disease has already killed millions of piglets in the United States since it was discovered there in 2013. PED was first found in Canada in January 2014. It is highly contagious among pigs and is an example of one type of disease that can be minimized by following strict farm biosecurity practices such as limiting visitors in and out of barns.

Food Safety on Crop Farms:



Spraying a field

Why do farmers use pesticides?

Pests are called pests for a reason - because they will eat our food and destroy our crops. Pesticides in appropriate and approved quantities, used together with other methods of crop protection, have helped us grow more and better quality food — namely fruits, vegetables and field crops. Being able to protect plants against pests, diseases and invasive weeds reduces the risks of food shortages due to crop failures, which also helps keep food prices affordable.



Farmers taking a pesticide safety course

Do farmers know how to use these products?

As farmers, we take the use of any chemicals very seriously and respect the importance of doing so. We take courses and attend workshops to make sure we're up to date with latest technologies and farming practices, including following product label requirements.

For example, in Ontario, farmers must take a course and pass an exam in order to become certified to purchase and use pesticides. We learn about pest management techniques, preventing pest resistance, how to protect the environment and avoid health risks, proper storage, maintenance of application equipment, and the importance of record-keeping. To keep current, we must be re-certified every five years (see www.pesticidesafety.ca for more info).

Quick fact: How much is a part per billion anyway? It's an extremely tiny amount: one part per billion is the same as one second in 32 years — or a drop of water in a pool — or one blade of grass in a sports field.

Could we have another Irish Potato Famine?



In 1845, a strange disease struck potatoes growing in the fields of Ireland. Almost half of the crop was destroyed. What later became known as potato blight was caused by a fungus. At that time, there were no treatments available to fight pests and diseases like we have today and there was nothing to be done to save the essential food crop. Today, potato blight can be prevented by modern fungicides which greatly decrease the crop's vulnerability to massive losses. This is a clear case where modern farming practices increased the reliability and security of our food supply.

Do I need to worry about chemical residues in my food?

The Canadian Food Inspection Agency (CFIA) monitors for drug residues in meat. Thousands of meat samples are regularly tested for residues and results (available from the CFIA) have confirmed that Canadian meat is free from residues.

Similar programs are in place for fruits and vegetables. In May 2012, for example, the CFIA reported that over the last 10 years, 99.6 per cent of fresh fruit and vegetables met Health Canada standards for pesticide residues.

In the real world, there's no such thing as "zero" when you're hunting for residues (or controlling risks). Modern lab equipment and testing methods are so sophisticated now that they can detect something very minute. What's important to remember is that what you're finding is in smaller and smaller (and smaller) quantities. Where once parts per million were detectable, it is now possible to detect parts per billion or even trillion.

The more sophisticated the testing method, the more likely that the smallest of residue traces will be detected, amounts so tiny that they won't cause harm but still show up in the tests. That said, residues in food are regulated to remain 100 to 1,000 times below the "no effect" level in Canada.





Carley Matheson

WHAT TESTING TAKES PLACE TO BE SURE ALL PRODUCTS USED ON THE FARM ARE SAFE?

We don't want to and aren't permitted by law to use chemicals unless they're assessed for safety and approved for use. Canada has some of the strictest product approval, residue monitoring and control systems of any country in the world. Our regulators — like the Canadian Food Inspection Agency (CFIA) and Health Canada's Pest Management Regulatory Agency (PMRA) — make sure products are safe for people to use and for the environment and are effective at doing the job they're supposed to do.

Before being approved for use in food production, new crop protection and animal health products go through years of testing and trials to prove that they're safe and effective.

PMRA, which regulates and monitors pesticides, employs hundreds of independent scientists to review safety data and test all pest control products to ensure they can be used safely before they are approved for use in Canada (see www.pmra-arla.gc.ca).

A similar process is in place for animal health products, which are regulated by Health Canada and/or its agencies:

- Pharmaceuticals (medicines for animals) are regulated by the Veterinary Drugs Directorate, which is an Agency of Health Canada.
- Animal pesticides, such as ear tags, sprays and powders used to manage pests such as flies, fleas and ticks are under the jurisdiction of the PMRA.
- Animal vaccines and feed additives must meet the regulatory requirements of the Canadian Centre for Veterinary Biologics or the Feeds Division, respectively. Both are part of the Canadian Food Inspection Agency.

When used as directed, pesticides or animal medicines approved in Canada don't harm people, animals or plants — in fact they are largely used to improve health of plants and animals. This is critically important for everyone, and particularly for us as farmers who work directly with products for our animals or our crops.

Better and safer products are under constant research and development. New crop protection and animal health products coming on the market take into account the latest advances in plant and animal science, respectively. They're narrowly targeted, which means they focus on treating specific problems. In the case of pesticides, they're designed to break down in the soil without causing harm to crops or the environment. With animal medicines, there are precise withdrawal times in place — meaning how long it takes the medicine to leave an animal's body — to eliminate/minimize the possibility of any residues in our food supply.

Once a new medicine is approved, its use is monitored by government agencies that test for residues to make sure our food and water are safe.



Dwane Morik

Quick fact:

It can take 10 to 13 years of research, development and testing to develop and bring a new crop protection product to market⁴³, at a cost of \$250 million per product. According to the PMRA's website, the process can involve the review of over 200 different types of studies in three key areas: health, environment and value.



What is the "dirty dozen?" How do I know what fruits and vegetables are safe to eat?

Each year an environmental group from the United States publishes a "dirty dozen list" of fruit and vegetables it claims contain high pesticide residue levels. Scientists at the University of California-Davis⁴⁴ and elsewhere, however, have debunked this myth.

Scientific analysis shows that although residues are in fact present, they are at extremely low levels. According to www.safe-fruits-and-veggies.com, a child could eat 154 apples in one day without any effect, even if those apples had the highest pesticide residues recorded by the United States Department of Agriculture⁴⁵.

IT ALL COMES DOWN TO COMMON SENSE — AND DOLLARS AND CENTS

Most farmers live where we work, so we breathe the air and drink the water from our own wells. Our families also eat the food we grow and we take pride in feeding these foods to you and to people around the world.

Crop protection and animal health products represent an expensive cost of doing business, so farmers only use them when absolutely necessary and in the recommended amounts. Food products that are found to have residues are at risk of being detained or destroyed and could cause trade disruptions or damage trust with importing nations. On top of that, we can face significant fines, so there's no incentive to over-use expensive products or to over-medicate our animals.

BETTER SCIENCE MEANS BETTER FOOD ON LESS LAND

Most of the tools we have been using to grow more food over the last 100 years — what those of us in agriculture call "gains in productivity" — started with science. Plant and animal genetics, soil management, pest and disease management strategies, feeds and animal housing, even weather forecasting — every aspect of farming has benefited from the use of science.

Canadians win too: we have more nutritious, more abundant, more reliable, less expensive food and it's being produced using less farm land than in the past. And with our growing world population — expected to reach nine billion by 2050 — we know that we'll need more and different technologies so people won't go hungry and our natural ecosystems are protected.

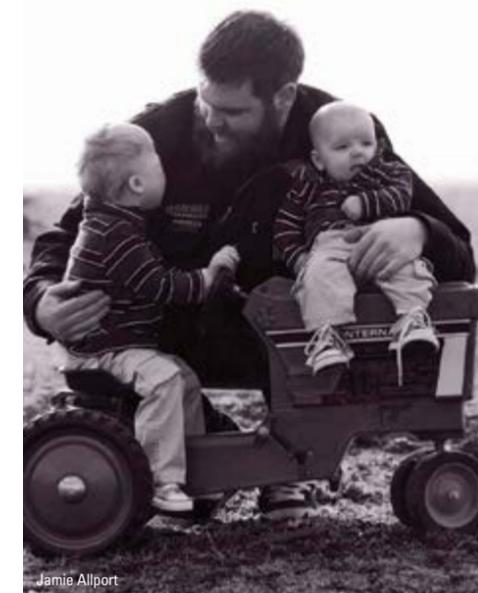
Did you know...

...in 2009 alone, biotechnology helped farmers reduce global carbon dioxide emissions by 39 million pounds? That's the same as taking eight million cars off the road for an entire year⁴⁷.

TRACEABILITY OF FOOD — A WORLD CLASS SYSTEM THAT'S GROWN AT HOME



Traceability is an important word in food production. Essentially, it means being able to trace exactly what went into raising an animal or growing a crop all the way through harvest and/or processing and delivery to your grocery store or you.



Jamie Allport



WHAT IS BIOTECHNOLOGY OR GMO?

For some people, scientific progress can be intimidating. Thanks to sensational media headlines and clever social media campaigns, terms like biotechnology, GM or GMO, and genetic engineering can strike fear — but what do they really mean?

Biotechnology involves introducing desirable traits from one organism to another and the beneficial use of organisms. Bread, beer and wine, which are produced with the help of yeast, are early versions of this type of science. More recently, vaccines, antibiotics, and other medicines have been produced using biological agents. When it comes to food, the goal is to produce more and better food by influencing or improving the natural biological processes in the plants or animals where the food originates.

Genetic engineering is a form of biotechnology where specific genes are added or removed from an organism to change its genetic makeup. The result is a genetically modified (GM) product or a genetically modified organism (GMO).

Growing GMO crops that are resistant to certain pests or diseases, for example, mean farmers may require fewer pesticides, less labour and less fuel-intensive ways to manage infestations. This is beneficial to farmers and helps keep food costs down. For example, 93 per cent of all canola crops planted in Canada are GMO varieties.

Quick fact:
Foods made from GMO crops are actually nutritionally and chemically identical to food made from non-biotech crops⁴⁶.



FARMER PROFILE:

Third generation farmer **Jamie Cornies** can trace his English cucumbers from his Ontario greenhouse through to the grocery store thanks to an on-farm traceability system. His greenhouses produce upwards of 84,000 cucumbers a day during peak harvest season. Every cucumber is labelled with an ink jet code and bar code printed on its plastic sleeve. That bar code contains the greenhouse name and the date that cucumber was picked. If there was ever a problem with produce coming from the farm, that code would also enable them to trace an individual cucumber back to the area of the greenhouse where it was grown in and thus the source of the problem.



I heard Cheerios are now GM-free. What does this mean?

It's true that General Mills recently announced its "original Cheerios" would have no genetically modified (GM) ingredients. However, the main ingredient in Cheerios is oats — and there are no genetically modified oat varieties grown in North America, so with the exception of corn sweetener and a few other minor ingredients, Cheerios have always been GM-free.



BETTER HEALTH THROUGH FUNCTIONAL FOODS

Plant biotechnology can also benefit human health and nutrition. Crops have the potential to be grown for their value as "functional" foods or nutraceuticals, appearing in vaccines and nutritional compounds to prevent or treat disease. Here's a sampling of some developments underway:

- Tomatoes that contain more lycopene, an antioxidant that reduces the risk of prostate cancer;
- Nuts without allergenic proteins (which can be deadly to some people);
- Tobacco plants (yes!) to produce therapies to fight Crohn's disease;
- Crops that can grow in colder climates than ever before, like cold-tolerant grapes;
- Drought hardy crops, like a corn variety that doesn't need as much water to grow.

Some of these new foods have the potential to save millions of lives by improving human nutrition, particularly in parts of the world where there isn't enough food.

Every year, Vitamin A deficiency causes 500,000 cases of irreversible blindness and up to two million deaths. It is estimated that approximately 19 million pregnant women and 190 million children suffer from this condition, which can be prevented if people get enough Vitamin A in their diet.

The Golden Rice project developed a rice variety that produces large amounts of Vitamin A. For many people around the world, rice is a key part of their diet and a major source of energy, so it was a logical choice. However, environmental and anti-technology activists are actively blocking the use of Golden Rice because it is a GM food that was developed with the help of science⁴⁸.



USING TOBACCO PLANTS TO FIGHT EBOLA

An experimental new drug that has been developed to treat the deadly Ebola virus is made from tobacco plants that have been modified to produce disease-fighting proteins — called monoclonal antibodies — that target a specific part of a pathogen.

The drug, called ZMapp, contains three kinds of these monoclonal antibodies, two of which were developed by Canadian researchers at the Public Health Agency of Canada's National Microbiology Laboratory in Winnipeg.

DON'T BRING THAT ... BACK FROM VACATION!

Everyone can take an active role in preventing disease and helping us keep our animals and crops healthy. This means following government rules against bringing agricultural products like plants, soil or meats into Canada from other countries. Strange bugs or diseases could destroy our crops or our animals, as we've so sadly witnessed in other countries.



YOUR FOOD IS IN YOUR HANDS

Farmers can do absolutely everything to grow safe fruit, vegetables, meat, milk and eggs. Food industry partners work hard to produce a safe product. But once it's in your hands, it's in your hands. Handling food with unwashed hands and inadequate washing or cooking can encourage the risk of unsafe foods and food-borne illness — or what is popularly called "food poisoning". And then everybody around the dinner table suffers. To learn more about proper food handling, visit www.befoodsafe.ca.

6

Farmers: the active environmentalists



We understand the importance of healthy soil, water and air: we live on our farms with our families, and we depend on the environment to create a healthy place to live, as well as the right conditions to grow crops and raise livestock. We want to leave our farm in better shape for our kids than when we started farming.

Through farm groups and on our own farms, we invest in environmental research and help develop programs to share the latest findings with our members. In fact, Canada is a world leader in on-farm environmental programs.

Crop farming and the environment

Was farming more environmentally friendly in the 'good old days'?

Some people believe that environmental degradation is a phenomenon of "modern" farming. History tells a different story.



A prairie farmer stands in his field during the Dust Bowl (or Dirty Thirties). The dust storms were caused by drought and too much tillage.

The farming systems adopted by settlers before 1850 included planting only wheat — called "monoculture" — every other year and leaving fields fallow, or without crops, in between. This system wasted land and ruined soil health by depleting the ground of nutrients that plants need to grow. And many early methods of crop protection involved either excessive tillage — plowing or working the soil too much — or using inorganic chemicals like sulphur, mercury, and arsenic compounds to fight pests and diseases. Many of these older chemicals are no longer used because of their toxicity or inability to break down in the environment.

On the Canadian prairies until the 1980's, many farmers used to burn their stubble fields (what remained of the grain after it was cut) to facilitate clearing the fields for planting for the next crop year. Now, a 'no-till' or 'zero tillage' method is widely employed. Left over material from the harvested crop is left on the field and the seeds are planted directly into the soil. This technique increases the amount of water and organic matter (nutrients) in the soil and stops soil erosion. Plus it's less work for farmers — and there's no smoke from fires to affect air quality.

Today, we have, and continue to, learn from these past shortcomings. For example, crop rotation (planting different crops in the same field every year) is the norm and we're much better at looking after our soil's health. Crop protection products are also safer and highly regulated.

VARIETY IS THE SPICE OF LIFE

Farmers now grow a variety of crops and avoid planting the same crop on the same field year after year by following what is called crop rotation. Because different pests attack different crops, a rotation schedule prevents a major build-up of certain diseases or insects. As well, since different crops need different nutrients, changing crops each year helps the soil stay healthy by not draining it of nutrients. On Prince Edward Island, for example, it is now mandatory to have a three-year crop rotation on all farms. The common rotation is potatoes, grains (like wheat or barley) and forages (types of grass).

NO-TILL TAKES OVER

Farmers are on the frontline of weather conditions, so we're the first to experience and adapt to changing conditions. Persistent dry conditions in the Prairies, for example, have inspired significant shifts in preferred tillage methods.

Tillage is an age-old practice and refers to plowing or working up the soil, something that's done mostly to control weeds. Many farmers in Canada have adopted "conservation or minimal tillage" or "no-till" practices. This means crops are grown with minimal or no cultivation of the soil. Any plant materials remaining from the previous year's crop, like corn stubble, is left on the soil, building up its organic matter. The advent of crops tolerant to specific herbicides (through biotechnology) allows farmers to effectively control weeds without resorting to tillage.

Minimal or no-till practices also help maintain populations of beneficial insects, and soil and nutrients are less likely to be lost from the field. Less time, labour and fuel are spent preparing the field for planting, thus reducing our greenhouse gas emissions.



Planting directly into corn stubble to prevent soil erosion

SOIL OR DIRT? WHAT'S THE DIFFERENCE?

Soil is alive; it contains small particles of sand and clay, decaying organic matter, earthworms, bacteria, insects and microorganisms. Soil is a living environment and is ideal for growing crops. Dirt is basically dead soil, which can be revitalized by adding organic matter. The texture and colour of the soil, how it looks, feels and even smells, depends on the amount of each component in the soil blend.

Sand — what you find on the beach

Clay — what you find at the bottom of a valley

Organic matter — decaying plants and earthworms, bacteria and other microorganisms

Loam — the perfect mixture of sand, clay, organic matter — ideal for growing crops

Quick fact:
Conservation tillage in Canada saves more than 170 million litres of fuel from being burned each year since farmers don't work the land⁴⁹.



According to Statistics Canada, more than half of all farmland in Canada is now using no-till practices. No-till is especially popular in the prairie provinces (Alberta, Saskatchewan and Manitoba), and Quebec has doubled its no-till area in recent years with a 69 per cent increase in the number of farms using these practices⁵⁰.



Sarah Cameron



Manitoba Canola Growers

FARMER PROFILE:

Doug Chorney is a third-generation Manitoba fruit and vegetable farmer. His ancestors made a commitment to farming sustainably when they immigrated to Canada 100 years ago – and he plans on his descendants continuing that practice for at least another century.

What's his favourite part about farming? The smell of the soil! He explains,

“For me it's about living the great life that you can on a farm with fresh dirt and hard work...It's the smell, the sound, the feeling you get when you're out there. It's very fulfilling.”



DIFFERENT TYPES OF SOIL? REALLY?

Farmers work with different soil types, depending on where they live. The type of soil found across Canada is directly dependent on glacier movement thousands of years ago. About 12,000 years ago, during ice age events, advancing glaciers slowly ground rocks into finer particles as they moved south. Then, centuries later, retreating glaciers deposited sand and gravel in a mixture with the soil they were travelling over. That, combined with the annual cycles of plant and animal growth and decay over millions of years, has built the soil in your region into what it is today.

Soil by depth is broken into three groups: Topsoil (on the top) is rich in organic matter but lower in minerals. Subsoil, found below the topsoil layer has a higher clay and mineral content. Parent Material is made up of deeper rock, sand or clay with no organic content.

Scientists have created soil maps of Canada. On those, you'll see local soil types like Brookstone Sand Loam or Staten peaty muck referencing types of soil found just in that area. The type of soil found on a farm will certainly influence a farmer's crop choices and management systems. Although you cannot change your basic soil type, there are many management techniques that can help maintain or improve soil structure.



WHAT'S A BUFFER ZONE?

A buffer zone is a grassy area directly next to a body of water like a stream or pond. These buffers (aka “riparian” areas) have a multitude of benefits:

- cooler water temperatures (afforded by increased shade) that attract desirable fish species
- increased biodiversity through rich and varied streamside habitats
- protection for endangered or at risk species by providing habitat
- reduced soil erosion
- increased natural pollinator populations

Farmers often put fences around ponds and streams to keep out livestock and use technologies like solar or wind-powered pumps to provide water for cattle, sheep and goats on pastures.

ENVIRONMENTAL FARM PLANS

In all provinces across Canada, an educational initiative called the Environmental Farm Plan is helping farmers assess their farms for environmental concerns and set goals and timetables for improvements. In Prince Edward Island, for example, 90 per cent of farmers have completed an Environmental Farm Plan⁵². And in Ontario, about 70 per cent of farmers have participated and have invested over \$600 million in on-farm environmental improvements over the last 20 years.

It's a model that's being actively copied and adapted in other provinces as well around the world, truly making a positive difference for the environment and for the families who live on the farm.

FIGHTING PLANT PESTS, BUGS AND DISEASES WITH INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) is a sophisticated way of controlling disease and pest levels. It is often described as good bugs fighting bad bugs, but it's actually more complicated than that.

The system works together with nature: farmers monitor fields and orchards closely to determine when, or if, pest levels reach a threshold where they need to take some kind of action.

It also uses a combination of cultivation techniques like crop rotation, physical barriers, and use of other “beneficial” insects and fungi help to ensure the best combination of pest control tactics, whether they be mechanical (like tillage), cultural (like good bugs) or chemical (like pesticides).

Advancements in the science of pest management and today's safer, more targeted control products are helping us reduce our environmental footprint.



USING TECHNOLOGY TO KEEP UP WITH MOTHER NATURE

When it comes to farming, no one plays a greater role in the success or failure of a crop than Mother Nature herself. Too much or too little rain, temperatures that are too high or too low, wind or snow and ice storms – all of these can wreak havoc on livestock and crops.

Some farmers are turning to technology, however, to help them manage the weather. For example, large outdoor fans can be installed in orchards to keep the air circulating during times of possible frost. (Frost damage affects the number and quality of apples a tree will produce or no apples at all if frost hits at blossom time). Other farmers have been known to hire helicopters to fly over their orchards at nights when there is a risk of frost to protect their fruit by keeping the warmer air circulating.

Hail can also be devastating to fruit farmers – damaged trees can get sick and die very quickly, and apples with hail damage are unsuitable for sale on the fresh market and must be processed into juice, resulting in a much lower price for farmers. A technology called a hail cannon is used in some orchards. It shoots sound waves into the air every six seconds whenever there is the threat of hail and breaks up the hailstones that are forming in the atmosphere.

Biotechnology is also offering ways to help farmers cope with Mother Nature – developing crop varieties that are better tolerant of drought, salinity and frost are examples of using science to cope with Mother Nature.



Large fans can save crops from frost damage in a fruit orchard.



A GPS system in a tractor

SATELLITES IN FARM EQUIPMENT

Many farmers today rely on precision agriculture to manage their field work, including planting, nutrient and crop protection application and harvesting. Satellite-controlled Global Positioning Systems (GPS) on tractors and equipment help ensure fertilizers and crop protection products are applied in the right amount to the right place, and make sure crops are planted in straight, even rows, for example. This reduces fuel consumption, and helps farmers ensure a more efficient use of nutrients, seeds and crop protection products.

Quick fact:

Some farmers are starting to use unmanned aerial vehicles – UAV for short (but you probably know them as drones or small flying robots) – to help them with farm chores, such as identifying insect problems, assessing crop yields or helping to track down cattle that have wandered off. These drones are equipped with infrared cameras, sensors and other helpful technology.

ENERGY FROM THE SUN, WIND – AND EVEN PLANTS

Our society depends heavily on natural gases, petroleum and other non-renewable resources for energy – but we're all becoming more energy conscious and looking for ways to lower our costs and reduce our environmental footprint.

Farmers are turning to the sun and the wind as sources of energy by installing solar panels and wind turbines on their farms. Some use the electricity in their homes and farm buildings; others sell the electricity they generate into the grid to power homes, offices and factories in Canada's cities. Other farmers are growing plants like miscanthus or switch grass – called biomass or energy crops – specifically to be turned into energy.

SMARTPHONES AND GOOGLE = PEST-FIGHTING POWER



Technology can be a great help when it comes to identifying and dealing with pests. The Canadian Grain Commission (CGC), for example, has developed a series of web-based insect keys that farmers can use to identify insects in stored grain. The keys contain images and information about more than 50 recognized species that can be found in stored grain in Canada. Previously, keys used by entomologists were only text-based or drawings instead of actual images. The real-life photos, available at their fingertips, make this tool more practical for farmers to use.

Did you know...

...in France, biologists at the French National Agency for Agricultural Research say Google Street View – which films and posts 360 degree street-level views of homes and businesses online – can also be a useful tool to fight invasive insect species? They've used it to gauge the spread of a tree-killing insect from southern Europe that has started migrating north. Using Google Street View, researchers mapped areas that had been invaded by the bug by looking for the highly visible, light bulb-shaped nests the larvae build in fall. Their results were 90 per cent as accurate as a test conducted on the ground by a person who drove around the same area in a car.

BARCODES AREN'T JUST FOR SUPERMARKETS ANYMORE

DNA barcoding is a made-in-Canada tool that helps identify pests. Here's how it works: a small tissue sample is taken from a species and the DNA is extracted from it in a lab. That DNA is then amplified and sequenced for identification, similar to how a barcode is read when a product is passed over a scanner at the supermarket.

Development of this technology was led by the University of Guelph, which has become an international leader in the field and is home to both the Biodiversity Institute of Ontario (BIO) and the Centre for Biodiversity Genomics. To date, the library has collected bar codes from 137,000 animals, 50,000 plants and 3,400 fungi and other life forms, all of which is accessible to the public.

The barcode library can, for example, be used for invasive species monitoring, early detection of new pests and testing for seed lot contamination. BIO staff is able to barcode species samples sent into their lab for as little as \$20 per specimen and return results in less than a week, letting farmers, agronomists and others know exactly what they're dealing with. Work is now underway to develop a handheld identification tool that will provide on-the-spot identification of pathogens, insects and other pests.

BIODIESEL HELPS FUEL THE FUTURE

Biodiesel is a clean-burning alternative fuel produced from renewable resources like animal fats and plant oils. Current biodiesel markets are in mass transit, marine transportation and other environmentally sensitive areas like mines. Look to farmers for this and other innovative, green energy sources in the future.

HENRY FORD AND ETHANOL

Ethanol is a renewable fuel made from plants, mostly corn. Ethanol made an early debut as a renewable fuel back when Henry Ford designed the Model T, but gasoline outpaced it because it was easier to use in engines and the supply was cheap and plentiful. Today, ethanol is back as we all want cleaner fuels for the environment and human health, and ethanol is being added to our gasoline. In Ontario alone, implementing a five per cent blend of ethanol in gas is creating a market for 50 million bushels of corn annually and reducing greenhouse gas emissions by the equivalent of 200,000 cars.

Quick fact:
How many acres of corn do you need to drive a car across Canada? Less than you think. Imagine this scenario:

How much corn does it take to drive across Canada?

- Trans Canada highway across the country = 5,718 km
- 3,963 kg of corn grown per acre (Ontario, 2008)
- 11.79 kg of corn = 3.79 litres of ethanol
- Driving a vehicle with fuel economy of 8.5 litres per 100 km
- 5,718 km of Trans Canada highway at 8.5 l/km = 672 litres of fuel
- 672 litres of fuel x 11.79 kg of corn to make 3.79 litres of ethanol = 2,103 kg of corn

So you need about half an acre of corn to drive a car from Vancouver to Charlottetown.



What about manure and water concerns?

If manure isn't managed properly, it can contaminate water. As farmers, we value water quality on our farms and follow strict guidelines and regulations to help keep our water clean.

Nutrient management planning — which covers manure, commercial fertilizers, and all other nutrient sources for farm land — is a way of making sure crops and soils get all the benefits of the nutrients without harming the environment. Here's how we're doing it:

- Testing soil and manure — by knowing exactly what nutrients we already have and what's needed and when, we apply only what the soil or specific crop can absorb and use.
- Calibrating (or adjusting) manure and fertilizer spreaders — so we know exactly how much we're applying and that we're applying it correctly.
- Managing stored manure — manure can't be put on the land during the winter months, so farmers have to make sure we have the proper facilities to safely store all the manure from our livestock on our farms.
- Locating new farm facilities — so they are far enough away from natural resources and neighbours. This distance depends on things like the number and type of livestock, whether there is a stream or pond nearby, etc.
- Planning for contingencies — knowing what to do in case of emergency so we can respond quickly and effectively.



Livestock manure storage

Farm animals and the environment

About 30 per cent of Canada's agricultural land is too hilly, rocky, cold or wet to grow crops, but it can support grazing livestock. Animals convert grasses and otherwise indigestible plant matter into nutrient and protein rich food, while returning organic matter (manure) to the soil. It's the original recycling program.

Some people incorrectly believe that Canadian farm animals use food needed by people. Livestock doesn't compete with people for food grains.

In countries without extra grain, animal feed tends to consist mostly of grasses and forages or other suitable feeds. Some animals can consume grass, pest or weather-damaged grains, crop residues like corn stalks, leaves and straw, and by-products from food processing such as unusable grains (or parts of grains) left over from the production of things like breakfast cereal. And, of course, even grains intended for humans are sometimes damaged by insects or weather and can only be eaten by animals.



So what about the smell of manure?

There's nothing like the smell of manure to come between farmers and our non-farming neighbours. It's a fact of life in farming and one that's not going to go away altogether anytime soon. Odour can waft out of barns and storages, but is strongest a few times a year when manure is spread on our fields as a natural fertilizer.

We've already learned a lot about odour-reduction through research and innovation, but one of the best tools is common courtesy. Many farmers let their neighbours know in advance of manure spreading to ensure it's not going to affect their plans. In return, we ask that they understand a bit about our farm and realize that some level of odour is inevitable.

Did you know...

...some farms are generating electricity from manure produced by their cattle through a process known as anaerobic digestion. This involves the decomposition of organic matter such as livestock manure, plant material and food processing waste, in an oxygen-free environment to produce a methane-rich-gas (biogas). Biogas is a renewable gas that can produce heat, electricity or be upgraded to a natural gas substitute. What's left over can be put on the land as fertilizer or used for animal bedding.

Grober Nutrition has an anaerobic digester on their farm which converts waste into electricity. The digester is "fed" a blend of manure from the farm's veal calves as well as other inputs like potato chip waste, cooking oil, coffee grounds and grease from restaurants and discarded fruits and vegetables from grocery stores. The project not only diverts waste from landfills but the power generated is used to power 500 homes near Cambridge Ontario. Cool!

Did you know...

...that greenhouse gas is not actually gas coming from a greenhouse? It's a series of gases like methane and carbon dioxide, which act as a shield that traps heat in the earth's atmosphere — much like the way a greenhouse retains heat. This is thought to contribute to global warming.



What about methane? I've heard that cow burps are contributing to greenhouse gas.

Scientists estimate agriculture produces 10 per cent of Canada's greenhouse gas emissions. Methane, coming largely from livestock, accounts for one-third of agriculture's emissions. Nitrous oxide, which accounts for most of the rest, comes from farm soils, especially those where manure has been applied.

And yes, cow burps are a source of methane. All ruminants — animals like cattle, sheep, goats and deer that have a four chambered stomach called a rumen — have bacteria in their stomach that help break down the food they eat. Methane is generated during this break-down process, which is called "enteric fermentation", and the animals release this gas by burping.

These emissions vary with feed quality and digestibility. In Canada, the quality of feed and pastures exceeds that of many other countries. In fact, Canadian scientists have estimated that greenhouse gas emissions decreased from 16.4 kg to 10.4 kg of carbon dioxide equivalents from 1981 to 2006⁵³.

Scientists have developed many different ways to measure how much methane is going into the environment through belching animals, including a "cow backpack". Researchers at a university in the United Kingdom fitted cows with small backpacks, from which tubes sucked in air samples from the cows' noses and mouths for a period of 24-hours. If we know how much methane livestock emit and when, we can figure out what we can do to reduce it⁵⁴.



Curtis Matwishyn

WILDLIFE HABITAT ISN'T JUST IN PARKS

More than a third of Canada's 68 million hectares classified as agricultural land isn't suitable for planting crops (i.e. too rocky, hilly, wet or dry). Often these areas are put to use as pasture for grazing livestock, but many do double-duty as excellent wildlife habitat. Many farmers choose practices such as planting native grasses, moving their livestock from pasture to pasture — we call this rotational grazing — and establishing buffer zones around water bodies to help sustain wildlife populations and promote biodiversity. And some species, such as grassland birds like the Bobolink or Eastern Meadowlark, rely on areas with tall grasses to nest. If farmers stop planting and maintaining grass crops, small shrubs and trees start to take over and those types of birds lose their habitats.



Curtis Matwishyn

PROTECTING OUR BIODIVERSITY

Canadian beef farmers own and manage about 30 per cent of Canada's agricultural land as grass pasture. Overgrazing can cause erosion and a decrease in the amount of native plant species. Farmers have made biodiversity and habitat conservation a major priority.



Canadian Cattlemen's Association

Allen and Lillian Patkau

FARMER PROFILE:

The Environmental Stewardship Award is a national award given annually by the Canadian Cattlemen's Association to recognize farmers who use environmentally innovative practices on their farms and ranches. In 2013, the award was presented to Allen and Lillian Patkau, the owners of Sandy Arrow Ranch in Saskatchewan. Their ranch is based on land that is difficult to manage because it is prone to erosion. Despite the poor soil quality, the Patkaus have been able to foster productive land, which is essential for raising their cattle on a rotational grazing system. As one example, they use a remote winter watering site to winter the cattle in a specific area of the ranch that needs additional organic matter and they have plans to improve the land further with a variety of environmental initiatives.

Courtesy of Canadian Cattlemen's Association



Broiler chick (meat chicken) helping itself to a drink of water.

WHAT ABOUT WATER?

- A mature sheep drinks between four and nine litres of water per day
- A dairy cow drinks 80 - 160 litres of water, and produces about 27 litres of milk per day
- Canadians use up to 350 litres of water per day per person - the second highest rate in the world
- A five-minute shower with a standard shower head uses 100 litres of water
- A single load of laundry can use up to 225 litres of water



Columbe Lane

Did you know... ...animal feed plays a key role in recycling? As an example, the ethanol industry uses corn as its main ingredient. During the ethanol production process, starch is removed from corn, leaving behind a product called dried distillers' grain that has increased concentrations of other nutrients like fiber, protein, fat and minerals. It is an excellent feed ingredient, and feed manufacturers are now using it in pig and cattle diets. Many soybeans are grown primarily for their oils – but once the beans are crushed, the crushed beans (minus the oil) are ground into soybean meal and fed to livestock, providing an excellent source of protein.

THE ORIGINAL WATER RECYCLING PROGRAM

There are many misleading or confusing reports about the amount of water that goes into growing a bushel of wheat or producing a kilogram of beef, for example.

The simplistic math that is sometimes used to calculate water consumption ignores the reality that in crops, water falls as rain or snow before it evaporates or moves through the soils and is recirculated. It's the same for livestock. It doesn't make sense to say that animals drink water and then it's lost forever. Animals retain only a very small fraction of the water they consume. Most of the water they drink is recycled back in the environment.

WATER, WATER EVERYWHERE ... OR NOT

Some high-value and weather sensitive crops — usually fruits and vegetables — require irrigation. Today's irrigation systems come in a variety of forms, and are made to make sure every drop of water is used. Water availability and quality are an important issue for all of us.

In Canada only 8.5% of farms use any form of irrigation. The remaining 91.5% of farms rely solely on precipitation for crop watering. Irrigation is used on higher quality crops like berries, fruits and vegetables that are for direct human consumption.

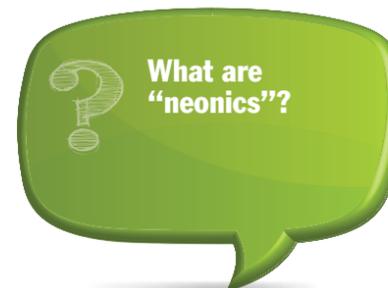
Sometimes land used to grow crops is too wet, so farmers will drain it using underground tile to remove surplus water from fields. This improves crop quality and yield and reduces water runoff and soil erosion. In some provinces, farmers must apply for a government-issued permit to take water to ensure that they are using water resources properly and in an environmentally responsible way.



YOU WERE ASKING ABOUT... BEE HEALTH

Bees are important pollinators of plants and they are vital to farmers and growing our food. In recent years, bee deaths have been reported in areas of Europe, Canada and the United States. This is a complex issue and experts from around the world are examining many factors impacting bee colony health. Unfortunately, there are no easy answers.

Beekeepers routinely lose a percentage of their bees each winter, depending on a number of factors including how cold it gets and how long winter lasts. Researchers around the world are currently working to figure out why bee populations are growing in some areas while death rates are higher in others.



Neonics — which is short for neonicotinoids — are a class of insecticides chemically related to nicotine. Their name literally means “new nicotine-like insecticides”. They are used on a variety of agricultural crops — as well as home gardens — to protect plants against insect pests. The class of insecticides was welcomed when they were introduced because they had low toxicity to humans and animals compared to many of the older products it replaced.

Some people believe neonics are contributing to bee death but there are conflicting views and scientists around the world are working hard to determine what is causing bee mortality. A key factor in bee mortality in recent years has been a parasitic mite called *Varroa destructor* which has been devastating to some Canadian bee colonies. We know this topic is important to farmers and Canadians and will continue to commit to finding the solutions.



THE BUZZ ABOUT BEES



Bee hives house bees pollinating a fruit orchard in the spring.

Canada produces about 75 million pounds of honey every year. Honey bees play a critical role in the production of fruits, vegetables and other crops — they pollinate blossoms on the plants to turn them into fruits (like apples for example) or vegetables (like pumpkins). In fact, it's estimated that every third bite of food we eat relates back to honeybees and pollination.

The centre of every beehive is the queen bee, surrounded by a cluster of worker bees tending to her every whim. Annually, about 150,000 queen bees in Canada are imported from Hawaii (because Canadian queens aren't available as early in the year) — travelling to their new home at one to two months of age in a little match-box sized cage with five attendant bees to feed her from a little candy plug at the end of the box that provides nutrition while they're in transit. Canada also imports queen bees from Australia and other countries.



Bee box in a greenhouse

7

Caring for farm animals

Whether it's helping a cow give birth to a calf in the middle of the night or feeding our chickens before we open our Christmas presents, caring for animals has been at the core of what farmers do every day for generations. All animals have basic needs, like food and water, health, and quality of life. Livestock depend on us for everything, and, as farmers, we take this responsibility seriously.

Farmers and ranchers choose to work with animals because we enjoy it. Caring for animals properly is simply a matter of doing the right thing. We're also continually working to improve farm animal care based on new and proven science. We invest in research into farm animal behaviour and housing to help us better understand what farm animals need.

A QUICK TOUR OF FARM ANIMAL REAL ESTATE

The two most common questions we get asked about farm animal care are about animal housing. Let's take a look at them in more detail:

1. Why are most farm animals raised indoors in Canada?

Ask us this question in Winnipeg in January! In all seriousness, some grazing animals like sheep, horses and beef cattle do live outside all year, with shelter and access to food and water. However, many animals, like pigs and poultry, usually live in barns in Canada. Why, you ask? Barns protect livestock from extreme weather and temperatures (hot and cold), diseases like avian influenza and, of course, the age-old problem of predators like wolves and coyotes.

Another reason for indoor housing is for animal monitoring and care. It's much easier to ensure each animal gets the right food, clean water, and general care when they are inside a barn than when they are outside on pasture. And many new barns now have side walls made partially of curtains that can be rolled up when the weather is warmer to let in fresh air and sunlight.

THERE'S AN APP FOR THAT

Many farmers have an alarm system built into the panel in our barns that controls the electricity and climate in the building. If there's a problem, such as the power going off or the temperatures getting too hot or too cold, the alarm will automatically notify us via mobile phone or in our house to let us know we need to get to the barn right away. And increasingly, farmers can control heat and electricity in our barns from our computers, tablets or smart phones without having to go inside the facility. Many of us have also invested in generators to make sure there is electricity for our barns if the power goes out.



...that many barns have water sprinklers and fans to help keep their animals cool and comfortable in hot weather?

Quick fact:
Almost one billion households worldwide rely on livestock for their livelihood⁵⁷.



Joanne Gilbraith



Wayne Riley

2. Why can't they have more space?

This is a common question when people walk into a barn for the first time. The first thing we must do is separate human needs from animal needs, and remember that it's not about us when it comes to animal housing, but about what the animals need. This can be a tough concept to grasp.

As humans, it's in our nature to project our own values onto other creatures. However, every creature has different needs. For example, a bat chooses to live upside down in a dark cave while a Siberian Husky dog might actually prefer to live outdoors in a snowy climate. Each type of farm animal is different too. It's not always a matter of more space, but what's available to them in that space and how they can use it. For example, if you put a group of calves in a very large open barn, research shows they choose to sleep very close to each other and against the walls or gates for a sense of 'protection' or warmth.

As farmers, our priority is to provide the best environment that we can for the animals in our care. It's always a balancing act between animal needs, safe food, and environmental and economic realities, but we're continuously investing in animal welfare research to help us learn what's best. Today's farm practices are definitely a combination of practical experience, common sense and above all, good science.

CODES OF PRACTICE



Farmers, like all animal owners, must follow laws for humane treatment. In addition to these laws, farmers have helped to develop the "Codes of Practice for the Care and Handling of Farm Animals," in conjunction with animal scientists, government, veterinarians, industry partners and the Canadian Federation of Humane Societies. The Codes, which are internationally-recognized as models of responsible animal care, spell out what's appropriate in the daily care and handling of livestock and poultry in areas such as:

Accommodation/Housing/Handling Facilities

- Food and Water
- Management
- Health (e.g., record keeping, lameness, condition scoring, sick and injured animals)
- Transportation
- Euthanasia
- Husbandry/Stockmanship

The National Farm Animal Care Council is leading the process to update Canada's Codes of Practice to reflect new advances in animal welfare research and animal care methods. A Scientific Committee reviews research related to priority welfare issues for the species whose Code is being updated and its report is used to develop these codes.

A total of fourteen Codes are in existence. The Council has recently updated the Codes for beef and dairy cattle, equine, fox, mink, pigs and sheep. Two additional poultry Codes (for meat birds and layers) are currently being revised. To see all the Codes and for more information on how they are developed visit www.nfacc.ca.

Many of Canada's livestock sectors have created, or are creating, on-farm animal care assessment programs, based on the Codes. It varies widely, but farms can be assessed on their animal care standards and protocols as a self audit by the farmer themselves, by trained auditors, or by third party company auditors. The concept of auditing and assessments is to manage what you measure and provide verification that your farm is following best practices with the goal to find problems quickly and continually improve.



WHY DID THE CHICKEN CROSS THE ROAD? ASK IT YOURSELF.

Understanding animal behaviour and needs is a very complicated science. Unfortunately, animals only talk in the movies, so we have to 'ask the animals' what's best for them through scientific animal welfare research. Like many complicated topics, almost every housing or management practice we use on our farms has pros and cons. There's a reason the systems we have were developed, but we are always on the lookout for ways to do things better. Many animal welfare research programs provide options for the animals and measure what they prefer, such as different types of flooring or lighting or bedding.



Tracey Wright



RESEARCH PROFILE:

Dr. Karen Schwean-Lardner

grew up on a pig farm in south west Saskatchewan and has always had a love for farm animals. As a Masters student at the University of Saskatchewan, she designed and tested an early form of an enriched housing system for laying hens (also referred to as furnished housing). She completed her PhD specializing in poultry welfare and productivity at the University of Saskatchewan in 2011. Her research focused on the impact of daylight on the welfare and productivity of broiler chickens. As a Canadian livestock researcher, Karen is passionate about her work and about the welfare of birds. Today, her research continues to focus on how management practices and nutrition impact the welfare and productivity of birds raised on farms.



Did you know...

...there are many people with full-time careers in farm animal care? Many specialists dedicate their lives to improving humane handling for farm animals on the farm, on the truck and at processing plants.

TRANSPORTING LIVESTOCK SAFELY

It's also important that our animals are handled properly once they leave the farm. The Canadian Livestock Transport (CLT) program was specifically developed for people transporting livestock and poultry in Canada. Transporters and farmers and others who work with farm animals have led the development of this program, which focuses on promoting the well-being of livestock during moving and transport, improving animal welfare and reducing injuries and losses. CLT also covers the laws and regulations for transporting animals in Canada. Livestock drivers must take the course and pass an exam to be certified under the program. Visit www.livestocktransport.ca to learn more.

PROS AND CONS OF ANIMAL PRACTICES

There are some procedures we perform on farm animals that people may wonder "why". Farmers don't want to inflict unnecessary pain on animals. There are always pros and cons to everything we do, and in some cases it might be short term pain up front to prevent much bigger problems later. Here are a few examples.

Dehorning - Removing the horns from beef and dairy calves is done for the safety of both the animals and the people working with them. Research has shown it can be done with less pain and stress when calves are young and the horns haven't yet developed. There are now pain control options for the procedure and after it's done (like aspirin). There are also many breeds of cattle now that are 'polled', which means bred without horns at all. By the way, did you know that both females and males can have horns?

Beak trimming is done to prevent laying hens from hurting each other. Some people call it "debeaking" which might make you think that the whole beak is taken off but that's not the case at all. The proper procedure is to remove just the tip of the beak, which is done with an infra-red beam in most cases when the birds are very young. Picture the hook on the end of an eagle's beak and imagine what kind of damage that could do. Research into behaviour, nutrition and genetics is continuing to investigate if there are ways of eliminating the need for this procedure.



Did you know...

...that farm animal veterinarians are extremely specialized? A poultry veterinarian will be an expert in caring for chickens or turkeys – but likely wouldn't work with cows or pigs.



Are controls in place to deal with farm animal abuse?

Absolutely. As farmers we feel that neglect and abuse of animals of any kind is unacceptable and its against the law. Farmers and ranchers, like all animal owners, are responsible for caring for our animals properly and humanely and for following many different laws and regulations, including the federal Criminal Code and provincial animal care legislation.

It's important to note that most farmers and ranchers are doing a great job caring for animals. In cases where the level of care or management of farm animals isn't what it should be, farmers and other experts in the field want to help. Farm organizations in some provinces have developed their own peer service to help improve farm animal care. Farmers, veterinarians and others who work in the field are encouraged to call for help or report problems immediately.



Sheep tail docking is done to prevent manure from collecting on the tail and hindquarters of sheep, which can lead to flystrike. Flystrike is a condition where flies lay eggs that hatch into maggots and attack the sheep's flesh. Tail docking also makes it easier to shear sheep.

Did you know...

...since 1995, Alberta Farm Animal Care (an animal welfare organization funded by farmers and farm organizations) has provided a service by confidentially listening to and acting upon livestock welfare concerns as well as responding to individuals seeking advice on livestock care? The ALERT Line aims to intervene before animals are in distress and has been successful at helping the livestock industry become more aware of responsible animal care and management. An ALERT Resource Team Member responds to the concern, checking the farm and the animals in question and providing help and advice to the owner, as needed. The ALERT Line works closely with the Alberta Society for the Prevention of Cruelty to Animals (AB-SPCA), contacting them immediately should the animals be found to be in distress. In Alberta, the Alberta SPCA enforces the Animal Protection Act. In Ontario, Farm & Food Care also manages an animal care helpline service.

When there is a problem with farm animal care, Canada's farmers are actively part of the solution. In fact, the first farm animal council – dedicated to responsible farm animal care – was formed by farmers in Ontario over 25 years ago and similar organizations now exist at the national level, as well as in British Columbia, Alberta and Saskatchewan, along with several in the United States.



ANIMAL WELFARE OR ANIMAL RIGHTS?

Most people believe in **animal welfare** principles: humans have a right to use animals, but also have a responsibility to treat them humanely. Farmers and ranchers live by these principles. By contrast, **animal rights** supporters don't believe humans have a right to use animals — whether it's for food, clothing, entertainment or medicine. It can be confusing for the average person to sort out the many positions and groups involved with animal care or animal use issues. Activists of any kind are not usually interested in finding solutions, but prefer to focus on problems and dramatic examples to generate funds and support for their organizations.

Farmers are not interested in fighting with activists who are fundamentally opposed to raising animals for food. Our main focus is caring for our animals and figuring out how to do a better job of it. We support animal welfare research that generates real information based on sound science and we continue to improve our practices. Unfortunately, someone doing a good job of caring for their animals 365 days a year rarely makes the news. We want to have conversations and answer questions about what we do and why we do it. If you want to know more about how farmers care for farm animals, please just ask us.

Did you know...



...many farmers today are active on Twitter and other social media sites so it's easier than ever to have your questions answered by someone who works with farm animals or grows crops every day? Try searching popular farming hashtags like #ontag (for stories about Ontario agriculture) and #westcdnag (for stories about agriculture in Western Canada) or following @farmfoodcare.

BEHIND THE SCENES ON GOING “UNDERCOVER”

From time to time, undercover farm animal cruelty video footage makes the headlines when it is released to the media or on the internet by activist groups. This footage is disturbing for everyone who cares for animals, especially farmers. Here are a few points for you to consider:

Sometimes there are acts of cruelty that are shown. This is unacceptable as almost all farms and companies have zero tolerance for animal abuse. There are laws to deal with these cases and they should be used accordingly.

In other cases, it's important to note that the individuals filming the undercover footage may have been there for months without taking action to stop abuse or questionable activity. These cases should be reported to the proper authorities immediately.

With modern camera equipment and video-editing software, situations can be misrepresented to suit a particular agenda or campaign with months' worth of video edited to a few minutes.

It's also important to note that one extreme case (which is always one too many) does not reflect the care that the other millions of farm animals receive every day. Ask questions and find legitimate sources for protecting our animals.

Farmers are as shocked and outraged as everyone else when examples of animal cruelty are brought forward and we want to work with people who are committed to make a difference for how animals are cared for.



During World Wars I and II, Meatless Mondays were part of U.S. government efforts to encourage consumers to do their part on the home front by rationing and reducing consumption of certain food items. It was a patriotic way for those at home to support the war effort and the troops fighting overseas by ensuring our soldiers had access to all the nutritious food they needed.

Today, the Meatless Monday campaign is back, but now it's the brainchild of two New York socialites who support a number of animal rights and anti-meat programs. Contrary to how it's presented, the campaign's intent is not to help consumers make well informed healthy, environmentally-friendly or budget-conscious eating choices. The real goal is to get people to stop eating meat — with the ultimate aim of ending animal agriculture altogether. A healthy, balanced diet is important. What's key is that you have the ability to make food choices for yourself and for your family based on factual, credible information and not simply on the word of celebrity spokespeople.

SEE FARMS FOR YOURSELF

So if you really want to know about how Canada's farm animals are treated and raised, ask questions, talk to real farmers at fall fairs, farmers' markets and other events, or visit www.virtualfarmtours.ca. That's the best way to discover what Canadian farms are really like.



THE GOOD OLD DAYS WEREN'T NECESSARILY THAT GOOD

Storybook images of farm animals frolicking in the meadows block out the realities of extreme temperatures, wind and rain, unreliable food and water sources, and no protection from diseases and predators. Many farm animals are kept inside in barns for the same reasons that many of us keep our pets inside: health, comfort, safety, food and water.

A DRESS CODE FOR THE BARN? IT'S CALLED BIOSECURITY

If you visit a barn, you might be asked to take a shower or wear overalls and plastic boots over your shoes before entering. Other farms don't allow any visitors at all — people or animals. This is called “biosecurity” and it is one part of an animal health program that helps to keep our herds or flocks healthy. By not allowing visitors into the barn, we help keep germs or sickness out. Although we can give our livestock medicine when they're sick, we always choose prevention over treatment.



Conclusion: Food, farming and the future

As farmers, we can look back at the days when we bought our farm animals based on their looks or pedigree. Our crops were planted with a hope and a prayer on the weather and seed quality, with best guesstimates from the neighbours on how much fertilizer or manure we needed to apply.

Fast-forward to today. New technology continues to accelerate change from farm to field to table. We are learning more than we ever thought possible about agriculture's impact and its effect on our daily lives.

GROWING YOUR GARDEN WITH FISH

Michael Meeker raises trout on Ontario's Manitoulin Island. When an average rainbow trout reaches market size, it weighs between 2.5 and three pounds — but only half the fish is used for human consumption. Meeker used to pay to dispose of what was left (called offal) in a landfill site.

Today, he mixes those fish byproducts with sawdust to create Meeker's Magic Mix, a compost product that has a high nutrient value for lawns, flower beds and field crops. Instead of farmers paying to dispose of their offal, it's now being turned into a premium, environmentally-friendly product. Today, Meeker is using about 4.5 million pounds of fish by-products from his farm and others in northern Ontario and his compost is sold to landscapers and through retailers like Home Hardware and Costco.



Mike Meeker

BIO WHAT?

A growing sector in Canada is called the bioeconomy - farmers, processors, researchers and others are trying to develop products that will be cheaper, more environmentally sustainable and lessen dependence on non-renewable resources.

For example, at the University of Waterloo's Institute for Nanotechnology, Professor Leonardo Simon is leading research to invent a process that combines wheat stalks with plastic to create lighter car parts. Ford has been using these new parts in its Ford Flex vehicle since 2010.

Researchers at the University of Guelph's Bioproducts Discovery and Development Centre are also on the leading edge. They are developing and commercializing technology that can turn plant materials into resins, polymers and fibres to produce petroleum-free plastics. One significant success story coming out of the Centre's research to date are plastic bio-bins, flower pots and bird feeders that contain 25 — 30 per cent bioproducts and are currently being sold through Home Hardware and Canadian Tire.



FARM PROFILE:

New Brunswick maple syrup producers Gérald Turcotte and Lyse Fortin are great examples of how farmers' uses of modern technology can vastly improve an age-old farming practice. With a maple syrup business established in 1960, the family were pioneers in the province since they were the first to install gravity tubing, using a vacuum driven by a pump. Their success is due to their adoption of innovative new sap collection practices, perseverance and vision.



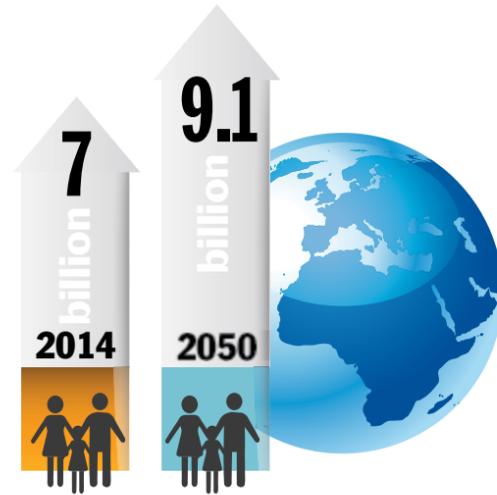
Soybean pods

THE HOUSE OF GRAIN

Today, food, fuel and bio-products can be produced from common Canadian crops like corn, soybeans and wheat. For example, paints and varnishes, adhesives, household insulation, kitchen cabinets, carpet backing, wallpaper, fabrics, bathroom fixtures, sofas, mattresses, bedding, clothing, food, candles, soaps, and cosmetics can all be made from grain-based products. At the Royal Agricultural Royal Fair in Toronto, the Grain Farmers of Ontario showcased four rooms built and decorated with grain-based products - the living room, kitchen, office and garage.

WHAT WE NEED TO FEED NINE BILLION

- World population is projected to grow by 34 percent from seven billion today to 9.1 billion in 2050. Nearly all of this increase in population will take place in the part of the world comprising today's developing countries. The greatest relative increase, 120 percent, is expected in today's least developed countries⁵⁸.
- By 2050, more than 70 percent of the world's population is expected to be live in urban centres.
- In order to feed this larger, more urban and richer population, food production (net of food used for biofuels) must increase by 70 percent. Annual cereal production will need to rise to about 3 billion tonnes from 2.1 billion today and annual meat production will need to rise by over 200 million tonnes to reach 470 million tonnes⁵⁹.



Grain elevators for storing crops

Karla Sunderland

At the end of the day...

We know we're going to have to keep working hard to feed you and nine billion other people. And we know we're going to have to use every tool in our tool box – and likely some that haven't even been invented yet – to make sure there is enough food for everyone.

While much has changed, the most important things about food and farming in Canada haven't changed a bit since Old McDonald's time. The ultimate success of growing food starts with the values and commitment of farm families to our land, to our animals, and to this special way of life.

Ultimately, we all want the same thing: food that is reliable, affordable, safe, nutritious and responsibly produced. We live in a country that is blessed with more food choices and opportunities than most other countries, and how and what we eat is a matter of choice – by you, the consumer, in what you choose to buy, and by us, the farmers, to choose how and what we want to farm.

Thank you for supporting Canadian farmers by buying our products and for being interested in what we do to produce food. By buying Canadian, you are investing in us. We, in turn, promise to continue investing in improving our environment, caring for animals and providing safe, high quality food for your families and ours.

Thank you.



Sheri Mangin



Krystle VanRoboys

With Thanks

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- 1 <http://www.agr.gc.ca/eng/about-us/publications/economic-publications/alphabetical-listing/an-overview-of-the-canadian-agriculture-and-agri-food-system-2014/?id=1396889920372>
- 2 [1] http://www41.statcan.gc.ca/2006/0920/ceb0920_000-eng.htm
[2] <http://www.statcan.gc.ca/pub/95-640-x/2011001/p1/p1-01-eng.htm>
- 3 <http://www.statcan.gc.ca/pub/95-640-x/2011001/p1/p1-01-eng.htm>
- 4 <http://www.agr.gc.ca/eng/about-us/publications/economic-publications/alphabetical-listing/an-overview-of-the-canadian-agriculture-and-agri-food-system-2014/?id=1396889920372>
- 5 <http://www.statcan.gc.ca/pub/95-640-x/2011001/p1/p1-02-eng.htm>
- 6 <http://www.statcan.gc.ca/ca-ra2011/ha-sa-eng.html#a1-3-4>
- 7 <http://www.statcan.gc.ca/ca-ra2011/ha-sa-eng.html#a1-3>
- 8 <http://www.theguardian.com/global-development-professionals-network/2014/feb/19/family-farming-sustainable-food-un-fao>
- 9 <http://www5.statcan.gc.ca/cansim/pick-choisir?lang=eng&p2=33&id=0020026>
- 10 <http://www.statcan.gc.ca/pub/95-640-x/2011001/p1/p1-01-eng.htm>
- 11 Top Commodities by Province and Territory Chart C4.4 in *An Overview of the Canadian Agriculture and Agri-Food System, 2011*
- 12 <http://www.agr.gc.ca/eng/about-us/publications/economic-publications/alphabetical-listing/an-overview-of-the-canadian-agriculture-and-agri-food-system-2013/?id=1331319696826>
- 13 <https://twitter.com/woolwichdairy/status/454396037160239104?refsrc=email>
- 14 Table 004-0224, Census of Agriculture, other livestock on census day
- 15 <http://www.agriculture.gov.sk.ca/Default.aspx?DN=d8961587-68b3-49bc-93d9-1cdab3172f01>
- 16 Fur Council of Canada
- 17 <http://farmflavor.com/soybean-fun-facts/>
- 18 <http://www.pulsecanada.com/pulse-industry>
- 19 2013 Specialty Crop Report, Saskatchewan Ministry of Agriculture
- 20 <http://www.statcan.gc.ca/pub/22-003-x/2011002/part-partie1-eng.htm>
- 21 www.tomatosphere.org
- 22 Ontario Farmer, April 2, 2014, 14A: Canada's favourite astronaut draws on farming roots
- 23 <http://www.statcan.gc.ca/pub/95-640-x/2011001/p1/p1-04-eng.htm>
- 24 <http://www.ontariogreenhouse.com/default/assets/File/2014%20Fact%20Sheet%20FINAL.pdf>
- 25 <http://www.statcan.gc.ca/pub/21-010-x/2014001/aftertoc-aprestdm1-eng.htm>
- 26 <http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/crops-market-information-canadian-industry/market-outlook-report/canadian-farm-fuel-and-fertilizer-prices-and-expenses-july-2013/?id=1389124331873>
- 27 <http://www.ers.usda.gov/data-products/food-expenditures.aspx#.UzyFv4XEH30> – 2012 data
- 28 Agricultural Producers Association of Saskatchewan (www.apas.com)
- 29 Agricultural Producers Association of Saskatchewan (www.apas.com)
- 30 Provided by Chicken Farmers of Canada, 2014
- 31 <http://gfo.ca/Portals/0/Government%20Relations/Food%20vs%20Fuel/Food%20vs%20Fuel%20Executive%20Summary.pdf?ver=2015-09-17-134927-493>
- 32 http://www.cog.ca/about_organics/what_is_organics/
- 33 <http://www.statcan.gc.ca/pub/95-640-x/2011001/p1/p1-05-eng.htm>
- 34 [1] D. Ray, N. Mueller, P. West, J. Foley. "Yield Trends are Insufficient to Double Global Crop Production by 2050." (2013). <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0066428>
[2] Bill & Melinda Gates Foundation, Agricultural Development, Strategy Overview, 2011. <https://docs.gatesfoundation.org/Documents/agricultural-development-strategy-overview.pdf>
- 35 http://www.un.org/esa/population/publications/WPP2004/World_Population_2004_chart.pdf
- 36 <https://twitter.com/Syngenta/status/450664114201694209/photo/1>
- 37 <http://www.wri.org/publication/creating-sustainable-food-future-installment-two>
- 38 <http://vcm-international.com/wp-content/uploads/2013/04/Food-Waste-in-Canada-112410.pdf>
- 39 <http://www.unep.org/wed/2013/quickfacts/>
- 40 <http://www.beefresearch.ca/blog/qa-on-conventional-production-of-canadian-beef>
- 41 Canada Beef: Our shared commitment on E.coli O157:H7
- 42 <http://www.croplife.ca/agriculture-today/helping-solve-the-worlds-challenges>
- 43 http://www.genomeprairie.ca/files/1913/6275/9609/Janice_Tranberg.pdf
- 44 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3135239/>
- 45 <http://safefruitsandveggies.com/pesticide-calculator>
- 46 <http://findourcommonground.com/food-facts/gmo-foods/>
- 47 <http://findourcommonground.com/food-facts/gmo-foods/>
- 48 www.goldenrice.org
- 49 <http://www.croplife.ca/agricultural-pesticides/responsible-use-and-the-environment>
- 50 <http://www.statcan.gc.ca/pub/95-640-x/2011001/p1/p1-05-eng.htm>
- 51 <http://www.croplife.ca/agricultural-pesticides/responsible-use-and-the-environment>
- 52 <http://www.journalpioneer.com/Business/2014-03-31/article-3671672/P.E.I.-farmers-want-to-protect-environment%3A-Federation/1>
- 53 <http://www.sciencedirect.com/science/article/pii/S0308521X08000590>
- 54 <http://www.bbc.co.uk/news/uk-england-10765803>
- 55 Slobodan P. Simonovic. "Managing Water Resources: Methods and Tools for a Systems Approach." (2012) Routledge. Page 299.
- 56 Ibid.
- 57 CAHI: (FAO 2012a). Source: Animal Feed vs. Human Food: Challenges and Opportunities in Sustaining Animal Agriculture Toward 2050. CAST Issue Paper No. 53, September 2013. (pg 3)
- 58 http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf
- 59 http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf



Farm & Food Care cultivates appreciation for food and farming in Canada by connecting farm gates to our dinner plates. Farm & Food Care is a coalition of farmers and associated businesses proactively working together with a commitment to provide credible information and strengthen sustainable food and farming for the future.

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Manitoba Canola Growers Association



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PEI Federation of Agriculture