

Lesson A2–3

Determining Trends in Agriculture

Unit A. Agricultural Literacy

Problem Area 2. Recognizing the Role of Agriculture in Society

Lesson 3. Determining Trends in Agriculture

New Mexico Content Standard:

Pathway Strand: Agribusiness Systems

Standard: VI: Use sales and marketing principles to accomplish an AFNR business objective.

Benchmark: VI-A: Conduct market research.

Performance Standard: 1. Evaluate methods of marketing products and services. 2. Apply economic principles to marketing (e.g., supply and demand). 3. Research products and service design(s).

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Identify current trends in animal agriculture.
2. Identify 20th Century trends in plant agriculture.
3. Explain historical events and trends that have led to the development of today's agriculture industry.

List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. The following resource should be selected to accompany this lesson:

Morgan, Elizabeth M., et al. *AgriScience Explorations*, Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2000. (Textbook, Chapters 1, 8, 13, and 14)

Other Resources. The following resources should be of use to teachers and students:

Drache, Hiram M. *History of U.S. Agriculture and Its Relevance to Today*. Danville, Illinois: Interstate Publishers, Inc., 1996.

Lee, Jasper S. and Diana L. Turner. *AgriScience*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2003. (Textbook and Activity Manual, Chapter 1)

List of Equipment, Tools, Supplies, and Facilities

Writing surface

Terms. The following terms are presented in this lesson (shown in bold italics):

Aquaculture
Artificial insemination
Bovine somatotropin (bST)
Cloning
Embryo splitting
Embryo transfer
Estrous
Estrous cycle
General Agreement on Tariffs and Trade (GATT)
Genetic engineering
Global positioning system (GPS)
Hatch Act
Homestead Act
Implants
Information Super Highway (Internet)
Morrill Land-Grant College Act
Natural selection
No-tillage
North American Free Trade Agreement (NAFTA)
Porcine somatotropin (pST)
Site-specific farming
Smith-Hughes Vocational Education Act
Smith-Lever Agricultural Extension Act
Superovulation

Tissue culture
Transgenetic animals
United States Department of Agriculture (USDA)
Variable rate technology (VRT)

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is given here.

Have students name several recent technological advancements in plant or animal agriculture. List them on the classroom writing surface. Use the list as a basis for a discussion on emerging trends in agriculture. What benefits will these trends bring to the production of plants and animals? How will these trends impact U.S. production of commodities for the world market? Do these trends have any disadvantages associated with them?

Summary of Content and Teaching Strategies

Objective 1: Identify current trends in animal agriculture.

Anticipated Problem: What are the current trends in the animal industry?

- I. Advancements in science have led to higher quality animal products being produced more efficiently.
 - A. Prior to the 1960s the role of breeding and selection in animal improvement was primarily limited to natural selection. **Natural selection** is a natural process whereby animals with less vigorous traits are naturally eliminated from a population.
 - B. Reproductive developments since then have increased the speed of animal improvements.
 1. **Artificial insemination** is the placing of sperm cells in contact with female reproductive cells by a method other than natural breeding. It began during the 1960s and allowed the use of a superior male to father many times more offspring than would be possible naturally.
 2. **Embryo splitting** involves removing the embryo from an animal after conception, splitting or cutting the embryo in half, and placing each half in the uterus of another animal.
 3. **Embryo transfer** is a process that removes fertilized eggs from a female and places them in another female who carries them until birth.
 4. The reproductive potential of a female can be increased through procedures known as superovulation. **Superovulation** involves the injection of certain hormones which increase the number of ovulations during the estrous cycle.

- a. The **estrous cycle** is the reproductive cycle and is measured from the beginning of one cycle to the next. **Estrous** is the period that a female animal will mate.
 - b. After fertilization, the developing eggs are flushed from the animal and placed in a recipient animal.
- C. Biotechnological techniques are used to increase animal production.
1. **Bovine somatotropin (bST)** is a hormone that can be given to cows to increase the amount of milk they produce. This hormone naturally occurs in cows and is present in all milk.
 2. **Porcine somatotropin (pST)** is a hormone that regulates the growth of pigs, causing them to produce more muscle cells. This hormone is produced in the pituitary glands of hogs.
 3. **Implants** are small pellets that are placed under the skin of animals. They primarily provide a substance that will promote growth.
- D. During the 1980s scientists developed the process of **genetic engineering**, which refers to the movement of genes from one cell to another. **Transgenetic animals** have their genes changed or manipulated.
- E. **Aquaculture** is the culture of fish and plants in water. It has grown rapidly in North America and allowed producers to gain a niche market.

Provide students with copies of the suggested resources. Have them read Chapters 8 and 13 in AgriScience Explorations to begin to form an understanding of animal anatomy and the trends that are emerging in animal agriculture. Discuss and summarize the “Issues With Biotechnology” section in Chapter 8. Ask students to identify advantages and disadvantages associated with current trends in animal agriculture. Have them check the Internet and local newspapers for articles that feature the trends.

Objective 2: Identify 20th Century trends in plant agriculture.

Anticipated Problem: What are the 20th Century trends in plant agriculture?

- II. The use of technology during the 20th Century has led to smaller numbers of producers raising more crops for a growing world population.
 - A. During the 1920s agricultural scientists discovered that certain chemicals could change the growth of plants. Commercial fertilizers, fungicides, weed killers, and insecticides were discovered and put to use.
 - B. The change from horses to tractors and the adoption of a group of technological practices characterized the second American agriculture revolution in 1945. By 1954 the number of tractors on farms exceeded the number of horses and mules for the first time.
 - C. **No-tillage** agricultural practices began to take hold in 1970.
 - D. More farmers began to use low-input sustainable agriculture (LISA) techniques to decrease chemical applications.
 - E. Genetic engineering brought many advancements to plant production.

1. We now have plants that are resistant to certain herbicides, insects, and diseases. Plants have also been developed that are more resistant to frost and offer a longer shelf life.
 2. **Cloning** is a process of asexually reproducing organisms where there is no union of male and female sex cells.
 3. Plant **tissue culture** involves propagating plants using single cells or small groups of cells.
- F. The 1990s brought the information age to agriculture.
1. **Site-specific farming** involves using practices based on the specific needs of a location.
 2. A **global positioning system (GPS)** is a satellite-based approach to find exact positions in fields. Farmers began using GPS for soil sampling and soil type mapping. **Variable rate technology (VRT)** involves applying fertilizers and pesticides to specific spots in the field. It also allows tracking of yields with on-the-go monitors. These monitors allow the collection of site-specific yield data during harvesting.
 3. The **Information Super Highway (Internet)** is a system of worldwide computer links. It allows agribusinesses and producers from around the world to quickly communicate.

Provide students with copies of the suggested resources. Have them read Chapters 8 and 14 in AgriScience Explorations. Lead the class in a discussion of the introduction of Roundup Ready corn and soybeans. What advantages do these products bring to producers? Are there any disadvantages? For an in-depth discussion of these topics, have students search the Internet and local newspapers.

Objective 3: Explain historical events that have led to the development of today's agriculture industry.

Anticipated Problem: What historical events have led to the development of today's agriculture industry?

- III. History helps us understand our future. Events that occurred in the past have an impact on the agricultural practices of today.
 - A. A New Nation emerged with the passing of the Declaration of Independence. Ninety percent of all people farmed at that time.
 1. George Washington and Thomas Jefferson were farmers who readily adopted new practices and also served as presidents of the United States.
 - B. By the mid 1800s government leaders began to establish programs to encourage agriculture. The first laws of agriculture began to form agriculture policy.
 1. Congress set up a special committee on agriculture in 1825. With strong support from several groups, the U.S. Patent Office began agricultural research in 1852.
 2. In 1862, President Abraham Lincoln called on lawmakers to pass agriculture legislation. Three major acts were passed.

- a. The first act set up an agency that later became the **United States Department of Agriculture (USDA)**. By 1889 the department was elevated to the cabinet status that it enjoys today.
 - b. The second important piece of legislation was the **Homestead Act**, which made 160 acres of public domain land available to every American citizen who was the head of a family or over 21 years of age.
 - c. The third law was the **Morrill Land-Grant College Act** which established an agricultural and mechanical college in each state. The Morrill Act provided for a grant of 30,000 acres of land for each representative and senator a state had in Congress. The land was to be used as endowment for the support of a college of agriculture and mechanics.
- C. The **Hatch Act**, passed in 1887, appropriated money for experiment stations in connection with the various agricultural colleges. These stations conduct investigations, undertake experiments in all fields of agriculture, and publish the findings of the experiments.
 - D. The **Smith-Lever Agricultural Extension Act** of 1914 was passed to establish a link between the state land-grant colleges and the farmer. The Cooperative Extension Service grew from this.
 - E. The **Smith-Hughes Vocational Education Act** of 1917 provided federal aid to schools, particularly for vocational agricultural education.
 - F. The American Farm Bureau Federation was formed with the goal of education for its members and commercial and political activities on behalf of agriculture.
 - G. After World War II, important international measures were undertaken by the United States and its allies to liberalize trade and payment.
 1. The first was the **General Agreement on Tariffs and Trade (GATT)**. It was originally passed in 1947 and readopted in 1994. GATT includes the following provisions:
 - a. Obligates each country to accord nondiscriminatory, most favored nation treatment to all other contracting parties with respect to tariffs.
 - b. Prohibits the use of quantitative restrictions on imports and exports.
 - c. Provides special provisions to promote trade of developing nations.
 2. The **North American Free Trade Agreement (NAFTA)** was enacted on January 1, 1994. It is a comprehensive trade agreement that improves virtually all aspects of doing business within North America. Its goal was to open trade between the United States, Canada, and Mexico. NAFTA eliminates tariffs completely and removes many of the non-tariff barriers, such as import licenses, that have helped to exclude U.S. goods from the other two markets, especially Mexico.

Provide students with copies of the suggested resources. Have them read the “Agricultural Policies” section in Chapter 1 of AgriScience Explorations. Summarize important agriculture policies and legislation using the classroom writing surface. Invite a local Farm Bureau representative to be a guest speaker. Have the representative provide an overview of the purpose of the Farm Bureau and the legislation and policies it sees as important.

Review/Summary. Because agriculture is essential to the lives of all human beings, it is imperative that we understand our past in order help us prepare for our future. Focus the review of the lesson around the student learning objectives. Ask students to explain the content associated with each objective. Use their responses as the basis for determining any areas that need reteaching.

Application. Have students research an area of agriculture, documenting the trends that have occurred and what affect they have on us today.

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as a written test. A sample test is attached.

Answers to Sample Test:

Part One: Matching

1=h, 2=e, 3=c, 4=i, 5=a, 6=j, 7=b, 8=f, 9=d, 10=g

Part Two: Completion

1. artificial insemination
2. North American Free Trade Agreement (NAFTA)
3. selective breeding
4. Abraham Lincoln
5. implants
6. Tissue culture

Part Three: Short Answer

1. Soil sampling and soil type mapping.
2. Variable rate technology (VRT) for fertilizer and pesticide application to soil types and to specific trouble spots in the field.
3. To track yields in a field with on-the-go yield monitors allowing the collection of site-specific yield data during harvesting.

Test

Lesson A2–3: Determining Trends in Agriculture

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | | |
|------------------------|-------------------------|---------------------|
| a. bovine somatotropin | e. Hatch Act | i. Smith-Hughes Act |
| b. cloning | f. Homestead Act | j. Smith-Lever Act |
| c. embryo transfer | g. Morrill Act | |
| d. genetic engineering | h. porcine somatotropin | |

- _____ 1. Regulates the growth of pigs, causing them to produce more muscle cells.
- _____ 2. Appropriated money for experiment stations in connection with the various agricultural colleges.
- _____ 3. Process that removes fertilized eggs from a female and places them in another female who carries them until birth.
- _____ 4. Provided federal aid to schools, particularly for vocational agricultural education.
- _____ 5. Given to cows to increase the amount of milk they produce.
- _____ 6. Established a link between the state land-grant colleges and the farmer.
- _____ 7. Process of asexually reproducing organisms where there is no union of male and female sex cells.
- _____ 8. Made 160 acres of public domain available to every American citizen who was the head of a family or over 21 years of age.
- _____ 9. Refers to the movement of genetic information in the form of genes from one cell to another.
- _____ 10. Established an agricultural and mechanical college in each state.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. Placing the sperm cells in contact with female reproductive cells by a method other than natural breeding is known as _____.
2. The comprehensive trade agreement that improved virtually all aspects of doing business within North America is called _____. Its goal was to open trade between the United States, Canada, and Mexico.
3. Selecting the most desirable females and males to be crossed to produce animals as good as or superior to their parents is referred to as _____.
4. President _____ called on lawmakers to pass three pieces of legislation in 1862.
5. Small pellets that are placed under the skin of animals and primarily provide a substance to the animal that will promote growth are called _____.
6. _____ involves propagating plants using single cells or small groups of cells.

Part Three: Short Answer

Describe three areas in which farmers can use GPS.