



The Farm Equipment Explosion

In the last two hundred years the technology of farm equipment has dramatically changed. Farming has become much more mechanized and less labour intensive. As a result, Saskatchewan farming has changed dramatically. This lesson should follow Lesson 13: Early Tools of Agriculture.

Outcomes:

- RW4.1 Analyze the strategies Saskatchewan people have developed to meet the challenges presented by the natural environment.
- RW4.2 Investigate the importance of agriculture to the economy and culture of Saskatchewan.

Indicators:

- RW4.1 a. List the challenges and opportunities climate presents for residents of Saskatchewan.
- RW4.1 g. Investigate the technological evolution of farming practices in Saskatchewan, including crop variety development, pesticide and herbicide use, and soil and water conservation.
- RW4.2 b. Research production practices of various types of crop and livestock farms.

Note from AITC: Other expected outcomes include:

- Students will gain an understanding of how quickly things can change and the impact those changes can create.
- Students can verbalize some of the changes that have occurred in the production of grain.

Questions/Statements to Guide Inquiry:

1. How have the changes in farm equipment affected farming?
2. How have farm equipment advances contributed to feeding the world?
3. Farming is an expensive industry.

Teacher Background

Read "The Farming Equipment Explosion" (Teacher Information Sheet 14.1) for background information.

Also, refer to Teacher Information Sheet 10.2. Revisit this sheet when discussing how farm equipment technology has changed our agriculture and food system.

The websites listed in Lesson 13's Teacher Background would be valuable for Lesson 14 as well.



One - two
45 minute
classes

MATERIALS NEEDED:

- * Student Handout 14.1
- * A selection of farm equipment dealership brochures
- * Internet (optional)





Before Activity

Distribute a variety of informational material obtained from a number of farm equipment dealerships. Have students make some observations. (These observations will vary according to the student demographics). Prompting may be necessary (e.g. size, price, intended audience, horsepower, and the meaning of horsepower).

During Activity

With students, read “Farm Machinery” (Handout 14.1). Pause at the first question inviting students to discuss the chart with the person beside him/her. Discuss the chart as a class.

Give students time to work through the second question with a partner. Discuss as a class. You may wish to select fewer examples than listed.

You may want to bring up pictures of modern farm equipment on an overhead projector as you are having the class discussion. Pictures can be found on the AITC photo gallery at www.aitc.sk.ca/photo-gallery.

After Activity

Agriculture is an expensive industry. Indicate to students that tractors, trucks, and other farm implements are very costly as they saw earlier with the dealer brochures. A farmer’s investment in land, buildings, machinery, and livestock may easily reach over a million dollars.

Invite students to reflect on the costs of farming. Have pairs of students make a rough list of what expenses a modern grain farmer would have. Have them compare their list to another pair’s list. Finally, share as an entire class.

Debrief, ensuring the basics such as seed, fuel, fertilizer, and herbicides have been mentioned in addition to machinery. The purpose is not arriving at a precise number, but getting a sense of the complexity and demands involved.

Assessment

Teacher Checklist

- ✓ Could students make meaningful observations about dealerships’ materials?
- ✓ Could students make appropriate connections to the questions on Handout 14.1?
- ✓ Could students generate a reasonable list of farming expenses?



Further Investigation

Have a recently retired farmer come and share memories of past and present day farming. Another possibility is a young farmer visiting with a retired farmer to do a “then and now” discussion. A retirement home is an excellent place to connect with retired farmers who might welcome the opportunity to visit a classroom.

Visit a provincial museum or another historic place (e.g. Motherwell Homestead or the MacDowell exhibition) to view antique farm equipment and/or a modern farm equipment dealership to see some present equipment.

Visit <http://historylink101.com/index.htm> to see more visuals of farm equipment.

Visit websites of other community dealership(s).

Finish the timeline adding pictures, illustrations, or any other information to give the complete story.



The Farming Equipment Explosion

Farming was very manual and extremely labour intensive from its early beginning 9000 years ago until the mid-1800s. In the last two hundred years the development of new farming equipment made farming more equipment intensive and lighter on the need for labour. Today, farmers manage huge numbers of hectares with massive equipment and few labourers. Technology found its way onto the farm.

This dramatic change started in 1797 with Charles Newbold, who patented the first cast-iron plow. By 1819, steel plows were being manufactured. Horses were replaced by tractors and equipment became bigger and better. Improvements to equipment were often made by farmers who could visualize what would work better and make their job easier. Tillage, seeding, and harvesting were the main areas of focus for development to begin with. However, it didn't take long until the soils of the Prairies became depleted of nutrients and weeds became a problem. Fertilizer applicators and weed sprayers were soon developed to help solve the new issues that plagued the farmers.





Farmers faced many challenges and creative solutions in equipment and practices helped to solve them. Wind erosion devastated farmers in the 1930s. During that time farmers tilled their land in order to get rid of the weeds and many farmers summerfallowed. Summerfallowing meant that farmers rested their land by not planting a crop. Much of the rich, black topsoil ended up in the bushes and ditches!

Today most farmers don't leave their field in black summerfallow. If they want to rest the land for a year, they spray the weeds with chemicals and leave straw from the crop instead of trash on the fields to prevent erosion by wind or rain. This method is called chemfallow. Thanks to new crops like peas and lentils that put nitrogen back into the soil, farmers don't have to rest their land anymore. Instead they rotate different crops on the land.

Farmers use crop rotation to balance the nutrient draw on the land and to manage weeds. Some farmers test the soil in their fields to know exactly the right fertilizer blend to put into the soil so the crop they are planting will produce the highest yield. Insects and weeds are controlled with a sprayer. Crops are harvested using a swather and combine. Large semi trailers and grain carts move grain from the combine into storage or to the elevator.



Though the fields may be empty, there is still work to do in winter



Crop management is critical to produce top quality grains!



On the farm, there have been many changes in the storage bins. Years ago farmers used wooden bins. They were approximately 3.6 m x 3.6 m x 3 m wooden and held about 1000 bushels. Then round steel bins were invented with flat bottoms, these bins could range from 500 to 7000 bushels. This meant a lot of shovelling for the farmer to get the grain out of the bin. To make loading grain easier, grain vacs and drag augers were invented. Soon hopper bottoms were invented, eliminating the need to shovel which saved both time and the farmer's health. In recent years grain storage has also moved out to the field in the form of grain bags that can hold between 10 -15 thousand bushels per bag. The grain is augered in and out of the bag with relatively little manual labour.

Computers are very important in farm equipment. Almost all new equipment is run with sophisticated technology. Computers in tractors are used to manage seed and fertilizer output and placement in the new zero till air drills. Combine computers manage the machine's operating systems, take moisture samples, indicate grain loss, calculate yields, warn of malfunctions and bin levels, and collect data for analysis to aid in next year's planning.



Auger loading grain into a wooden bin



Storage bins



Lots to learn if you want to drive a modern tractor



GPS (Global Positioning System) mapping units are integrated with auto steer. The field is mapped into the GPS and the tractor drives itself. This eliminates overlap and reduces the amount of fuel, chemicals, and seed used. GPS units also collect precise data the farmer uses for planning of next year's crop.

With every improvement in equipment the production of grain crops become becomes more efficient. This means farmers are able to grow more grain on the same amount of land. More and more food will be needed to feed the world's growing population and there is no new soil on which to farm.

The explosion of high tech farm equipment has reduced the need for as many farmers to manage the land. This means fewer people are farming but many more people are involved in the agriculture industry from scientists to salespeople.

People working in research and development are constantly looking for ways of improving farming equipment and practices. Producing, marketing, and maintaining this high-tech equipment requires precise metal workers, highly skilled technicians, and knowledgeable sales people. Much has changed from the earliest wheat gatherers of 9,000 years ago to farmers of today, but the biggest changes are actually very recent.





The transition from horse drawn, simple basic equipment to the modern high tech equipment of today has actually happened in a farmer's life span. A seventy-five year old farmer will remember seeding with a 3.6 m seed drill and a team of horses.

Today, direct seeding implements can be as wide as 23 m. Binding the grain into bundles and stoking it would have been another one of his many back breaking tasks. He will recall threshing crews coming to the farm and throwing sheaves off the horse drawn wagons onto the belt of the threshing machine. The grain would be threshed, unloaded with a grain scoop, and then reloaded into the wagon to deliver it to the elevator. He might tell stories of picking rock and clearing land using his hands and an axe or hand saw. When equipment broke down he repaired it himself often with material he carried with him or had at the farm.

Over his lifetime our farmer has experienced many tremendous changes in the equipment he uses to seed, care for, and harvest his crop. The labour he now puts in is more mental than manual. Learning the new computer technology taxes his brain power not his back power. The GPS and auto steer manage the tractor and the computer directs seed and fertilizer placement allowing the farmer to work longer hours and enjoy the air conditioned cab.



Hauling round bales



Air seeder



If the brand new equipment breaks down he might use his cell phone to call the machinery dealership to send out a specialized technician. Sometimes the technician connects to the computer in the equipment using wireless technology and fixes it from a desk top. The farmer may also use his Blackberry® to constantly monitor grain prices so he can stay on top of the grain prices.

Technology has allowed farmers to be more productive but they still work hard! Not every farmer can afford brand new equipment and all equipment still needs to be serviced and taken care of. It is a big decision to purchase a brand new, expensive piece of equipment. For example, a new combine costs around \$400,000.

Most farmers are still “jacks of all trades” and have to be good managers, financial planners, agronomists, mechanics, environmentalists, and optimists. At the end of the day, farmers never forget that it is Mother Nature who decides how good the crop will be!

There is only about 3-10% of the entire earth’s surface that is suitable for growing crops for humans to eat. As our world population continues to expand it is important that farmers continue to produce more food.

| The labour hours it takes to produce 100 bushels of wheat | |
|---|--------------------|
| 1830 | 250-300 |
| 1850 | 75-90 |
| 1890 | 40-50 |
| 1930 | 15-20 |
| 1955 | 6-12 |
| 1965 | 5 |
| 1975 | 3.75 |
| 1987 | 3 |
| 2010 | less than one hour |

*If you ate today
thank a farmer!*



Farm Machinery

The modern farmer needs a wide range of tools and machines for loosening the soil, getting rid of weeds, planting, mowing, and harvesting the crops.

There are specific machines designed for the different crops that are grown on farms. Some are designed for grain crops, while others are designed to plant and harvest potatoes, lentils, and other crops.

The change from simple equipment, like the sickle and the horse-drawn plough, to the modern high tech equipment of today has changed farming in Saskatchewan. Many changes have taken place during the lifetimes of some older farmers. An older Saskatchewan farmer, possibly still working on the land, may remember binding the grain into bundles and stoking it. This farmer may remember threshing crews coming to the farm to help with harvest. The crews would throw sheaves off the horse-drawn wagons onto the belt of a threshing machine.

There have been many changes in the equipment used to seed, care for, and harvest the crop. New technology and machinery has allowed farmers to work much more land. There are fewer, but much larger, farms now than ever before. In the 1930s, one of every three Saskatchewan people lived on a farm. Now, it is one in forty-six. The number of hours it takes to produce a hundred bushels (a unit to measure grain) of wheat has changed too.



About 1912 - Double cylinder Gaar - Scott steam tractor & Cocksfoot plow's working in Saskatchewan.



1920-1925 Steam threshing at Perdue, SK.



1930 Threshing wheat at Melfort, SK.



Question: Look at the following chart. What observation can you make from it?

| Year | Number of Hours to Produce 100 Bushels of Wheat |
|------|---|
| 1830 | 250-300 |
| 1890 | 40-50 |
| 1955 | 6-12 |
| 1975 | 3-4 |
| 2010 | Less than an hour |

Farming practices have changed dramatically in the last 100 years. The early pioneers farmed the way they did in their homeland. This involved deep ploughing of the land to prepare it for seeding and control the weeds. Farmers also began to summer-fallow their land. This meant the land would not be seeded every year in order to conserve moisture and control the weeds with cultivating. This resulted in wind and soil erosion and much of our precious topsoil ended up in the bushes and ditches.

Today the common practice is to “zero-till” or “minimum-till” farm. This means farmers leave the stubble (the part of the crop that is not cut down) to conserve moisture and soil. In the Spring, farmers seed directly into the stubble. Farmers conserve organic matter in the soil by reducing the amount of tillage.





Today, in a zero-tillage farm, farmers control weeds with herbicides and do not disturb the soil. This helps conserve both soil and fuel. Organic farmers still cultivate their fields often as their options for weed control are more limited.

Technology plays a big role in the farm. Many farms use Global Positioning Systems (GPS) in their tractors, sprayers, and combines. This helps the farmer to reduce overlap. This reduces the amount of seed, chemical and fuel used – both good for the farmer’s bottom line and the environment!

Question

Read through the following list of modern farm equipment. Try to determine what older ‘tool’ each of these modern ‘tools’ might have replaced. For pictures of modern equipment go to the photogallery at www.aitc.sk.ca.

TRACTOR - the work horse of the farm; tractors pull farm implements and are used for many tasks

CULTIVATOR - has blades or shovels that work up the soil without turning it over; is pulled between rows of plants to kill the weeds

DISKER - kills the weeds and smoothes the soil; metal plates dig deep into the soil



Harvest near Jasmin, SK



Tractor and cultivator



Specialty combine used for sunflower crops



Equipment is getting bigger and bigger!



HARROW - has iron teeth or spikes; it spreads out the straw and smoothes out the soil

DRILL (seeder) - plants seeds; a shovel cuts a trench in the soil, the seed falls into the trench and loose soil covers the seeds

ZERO TILL DRILL - implement that puts seed into the ground with little or no soil disturbance

SPRAYER - used for liquid herbicide or insecticide; solution is sprayed through nozzles

SWATHER - (windrower) cuts down the crop and lays the plants in a swath on top of the stubble

COMBINE - picks up the swath, separates the seeds from the stems and throws the straw back on the field

AUGER - a long metal tube (on wheels) which carries grain upward and dumps the grain into a grain bin or truck

TRUCKS - used for hauling the grain to the granaries and storage bins, or to the grain elevators

HAY BIND - cuts hay or feed crops

BALER - picks up hay or straw and forms it into round or square bales for storage

Adapted from www.aitc.sk.ca/educational-resources/sask-schools



Harvest - hope it stays dry!



High clearance sprayer with big tires = lighter footprint!



Museums re-enact animal powered farming



Press drills were common before minimum and zero tillage.