UNIT I - OVERVIEW

Lesson 1: Missouri Crops and Their Uses

Competency/Objective: Identify the major Missouri crops and their uses.

Study Questions

1. **What are the major agricultural crops in Missouri?**
2. **What are the main uses of the major Missouri crops?**
3. **What are the main uses of components from the major crops?**
4. **What are the alternative uses of the major crops?**
5. **What other important crops are grown in Missouri?**
6. **Which companies use the major crops or crop components?**

References

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit I.
2. *AgriMissouri Buyers Guide*. Missouri Department of Agriculture, Market Development Division, AgriMissouri Program. Jefferson City, MO. Current copies are available by telephone (573-751-9266) or can be accessed on the Internet at <http://www.mda.state.mo.us/bguide.htm>.
3. Activity Sheets
    a) AS 1.1: Processed Food
    b) AS 1.2: Everyday Products from Soybeans

UNIT I - OVERVIEW

Lesson 1: Missouri Crops and Their Uses

TEACHING PROCEDURES

A. ***Introduction***

Agriculture is Missouri's number one industry and therefore crop production plays an important role in the state. The variation in topography and climate throughout the state allows for the great variation in crops being produced. This also leads to the numerous individuals, companies, and corporations across the state that use crops to manufacture many everyday products. Because of this diversity, Missouri is among the country's leaders in agricultural production, growing, and processing of many high-quality food, feed, and industrial products.

B. ***Motivation***

1. Ask students individually or in groups to make a list of what crops they think are grown in the state. Next have students select one crop and make another list of how this crop is used and who uses it. Keep these lists for students to review at the completion of the lesson to compare with what they have studied. Initiate a competition among students or student teams for a week or throughout the crop science course by collecting labels or brochures from different types of products that are made from a selected crop. Winners could be determined by the student or team finding the most unusual crop product and the most uses of a crop.

2. Visit a nearby processing plant that produces consumer or industrial products from crops. (Examples might be a local elevator or feed mill, a flour mill, an ethanol plant, or a soybean processing plant.) Observe how harvested crops enter the plant and what steps they go through to make the manufactured product(s). Students should be able to discuss how some crops take little or no processing (livestock feed), wheras others take extensive processing to be used in everyday products (flour, fuel products, or cooking oil). Use *AgriMissouri Buyer's Guide* to locate plants or companies to visit.

C. ***Assignment***

D. ***Supervised Study***

E. ***Discussion***

1. Discuss the variety of crops produced in the state of Missouri and where they are grown. Explain how variances in topography and climate play a role in the diversity of crops grown. Highlight the top 10 crops (by value) grown in the state. Let students know that only seven crops will be covered in detail. Refer to Table 1.1, 1998 Top 10 Missouri Crops, found in the Student Reference. For current values, refer to the most recent *Missouri Farm Facts.*

What are the major agricultural crops in Missouri?

a) Soybeans - grown everywhere in Missouri except south central region
b) Corn and grain sorghum - grown throughout state
c) Wheat - grown throughout state
d) Hay - grown throughout state
e) Rice - grown in the southeast, or "Bootheel"
f) Cotton - grown in the southeast (Bootheel) and the southwest
g) Tobacco - grown in the uplands (elevated plains) along the Missouri River
h) Vegetables and fruits - grown in the river bottoms along Missouri and Mississippi rivers

2. Discuss the major uses of the crops produced in Missouri. Explain how these crops are mainly used for either livestock feed or human food.

What are the main uses of the major Missouri crops?

a) Soybeans
   1) Whole beans - processed into protein-rich meal and used for livestock feed
   2) Oil - cooking oils (food); diesel fuel, inks, paints, and plastics (industrial)
   3) Meal - livestock and poultry feed
b) Corn - 61% used for livestock feed
c) Grain sorghum - livestock feed
d) Hay - livestock roughage feed source
e) Wheat - flour (food)
f) Cotton - cotton fiber used for clothing
g) Rice - food for human consumption

3. Discuss which components of the major crops are used. Refer to Figures 1.1 and 1.2 in the Student Reference, which give a detailed listing of uses for soybeans and corn. Also explain the processing of soybeans used to remove oil and meal from grains for food, feed, and industrial uses. (If possible, incorporate Motivation 2 into the lesson at this point.)

What are the main uses of components from the major crops?

a) Soybeans (seed or bean used in three ways)
   1) Whole beans
      (a) Hulled and rolled into full fat flakes
      (b) Can be ground for feed or flour
   2) Oil
      (a) Fat flakes bathed in solvent (degumming) to remove lecithin then crushed to remove crude oil
      (b) Refined to produce cooking oil, margarine, and shortening
   3) Meal or protein
      (a) Defatted flakes are ground into a meal for animal feed or soy flour (50% protein); flour processed into higher protein concentrates used in protein drinks, soup bases, or gravies.
      (b) Defatted flakes are chemically processed to create soy isolates (90% protein) used in dairylike products.
b) Corn
   1) Whole seed/kernel - used as a livestock energy feed source; fed in a cracked, rolled, or ground form
   2) Seed parts - refined into two groups
      (a) Primary products - starches, syrups, and dextrose, generated from the endosperm (starch) of the seed; used in foods, industrial products, and drugs
      (b) Co-products - solubles (dissolved carbohydrates in water processing solution), gluten (protein) and hulls, and seed germ (oil); used in drugs, livestock feed and food
   3) Immature or green plant - harvested as silage, used as livestock forage feed
   4) Stalks - used as a winter feed supplement for cattle
c) Grain sorghum
   1) Kernel - very hard, requires additional processing for feed
   2) Green plant - cut as silage for livestock feed
d) Wheat
   1) Seed
      (a) Endosperm - source for all flour manufacturing
      (b) Bran (outer coat) and germ - by-products from white flour milling, used separately or included in whole wheat flour

(c) Middlings and shorts - discarded waste products from flour manufacturing; includes germ, fine bran, and some flour; processed into livestock feed

2) Stem - (stubble left after harvest) cut, dried, and baled into straw; used for livestock bedding, ground cover, mulch, and crop residue

3) Immature or green plant - harvested as silage, used as livestock forage feed

e) Grass or legume hay

1) Stems, leaves, and seed heads of grasses and legumes - cut, dried, and baled; used for livestock roughage feed

2) Roots - legumes that replace nitrogen in soil

f) Cotton

1) Fiber - processed into thread and woven into fabric and textiles for clothing and home furnishings

2) Seed

(a) Oil and meal - used for food products, livestock feed, and flour

(b) Foots (wastes from oil refining) - processed into fatty acids for industrial products

(c) Hulls - used with or without the meal for livestock, poultry, and fish feed or as fertilizer

g) Rice

1) Seed

(a) Brown rice - hulled, leaving bran layer surrounding kernel; used as food

(b) White rice - milled further; cooked and eaten whole, or processed into cereals, rice cakes, or starch that is used in other food products

(c) Bran (including hull and germ) - processed further to make rice oil, a cholesterol-free cooking oil

2) Hulls - ground for use in poultry bedding

3) Stem - cut, dried, and baled as straw for livestock feed and bedding

4. Discuss how crops and processing wastes can be further processed into edible and industrial products. Refer to Figures 1.1 and 1.2 in the Student Reference.

What are the alternative uses of the major crops?

a) Soybeans - more alternative uses than most other crops (refer to Figure 1.1 Soybeans' Many Uses)

b) Corn - refer to Figure 1.2 Primary Products and Co-Products of Corn

c) Grain sorghum - ethanol, produced from the endosperm

d) Wheat

1) Livestock roughage feed source; injected with ammonia

2) Foods/beverages - breakfast foods, beer, whiskey, alcohol, and coffee substitutes

3) Building materials

e) Hay - livestock bedding; ethanol research

f) Cotton

1) Fiber

(a) Processed into lint (fiber after the seeds have been removed at the gin); used for padding in furniture, mattresses, and car seats

(b) Other cellulose products, cardboard, plastic, and U.S. paper currency

2) Waste - recycled into new products

g) Rice

1) Meal, bran, and rice polish - used as livestock feed

2) Broken kernels (less than 3/4 of whole kernel) - used to brew beer and make flour

3) Stems - ethanol research

5. Discuss other crops grown in Missouri and their impact on the state's economy.

What other important crops are grown in Missouri?

a) Tobacco
b) Vegetables - potatoes and watermelons
c) Fruits - apples, peaches, and grapes

6. Discuss the importance of agricultural processing in the United States. Without additional processing, many products produced from raw grains would not be available on a daily basis. The companies listed are only a sampling of the many grain merchandisers and processors in Missouri and in the United States. Have students complete AS 1.1.

Which companies use the major crops or crop components?

a) Grain merchandisers - connection between producers and consumers.
b) M.F.A. Incorporated - production of feed, grain sales, sales of seeds, fertilizer, and crop protection chemicals.
c) Cargill, Inc. - international marketing, processing, and distribution of agricultural food.
d) Archer Daniels Midland Company - processing cereal grains and oilseeds.
e) Farmland - crop production and crop protection products; livestock feed; petroleum; grain processing and marketing; and processing and marketing of pork and beef products.
f) Koch Industries - large livestock producer; specializes in using crops or crop components to feed cattle at their company-owned ranches and feedlots.
g) Nestle USA - food processing plant
h) Ralston/Purina - grain processing facility
i) ConAgra, Inc. - diversified international food company
j) Other large food processors
    1) RJ Reynolds
    2) Nabisco
    3) Sara Lee
    4) General Mills
    5) Quaker Oats
    6) Pillsbury
    7) Colonial Baking Company
    8) Kraft Foods
    9) Ralcorp Holdings, Inc.
    10) Frito-Lay, Inc.

F. *Other Activities*

1. After completing Activity Sheet 1.2, make posters listing products derived from soybeans. Each day challenge the students to think of additional products to add to the posters.

2. Have students use their creativity and imagination to invent a new food product. Explain what plant it comes from and how it is harvested and processed. Design packaging for the product and explain who will probably purchase and use it.

3. Have the students research various grain merchandisers or food processors. Information is available on the Internet to develop a company profile. Have the students write a report and share the information with the class.

G. *Conclusion*

Missouri is a major contributor of crops and crop products both nationally and internationally. Not only are Missouri crops used to produce food for human consumption, but also for livestock feed and alternative uses such as plastics, clothing, cleaning agents, and building materials. Missouri is home to major corporations that process raw grains into products used throughout the world.

H. ***Answers to Activity Sheet***

Answers will vary for both activity sheets.

I. ***Answers to Evaluation***

1. d
2. b
3. d
4. e
5. a
6. f
7. b
8. d
9. c

10. Answers will vary but should include two of the following for each crop:
    a) Corn
        1) Kernel - used as a livestock energy feed source
        2) Seed (primary products) - endosperm of the seed; used in foods, industrial products, and drugs
        3) Seed (co-products) - solubles, gluten and hulls, and seed germ; used in drugs, livestock feed and food
        4) Green plant - harvested as silage, used as livestock forage feed
        5) Stalks - used as a winter feed supplement for cattle
    b) Wheat
        1) Seed (endosperm) - used for flour
        2) Seed (bran and germ) - used separately or in whole wheat flour
        3) Seed (middlings and shorts) - processed into livestock feed
        4) Stem - baled into straw; used for livestock bedding, ground cover, mulch, and crop residue
    c) Rice
        1) Seed (brown rice) - used as food
        2) Seed (white rice) - used as food or processed into cereals, rice cakes, or starch for food products
        3) Seed (bran) - cholesterol-free cooking oil
        4) Hulls - used as poultry bedding
        5) Stem - baled as straw for livestock feed and bedding

11. Answers will vary but should include one of the following for each crop:
    a) Soybeans - refer to Figure 1.1 in the Student Reference
    b) Grain sorghum - ethanol
    c) Cotton
        1) Lint used for padding in furniture, mattresses, and car seats
        2) Other cellulose products, cardboard, plastic, and U.S. paper currency

12. Tobacco, Vegetables, Fruit

13. Answers will vary, but should include three of the following companies.
    MFA Incorporated; Cargill, Inc.; Archer Daniels Midland Company; Farmland; Koch Industries; Nestle USA; Ralston/Purina; ConAgra, Inc.; RJ Reynolds; Nabisco; Sara Lee; General Mills; Quaker Oats; Pillsbury; Colonial Baking Company; Kraft Foods; Ralcorp Holdings, Inc.; Frito-Lay, Inc.

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EVALUATION

Circle the letter that corresponds to the best answer.

1. Most of our food supply comes directly or indirectly from _____ .

   a. Food processors
   b. Supermarkets
   c. Producers
   d. Crops

2. _____ is Missouri's largest cash crop.

   a. Grain sorghum
   b. Soybean
   c. Corn
   d. Hay

3. Missouri ranks second in the United States in _____ production.

   a. Grain sorghum
   b. Soybeans
   c. Corn
   d. Hay

Match the crop on the right with its main use on the left. All of the answers should be used once.

4.	_____ Livestock feed	a.	Soybeans
5.	_____ Industrial products	b.	Rice
6.	_____ Flour	c.	Hay
7.	_____ Human consumption	d.	Cotton
8.	_____ Clothing	e.	Corn and grain sorghum
9.	_____ Livestock roughage feed	f.	Wheat

Complete the following short answer questions.

10. List two components from each of the following crops and describe how each component is used.

    a. Corn
       (1)

       (2)

    b. Wheat
       (1)

       (2)

c. Rice

(1)

(2)

11. List an alternative use for each of the following crops.

a. Soybeans

b. Grain sorghum

c. Cotton

12. List three alternative crops that make an important contribution to the Missouri economy.

a.

b.

c.

13. Name three companies that use crops or crop components.

a.

b.

c.

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Processed Food

Objective: Students will identify crops that produced the processed food items they eat.

Directions: Select a favorite processed breakfast cereal and answer the questions listed below. If research is necessary, use reference books, Internet sources, local and state crop associations, companies, etc., to help locate where the cereal was grown and processed. Finally, write a report and share with the class what you have learned.

1. Name the processed breakfast cereal you have selected.

2. List the top three ingredients shown on the package.

   a.

   b.

   c.

3. What crop was this food item derived from?

4. Where is this crop grown?

5. What company processed the item? (Some packages may list the distributor and this may be different than who processed the item, so you may need to do some research.)

6. Where is the company located?

7. What other processed food products does this company make?

Bonus points:

8. Determine how the food was processed to get it from the farm to the table.

Lesson 1: Missouri Crops and Their Uses Name_____

Everyday Products from Soybeans

Objective: Students will be able to identify products derived from soybeans.

Directions: Using the columns below, list all activities that you were involved in for a whole day. Also, list all the foods you ate that day, collecting their product labels if possible. Using the table on the back, list all the products you used or ate that were produced from soybeans.

ACTIVITIES	FOODS
Examples: *Checked cattle on tractor, bottle fed calf*	*Examples:* *Pancakes, butter, syrup, sausage, milk*
Drove diesel truck to town for new paint job	*Snickers bar, Coke, and Doritos*

SOYBEAN PRODUCTS								
Soybean Oil Products				**Soybean Protein Products**			**Whole Soybean Products**	**Soybean Hulls**
Soy Oil		**Soybean Lecithin**		**Soy Flour Concentrates & Isolates**		**Soybean Meal**		
Edible Uses	Technical Uses	Edible Uses	Technical Uses	Edible Uses	Technical Uses	Feed Uses	Edible Uses	
Doritos	*Diesel fuel*	*Snickers bar*	*Calf milk replacer*	*Sausage casings*		*Calf milk replacer*	*Pancake flour*	

UNIT I - OVERVIEW

Lesson 2: The Importance of Crops

Competency/Objective: Explain the economic importance of crop production.

Study Questions

1. **What is the economic importance of crops in Missouri?**
2. **What is the economic importance of crops in the United States?**
3. **What is the economic importance of crops in the world?**
4. **What are the major grain-exporting countries in the world?**
5. **What are the major importing countries of U.S. crops?**
6. **How do marketing principles affect crop economics?**

References

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit I.
2. Transparency Masters
   a) TM 2.1: 1998 Missouri Cash Receipts
   b) TM 2.2: 1998 U.S. Crop Values
3. Activity Sheet
   a) AS 2.1: Missouri Cropland

UNIT I - OVERVIEW

Lesson 2: The Importance of Crops

TEACHING PROCEDURES

A. ***Review***

Lesson 1 discussed the major crops and crop components grown in Missouri. This lesson will discuss the economic impact those crops and crop components have, not only in Missouri, but in the United States and the world. Also included will be major importers and exporters of crops and the impact marketing has on crop economics.

B. ***Motivation***

Ask the students if they know how many crops are produced in the state, nation, and/or world. Using a bale of hay (60 lb.) or a bushel of corn (56 lb.), have students guess how many of each were produced in the state during the past year. For example, in 1998 the total bushels of corn produced for grain was 285 million, 2.9% of the total produced in the United States. Use various crops to stress the importance of how much grain is actually produced. The most current *Missouri Farm Facts* guide will provide this information. Using the most current *Missouri Farm Facts* and the *USDA Agriculture Fact Book* allows students to research specific crop production facts for their county, state, and the United States.

C. ***Assignment***

D. ***Supervised Study***

E. ***Discussion***

1. Discuss the diversity of agriculture in Missouri. Consider the economic importance of crop production by illustrating how the value of crops sold in the state has a direct impact on the state's economy. Have students complete AS 2.1.

   What is the economic importance of crops in Missouri?

   a) In 1998, 49.8% of Missouri farm income was from crop production (Figure 2.1).
      1) Soybeans accounted for 21.2% of crops sold in Missouri.
      2) Feed crops (corn, hay, oats, and grain sorghum) comprised 17.6%.
      3) Food grains (rice and wheat), cotton, and miscellaneous crops consisted of 11%.
   b) Missouri ranks in the top 10 crop-producing states in the United States for hay, sorghum, soybeans, rice, corn; 11th in winter wheat production, and 12th in the nation in cotton.
   c) Missouri grew 6% of all U.S. soybeans and grain sorghum.
   d) Missouri agriculture employs 15% of the state's labor force (400,000 workers).

2. Discuss the economic impact crop production has on the U.S. economy. Explain that humans would not be able to enjoy the abundant food supply of the United States without efficient and productive farmers. The United States is the largest food supplier worldwide, and grains are the leading U.S. export.

   What is the economic importance of crops in the United States?

   a) In 1998, the value of crops sold in the United States totaled $98 billion.
   b) Crops were 48% of the $196.8 billion total farm receipts in 1998.
   c) Crop distribution in the United States is substantial.
      1) Corn (America's largest crop) added $24.4 billion to the economy in 1998.

2) Soybeans added $17.7 billion to the economy.
3) Wheat contributed $8.7 billion to the economy.
4) Cotton contributed 5.9 billion to the economy.
5) Hay contributed 13.3 billion economy.

3. Explain the importance of grain production in feeding the population of the world. Countries trade their products for grains to feed their people and livestock. The topography and climate of a country determine what crops it produces.

What is the economic importance of crops in the world?

a) Food and feed crop production must increase to meet the demand of increasing populations.
   1) 5.6 billion people in the world in 1997
   2) Increasing at 1.7% per year
b) Underdeveloped countries have difficulties meeting grain needs of their populations.
   1) Limited knowledge of grain production
   2) Lack of equipment and seeds
   3) Climate
   4) Lack of infrastructure (transportation, processing, storage)
c) U.S. production accounts for largest percentage of crops produced.
   1) U.S. produced 46% of the 500 million metric tons of corn grown worldwide.
   2) U.S. produced 50% of the world's soybeans in 1997 - 2.73 billion bushels.
   3) Only 1/5 of U.S. land is used in crop production.
   4) The American farmer produces enough food to feed nearly 150 people at the end of the 20th century.
d) Brazil, China, Argentina, Canada, and Australia are also large crop-producing nations.

4. Discuss how the United States competes against other countries in crop production. Students need to understand how crop-producing countries compete to sell their grain to the major grain importers. Producers need to know whom they are competing against, so they can be better players in the worldwide market. This competition affects the prices paid to American producers for their crops.

What are the major grain-exporting countries in the world?

a) The United States is the largest exporter with yearly exports of agriculture products exceeding $69.7 billion dollars in 1998.
b) The largest feed grain (corn and wheat) exporters in the world are the United States, China, Canada, and Australia.
c) The largest oil crop (soybeans) exporters in the world are the United States, Brazil, and Argentina.
d) Improved technologies and competition from other countries are reducing the amount of exports from the United States.

5. Discuss the importance of knowing which countries purchase the most crops. This could be explained by comparing the producer to a small business owner who must know the customer base to provide the most needed or desired products (crops) or services. It is important to know what prices those customers can or are willing to pay for those products and services. The United States tries to maintain good trading relationships with large world grain importers by offering them a high-quality product at an affordable price. The more grain imported by these countries, the better prices American producers will receive for their crop.

What are the major importing countries of U.S. crops?

a) Major importers of U.S. grains include Japan, Mexico, Taiwan, and Middle East countries.
b) The United States imports crops it is unable to grow or cannot grow in sufficient quantities.

1) Bananas
2) Coffee beans
3) Cocoa beans

6. Producers of grain should understand the basic marketing principles that play a role in the economics of production. These principles are basically the same as with other agricultural commodities. Research into the marketing of a specific commodity and careful planning are keys to success. The University of Missouri's *Missouri Farm Financial Outlook* guide can be used as a reference.

How do marketing principles affect crop economics?

a) The basic economic law of supply and demand plays a major role in grain marketing.
b) Surplus grains lead to lower prices and smaller profit margins.
c) The Chicago Board of Trade (CBOT) plays a major role in grain price discovery and determination.
   1) CBOT was established in 1848 to bring order to a chaotic marketing situation.
   2) It brings buyers and sellers together through brokers to negotiate prices.
   3) Daily world news of government grain-buying orders, weather changes, etc. help establish prices.
d) Successful grain marketing is a three-step process.
   1) Determine the cost of production and break-even price per unit.
   2) Develop a marketing plan with different pricing alternatives (cash sales, forward contracting, futures and options).
   3) Develop a follow-through plan as the last step. Track the markets daily.
e) Stick to your marketing plan.

F. ***Other Activity***

Have the students select one of the important grains marketed in Missouri and follow the prices of that grain on a daily basis during this unit. Students could report the finding by chart or bar graph format to determine when might be a best time to sell their commodity.

G. ***Conclusion***

The production of grains in Missouri and the United States is important to our economy. Grain sales and the exporting of grains play a major role in reducing the balance of trade between American and its trading partners. Missouri is a leader in the United States in hay production as well as being in the top 10 among all other states in corn and soybean production. Missouri agriculture employs over 15% of our state's workforce and is the home of about 2,000 agribusinesses.

H. ***Answers to Activity Sheet***

Answers will vary with the census year.

I. ***Answers to Evaluation***

1. d
2. a
3. Corn
4. Answers should include four of the following: United States, China, Canada, Australia, Brazil, and Argentina.
5. Answers should include three of the following: Japan, Mexico, Taiwan, Korea, Middle East.
6. Answers will vary.

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EVALUATION

Circle the letter that corresponds to the best answer.

1. What was the total value of crops sold in Missouri in 1998?

   a. $1-2 million
   b. Under $10 million
   c. $1-2 billion
   d. Over $4 billion

2. What is the total value of crops sold annually in the United States?

   a. Over $90 billion
   b. $25-50 billion
   c. $100 million
   d. Under $100 million

Complete the following short answer questions.

3. What is the largest grain crop produced in the United States?

4. List four countries that are large exporters of crops in the world.

   a.

   b.

   c.

   d.

5. List three countries that import the most crops from the United States.

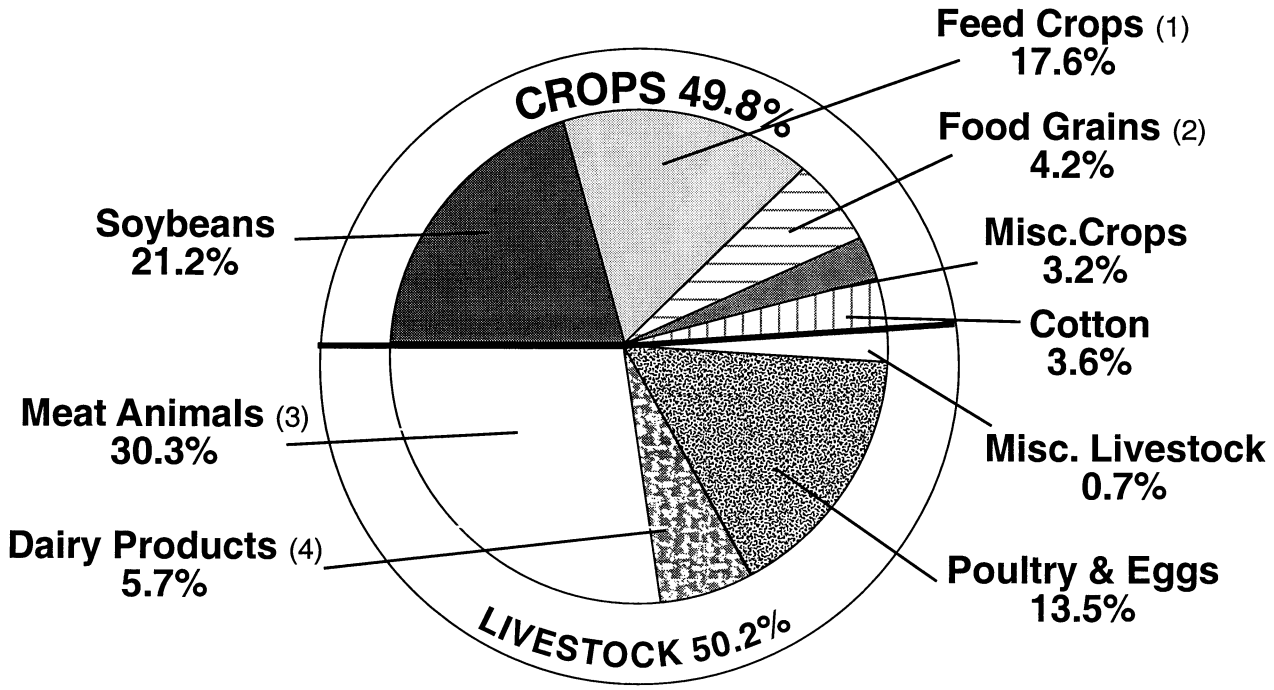
   a.

   b.

   c.

6. Explain how marketing principles affect crop economics.

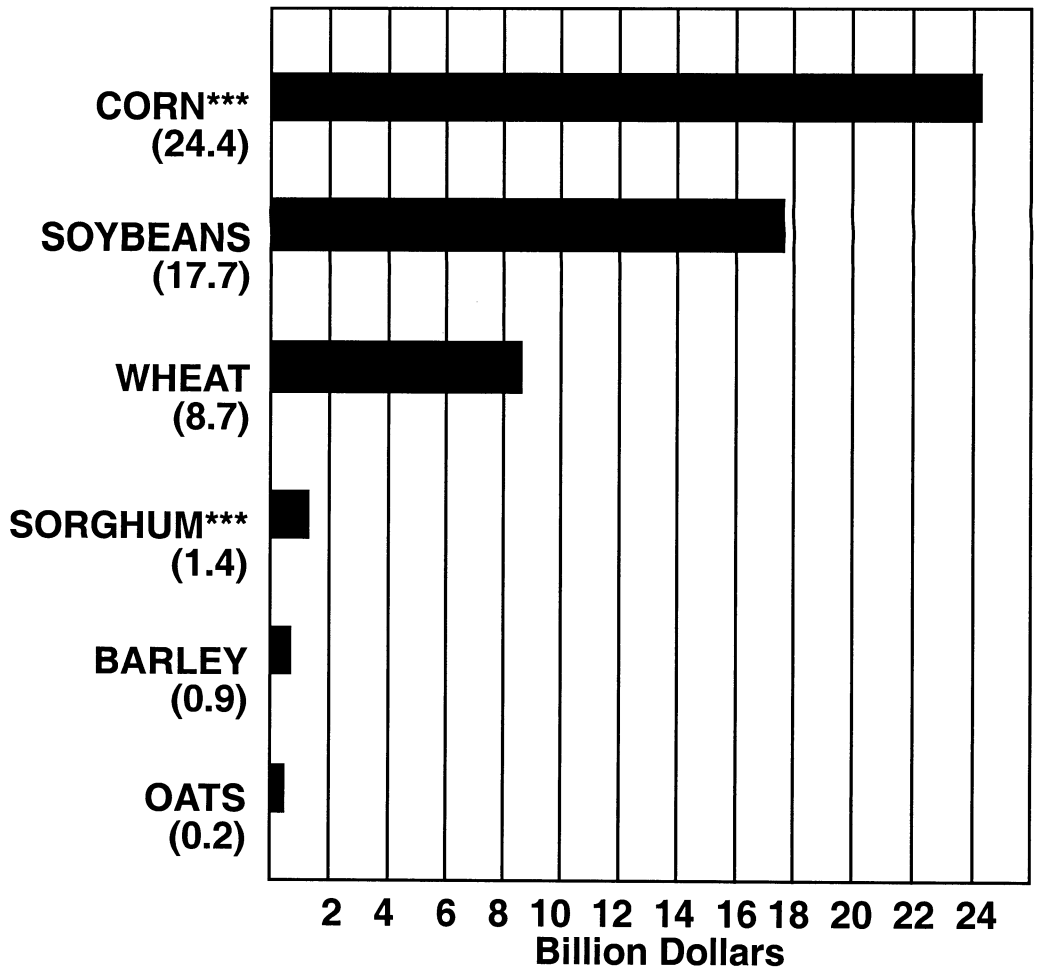
1998* Missouri Cash Receipts



1 - Corn, Hay, Grain Sorghum, and Oats
2 - Wheat and Rice
3 - Cattle, Hogs, and Sheep
4 - Wholesale Milk

*Source: Economic Research, U.S.D.A. preliminary data for 1998

1998 U.S. Crop Values
(Billion Dollars**)



*Estimate for marketing year ending August 31, 1998.

**All figures calculated by multiplying year-end production by projected average farm price.

***Includes grain production only.

Source: USDA/National Agricultural Statistics Service

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Missouri Cropland

Objective: Students will determine impact of crop farming in the state of Missouri and in their local county.

Directions: Using the Internet, access the Missouri Agricultural Statistics Service web site at <http://agebb.missouri.edu/mass/moagri.htm>. For the current year listed, complete the following table.

Year: _____

Commodity	Acres Harvested	Yield	Production
Corn			
Soybeans			
Winter wheat			
Grain sorghum			
Oats			
Rice			
Tobacco			
All potatoes			
Cotton			
All hay			
Potatoes			

From the Missouri Agricultural Statistics Service site <http://agebb.missouri.edu/mass/agrifact/index.htm>, locate your local county on the map. Use the link to "Rank Within Misouri's 114 Counties" and complete the following table.

Commodity	Rank Within Missouri's 114 Counties
Corn	
Wheat	
Soybeans	
Sorghum	
Hay	
Tobacco	
Rice	
Cotton	

UNIT I - OVERVIEW

Lesson 3: Careers in Crop Science

Competency/Objective: Identify career opportunities in crop science or crop-related agribusiness.

Study Questions

1. **What career opportunities are there in crop science and crop-related agribusiness?**

2. **What are the educational requirements for careers in crop science and crop-related agribusiness?**

References

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit I.

2. *Think About It* (Brochure) National FFA Organization. Available by phone at 888-332-2668 or on the Internet at <www.ffa.org>.

3. Transparency Master

   a) TM 3.1: Employment Categories

4. Activity Sheet

   a) AS 3.1: Selecting a Crop Science Career

UNIT I - OVERVIEW

Lesson 3: Careers in Crop Science

TEACHING PROCEDURES

A. ***Review***

A career in crop production or any agribusiness-related field is available to students willing to learn and work hard. To be competitive, a producer needs to understand basic math, read detailed manuals, and keep current on computer-based technology. A high school education is a necessity with some jobs requiring college degrees ranging from a bachelor's to a doctorate.

B. ***Motivation***

1. Arrange for a person employed in crop production or a crop-related agribusiness to visit the class. Hold a discussion on the educational qualifications, technical experience, duties, benefits, etc., required for his or her job. Allow time for student questions.

2. Arrange a visit to a college campus to tour the agriculture facilities. Talk to faculty members and students about the programs offered. Collect brochures and other information about the school and programs. The high school guidance counselor can be a good source of information and help with these arrangements.

C. ***Assignment***

D. ***Supervised Study***

E. ***Discussion***

1. Discuss possible career opportunities available in crop science and crop-related agribusiness. This lesson breaks career opportunities into six categories with examples in each category. Refer to TM 3.1 to illustrate the various employment categories and the percentage of available jobs. The student reference lists jobs in each category. Also, refer to National FFA publications such as the *Think About It* brochure.

What career opportunities are there in crop science and crop-related agribusiness?

a) Marketing, merchandising, and sales
   1) Work with producers and consumers to provide agricultural products
   2) Employ 32.4%
b) Scientists, engineers, and related professionals
   1) Leading edge of agricultural technology
   2) Employ 28.8%
c) Managers and financial specialists
   1) Business skills, extensive knowledge and understanding of agriculture
   2) Employ 14%
d) Social service professionals
   1) Safeguard the public, assist with individual, community, world needs
   2) Employ 9.7%
e) Education and communications
   1) Sharing news and information about agriculture
   2) Employ 7.6%
f) Production
   1) Require knowledge and development of multiple skills
      (a) Machinery and equipment operation
      (b) Chemical safety

(c) Marketing strategies
2) Employ 7.5%

2. Discuss the importance of education to increase career opportunities in crop science and crop-related agribusiness. Ask the students how the educational levels required now are different from those required in previous generations. Also explain the various levels of postsecondary education (refer to Table 3.1 in Student Reference).

What are the educational requirements for careers in crop science and crop-related agribusiness?

a) Types of education
   1) Informal - learning by observing
      (a) Growing up on a farm
      (b) Working in production agriculture
      (c) Working in an agribusiness environment
   2) Formal - structured learning in a school setting
      (a) High school agriculture courses
      (b) Vocational or technical training
      (c) Course of study to obtain a specific degree at a college or university
b) Levels of education
   1) High school - agriculture courses/diploma
   2) Postsecondary
      (a) Technical school - certificate with course work in specific subject area
      (b) College - associate's, bachelor's, master's, or doctorate degree
         (1) Longer than a certificate program
         (2) General education classes along with specific subject area

F. ***Other Activities***

1. Arrange for students to spend a day with someone in a crop science or crop-related agribusiness occupation. Have students give an oral or written report on the machines used, people they talked to, and the general nature of the work.

2. Have students take the *AgriScience Interest Inventory* to help assess their individual interests. This is not a test but a way to have students think about what they like and jobs they might not have considered before. This is a computer-based questionnaire that is available from Interstate Publishers, Inc., Danville, Illinois.

G. ***Conclusion***

Careers in crop science or crop-related agribusiness are continually increasing in variety and importance. Individuals with on-the-job experience or a college degree in crop science can find a variety of jobs available. If students are interested in working with crops they should also consider what their outside interests and abilities are to find a career both challenging and rewarding.

H. ***Answers to Evaluation***

1. f
2. d
3. e
4. c
5. a
6. f
7. d
8. a
9. b

10. f
11. e
12. b
13. c
14. e
15. An informal education is learning by observing and can be obtained from knowledge acquired growing up on a farm, working in production agriculture, or in an agribusiness environment.
16. A formal education is structured learning in a school setting and includes taking high school agriculture courses, vocational or technical training, or a required course of study to obtain a specific degree at a college or university.

UNIT I - OVERVIEW

Name _____

Lesson 3: Careers in Crop Science

Date _____

EVALUATION

Match the employment category on the right with the job title on the left. Answers will be used more than once.

1. _____ Food Inspector
2. _____ Agricultural Educator
3. _____Agricultural Credit Analyst
4. _____ Agricultural Chemical Dealer
5. _____ Custom Harvester
6. _____ Cotton Grader
7. _____ Cooperative Extension Agent
8. _____ Greenhouse Manager
9. _____ Water Quality Specialist
10. _____ Federal Grain Inspector
11. _____ Fertilizer Plant Supervisor
12. _____ Entomologist
13. _____ Fruit Distributor
14. _____ Commodity Broker

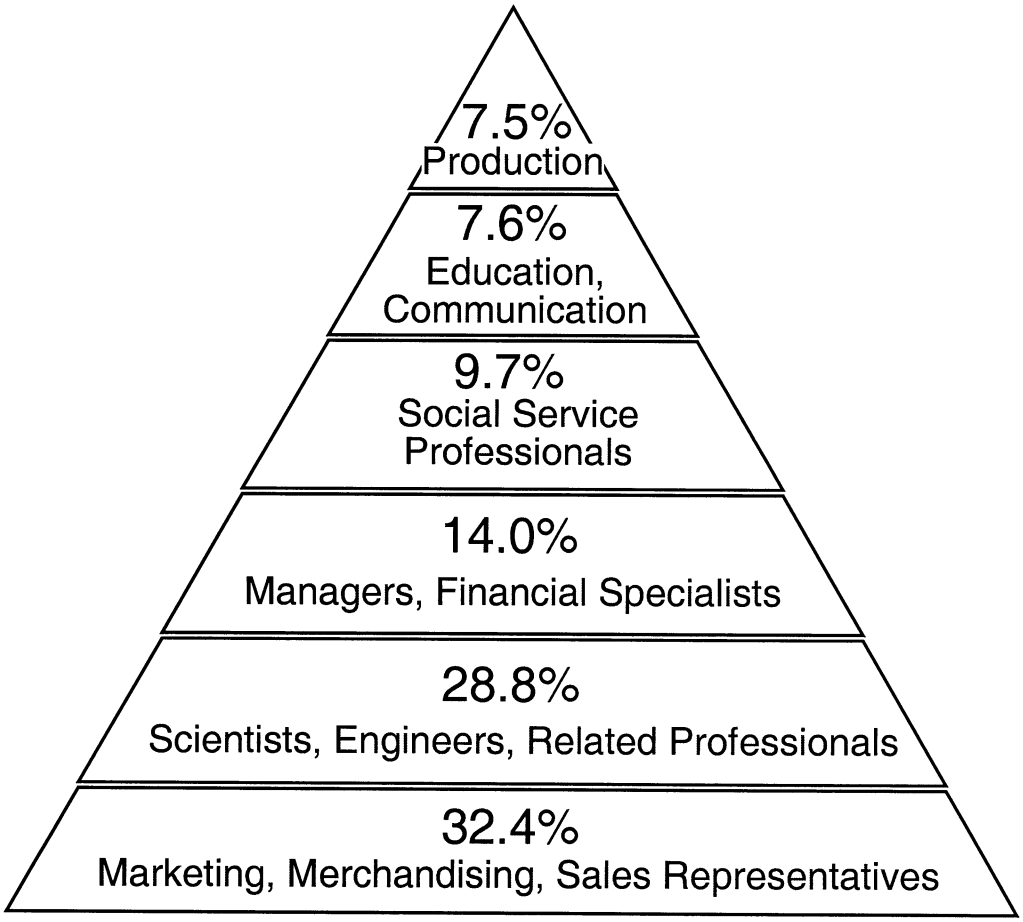
a. Crop production
b. Scientists, engineers, and related professionals
c. Marketing, merchandising, and sales
d. Education and communication
e. Managers and financial specialists
f. Social service professionals

Complete the following short answer questions.

15. What is an informal education?

16. What is a formal education?

Employment Categories



Employment Categories

Source: Higher Education Programs, USDA (1995)

Lesson 3: Careers in Crop Science Name _____

Selecting a Crop Science Career

Objective: Students will be able to learn facts concerning the educational and job skill requirements as well as other employment-related information of the selected career.

Directions: Using the Internet, find the FFA Agriculture Career Center at the web address <www.ffa.org>. Select the path to the interactive quiz under Ag Jobs. Follow the instructions to find out which jobs are best suited to your interests. Write a short report on why you selected this career.

UNIT I - OVERVIEW

Lesson 4: Government Influence and Current Trends

Competency/Objective: Explain government influence and identify current trends in crop production.

Study Questions

1. **How do government programs and trade agreements influence crop production?**

2. **What are current trends in crop production?**

References

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit I.

2. Food and Agricultural Policy Research Institute (FAPRI) <http://www.fapri.iastate/edu/default.htm>

3. Activity Sheet

   a) AS 4.1 The World Trade Organization (WTO)

UNIT I - OVERVIEW

Lesson 4: Government Influence and Current Trends

TEACHING PROCEDURES

A. ***Review***

In previous lessons, we have examined Missouri crops, their economic importance, and careers associated with crop production. This lesson will finalize the overview unit and discuss how government programs influence crop production as well as some of current new technologies that affect producers.

B. ***Motivation***

Make a list of the following acronyms on the board; NAFTA, IPM, GMO, GATT, and CRP and ask students if they can tell you what the letters mean. You might also ask them to describe what impact government farming programs have on crop production.

C. ***Assignment***

D. ***Supervised Study***

E. ***Discussion***

1. The effect of government programs and trade agreements on agricultural production can be very complicated. Students should have a basic understanding of these activities and how they function. Have students complete AS 1.1.

   How do government programs and trade agreements influence crop production?

   a) GATT (General Agreement on Tariffs and Trade)
      1) Existed from 1948 to 1995
      2) Purpose - minimize tariffs, quotas, and other barriers to international trade
      3) Sponsored eight rounds of trade negotiations
      4) Formation of the WTO (World Trade Organization) that took over GATT's functions
         (a) Stronger powers to enforce agreements
         (b) Authority to issue trade sanctions
         (c) Disciplines imposed on trade barriers and trade-distorting domestic farm policies

   b) NAFTA (North American Free Trade Agreement)
      1) Took effect on January 1, 1994
      2) Agreement between Canada, Mexico, and the United States to foster trade and investment
      3) Purpose - eliminate tariffs and nontariff barriers between these three countries
      4) Most goals reached by January 1, 1998
      5) Some tariffs on sugar, dairy, peanuts, and cotton from the United States
      6) Substantial increase in trade and investment between these three countries

   c) U.S. farm policy
      1) First organized policy began in 1933 with the Agricultural Adjustment Act.
      2) It was designed to address the farm problems of low prices, surpluses, and low incomes.
      3) It changed over the years but new legislation was introduced in 1996 with the Federal Agricultural Improvement and Reform Act (FAIR).
         (a) This was a major step toward eliminating commodity programs and taking the United States toward an almost fully market-oriented farm policy.

(b) This change has led to farm income being more variable from year to year in response to supply and demand spikes.

d) CRP (Conservation Reserve Program)
   1) CRP is a long-term, land retirement program to offset agriculture's adverse effects on the environment.
   2) It was established in 1985 to conserve and improve soil, water, and wildlife resources on highly erodible and environmentally sensitive land through 10- and 15-year leases.
   3) Renewal of FAIR program gives the authority to sign up 36.4 million acres through 2002.
   4) One benefit is to increase market sales of farm commodities by increasing farm prices caused by idling formerly cultivated farmland.
   5) It also benefits the private sector through improved water quality and improved wildlife for hunting and fishing.

2. New technologies are greatly changing the face of agriculture. Their impact could be significant. Students and agricultural producers must stay current on these new developments and what they mean to the production of agricultural products.

What are current trends in crop production?

a) Organic foods
   1) They were developed to promote healthier foods for humans and to protect the environment.
   2) Agricultural producers are encouraged to use methods that neither deplete the soil nor hurt environmental systems or workers.
   3) Organic farming helps to promote biological diversity and recycling resources.
      (a) Crop rotation
      (b) Rotational grazing
      (c) Planting of cover crops
      (d) Intercropping
      (e) Animal and plant waste recycling
      (f) Reduced tillage methods
      (g) Adding minerals to crops
   4) National Organic Standards Board defined "certified organic" in 1995.
      (a) Labeling term denoting products produced under authority of the Organic Foods Production Act
      (b) Controversy over trying to define organic standards
   5) USDA first proposed national standards in 1997.
   6) USDA released new standards in March 2000.
      (a) Bar the use of genetic engineering or irradiation of foods
      (b) Prohibit antibiotics in livestock production
      (c) Require use of organic feed
      (d) Carry "USDA Certified Organic" label

b) GMO (genetically modified organisms)
   1) GMO has been done for many years with strains of wheat, corn, etc.
   2) Today's technology now allows for splitting and inserting genes to make drastic changes in plants.
   3) Genetic engineering will help meet the challenges of a growing, hungry population.
   4) Genetically engineered plants were germinated on 65 million acres of prime farmland in 1998.
   5) Bt corn and herbicide-resistant soybeans have initiated a worldwide debate as to the ethics of this biotechnology.
   6) Bt corn develops a toxin that kills worms when they attack the plant.
   7) Herbicide-resistant soybeans allow for better weed control.
   8) GMOs have the potential to improve proteins, fat, and vitamins in crops and increase resistance to drought, frost, and bacteria in plants.

9) Critics contend the GMOs create the following problems.
   (a) GMO is a vast uncontrolled experiment.
   (b) New seeds will benefit large corporations.
   (c) Organic farmers, the environment, and the consumer will suffer long-term damage.
   (d) Bt corn kills the monarch butterfly.
   (e) Long-term consequences of these technologies for human health and the environment are unknown.

c) Alternative or sustainable agriculture
   1) Producers are looking for different methods of increasing their farm income.
   2) Other sources of agriculture income include the following items.
      (a) Elk
      (b) Bison
      (c) Berries
      (d) Shiitake mushrooms

d) Precision farming
   1) Carefully tailored soil and crop management fit different conditions found in each field.
   2) This is also known as "prescription farming," "site-specific farming," and "variable rate farming."
   3) It makes use of new technologies such as remote sensing, geographic information systems, and global positioning systems
   4) Producers can adjust seeding rates, plan crop protection programs, perform more timely tillage, and determine yield variation within a field.

e) IPM (Integrated Pest Management)
   1) Pests are managed with biological, cultural, physical, and chemical tools to minimize economic, health, and environmental risks.
   2) Pests may include insects, disease, weeds, nematodes, arthropods, and vertebrates.
   3) IPM uses beneficial organisms such as predators, parasites, etc., to suppress pest organisms.
   4) Cultural controls include crop rotation, cultivation, and sanitation to reduce pests.
   5) Physical controls involve barriers, traps, and adjustment of planting location or timing to evade or diminish pest pressure.
   6) To use IPM wisely, producers must spend more time observing and interpreting the impact of pest populations.

F. *Other Activity*

This would be an excellent time to take a field trip or have a guest speaker (with slides, etc.) to demonstrate alternative farming programs.

G. *Summary*

With the changes in agricultural production occurring so rapidly, producers must spend more time investigating and studying the new technologies that are being developed if they are going to remain in the business of agricultural production. They must also keep informed of the current agricultural policies of the government to take advantage of those programs that will assist them in maximizing their income.

H. *Answers to Activity Sheet*

1. Geneva, Switzerland
2. To ensure that trade flows as smoothly, predictably, and freely as possible
3. By negotiating and signing WTO agreements with the world's trading nations. These contracts guarantee important trading rights and bind governments to keep trading policies within agreed limits to everybody's benefits.

4. a. Promotes peace
   b. Handles disputes constructively
   c. Rules make life easier for all
   d. Free trade cuts the cost of living
   e. Provides more choice of products and qualities
   f. Raises incomes
   g. Stimulates economic growth
   h. Makes life more efficient
   i. Shields governments from lobbying
   j. Encourages good government

I. ***Answers to the Evaluation***

1. b
2. b
3. c
4. a. Federal Agricultural Improvement and Reform Act
   b. North America Free Trade Agreement
   c. General Agreement on Tariffs and Trade
   d. Conservation Reserve Program
   e. Genetically Modified Organisms
   f. Integrated Pest Management
   g. World Trade Organization
5. Organic foods, alternative or sustainable agriculture, precision farming, IPM (Integrated Pest Management)
6. Any one of the following: precision farming, prescription farming, or site-specific farming

UNIT I - OVERVIEW Name _____

Lesson 4: Government Influence and Current Trends Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. The GATT organization was organized in _____.

   a. 1933
   b. 1948
   c. 1994
   d. 1996

2. NAFTA is a trade agreement between the United States, _____, and _____.

   a. Mexico and Brazil
   b. Mexico and Canada
   c. Canada and Brazil
   d. Argentina and Brazil

3. The FAIR Act was adopted in _____.

   a. 1994
   b. 1995
   c. 1996
   d. 1998

Complete the following short answer questions.

4. What do the following letters represent?

   a. FAIR -

   b. NAFTA -

   c. GATT -

   d. CRP -

   e. GMO -

   f. IPM -

   g. WTO -

5. List the four current trends in crop production discussed in this lesson.

   a.

   b.

   c.

   d.

6. What is another name for “variable rate farming”?

Lesson 4: Government Influence and Current Trends Name_____

The World Trade Organization

Objective: Students will develop an understanding of the WTO and its purpose.

Directions: Using the Internet, research the World Trade Organization (WTO) using the following web site: <http://www.wto.org> and answer the questions below.

1. Where is the headquarters of the WTO?

2. What is the main function of the WTO?

3. How does it accomplish this function?

4. What are the "10 benefits" of the WTO?

   a.

   b.

   c.

   d.

   e.

   f.

   g.

   h.

   i.

   j.