Timeline of Farm Machinery and Technology

Grade Level: 4-8

Lesson Overview

What inventions have been created to improve agriculture throughout the years? What effect have they made? After reading a timeline, charts and graphs to gain information, students will answer questions and create graphs.

Student Objectives

1. Assess where our nation's food supply comes from.
2. Summarize how American farmers are able to produce so much food.
3. Describe trends occurring in farming over the last 200 years.
4. Explain what changes have occurred on U.S. farms over the last 200 years and the effects of those changes on the U.S. and farmers.
5. Answer questions and graph information by gathering facts from a timeline.

Materials

- ✓ Farm Machinery and Technology Timeline
- ✓ Labor Hours Graph
- ✓ Farmers Feed You! Graph

Vocabulary

- **acre –** 43,560 square feet.
- **binder** – a machine that ties grain (wheat, oats, etc.) into bundles.
- **bushel** – unit of dry measure (1 cubic foot) for grain, fruit, etc., equivalent to 8 gallons of liquid. Weight varies with the density/bulk of the commodity. (Oats: 32 lbs. per bushel, corn: 56 lbs. per bushel).
- **combine** - a large self-propelled machine that cuts, threshes, and cleans grain crops. It has different front attachments, called heads or headers, designed for use in harvesting specific crops. Corn is harvested using a corn head; wheat and soybeans are harvested using a reel-type head known as a grain platform. (The word combine is pronounced with the accent on the first syllable, which rhymes with "Tom".)
- **cotton gin** - a machine for separating the fibers of cotton from the seeds.
- **cultivator** – an implement that is pulled by a tractor through a field to loosen the earth and destroy weeds, either before a growing crop is established (covers all

area of the field) or between the row of growing crops (only covers area between the rows).

- **disk** – an implement that contains a number of round, concave-shaped, metal plates (disks) held perpendicular to the ground, and free to rotate. It is pulled across a field by a tractor in order to loosen the earth and destroy weeds.
- **flail** – an agricultural tool used for threshing. Normally it is made from two or more sticks attached by a short chain or leather thong; one stick is held and swung, causing the other to strike a pile of grain, loosening the husks.
- **harrow** – a type of cultivator that pulverizes or smooths the soil.
- **herbicide** – a pesticide used to control unwanted plants (weeds).
- **labor hours** – number of hours worked.
- **moldboard** - the curved plate of a plow that turns over the earth.
- **picker** – a self-propelled machine used for removing the ears of corn from the corn plant. Their kernels of corn stay intact on the cob.
- **plow** - an agricultural implement used for cutting, lifting, turning over, and breaking up soil.
- **reaper** - a machine used for cutting the stalks of standing grain or a person who reaps.
- **self-propelled** – a term used to describe an implement in which the propelling power unit is an integral part of the machine.
- **sickle** – a hand-held implement that has a semicircular blade attached to a shor handle used for cutting grain and small grass. Also, the cutting mechanism of a reaper or mower.
- **silo** - a tall cylindrical structure, usually beside a barn that is used to store grain, hay, or silage.
- **threshing** - to beat the stems and husks (of grain or cereal plants) to separate the seeds from the plants stems and husks.
- **thresher** – an implement that beats the stems and husks (of grain or cereal plants) to separate the seeds from the plant's stems and husks.
- **tillage** - breaking-up of the soil in order to prepare land for the raising of a crop. A wide variety of tillage methods are used including plowing, disking, harrowing, ripping, cultivating, etc.
- **tractor** – a motor vehicle used to pull heavy loads and provide power to operate, carry, push, and/or pull agriculture implements.

- **yield per acre** – amount of commodity produced by the acre.

Procedure

1. Start out this lesson by writing the following statement somewhere in your classroom where all students can read it to get them thinking about changes in agriculture in the last 200 years:

   "More than 90% of America's population farmed 200 years ago. There were about 5 million Americans then. Today less than 2% of the American population work on farms; that is about 5 million producers. Our population of about 300 million today has plenty of food."

2. Let your students read this statement and then pose the following questions for them to answer:

   a. How has America fed itself and much of the world?

   b. What has happened in the last 200 years to reduce farm labor and increase production?

   c. How has agriculture made it possible for Americans to pursue their hopes and dreams?

3. Make handouts for each student of the Farm Machinery and Technology Timeline provided in this lesson. Pick out events on the timeline to highlight with your students.
4. Revisit the questions you discussed about in number 2.
5. Make copies of the Labor Hours Graph. Hand these out to your students for them to complete on their own.
6. After grading Labor Hours Graph discuss the answers with your students.
7. The timeline also gives statistics for the number of people one farmer feeds for the years 1930-1990. Talk to the students about where their food comes from and the steps it takes to get to them.
8. Have them complete Farmers Feed You! Graph.
9. Finally, revisit the interest approach question to complete the lesson or continue with one or more of the following extension activities.

Extension Activities

From the Growing a Nation Educational Resources - https://growinganation.org/

1. Class Project – Timeline

As a class, review the Farm Machinery and Technology Timeline, the Labor Hours Graph, and Farmers Feed You! Graph, noting the production numbers and labor hours required to produce wheat and corn from 1830-2000.

Together the class is going to create a cause and effect timeline. Use a strip of masking tape or crepe paper to create the timeline on one of the classroom walls. Add decade markers, spaced appropriately. Assign each student or group of students a decade between 1800 and 2000 from the timeline. (There are 15 decades, so depending on your class size you may have 3 students to a group.)

Each student or group of students should identify the events in their decade and evaluate the item as a cause or effect contributing to the increase in production or decrease in labor. Ask students to create a pamphlet by folding a sheet of 81/2 inch by 11-inch paper in half (lengthwise). On the top front page, students should glue or tape a picture from the Growing a Nation photo gallery or from other websites to identify the event. These “pamphlets” will be used on the timeline. If they have more than one event in their assigned decade, they should create a separate sheet for each. On the inside, students should write down whether the event is a “cause” or “effect” related to the increase in production or the decrease in labor. If the event is a cause, ask students to find the effect; if the event is an effect, ask students to find a cause, even if they have to look in different decades. Students may also look at other categories of Growing a Nation Timelines or in their textbook to help them determine causes or effects. For example, were other things going on in the 1950s in the other timeline categories (Economic Cycles, Land, Crop and Livestock, Transportation, Trade, Life on the Farm, Organizations, Agricultural Education and Extension, or Government Programs and Policy) that had a cause or effect relationship to the event? If so, they should identify them on the inside of the pamphlet. Once the pamphlets are completed, ask students to present their event and then paste the event onto the timeline in the appropriate decade.

2. Event or Invention Project
   Ask students to select an event or invention from the timeline and then research the event or invention and create a PowerPoint slide show or advertisement flyer/poster about the event and present this project to the class. The presentation should include important statistics, highlights, graphs and or pictures.

3. Farming Around the World
   In some parts of the world machinery that we consider outdated is still the main type of machinery used, have your students use the Internet or library to research types of machinery used in other countries.

4. Innovations, Inventions, and a Slice of Bread is a math lesson that coordinates well with this lesson.

Additional Resources

- Read more about farm machinery and the agriculture impacts of the various inventions at your library or on the Internet.
- Growing a Nation – The Story of American Agriculture (USDA) https://growinganation.org/

Standard

Illinois Social Science Standard

SS.H.1.6-8.MdC: Analyze connections among events and developments in broader historical contexts

The **M**ultidisciplinary **AG**ricultural **I**ntegrated **C**urriculum (mAGic) was created in 2004 under the leadership of the Illinois State Board of Education (ISBE) and the Facilitating Coordination in Agricultural Education Project (FCAE). Funding was made available through the FCAE grant budget from the agricultural education line item of the ISBE budget. This revision, as printed, was developed in September 2021.

These mAGic lessons are designed to bring agriculture to life in your classroom. They address the Illinois Learning Standards in math, science, English language arts and social studies.

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Farm Machinery and Technology Timeline Information Sheet

18th century
Oxen and horses used for power, crude wooden plows, all sowing by hand, cultivating by hoe, hay and grain cutting with sickle, and threshing with flail

1793
Invention of cotton gin

1794
Thomas Jefferson's plow with moldboard of least resistance tested

1797
Charles Newbold patents first cast-iron plow

1819
Jethro Wood patents iron plow with interchangeable parts

1819-25
U.S. food canning industry established

1830
About 250-300 labor-hours required to produce 100 bushels (5 acres) of wheat with walking plow, brush harrow, hand broadcast of seed, sickle, and flail

1834
McCormick reaper patented; John Lane manufactures plows faced with steel saw blades

1837
John Deere and Leonard Andrus begin manufacturing steel plows; practical threshing machine patented

1841
Practical grain drill patented

1844
Practical mowing machine patented

1847
Irrigation begun in Utah

1850
About 75-90 labor-hours required to produce 100 bushels (2 ½ acres) of corn with walking plow, harrow, and hand planting

1856
Two-horse straddle-row cultivator patented

1862-75
Change from hand power to horses characterizes the first American agricultural revolution

1865-75
Gang plows and sulky plows come into use

1868
Steam tractors are tried out

1869
Spring-tooth harrow for seedbed preparation appears

1870s
Silos and deep-well drilling come into use

1874
Glidden barbed wire patented; fencing of rangeland ends era of unrestricted, open-range grazing

1880
William Deering puts 3,000 twine binders on the market

1884-90
Horse-drawn combine used in Pacific coast wheat areas

1890
40-50 labor-hours required to produce 100 bushels (5 acres) of wheat with gang plow, seeder, harrow, binder, thresher, wagons, and horses; 35-40 labor- hours required to produce 100 bushels (2 1/2 acres) of corn with 2-bottom gang plow, disk and peg-tooth harrow, and 2-row planter

1892
The first gasoline tractor was built by John Froelich

1910-15
Big open-geared gas tractors introduced in areas of extensive farming

1915-20
Enclosed gears developed for tractor

1918
Small prairie-type combine with auxiliary engine introduced

1926
Cotton-stripper developed for High Plains; successful light tractor developed

1930s
All-purpose, rubber-tired tractor with complementary machinery popularized

1930
One farmer supplies enough food for 9.8 people (est.) in the United States and abroad; 15-20 labor-hours required to produce 100 bushels (2 1/2 acres) of corn with 2-bottom gang plow, 7-foot tandem disk, 4-sec- tion harrow, 2-row planters, cultivators, and pickers; 15-20 labor-hours required to produce 100 bushels (5 acres) of wheat with 3-bottom gang plow, tractor, 10- foot tandem disk, harrow, 12-foot combine, and trucks

1940
One farmer supplies enough food for 10.7 people (est.)

1942
Spindle cotton picker produced commercially

1945-70
Change from horses to tractors and increasing technological practices characterize the second American agricultural revolution; productivity per acre begins sharp rise

1945
10-14 labor-hours required to produce 100 bushels (2 acres) of corn with tractor, 3-bottom plow, 10-foot tandem disk, 4-section harrow, 4-row planters and cultivators, and 2-row picker; 42 labor-hours required to produce 100 pounds (2/5 acre) of lint cotton with 2 mules, 1-row plow, 1-row cultivator, hand hoe, and hand pick

1950
One farmer supplies enough food for 15.5 people (est.)

1954
Number of tractors on farms exceeds the number horses and mules for the first time

1955
6 1/2 labor-hours required to produce 100 bushels (4 acres) of wheat with tractor, 10- foot plow, 12-foot row weeder, harrow, 14-foot drill, self-propelled combine and trucks

1959
Mechanical tomato harvester developed

1960
One farmer supplies enough food for 25.8 people (est.)

1965
5 labor-hours required to produce 100 pounds (1/5 acre) of lint cotton with tractor, 2-row stalk cutter, 14- foot disk, 4-row bedder, planter, cultivator, and 2-row harvester

5 labor-hours required to produce 100 bushels (3 acres) of wheat with tractor, 12- foot plow, 14-foot drill, 14- foot self-propelled combine, and trucks; 99% of sugar beets harvested mechanically; Federal loans and grants for water/sewer systems

1968
96% of cotton harvested mechanically

1970s
No-tillage agriculture popularized

1970
One farmer supplies enough food for 47.7 people (est.)

1975
2-3 labor-hours required to produce 100 pounds (1/5 acre) of lint cotton with tractor, 2-row stalk cutter, 20-foot disk, 4-row bedder and planter, 4-row cultivator with herbicide applicator, and 2-row harvester

3-3/4 labor-hours required to produce 100 bushels (3 acres) of wheat with tractor, 30-foot sweep disk, 27- foot drill, 22-foot self-propelled combine, and trucks; 3-1/3 labor-hours required to produce 100 bushels (1 1/8 acres) of corn with tractor, 5-bottom plow, 20-foot tandem disk, planter, 20-foot herbicide applicator, 12-foot self-propelled combine, and trucks

1980s
More farmers use no-till or low-till methods to curb erosion

1980
One farmer supplies enough food for 75.7 people (est.)

1987
1-1/2 to 2 labor-hours required to produce 100 pounds (1/5 acre) of lint cotton with tractor, 4-row stalk cutter, 20-foot disk, 6-row bedder and planter, 6-row cultivator with herbicide applicator, and 4-row harvester

3 labor-hours required to produce 100 bushels (3 acres) of wheat with tractor, 35-foot sweep disk, 30- foot drill, 25-foot self-propelled combine, and trucks; 2-3/4 labor-hours required to produce 100 bushels (1 1/8 acres) of corn with tractor, 5-bottom plow, 20-foot tandem disk, planter, 20-foot herbicide applicator, 12-foot self-propelled combine, and trucks

1990
One farmer supplies enough food for 100 people (est.)

1990s
Information technology and precision techniques increasingly used in agriculture

1994
Farmers begin using satellite technology to track and plan their farming practices. The use of conservation tillage methods, which leaves crop residues in the field to combat erosion, continues to rise. FDA grants first approval for a whole food produced through biotechnology, the FLAVRSAVR™ tomato. Farm Bureau celebrates its 75th anniversary. U.S. Congress approves General Agreement on Tariffs and Trade (GATT), helping liberalize world trade

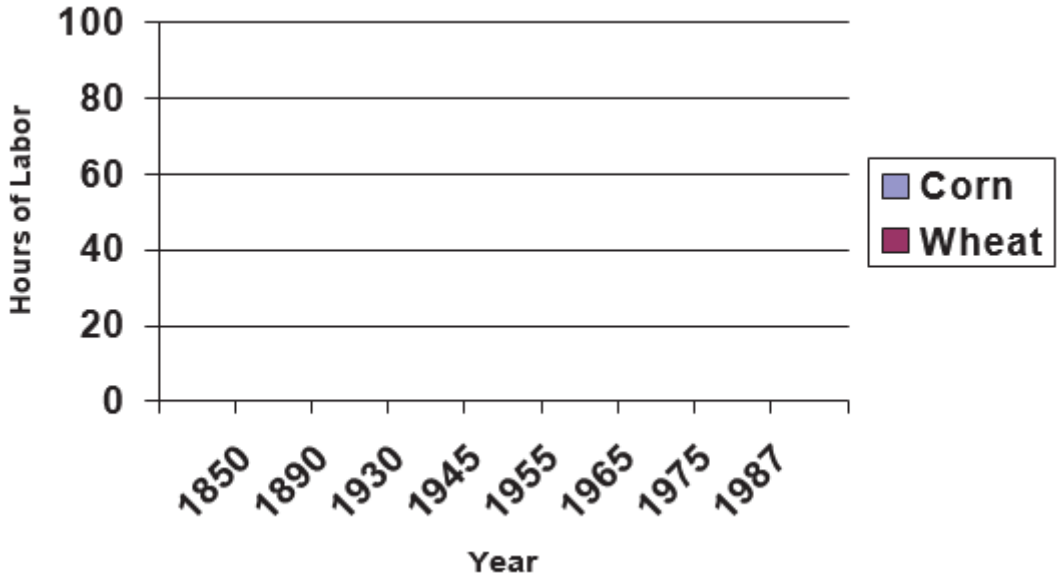
Name _____

Labor Hours Graph

Directions:

- Use the Farm Machinery and Technology Timeline to graph a double column graph of the hours of labor that it took from 1850–1987 to produce 100 bushels of wheat and 100 bushels of corn *(Note: Always use the largest number of labor hours in this graph. Some years may have only corn or wheat & not both.)*

- Then answer the questions below.



1. What did you notice about the number of hours that it took to produce 100 bushels of wheat and corn as you completed the graph?

2. How many hours did it take to produce 100 bushels of corn in 1890?
   How many hours did it take to produce 100 bushels of corn in 1987?

3. How many hours did it take to produce 100 bushels of wheat in 1890?
   How many hours did it take to produce 100 bushels of wheat in 1987?

4. Explain why the number of hours changed.

Labor Hours Graph ANSWER KEY

Directions:

- Use the Farm Machinery and Technology Timeline to graph a double column graph of the hours of labor that it took from 1850–1987 to produce 100 bushels of wheat and 100 bushels of corn *(Note: Always use the largest number of labor hours in this graph. Some years may have only corn or wheat & not both.)*

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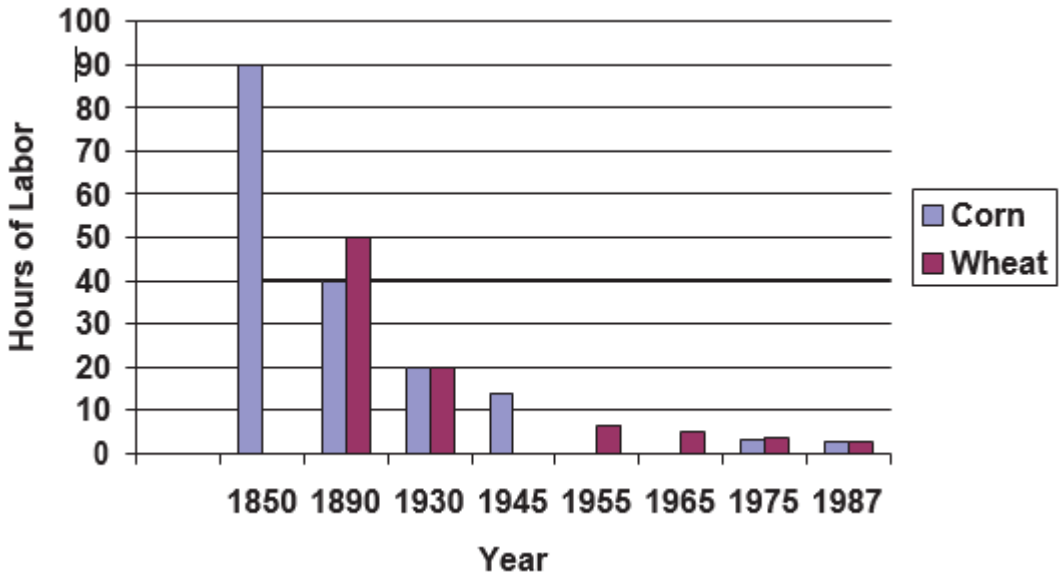


1. What did you notice about the number of hours that it took to produce 100 bushels of wheat and corn as you completed the graph? **They decreased.**

2. How many hours did it take to produce 100 bushels of corn in 1890? **40 hours**
   How many hours did it take to produce 100 bushels of corn in 1987? **2.75 hours**

3. How many hours did it take to produce 100 bushels of wheat in 1890? **50 hours**
   How many hours did it take to produce 100 bushels of wheat in 1987? **3 hours**

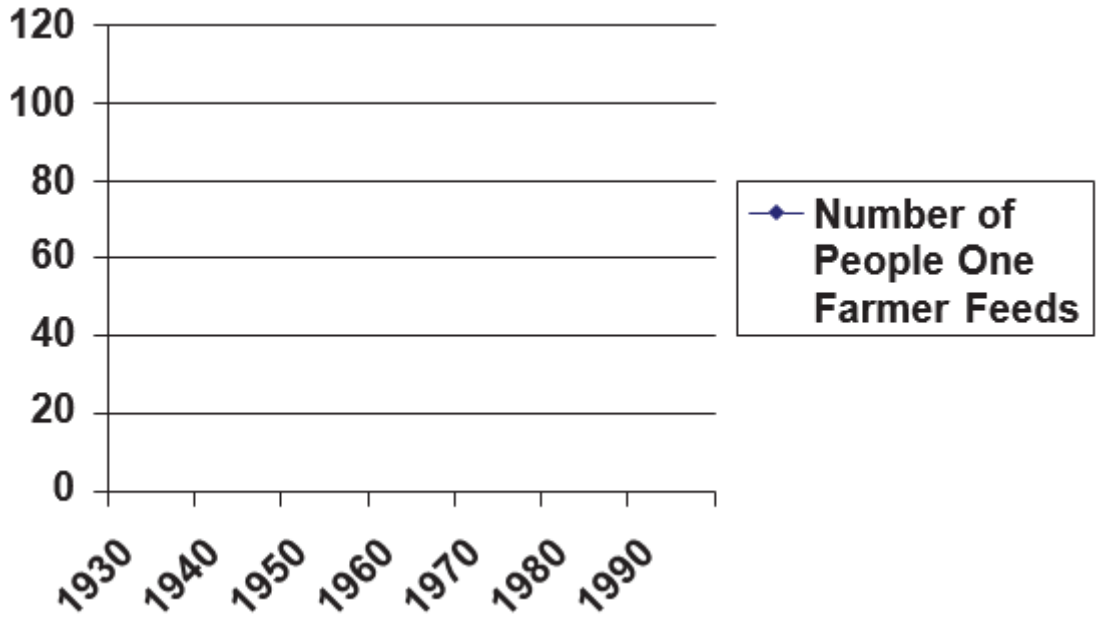
4. Explain why the number of hours changed.

   Students should mention something about the increased use of machinery. They could also mention increased use of hybrid seeds, fertilizer, herbicides, and pesticides.

Name _____

Farmers Feed You! Graph

Directions: Use the timeline to find the information to complete the following line graph on the number of people a farmer feeds from 1930-1990.



1. What has happened to the number of people that one farmer feeds since 1930?

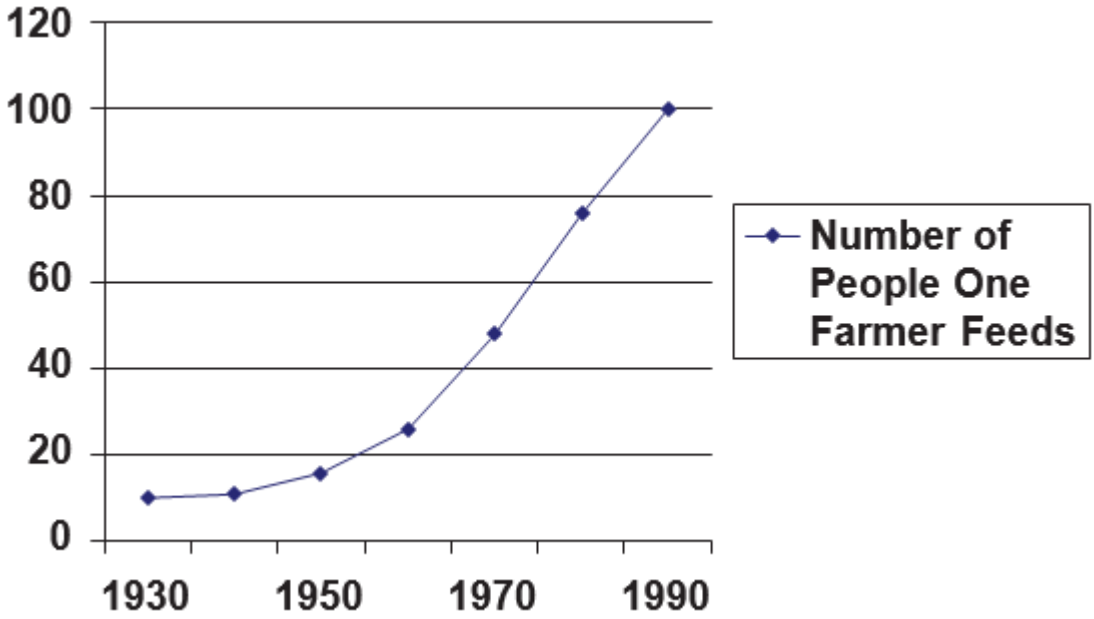
2. Why do you think that there is no information in the timeline before 1930?

3. What would happen in the United States and in the world if farmers next year could only produce enough food for 9.8 people?

4. How has machinery played a role in the changing number of people a farmer can feed?

Farmers Feed You! Graph ANSWER KEY

Directions: Use the timeline to find the information to complete the following line graph on the number of people a farmer feeds from 1930-1990.



1. What has happened to the number of people that one farmer feeds since 1930?
   It has increased from 9.8 to 100 people.

2. Why do you think that there is no information in the timeline before 1930?
   Before 1930, most people raised some food of their own. Families were large and if one farmer fed 9.8 people that farmer would basically just be feeding their family.

3. What would happen in the United States and in the world if farmers next year could only produce enough food for 9.8 people?
   More than likely, a lot of people would have to pay a lot more money for their food and there would be a lot of foods you just could not get at the grocery store. A lot of people would go hungry in the U.S. and abroad.

4. How has machinery played a role in the changing number of people a farmer can feed? **Machinery makes it much easier for farmers to do their job and raise more crops on a larger amount of land, thus being able to feed more people.**