project AGRICULTURE

SPARK questions about **sustainable** PRACTICES

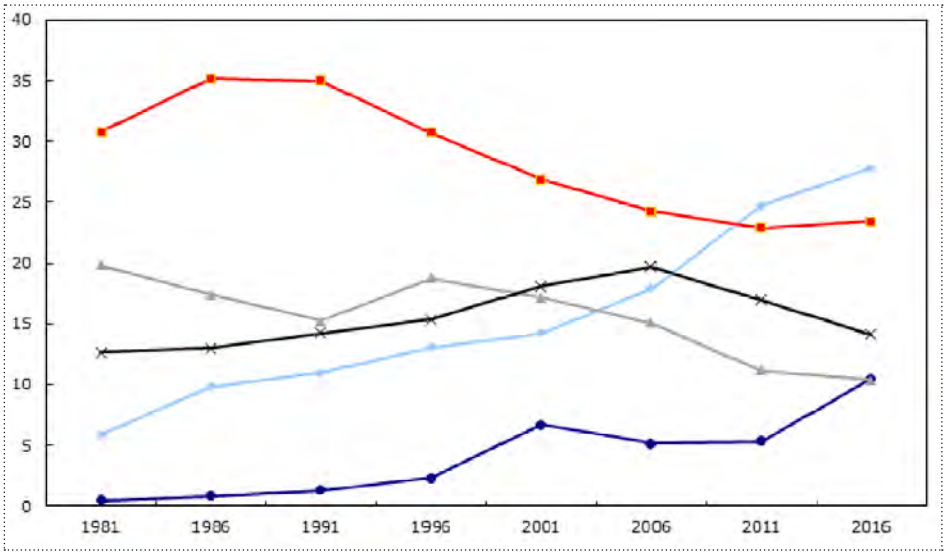
How does **technology** and **mechanization** support **sustainable** farming?

Technologies and mechanization have allowed farmers to grow more while using fewer resources.

farmers today grow more food with fewer resources

What do Canadian farmers grow today? Canada's largest crops in terms of acreage were canola, spring wheat, alfalfa and barley. Over the last few decades, **pulses** – the dry edible seeds of legume plants – and soybeans have grown through the development of seed varieties that can be grown in more regions.

The graph below shows the total seeded area of pulses, oilseeds, wheat, feed grains and hay from 1981 to 2016. What does it tell you about the amount of land that is used to grow these crops?



Graph from Seeding decisions harvest opportunities for Canadian farmers (May 31, 2017). Statistics Canada: Online. www150.statcan.gc.ca/n1/pub/95-640-x/2016001/article/14813-eng.htm

- [ ] **I will use information and INVESTIGATE FURTHER questions to help me identify a project question I want to investigate for an sustainable PRACTICES project.**
- [ ] **I will identify what I need to know more about.**

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As a result of improvements and innovations, Canadian farmers grow more food per acre of land than at any other time in history. Canadian farmers also grow a greater variety of field crops as a result of innovation in crop science and farming practices.

The use of new technologies and the development of more efficient machines means that farmers can use less water, fertilizers and/or pesticides and target very specific parts of their crops, or even treat individual plants with different quantities or concentrations. This has resulted in benefits such as:

- Increased crop yields
- Less impact on the natural ecosystem
- More protection of natural water sources and soil quality

Robotic technologies are being combined with more familiar agricultural machines like tractors and ploughs to monitor and manage how crops are grown more efficiently.

For example, **autonomous field ploughing** combines tractors with technology such as computer vision sensors and GPS to navigate and act as the driver. These tractors are able to drive without a driver. Specialized equipment can be added to the tractor and used to spray, seed, plough and identify and remove weeds on cropland. The photo below shows one example of an autonomous tractor, controlled by a smartphone. What other types of farming equipment do you think can be used with these tractors?

INVESTIGATE FURTHER

How have changing machinery and technologies affected the changes in Canada's crop yields and crop diversity?

INVESTIGATE FURTHER

How are machines being combined with digital technologies to increase food production? What more can you find out?

precision agriculture is changing the way farmers farm

Precision agriculture is a method of farming that uses technology and data – including GPS guidance, drones, sensors, soil sampling and precision machinery – to grow crops more efficiently.

It allows farmers to make better decisions about the use of crop inputs, such as fertilizers, pesticides, tillage and irrigation water. **Inputs** refer to the many resources used in farming and food production – like seeds, livestock, soil and water, farm equipment and tools, irrigation systems, fertilizer and pesticides as well as human labour.

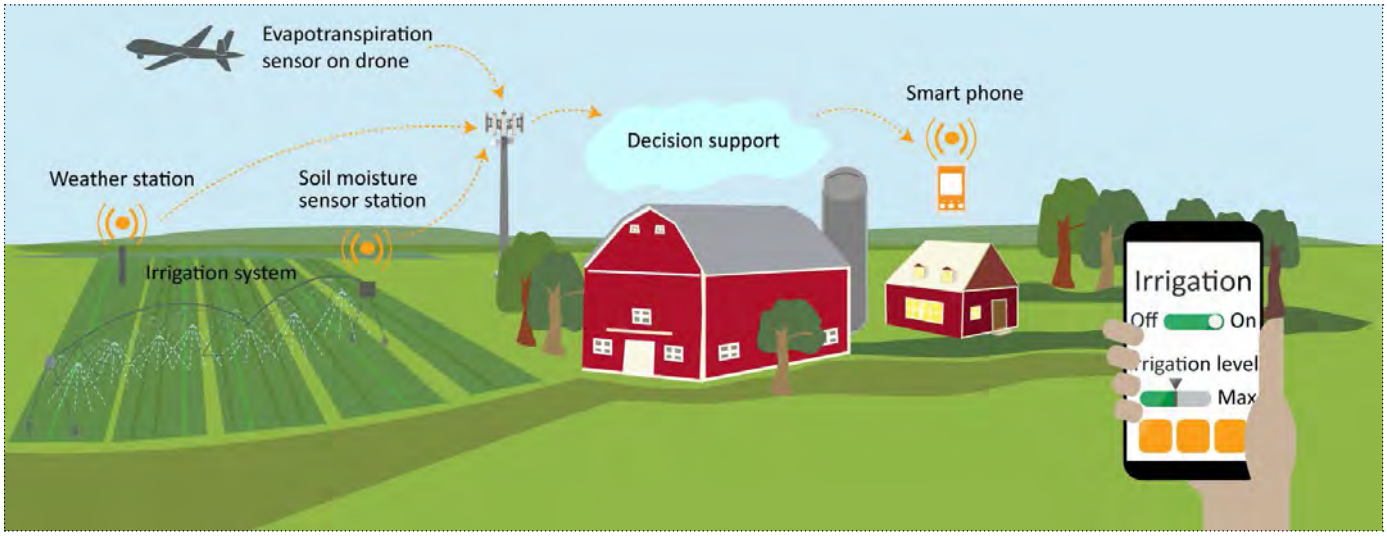
The goal of precision agriculture is more efficient and sustainable food production, while protecting the environment. Methods that involve drones, satellite mapping and sensors are used to collect information and make decisions about specific pieces of land. This allows farmers to identify areas of their fields that may need different care, from where in the field to apply a specific amount to when it's best to use fertilizer or seed.

This "precise" approach to decision making helps improve the yield of crops, reduces waste and improves environmental sustainability. The infographic below shows one example of this.

Weather, soil moisture, and evaporation data are collected and sent remotely to a decision support system, which then provides information that the farmer uses to make decisions.

INVESTIGATE FURTHER

How does mechanization make agriculture more efficient? How can mechanization make agriculture more responsible?



Infographic excerpted from Irrigated Agriculture: Technologies, Practices, and Implications for Water Scarcity (2019). U.S. Government Accountability Office. www.gao.gov/products/GAO-20-128SP