



conservation AGRICULTURE

Adapting farm practices

Climate is one of the most important influences on the food that is produced and the land that it comes from. As the climate changes, farmers use practices that help them adapt and address the risks that can affect the crops they grow and animals they raise.



In what ways do you think climate changes and changing weather events and patterns affect farmers who grow crops as well as farmers who raise livestock?

Why conservation matters

Conservation agriculture is a way of farming that helps protect and improve the environment while still producing food. It involves using techniques that protect the soil, conserve water and reduce the need for chemical pesticides and fertilizers.

Protecting the soil: Soil needs to be healthy for plants to grow. Conservation agriculture helps keep soil from washing or blowing away.

Saving water: By growing different crops and using modern technologies, farmers can save water, which is important especially in places where water supplies decrease during times of drought or are at risk.

Reducing chemicals: By growing different crops and using natural fertilizers, farmers can reduce the need for chemical pesticides and fertilizers. Technologies like drones allow for targeted application and less waste.

Reducing greenhouse gas emissions:

Greenhouse gases are gaseous substances that can trap and hold heat in the atmosphere. They include carbon dioxide, methane and nitrous oxide. Crop and livestock farming produces some greenhouse gases.

However, agriculture can help slow climate change by storing carbon on agricultural lands.

Storing carbon in soil as organic matter, and with vegetation and trees reduces carbon dioxide amounts in the atmosphere.



Exploring conservation practices

Conservation agriculture practices can help protect the land from climate and weather events, such as droughts, heavy rainfall and high winds. These practices can also reduce greenhouse gas concentrations in the atmosphere.

In what ways do practices used benefit farmers, the environment and people who depend on the food system? Explore the examples that follow to learn more.

Water Sources

Agriculture uses water to irrigate crops and feed animals. Some of this water returns to its original sources, where the water first came from. These sources can include lakes, rivers and streams.

However, this water can carry soil and other substances. There may be surface runoff of pesticides, which are substances used to kill insects. Fertilizers and manure can also mix with the surface water.



All of these substances can also run into **groundwater**, which is water found in the soil or in dents and cracks in rock. This groundwater, along with these different substances, will eventually find its way into lakes, rivers or the ocean.

Practices that use cover crops, no-till farming and windbreaks can help the soil's ability to hold water. They can also prevent water runoff from the soil.

Cover Crops

Have you seen home gardens with mulch covers? These are similar to cover crops.

Cover crops are plants that are grown to cover the soil when main crops aren't being grown. These plants reduce weeds and can provide be used by livestock for grazing. The cover crops protect the soil from water and wind erosion, add nutrients and help keep moisture in the soil.

Zero-Till Farming

Zero-till farming practices involve planting seeds directly into the soil without turning it over. This practice can also be called **no-till** or **reduced tillage** farming. This practice keeps the soil structure intact and protects soil organisms.

It also decreases the fuel needed by machines that were previously used to turn over the soil before planting.



DID YOU KNOW? Cover crops are not always suitable for every environment. Farmers must purchase seed and manage the crop. Alberta's shorter growing season does not always allow the cover crop to be planted and grown in time.



DID YOU KNOW? Traditionally, farmers would turn over the soil before planting a crop. This allowed carbon stored in the soil to be released into the atmosphere.

Crop Rotation

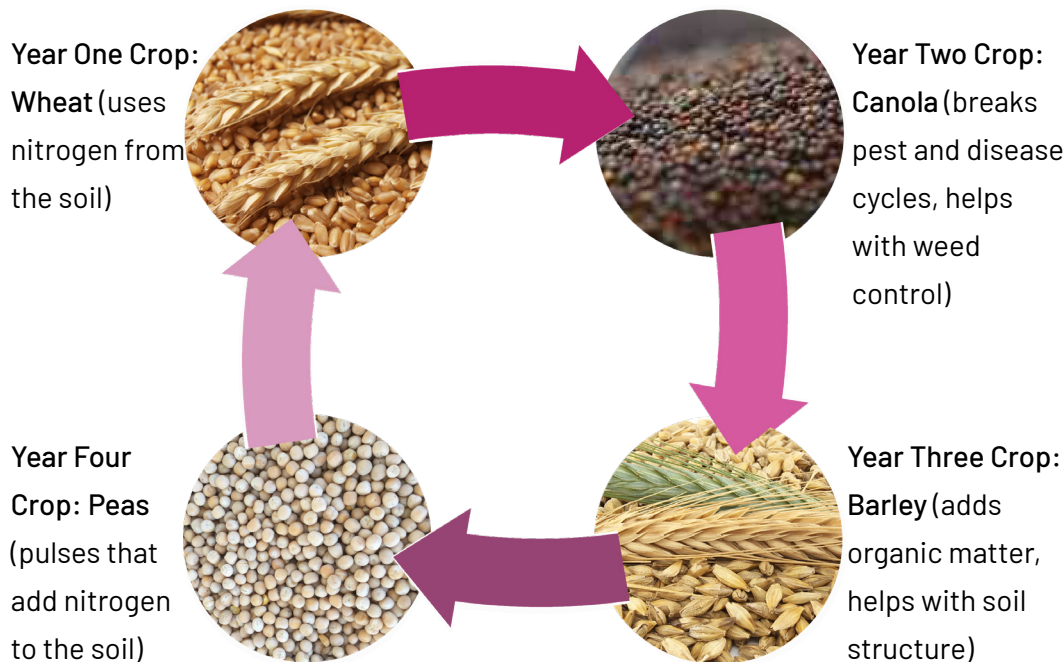
Crop rotation is a farming practice where different types of crops are planted in the same field in a planned sequence over several years. Instead of growing the same crop year after year, farmers change the crops each season.

For example, pulses like dry peas and beans that add nitrogen to the soil provide benefits to crops that are planted after them – for example, wheat, which requires nitrogen.

When crops are planted in a rotation, less nutrients in the form of fertilizers are needed for plants to grow well. Reducing the amount of fertilizers needed by plants can reduce the amount of nitrous oxide (a greenhouse gas) that is released into the atmosphere.

Crop rotation also disrupts the life cycles of pests and weeds and reduces the chance of disease outbreaks.

Consider this example of a **four-year crop rotation**:



DID YOU KNOW? **Agroforestry** is the use of trees as shelter to protect soil, water and animals. **Shelterbelts** are lines of trees that are planted to reduce soil loss and increase soil moisture. Fields that are protected by shelterbelts can produce better crops.



Why is it important to find ways to protect the soil for farmers who grow crops as well as for farmers who raise livestock?

Manure Management

Manure refers to animal excrement that is used for fertilizer. It can be a valuable by-product from livestock farms and is used as a resource with many benefits.

Applying manure to cropland as a fertilizer is a sustainable agricultural practice because nutrients can be effectively recycled.

Manure is a source of plant nutrients and improves soil organic matter, structure, aeration and water holding capacity. It is not just used on farms as a fertilizer. It is also used by many home gardeners.



Tiffany and Lane are chicken farmers in Saskatchewan. Lane ensures to utilize the manure from the chickens as fertilizer for the crops, reducing the need for synthetic fertilizer inputs by over 50 percent and sustaining the organic matter in the soil. The grain crops are used to feed the chickens, and the remaining straw is used for fresh bedding for each new flock of chicks. In this way, everything on Tiffany and Lane's farm goes full circle, with the outputs becoming inputs, and the land being preserved for future generations.



How do practices like manure management apply to both crop and livestock farming?

Greenhouse Gases

Greenhouse gases are gaseous substances that can trap and hold heat in the atmosphere. These gases include **methane**, the main component of natural gas, **nitrous oxide** and **carbon dioxide**. Greenhouse gases come from a variety of human activities, including agriculture.

About 10 percent of Canada's greenhouse gas emissions are from crop and livestock production. This percentage does not, however, include emissions from the use of fossil fuels or from the production of fertilizer.

Some methane comes from ruminant animals such as cattle and sheep. It can also be produced by manure.

Nitrous oxide is emitted by soil. If nitrogen is added to farm soil in the form of fertilizer, the amount of nitrous oxide emissions can increase.

Agricultural soils can either emit or absorb carbon dioxide. Carbon is stored in soil. In the air, carbon exists mostly as carbon dioxide.

Conservation agriculture practices help reduce these greenhouse gases.

Farm practices that help store more carbon in soil, which also removes more carbon dioxide from the atmosphere, include:

- ◆ The use of zero-till planting
- ◆ The use of cover crops, including pulses
- ◆ Using pulses in crop rotations



DID YOU KNOW? Dairy farmers have improved the type of feed used with their cows. This has contributed to their ability to produce the same amount of milk with fewer cows. These improvements help reduce methane emissions and greenhouse gas.



DID YOU KNOW? Pulse plants have **root nodules**. Inside these nodules, a type of bacteria lives that helps the plant take in nitrogen from the air. This nitrogen helps the plant to grow. When the plant dies, the fixed nitrogen is released, making it available to other plants, and helping to fertilize the soil.

As a result, farmers can use little to no fertilizer. This reduces the nitrous oxide emissions from soil.

- ◆ Rotating the pastures or fields used for grazing livestock
- ◆ Planting shrubs and trees as shelterbelts
- ◆ Restoring wetlands
- ◆ Adding animal manure to the soil to reduce fertilizer use

Information adapted from Agriculture and Agri-Food Canada: Greenhouse gas emissions and agriculture:
<https://agriculture.canada.ca/en/environment/greenhouse-gases>

Air Quality

Air quality also looks at the presence of tiny particles of solid matter and liquid droplets that are suspended in the air. These solids and liquids can come from chemical substances in things like fertilizers and pesticides. They can also include dust, feather fibres and bacteria.

These particles are invisible. They come from human activities like preparing cropland for planting and harvesting. Changes to soil practices, like the use of no-till, reduces the dust and other particles in the air. The trend across Canada's prairie provinces has been a decrease in these particles. This has a positive effect on air quality.

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Identify one conservation agriculture practice. Justify why this practice is part of conservation agriculture.

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In what ways could this practice help farmers respond to risks posed by changing climate and weather patterns?