

GOAL

Students will create a timeline to discover how agriculture has evolved over time and is always innovating to find new ways to produce food sustainably and efficiently.

CURRICULUM CONNECTIONS

General Learning Outcomes

Grades 3, 4, 5, 6, 7 & 8 Science	
A4	Identify and appreciate contributions made by women and men from many societies and cultural backgrounds towards increasing our understanding of the world and in bringing about technological innovations.
B1	Describe scientific and technological developments, past and present, and appreciate their impact on individuals, societies, and the environment, both locally and globally.
B2	Recognize that scientific and technological endeavours have been and continue to be influenced by human needs and the societal context of the time.

Skills Outcomes

The agriculture innovation timeline provides a fun and interactive way for your students to develop the skill of creating a timeline.

Grades 5, 6, 7 & 8 Science	
5-o-8c & 6-o-8c	Recognize that technology is a way of solving problems in response to human needs.
5-o-8d & 6-o-8d & 7-o-8d	Provide examples of technologies from the past and describe how they have evolved over time.
8-o-8d	Describe examples of how technologies have evolved over time in response to changing needs and scientific advances.
7-o-8e & 8-o-8e	Provide examples of Canadian institutions and individuals who have contributed to science and technology and describe their contributions.
Grade 3 Social Studies	
S-204	Use timelines to organize information chronologically.
Grade 4, 5, 6 & 8 Social Studies	
S-204	Create timelines and other visual organizers to sequence and represent historical figures, relationships, or chronological events

Specific Learning Outcomes

Grade 3 Social Studies – Clusters 3 and 4	
3-KE-035	Give examples of work, goods, and technologies in communities studied.
3-VH-007	Express interest in and curiosity about people, events, and ways of life in the past.
Grade 4 Social Studies – Cluster 4	
4-KH-035	Describe ways in which life in Manitoba has changed over time. Examples: housing, food, hunting and fishing, clothing, recreation, languages, education, agriculture, transportation...
4-VH-009	Appreciate the significance of history in their lives.
Grade 6 Social Studies – Clusters 1 and 3	
6-VL-010	Appreciate the efforts of people in early Canada to overcome environmental hardships.
6-VE-018	Appreciate the importance of agriculture in the development of Canada.
6-KE-059	Give examples of inventions and technologies created in Canada. Examples: kayaks, snowmobiles, Canadarm, insulin, canola
Grade 8 Social Studies – Clusters 2, 4 and 5	
8-KE-054	Describe technologies and tools in an early society of Mesopotamia, Egypt, or the Indus Valley. Examples: animal and crop domestication, irrigation, construction, weapons, transportation...
8-VE-017	Appreciate the ideas and technologies of early societies.
8-VH-012	Appreciate the contributions of all societies to the development of the modern world.
8-VE-018	Appreciate the benefits afforded to the modern world by ideas and technologies of past societies.

BACKGROUND INFORMATION

Humans started practicing agriculture over 10 000 years ago. Constant agricultural innovation has occurred throughout history which has made it possible for us to feed ourselves even as our world population has grown.

Agriculture and Agri-food is an essential Canadian and Manitoban industry that greatly impacts each of us in many ways. Agriculture provides:

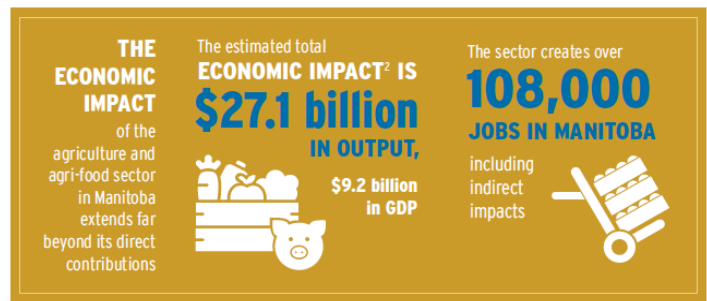
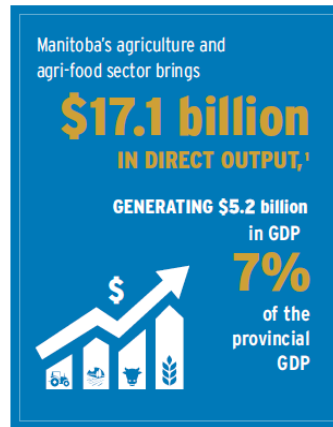
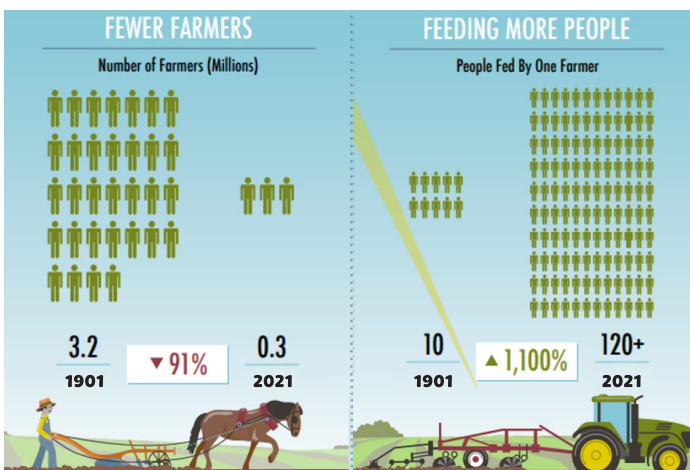
- Food, fibre, energy – Agriculture is the business of producing, processing, and distributing our most basic need - food. But it also provides us with
 - ingredients for everyday products like medicine, cosmetics, and airplane deicer
 - fibres like linen, wool, and bioplastics.
 - alternative energy like ethanol and biodiesel.
- Economic prosperity – Agriculture is a significant contributor to Manitoba’s economy.
- Jobs - Agriculture not only provides many direct jobs in Manitoba but many indirect jobs too

Agricultural innovation has greatly improved Canadian agricultural productivity so that today only 2% of Canada’s workers are farmers. This leaves the other 98% of Canadian workers to pursue other interests, talents, and careers in urban areas rather than living on the land to produce their own food.

Agriculture continues to constantly innovate to find the best way to produce the most food, fibre and energy in the most sustainable way.

Agriculture scientists, including animal and plant researchers, computer programmers, artificial intelligence and robotics designers, engineers, ecologists, and chemists are working

120 Years of Canadian Agricultural Innovation



<https://www.gov.mb.ca/agriculture/markets-and-statistics/economic-analysis/pubs/manitoba-agrifood-infographic.pdf>

hard to come up with innovations to help the agricultural industry meet future food and fibre production, processing, and distribution challenges such as:

- Producing enough food to feed 9 – 10 billion people by 2050
 - It is estimated we will need 50 – 70% more food in 2050 than we do today to provide **food security**¹ for all.
- Reducing **food waste**² throughout the agri-food system.
- Adapting to changing weather and pests caused by **climate change**⁴
- Finding ways to not only decrease the carbon footprint of food and fibre production but also using agriculture practices and products to reverse climate change.
 - **biodegradable plastics**⁶, **carbon sequestration**³, **regenerative agriculture**⁵, renewable fuels.

Find more information on the highlighted topics in the **snapAG section** of the Agriculture in the Classroom – Canada website aitc-canada.ca under Resources & Programs.

Agriculture Innovation Timeline Game

LESSON PLAN



MATERIALS NEEDED:

- Agriculture Innovation Timeline game box (4 card sets/box)
 - 30 cards/set - Innovation on one side, discovery date and innovation on the other side
- Table or floor space large enough for each group to create their timeline on.

➔ Activate

- Ask the students to name some modern conveniences i.e.) car or washing machine or cell phone. Ask them what was done in the past before the modern convenience i.e) cars (horses), washing machine (hand washing), or cell phones (in-person/ letters/land line)
- In agriculture, most farmers use tractors to pull farm machinery. What do you think farmers used to pull machinery before they had tractors? (Possible answers: horses, oxen, people)

➔ Acquire

- Have students play the Agriculture Innovation Timeline game to create a historical timeline of agriculture innovation from the time when people started farming to the present.

➔ Assess

Post-Game Classroom Discussion Questions:

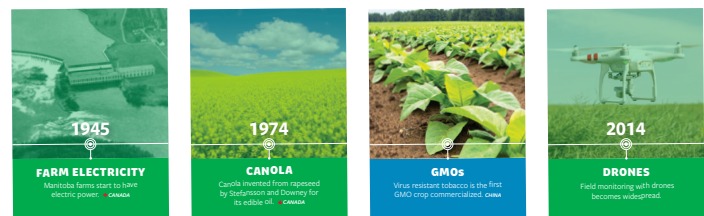
- What agricultural innovation surprised you?
- Why does agriculture keep changing and innovating?
- What are new inventions trying to achieve?

Examples: Trying to solve problems or adapt to new conditions like labour shortages, increasing population, climate change, environmental protection, changing food preferences, enhanced food safety, reducing food waste...

- What skills might you need to invent something?
Agriculture needs people who are good at Math, Science, Social Studies, English etc. and/or have skills in programming, designing, building, researching, marketing, financing etc.
- Ask students what they would invent to make agriculture better.

GAME INSTRUCTIONS:

- Divide the students into 4 groups. (Each group will need floor or table space to play)
- Give each group one card set from the game box. Tell the students to make sure the cards are all facing **blue** side up, then shuffle the cards and place the shuffled deck **blue** side up in the middle of the playing surface.
- To start the timeline, have each group take the top card of the deck and flip it over to reveal the date on the **green** side. Place this card **green** side up in the middle of the play area.
- To play the game tell the students to take turns taking the **blue** card from the top of the main card pile and placing it into the timeline. (Students are not to turn the card to the **green** side at this time.) The student places the card **blue** side up in the timeline to the right (more recent) or left (further in the past) of the original start card.



- Once a card is placed, the student can flip it over to the **green** side to reveal the date of the innovation. If they have placed it correctly, the student leaves it where it is. If it is incorrect, the student moves it to the appropriate place on the timeline.
- Have the students continue the process until all cards in the pile have been used and the whole timeline is **green**. ALL students will have the opportunity to guess and place a few cards.

ADD SOME COMPETITION

If groups have 4 or more students, then:

- Each group can have 2 teams of 2 or more students each. Each team can take turns drawing and placing a card on the timeline.
- The team can earn 3 points for every correct placement. (This will reinforce skip counting by 3's. For older students use 7 points or 9 points for more challenging skip counting.)
- The team with the most points at the end of the game is the winner.

EXTENSION ACTIVITIES

Students can:

1. Choose one of the Canadian innovations from the timeline and research that innovation. Then share what you learned by creating one of the following to present to or share with your classmates:
 - o An infographic or poster
 - o A short speech, presentation, or video
 - o A blog post, short written report, or news article
 - o A poem or song
2. Watch the Healthy Foods from Healthy Farms video, 16:31 minutes, and identify the technologies that farmers and food processors rely on to have healthy farms and safe food. (Choose one technology and create a mini booklet [below] on it).
3. Identify the regions or countries in the world where the inventions came from. Using sticky tack and a classroom map, put the cards on the region or country they came from.
4. Choose and read a book from the innovation books provided by your teacher and then complete the worksheet.
5. Individually or as a class watch a video from the video list below and then complete the worksheet.

All the videos are available on YouTube. Just enter video title into the YouTube search bar.

SUGGESTED BOOKS

Drones (2017) – Simon Rose; 32 pgs; ISBN: 978-1-515737759

Reggie Technology Adventure (2019) – AITC NFL; 36 pgs; ISBN 978-1-989393055

L'aventure technologique de Reggie (2019) – AITC-NFL; 36 pgs; ISBN 978-1-989393062

Full of Beans – Henry Ford Grows a Car (2019) – Peggy Thomas; 48 pgs; ISBN: 978-1-629796390

Gregor Mendel – The Friar Who Grew Peas (2006) – Cheryl Bardoe; 32 pgs; ISBN: 978-1-419718403

Agricultural Inventions - At the Top of the Field (2014) – Helen Mason; 48 pgs; ISBN: 9780778702337

More Advanced Book:

George Washington Carver for Kids: His Life and Discoveries, with 21 Activities (2019) – Peggy Thomas; 144 pgs; ISBN 978-0-915864003

SUGGESTED VIDEOS

The Innovators 3:00 minutes, Agriculture and Agri-food Canada
<https://youtu.be/VbO5QjjiJo8>

Farm to Car 2:57 minutes, Presented by Ford,
<https://youtu.be/Aa9d77hNN-o>

Why GMOs are Good for the World 2:17 minutes, Jacob Bless
<https://youtu.be/bnNy7aLEcos>

GPS Technology on the Farm 1:59 minutes. Manitoba Pork
<https://youtu.be/CNPokPMzD5o> (CDN)

Autonomous technology in the future of Canadian farming and agriculture 1:30 minutes, Invest in Canada
<https://youtu.be/peHbtzUASCI> (CDN)

Raven Autonomy: Dot Overview 3:15 minutes, Raven Precision
<https://youtu.be/4RziLDq8XUE>

The CNH Industrial Autonomous Tractor Concept (English) 2:27 minutes, CNH Industrial
<https://youtu.be/ALmqer12oqM>

The CNH Industrial Autonomous Tractor Concept (FRANÇAIS) 2:27 minutes, CNH Industrial
<https://youtu.be/tY7KfJMykiY>

Engineering and robotics 3:58 minutes, Matt Sterling (ON) G3 Grow Beyond Entry (suggest watching 0:00 – 2:58)
<https://youtu.be/243-4RgLqCo> (CDN)

How This Robotic Farm Is Reimagining Agriculture 3:11 minutes,
<https://youtu.be/fFxzWG-KGGU>

Lely Vector - How does it work (English) 4:38 minutes, Lely
https://youtu.be/pwjKWQNmw_4

Lely Vector - How does it work (French) 4:43 minutes, Lely
<https://youtu.be/xuarXBy28po>

More Advanced videos:

The Future of Farming 12:28 minutes, The Daily Conversation -,
<https://youtu.be/QmlagNLFbVU>

The Case for Engineering Our Food 17:49 minutes, Pamela Ronald:
<https://youtu.be/wZ2TF8-PGQ4>

Innovation and Research in Agriculture 4:10 minutes (suggest watching 0:00 – 2:47), Reid Blashko (AB) G3 Grow Beyond entry
<https://youtu.be/-XMWH4UKOeY> (CDN)

Agriculture Innovations Now and in the Future

An **innovation** is a new method, idea or product that is used to help solve a problem or improve how well a task is done.

Here are some examples of agricultural problems or challenges:

- Changing weather caused by climate change
- Reduce carbon footprint
- Pests like weeds, insects, and diseases
- Food waste
- Too few farm workers
- Keep crops and animals healthy
- Grow more food using less land, water, and energy for an increasing world population
- Reduce the distance food travels to get to you

Read the book or watch the video provided by your teacher. Then complete the following questions.

1. Name the one innovation that you read about or viewed that was most interesting to you.

2. Identify the problem that this innovation was created to solve.

3. Describe the innovation and how it helps to solve that problem.

ANSWER KEY

	INNOVATION	DATE	DESCRIPTION
1	Agriculture	8000BC	Humans start to farm. (Middle East)
2	Pesticide	2500BC	Sulphur compounds are used as an insecticide to kill insects. (Iraq)
3	Farming in Canada	2300BC	Indigenous people start farming squash. (Canada)
4	Ancient Seed Drill	200 BC	Multi-tube seed planter invented. (China)
5	Horse collar	400	Collar invented for horses to pull heavier loads. (China)
6	Horse shoe	600	Metal shoes invented for horses to work in difficult terrain.
7	Honey bee	1622	The European honey bee is introduced into North America.
8	Mechanical Seed Drill	1701	Horse-drawn seed planter invented by Jethro Tull. (England)
9	Cotton Gin	1793	Machine to separate cotton fibres and seed invented by Eli Whitney. (USA)
10	Mechanical reaper	1834	Horse-drawn mechanical harvester invented by Cyrus Hall McCormick. (USA)
11	McIntosh Apple	1835	McIntosh apple is invented through grafting by John McIntosh. (Canada)
12	Steel Plough	1837	Horse-drawn steel plough invented by John Deere. (USA)
13	Barbed fencing	1874	Barbed wire fencing invented by Joseph Glidden protects crops from livestock. (USA)
14	Marquis wheat	1907	Early maturing Marquis wheat variety invented by Charles Saunders. (Canada)
15	Nitrogen fertilizer	1909	A process to make nitrogen fertilizer from the air invented by Bosch and Haber. (Germany)
16	Tractor	1917	First mass-produced tractor invented by Henry Ford. (USA)
17	Combine	1937	Self-propelled combine harvester invented by Thomas Carroll. (Canada)
18	Penicillin	1944	Antibiotics are mass produced thanks to Alexander Fleming's discovery. (England)
19	Farm Electricity	1945	Manitoba farms start to have electric power.
20	Genetic code	1953	The double helix of DNA is discovered by a team of scientists. (England)
21	Conveyor belt	1963	Conveyor belt for egg collection invented by Gerald Kitson. (USA)
22	Canola	1974	Canola is invented from rapeseed by Stefansson and Downey for its edible oil. (Canada)
23	GMO	1992	Virus resistant tobacco is the first GMO crop commercialized. (China)
24	GPS	1996	Precision farming invented with introduction of GPS receivers in tractors (USA)
25	Robotic milker	1999	Robotic milker introduced into North America. (Canada)
26	Golden Rice	2000	GMO rice, high in vitamin A, invented by Beyer and Potrykus. (Germany/ Switzerland)
27	Vertical farms	2012	World's first commercial vertical farm. (Singapore)
28	Smart Barns	2013	Fully automated, remote barn management invented by Barrou and Spilmann. (Canada)
29	Drones	2014	Field monitoring with drones becomes widespread.
30	Robot tractor	2019	World's largest autonomous tractor invented by Norbert Beaujot. (Canada)

SOURCES

Background Notes

The following two-sided snapAG information sheets on each of the following topics can be found on the Agriculture in the Classroom – Canada site aitc-canada.ca under Resources & Programs.

1. Food Security snapAG
2. Food Waste snapAG
3. Carbon Sequestration snapAG
4. Climate Change see Plant Breeding and Food Security snapAG
5. Regenerative Agriculture snapAG
6. Biodegradable Plastics see Bioplastics snapAG

Inventions

1. <https://www.pnas.org/content/pnas/106/16/6427.full.pdf>
2. https://en.wikipedia.org/wiki/Pest_control
<https://courses.cit.cornell.edu/ipm444/lec-notes/extra/ipm-history.html>
3. <https://www.britannica.com/topic/agriculture/The-Americas>
https://en.wikipedia.org/wiki/Eastern_Agricultural_Complex
https://en.wikipedia.org/wiki/Agriculture_in_Canada
4. <https://china.usc.edu/sites/default/files/forums/Chinese%20Inventions.pdf>
5. https://en.wikipedia.org/wiki/Horse_collar
6. <https://en.wikipedia.org/wiki/Horseshoe>
7. https://en.wikipedia.org/wiki/Western_honey_bee#Domestication
8. [https://en.wikipedia.org/wiki/Jethro_Tull_\(agriculturist\)](https://en.wikipedia.org/wiki/Jethro_Tull_(agriculturist))
9. https://en.wikipedia.org/wiki/Cotton_gin
10. https://en.wikipedia.org/wiki/Cyrus_McCormick
11. [https://en.wikipedia.org/wiki/McIntosh_\(apple\)](https://en.wikipedia.org/wiki/McIntosh_(apple))
12. https://en.wikipedia.org/wiki/Timeline_of_agriculture_and_food_technology
13. Farm Progress - 10 Greatest Beef Innovations
14. <https://www.thecanadianencyclopedia.ca/en/article/marquis-wheat>
15. https://en.wikipedia.org/wiki/Haber_process
16. <https://en.wikipedia.org/wiki/Fordson>
17. https://en.wikipedia.org/wiki/Combine_harvester
18. <https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/flemingpenicillin.html>
19. https://www.hydro.mb.ca/corporate/history/history_of_electric_power_book.pdf

SOURCES (CONTINUED)

20. https://en.wikipedia.org/wiki/The_Double_Helix
<https://www.sciencehistory.org/historical-profile/james-watson-francis-crick-maurice-wilkins-and-rosalind-franklin>
https://en.wikipedia.org/wiki/Nucleic_acid_double_helix
21. <https://patentimages.storage.googleapis.com/38/af/30/879b2cf78463eb/US3107652.pdf>
22. <https://www.thecanadianencyclopedia.ca/en/article/canola>
23. https://en.wikipedia.org/wiki/Genetically_modified_crops
24. <https://americanhistory.si.edu/blog/precision-farming>
25. <https://www.topcropmanager.com/celebrating-150-years-of-canadian-agriculture/>
26. https://en.wikipedia.org/wiki/Golden_rice
<http://www.goldenrice.org/index.php>
27. https://en.wikipedia.org/wiki/Vertical_farming
<https://www.skygreens.com/2012/11/>
28. <http://www.maximus-solution.com/>
<http://www.feedlivestock.com/maximus-brings-brain-in-the-barn-management-system-to-asia/>
29. <https://www.topcropmanager.com/celebrating-150-years-of-canadian-agriculture/>
30. <https://agfundernews.com/a-qa-with-robert-saik-its-time-to-get-big-or-go-home-for-agriculture-robotics.html>