

Course	Agricultural Science II
Unit	Crop Science
Lesson	Economic Importance of Crops
Estimated Time	50 minutes

Student Outcome

The student will be able to describe the economic importance of crop production.

Learning Objectives

1. Identify the major crops produced in Missouri.
2. Identify where Missouri is ranked in crop production in the U.S.
3. Identify the major crops produced in the world.
4. Describe the factors that affect which crops are grown.
5. Explain how crop production impacts international relationships.
6. Explain how crop production in other countries affects the U.S.
7. Explain how the efficiency of crop production has affected the development of society.

Grade Level Expectations

SC/ST/3/B/09-11/a

SC/ST/3/B/09-11/b

SC/ST/3/B/09-11/c

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
2. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Agricultural food products or just the packages labeled AgriMissouri
- Display board for food products
- Large map of Missouri

Supplemental Information

1. Internet Sites
 - AgriMissouri Program. Missouri Department of Agriculture. Accessed January 9, 2008, from <http://www.mda.mo.gov/Market/agrimo.htm>.
 - Missouri Department of Agriculture. Accessed January 9, 2008, from <http://www.mda.mo.gov/>.
 - Missouri's Rank Among States, 2006 Farm Facts. USDA National Agricultural Statistics Service. Accessed January 9, 2008, from http://www.nass.usda.gov/Statistics_by_State/Missouri/Publications/Farm_Facts/2006/Rank_Among_States.asp.

Interest Approach

The instructor should secure several agricultural food products labeled AgriMissouri (either the food product or just the package) and have a display ready to be used in introducing this lesson. A list of AgriMissouri products can be obtained from your local grocer. Using a large map of Missouri, have students locate where each finished, packaged product is from. Next, look at the agricultural ingredients in each product (e.g., wheat, corn, and pork). Using the information from the Missouri Farm Facts website (included in the Supplemental Information), locate the areas that produce the raw products.

Ask students to list the jobs that are involved in processing the products. Discuss the importance of the income received by those employed in processing and the importance of the products to the economy of each community and the state.

Communicate the Learning Objectives

1. Identify the major crops produced in Missouri.
2. Identify where Missouri is ranked in crop production in the U.S.
3. Identify the major crops produced in the world.
4. Describe the factors that affect which crops are grown.
5. Explain how crop production impacts international relationships.
6. Explain how crop production in other countries affects the U.S.
7. Explain how the efficiency of crop production has affected the development of society.

Instructor Directions	Content Outline
Objective 1 <i>Missouri's diverse geography allows for the production of a wide range of agricultural products. From flat land to rolling hills, from low delta land to forested mountains, Missouri is able to produce a variety of crops.</i>	Identify the major crops produced in Missouri. <ol style="list-style-type: none">1. Soybeans2. Corn3. Wheat4. Grain sorghum5. Cotton6. Rice7. Fescue seed8. Lespedeza9. Hay
Objective 2 <i>Crop production in Missouri plays an important part in the overall production of crops in the U.S. (Data at right is from the Missouri Farm Facts website for 2006.)</i>	Identify where Missouri is ranked in crop production in the U.S. <ol style="list-style-type: none">1. 2nd in hay production (excluding alfalfa)2. 4th in hay production (all)3. 4th in rice4. 5th in grain sorghum5. 7th in soybeans6. 8th in corn for grain7. 9th in cotton

Instructor Directions	Content Outline
<p><i>Note: Farm Facts data is compiled annually. For the most recent information, consult the Missouri Farm Facts website.</i></p>	<ol style="list-style-type: none"> 8. 9th in cottonseed 9. 9th in winter wheat 10. 10th in tobacco 11. 10th in watermelon
<p>Objective 3</p> <p><i>World trade in agricultural products is important to the U.S. economy. Spices were one of the first goods purchased from foreign lands. Before the new colonies in North America declared independence, crops like tobacco and potatoes were exported to England. Agricultural products were imported from other countries to meet the growing needs of the new colonies. Agricultural trade has increased since the early history of the U.S. and so has the production of agricultural crops by other countries.</i></p>	<p>Identify the major crops produced in the world.</p> <ol style="list-style-type: none"> 1. Cereal grains (wheat, barley, oats, rye, corn, sorghum, rice) 2. Oilseeds (cotton, soybeans, peanut, canola, rapeseed, sunflower, safflower) 3. Sugar (sugar beets, some sugar cane) 4. Fiber crops (cotton, hemp, flax, jute)
<p>Objective 4</p> <p><i>The U.S. has been richly endowed with much productive land and a temperate climate. American farmers are able to produce more than what is needed by the people of this nation. The efficient production of agricultural crops holds both benefits and disadvantages for farmers. Discuss what factors affect which crops are grown in a given area.</i></p>	<p>Describe the factors that affect which crops are grown.</p> <ol style="list-style-type: none"> 1. Land capability and use 2. Climate 3. Resource availability 4. Product demand 5. International trade
<p>Objective 5</p> <p><i>Differences in natural conditions and economic structures lead to great differences in the cost of production of agricultural</i></p>	<p>Explain how crop production impacts international relationships.</p> <ol style="list-style-type: none"> 1. Helps stimulate the U.S. economy 2. Helps provide jobs in export/import industries 3. Contributes to the U.S. trade balance 4. Builds allies

Instructor Directions	Content Outline
<p><i>products from country to country. Many developing countries depend heavily on agricultural exports for their primary source of earnings. Production of agricultural crops and the ability to export those crops are affected by international agreements and relationships between countries.</i></p>	<ol style="list-style-type: none"> 5. Overproduction can reduce prices. 6. Overproduction can push developing countries out of the market. 7. Overproduction can increase international tension. 8. Continued trade may result in dependency for developing countries.
<p>Objective 6</p> <p><i>Although the U.S. is the largest exporter of agricultural products, there has been an increase of competition from countries entering the foreign trade market.</i></p>	<p>Explain how crop production in other countries affects the U.S.</p> <ol style="list-style-type: none"> 1. Crops not produced in the U.S. may be imported (e.g., teas, coffees, other beverages, and fibers). 2. Excess foreign production may result in surpluses and lower prices. 3. Foreign countries with lower labor costs may make products cheaper for U.S. imports.
<p>Objective 7</p> <p><i>Development of a society depends on many interrelated factors. Natural resources and energy are among the many factors that will stimulate the growth of a society. However, agriculture and the ability to produce food are the keys to economic development.</i></p>	<p>Explain how the efficiency of crop production has affected the development of society.</p> <ol style="list-style-type: none"> 1. People and resources are freed up to pursue other endeavors. 2. Less money is spent on food, leaving more money for other purchases. 3. Creation of jobs to meet the demand for other goods and services, which stimulates the economy 4. Trade is encouraged, which makes other products and opportunities available. 5. Assists other societies to develop
<p>Application</p>	<p>Other activities</p> <ol style="list-style-type: none"> 1. Have students examine their community to discover how many agricultural products or ingredients are imported. 2. Locate a world map and identify countries that purchase crops from the U.S.
<p>Closure/Summary</p>	<p>Crop production in Missouri affects more than just the local economy. The economic value of crop production stimulates income and trade in the community, state, nation, and other countries. The U.S. owes its strength and greatness to the progressive, hardworking American farmer.</p>

Instructor Directions	Content Outline
<p>Evaluation: Quiz</p> <p><i>Note: Questions 8–18 are based on Missouri’s ranking among states as determined by the National Agricultural Statistics Service for 2006. Rankings are updated annually and are available on the Missouri Farm Facts website.</i></p>	<p>Answers:</p> <ol style="list-style-type: none">1. True2. False3. False4. True5. True6. True7. False8. 8th9. 4th10. 7th11. 10th12. 2nd13. 9th14. 9th15. 5th16. 4th17. 9th18. 10th

Unit: Crop Science

Name _____

Lesson 1: Economic Importance of Crops

Date _____

Evaluation

True/False (Place the correct response in the blank provided.)

- ___ 1. Missouri's geography encourages agricultural diversity.
- ___ 2. Missouri ranks last among other states for sorghum grain production.
- ___ 3. All rice is produced in Asian countries.
- ___ 4. Climate is an important factor to consider when choosing which crop to grow.
- ___ 5. The U.S. is richly endowed with fertile land.
- ___ 6. Agricultural trade builds allies.
- ___ 7. Agricultural trade limits social development.

How does Missouri rank in the U.S. in the production of each of the following crops?

<u>Rank</u>	<u>Crop</u>	<u>Rank</u>	<u>Crop</u>
8. ___	Corn for grain	14. ___	Cotton
9. ___	Rice	15. ___	Grain sorghum
10. ___	Soybeans	16. ___	Hay production (all)
11. ___	Tobacco	17. ___	Cottonseed
12. ___	Hay production (excluding alfalfa)	18. ___	Watermelon
13. ___	Winter wheat		

Course	Agricultural Science II
Unit	Crop Science
Lesson	Crop Uses (Products and By-Products)
Estimated Time	50 minutes

Student Outcome

The student will be able to identify how crops are used.

Learning Objectives

1. Identify the major uses of crops.
2. Identify the major crops in each of the major use categories.
3. Identify the products that are made from corn.
4. Identify the products that are made from soybeans.
5. Describe the characteristics which determine how a crop is used.

Grade Level Expectations

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
2. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Several samples of retail products made from one crop

Supplemental Information

1. Internet Sites
 - Products Made from Corn. Corn Refiners Association. Accessed January 14, 2008, from <http://www.corn.org/products.htm>.
 - Products Made from Soybeans. SoyWorld. Accessed January 14, 2008, from <http://soyworld.com/>.

Interest Approach

Have samples of several retail products made from one crop (e.g., sweeteners, corn oil, soy-oil, peanut oil, linseed oil, and/or cottonseed oil), and discuss how the products are used.

Communicate the Learning Objectives

1. Identify the major uses of crops.
2. Identify the major crops in each of the major use categories.
3. Identify the products that are made from corn.
4. Identify the products that are made from soybeans.
5. Describe the characteristics which determine how a crop is used.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>As the world population continues to grow, the demand and need for a continual supply of food and agricultural products increases. In order to meet the growing need, agricultural scientists through research and technology continue to develop new products and by-products from crops. Crop plants can be grouped according to how they are used.</i></p>	<p>Identify the major uses of crops.</p> <ol style="list-style-type: none">1. Human and animal consumption (food or feed)2. Production of various oils (human consumption/industrial use)3. Medicines (pharmaceuticals)4. Fibers (cloth, pulp)5. Sugars/sweeteners6. Alternative fuels7. Shelter materials (lumber)8. Ornamentals9. Stimulants
<p>Objective 2</p> <p><i>Write on the chalkboard the major uses of crop plants, and ask the students for suggestions of what crops would belong under each major use area. (List plants suggested by students and also the list found here.)</i></p>	<p>Identify the major crops in each of the major use categories.</p> <ol style="list-style-type: none">1. Crops for human and animal consumption (food or feed)<ol style="list-style-type: none">a. Cereal or grain crops – wheat, rye, barley, oats, rice, sorghum, cornb. Legumes for seed – field beans, field peas, peanuts, cowpeas, soybeansc. Fruits – apples, peaches, berries, cherries, etc.d. Vegetables – tomatoes, cucumbers, squash, etc.e. Nuts – pecans, walnuts, etc.2. Oil crops for human consumption and industrial use: soybeans, peanuts, castor beans, flax, sesame, cottonseed, corn, canola3. Medicine crops: digitalis, quinine, reserpine4. Fiber crops: cotton, flax, hemp5. Sugar crops: sugar cane, sugar beets6. Alternative fuels: crops that contain sugar or starch

Instructor Directions	Content Outline
	for ethanol (corn, etc.) 7. Materials for shelter: timber production 8. Ornamental plants 9. Stimulant crops: tobacco, tea, coffee
<p>Objective 3</p> <p><i>Although corn is the most widely grown crop throughout the U.S., less than 10% is used for human consumption. Corn is used in a variety of products.</i></p>	<p>Identify the products that are made from corn.</p> <ol style="list-style-type: none"> 1. Livestock feed 2. Cooking oils 3. Breakfast cereals 4. Corn on the cob 5. Corn starch 6. Cornmeal 7. Refined corn sugar 8. Flour 9. Popcorn 10. Adhesives 11. Dyes 12. Plastics 13. Ethanol 14. Others
<p>Objective 4</p> <p><i>Soybean production has become very important to the U.S. and the world. Since World War II, soybean production has increased in the U.S.</i></p>	<p>Identify the products that are made from soybeans.</p> <ol style="list-style-type: none"> 1. Cooking oil 2. Soybean meal 3. Soy-flour 4. Tofu (protein supplement) 5. Shortenings 6. Margarines 7. Inks for printing 8. Industrial oils in paints, varnishes, caulking compounds and linoleum 9. Soy sauces 10. Others
<p>Objective 5</p> <p><i>Controlled production of plant crops plays a key role in the overall process of supplying food to the growing human population. However, not all plants are grown for food. Many plants are grown for specific products. Such plants</i></p>	<p>Describe the characteristics which determine how a crop is used.</p> <ol style="list-style-type: none"> 1. Nutritive value (protein content, carbohydrate content, oil content, etc.) of the plant parts 2. Palatability of the plant for food or feed products 3. Use of the plant's parts (stems, leaves, roots, seeds) for the processing of specific products other than food products

Instructor Directions	Content Outline
<i>are produced because of the desirable characteristics they possess.</i>	
Application	<p>Other activities</p> <ol style="list-style-type: none"> 1. Visit a processing plant in the area that uses plant products. 2. Divide students into groups and have them research a selected plant crop and list as many products or by-products from that crop as they can. 3. Using the lists generated in 2 above, write on the chalkboard all the plant products or by-products that the students would come in contact with on a daily basis. 4. Have each student write a paper on what everyday life would be like without plant products and by-products.
Closure/Summary	<p>Plant crops have many uses. The production of human food, animal feed, various oils, pharmaceuticals, sugars, stimulants, and fibers have been brought about through the manipulation of specific plant characteristics. Researchers continue to broaden the list of products through research and technology.</p>
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. True 2. True 3. False 4. True 5. FF 6. OC 7. OC, FC 8. MS 9. OC, FF 10. FF, OC, AF 11. OP 12. ST 13. FF 14. SC 15. ST 16. SC, AF 17. MS 18. OP 19. ST

Instructor Directions	Content Outline
	20. FF 21. PH 22. FF 23. FC

Unit: Crop Science

Name _____

Lesson 2: Crop Uses (Products and By-Products)

Date _____

Evaluation

True/False (Place the correct response in the blank provided.)

- T 1. Crops are used to produce products used by humans, livestock, and industry.
- T 2. Corn and soybeans can produce both a grain product and an oil product.
- F 3. Cotton is grown solely for the production of cottonseed oil.
- T 4. Corn is the most commonly grown field crop in the U.S.

Place the two-letter code that corresponds to the use of the plant. Some plants have more than one use.

Foods and feeds for human and animal consumption = FF

Oil crops = OC

Fiber crops = FC

Sugar crops = SC

Stimulant crops = ST

Pharmaceuticals = PH

Alternative fuels = AF

Materials for shelter = MS

Ornamental plants = OP

Crop Plants

- | | | | | | |
|------------|---------------------|--------|--------------------|----|----------------|
| FF | 5. Wheat | ST | 12. Coffee | ST | 19. Tobacco |
| OC | 6. Canola | FF | 13. Tall fescue | FF | 20. Apple tree |
| OC, FC | 7. Cotton | SC | 14. Sugar cane | PH | 21. Foxglove |
| MS | 8. Oak tree | ST | 15. Tea | FF | 22. Cucumbers |
| OC, FF | 9. Soybeans | SC, AF | 16. Sugar beets | FC | 23. Hemp |
| FF, OC, AF | 10. Corn | MS | 17. Pine tree | | |
| OP | 11. Goldenrain tree | OP | 18. African violet | | |

Course	Agricultural Science II
Unit	Crop Science
Lesson	Plant and Seed Identification
Estimated Time	Four 50-minute blocks

Student Outcome

The student will be able to identify common plants and seeds in Missouri.





Learning Objectives

1. Describe how seeds are identified.
2. Describe the characteristics of selected crop and weed seeds.
3. Identify the three classes of weeds in Missouri.
4. Describe how plants are identified.
5. Describe the characteristics of selected crop and weed plants.

Grade Level Expectations

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slides
 - PPt 1 – A Bean Seed
 - PPt 2 – A Cereal Grain
 - PPt 3 – Leaf Characteristics of Some Legumes
 - PPt 4 – Parts of a Grass Plant
 - PPt 5 – Parts of a Grass Leaf
 - PPt 6 – Leaf Characteristics of Three Grass Species
2. Activity Sheets
 -  AS 1 – Parts of a Bean Seed and Cereal Grain
 -  AS 2 – Parts of a Grass Plant and Leaf
 -  AS 3 – Characteristics of Selected Crop and Weed Plants
 -  AS 4 – Seed Identification Score Sheet
3. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
4. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Packages of mixed seeds (e.g., corn, sunflower, and pinto bean)

Supplemental Information

1. Internet Sites

- ❑ Invasive Species. Missouri Department of Conservation. Accessed January 15, 2008, from <http://www.mdc.mo.gov/nathis/exotic/>.
- ❑ Missouri Vegetation Management Manual. Missouri Department of Conservation. Accessed January 15, 2008, from <http://www.mdc.mo.gov/nathis/exotic/vegman/index.htm>.
- ❑ Noxious Weed Control. Missouri Department of Agriculture. Accessed January 15, 2008, from <http://www.mda.mo.gov/Pest/noxiousweed.htm>.
- ❑ Seed ID Workshop. Department of Horticulture and Crop Science, Ohio Agricultural Research and Development Center, Ohio State University. Accessed January 15, 2008, from <http://www.oardc.ohio-state.edu/seedid/>.
- ❑ Weed ID Guide. Weed Science Program, College of Agriculture, Food and Natural Resources, University of Missouri. Accessed January 15, 2008, from <http://weedid.missouri.edu/>.
- ❑ Weeds of the North Central States. University of Illinois Extension and departments of the University of Illinois College of Agricultural, Consumer and Environmental Sciences. Accessed January 15, 2008, from http://www.ag.uiuc.edu/~vista/html_pubs/WEEDS/list.html.

2. Print

- ❑ Coombs, E. M., J. K. Clark, G. L. Piper, and A. F. Cofrancesco, Jr., eds. *Biological Control of Invasive Plants in the United States*. Corvallis: Oregon State University Press, 2004.
 - ❑ Czarapata, E. J. *Invasive Plants of the Upper Midwest: An Illustrated Guide to their Identification and Control*. Madison: University of Wisconsin Press, 2005.
 - ❑ Kaufman, S. R. and W. Kaufman. *Invasive Plants: A Guide to Identification, Impacts, and Control of Common North American Species*. Mechanicsburg, PA: Stackpole Books, 2007.
 - ❑ Yatskievych, G. *Steiermark's Flora of Missouri*. Vol. 2. St. Louis: Missouri Botanical Garden Press, 2006.
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Interest Approach

Divide the class into groups. Give each group a package of mixed seeds (e.g., corn, sunflower, and pinto bean). Have students separate and identify them. Discuss how they identified the seeds and why identification is important.

Communicate the Learning Objectives

1. Describe how seeds are identified.
2. Describe the characteristics of selected crop and weed seeds.
3. Identify the three classes of weeds in Missouri.
4. Describe how plants are identified.
5. Describe the characteristics of selected crop and weed plants.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>While the students are divided into groups with the seeds separated, point out to them distinguishing characteristics of specific seeds. Use Ppt 1-2 to aid in this discussion. Have students complete AS 1.</i></p> <ul style="list-style-type: none"><input type="checkbox"/> Ppt 1 – A Bean Seed<input type="checkbox"/> Ppt 2 – A Cereal Grain<input type="checkbox"/> AS 1 – Parts of a Bean Seed and Cereal Grain	<p>Describe how seeds are identified.</p> <ol style="list-style-type: none">1. Size2. Shape3. Color4. Surface markings5. Other botanical characteristics
<p>Objective 2</p> <p><i>Select some crop and/or weed seeds that you feel are important and prepare seed samples on paper plates. (NOTE: Seed samples are available through IML.) Have students use the crop and weed seed information in the student reference to identify the seeds.</i></p>	<p>Describe the characteristics of selected crop and weed seeds.</p> <ol style="list-style-type: none">1. Crop seeds (student should use information in student reference)2. Weed seeds (student should use information in student reference)
<p>Objective 3</p> <p><i>Weeds are plants. However, a weed is any plant that is growing</i></p>	<p>Identify the three classes of weeds in Missouri.</p> <ol style="list-style-type: none">1. Prohibited – weeds that are nearly impossible to control; Missouri law “prohibits” the sale of

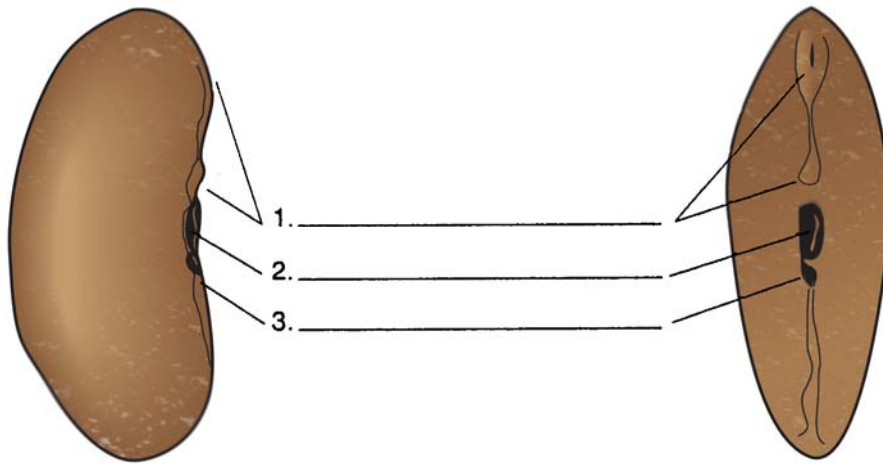
Instructor Directions	Content Outline
<p><i>where it is not wanted. Weeds can be classified into groupings for identification.</i></p>	<p>agricultural seeds which contain “prohibited” weed seeds.</p> <ol style="list-style-type: none"> 2. Noxious – weeds that can be controlled with some difficulty; the presence of “noxious” weed seed in agricultural seeds is restricted in Missouri. 3. Common – weeds that are relatively easy to control, but reduce crop yields and increase production costs.
<p>Objective 4</p> <p><i>Identification of plants is important in crop production and weed control. There are several characteristics which can be used to identify crop and weed seeds. Refer to AS 2.</i></p> <p> AS 2 – Parts of a Grass Plant and Leaf</p>	<p>Describe how plants are identified.</p> <ol style="list-style-type: none"> 1. Life cycle 2. Plant height 3. Leaves 4. Stems 5. Flower 6. Roots
<p>Objective 5</p> <p><i>Select a few plants that you feel are important and prepare several samples of major field crop and weed plants of Missouri. Be sure to select those plants that display distinct characteristics (e.g., flowers, leaves, roots, and stolons). Use PPt 3-6 to discuss the differences of plant characteristics (e.g., pinnately or palmately structured leaves). Have students refer to information in the student reference and complete AS 3.</i></p> <p><input type="checkbox"/> PPt 3 – Leaf Characteristics of Some Legumes</p> <p><input type="checkbox"/> PPt 4 – Parts of a Grass Plant</p> <p><input type="checkbox"/> PPt 5 – Parts of a Grass Leaf</p>	<p>Describe the characteristics of selected crop and weed plants.</p>

Instructor Directions	Content Outline
<p>☐ PPt 6 – Leaf Characteristics of Three Grass Species</p> <p>📄 AS 3 – Characteristics of Selected Crop and Weed Plants</p>	
<p>Application</p> <p>📄 AS 1 – Parts of a Bean Seed and Cereal Grain</p> <p>📄 AS 2 – Parts of a Grass Plant and Leaf</p>	<p>Answers to AS 1</p> <ol style="list-style-type: none"> 1. Raphe (d) 2. Hilum (f) 3. Micropyle (g) 4. Cotyledons (c) 5. Seed coat (a) 6. Radicle (b) 7. Shoot (e) 8. Mid vein (b) 9. Callus (d) 10. Suture (f) 11. Awn (a) 12. Apex of palea (c) 13. Lemma (e) 14. Teeth of edge of palea (keel) (i) 15. Palea (g) 16. Rachilla (h) <p>Answers to AS 2</p> <ol style="list-style-type: none"> 1. Culm (a) 2. Leaf blade (e) 3. Ligule (b) 4. Sheath (d) 5. Auricles (c) 6. Inflorescence (e) 7. Culm (d) 8. Sheath (b) 9. Roots (c) 10. Leaf blade (h) 11. Node (g) 12. Stolon (f) 13. Rhizome (a)

Instructor Directions	Content Outline
<p>AS 3 - Characteristics of Selected Crop and Weed Plants</p> <p>AS 4 - Seed Identification Score Sheet</p>	<p>Answers to AS 3 Instructor needs to determine if answers are appropriate.</p> <p>Answers to AS 4 Instructor needs to determine if answers are appropriate.</p> <p>Other activities</p> <ol style="list-style-type: none"> 1. During this lesson, have a daily display of selected seeds in a tray identified only by a number. Have students identify them. Do at least 5 a day until all seeds are identified. Develop a score chart to record student progress. (A classroom contest can be arranged for motivation.) Use AS 4. 2. Display pictures of selected crop and weed plants identified by only a number. Have students identify them. Do at least 5 a day until all crops and weeds in the lesson are identified.
<p>Closure/Summary</p>	<p>The presence of weeds in crops is costly to the producer. Proper plant identification plays a part in the process of reducing weeds and in turn reducing the damage to crops because of them.</p>
<p>Evaluation: Quiz</p>	<p>Answers: Correct answers need to be determined by the instructor.</p>

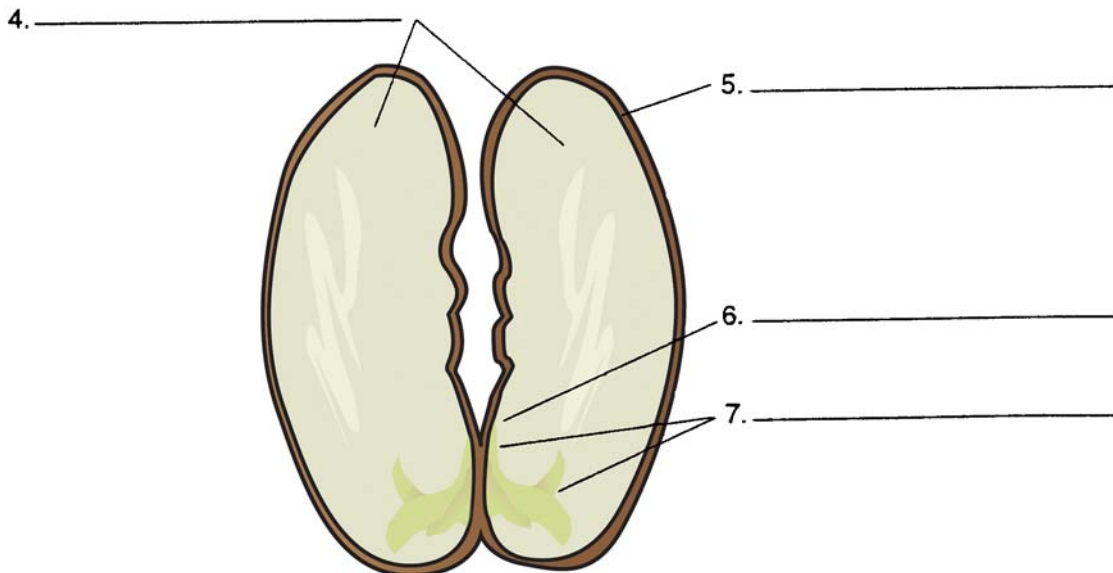
Parts of a Bean Seed

Directions: Place in the appropriate space the correct part.



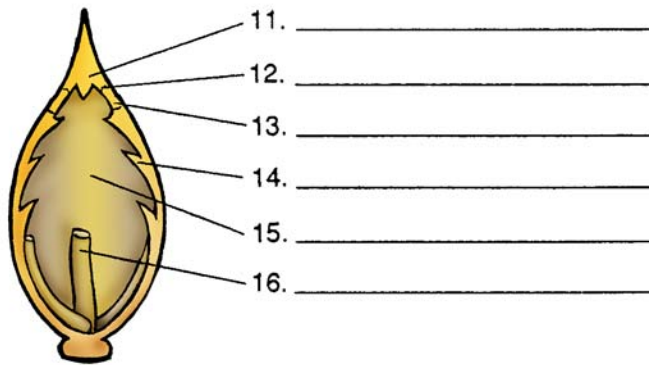
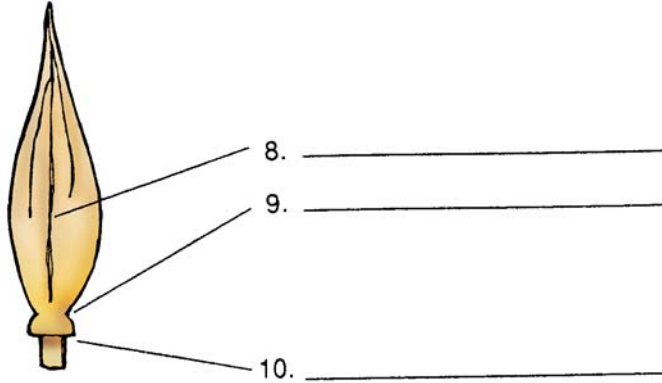
Parts

- a. Seed coat
- b. Radicle
- c. Cotyledons
- d. Raphe
- e. Shoot
- f. Hilum
- g. Micropyle



Parts of a Cereal Grain

Directions: Place in the appropriate space the correct part.



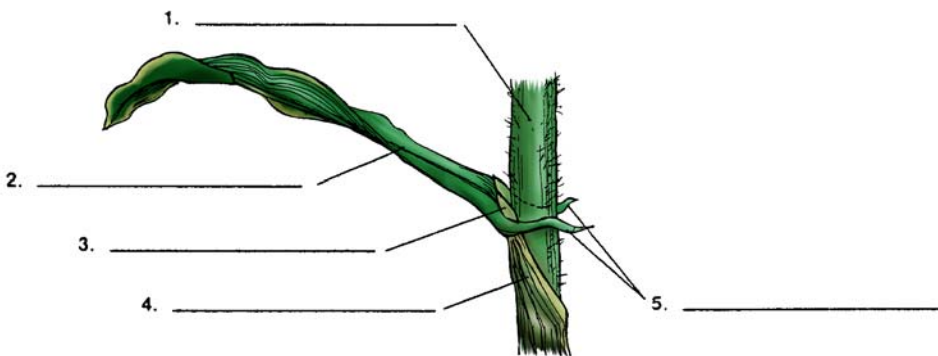
Parts

- a. Awn
- b. Mid vein
- c. Apex of palea
- d. Callus
- e. Lemma
- f. Suture
- g. Palea
- h. Rachilla
- i. Teeth of edge of palea (keel)

Parts of a Grass Plant and Leaf

Directions: Place in the appropriate space the correct part.

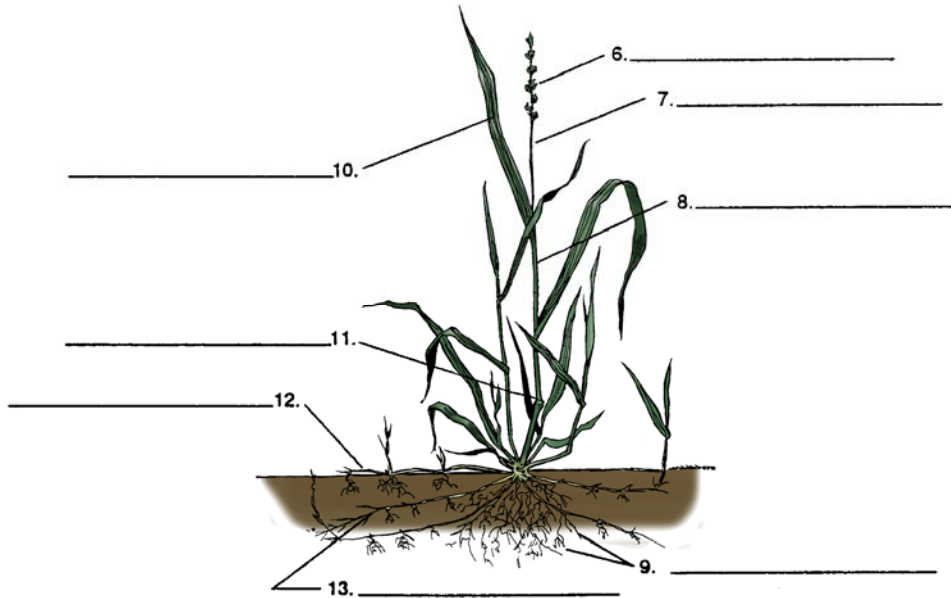
A Grass Leaf



Parts

- a. Culm
- b. Ligule
- c. Auricles
- d. Sheath
- e. Leaf blade

A Grass Plant



Parts

- a. Rhizome
- b. Sheath
- c. Roots
- d. Culm
- e. Inflorescence
- f. Stolon
- g. Node
- h. Leaf blade

Characteristics of Selected Crop and Weed Plants

Directions: Using the selected plants provided by the instructor and information found in the student reference, fill in the appropriate sections with the correct information describing the characteristics of the selected crop and weed plants.

Plant #1

Common name _____

Life cycle _____

Plant height (mature) _____

Type of leaves _____

Type of stems _____

Type of flowers _____

Type of roots _____

Plant #2

Common name _____

Life cycle _____

Plant height (mature) _____

Type of leaves _____

Type of stems _____

Type of flowers _____

Type of roots _____

Plant #3

Common name _____

Life cycle _____

Plant height (mature) _____

Type of leaves _____

Type of stems _____

Type of flowers _____

Type of roots _____

Plant #4

Common name _____

Life cycle _____

Plant height (mature) _____

Type of leaves _____

Type of stems _____

Type of flowers _____

Type of roots _____

Plant #5

Common name _____

Life cycle _____

Plant height (mature) _____

Type of leaves _____

Type of stems _____

Type of flowers _____

Type of roots _____

Unit: Crop Science

Name _____

Lesson 3: Plant and Seed Identification

Date _____

Evaluation

1. Crabgrass, which is relatively easy to control but can interfere with production, is an example of a _____.
- a. Crop plant
 - b. Common weed
 - c. Noxious weed
 - d. Prohibited weed

Correct answer is b.

Match each term below with its correct definition.

h 2. Callus	a. The husk on the back, dorsal side of the grass seed
e 3. Culm	b. Underground creeping stem
j 4. Hilum	c. Above ground, horizontal stem
a 5. Lemma	d. The husk on the front, ventricle side of the grass seed
d 6. Palea	e. Stem
f 7. Pinnately trifoliate	f. Central-terminal leaflet borne on a conspicuous petiolule
i 8. Rachilla	g. Leaf-like structure from either side of the leaf base
b 9. Rhizome	h. Enlarged base at end of the lemma
g 10. Stipule	i. A small stem to which a grass seed is attached to the branch or stem
c 11. Stolon	j. The scar at the point of attachment of a seed to the pod

Course	Agricultural Science II
Unit	Crop Science
Lesson	Certified Seed and Variety Selection
Estimated Time	Two 50-minute blocks

Student Outcome

The student will be able to identify characteristics of quality seed.

Learning Objectives


1. Describe the characteristics of quality seed.
2. Identify the four classes of seed certification.
3. Describe the requirements for seed certification.
4. Describe the benefits of using certified seed.
5. Identify factors that should be considered in selecting a crop variety.

Grade Level Expectations

SC/EC/3/B/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. Activity Sheet
 -  AS 1 - Seed Information and Germination Test
2. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
3. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Tin pie plate (need 1 for each student or group of students)
- Two paper towels (for each student/group of students)
- Twenty seeds (for each student/group of students) - instructor determines variety
- Seed tag information from the variety selected
- Masking tape

Supplemental Information

1. Internet Sites
 - Certified Seed. Ag Websites. Accessed January 15, 2008, from <http://www.certifiedseed.net/>.
 - Producing Certified Seed. Agriculture and University Extension, North Dakota State University. Accessed January 15, 2008, from <http://www.ag.ndsu.edu/pubs/plantsci/crops/a1125w.htm>.
 - Seed Certification. Electronic Data Information Source, Institute of Food and Agricultural Sciences, University of Florida. Accessed January 15, 2008, from <http://edis.ifas.ufl.edu/NFREC22>.


Interest Approach

Use AS 1 (Seed Information and Germination Test) to generate interest in the process of seed quality testing and germination rates found on certified seed tags. Students will need to be responsible for their seed germination tests.

Communicate the Learning Objectives

1. Describe the characteristics of quality seed.
2. Identify the four classes of seed certification.
3. Describe the requirements for seed certification.
4. Describe the benefits of using certified seed.
5. Identify factors that should be considered in selecting a crop variety.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>In order to ensure an adequate crop stand, quality seed should be used when planting the crop. Crop yields can be affected by the seed used. Agronomists estimate the yields from the use of good seed to be 10% to 20% greater than yields resulting from poor quality seed. There are several characteristics of quality seed.</i></p>	<p>Describe the characteristics of quality seed.</p> <ol style="list-style-type: none">1. Good genetic potential2. Good germination3. Proper size and development4. Uniformity in size and shape5. Absence of seed-borne diseases and insects6. Absence of prohibited, noxious, and other weed seeds7. Absence of other crop seeds and other varieties8. Absence of inert materials
<p>Objective 2</p> <p><i>The objective of seed certification is to ensure the quality of seed used by farmers. Seed certification also assures the buyer that genetic purity of the variety is maintained. There are four classes of certified seed.</i></p>	<p>Identify the four classes of seed certification.</p> <ol style="list-style-type: none">1. Breeder seed – this seed is used to produce foundation seed. Small quantities are produced by commercial seed companies.2. Foundation seed – Foundation seed is the parent line for registered seed and/or certified seed. (white tag)3. Registered seed – This seed is produced from foundation seed; it may be used to produce certified seed or sold directly to farmers. (purple tag)4. Certified seed – Certified seed is produced from foundation or registered seed; it is sold directly to farmers. (blue tag)
<p>Objective 3</p> <p><i>Many states have seed laws that are designed to control the quality</i></p>	<p>Describe the requirements for seed certification.</p> <ol style="list-style-type: none">1. The seed is grown from registered or foundation seed stock.

Instructor Directions	Content Outline
<p><i>of seed sold within the state. Seed associations work to produce quality seed with strict requirements.</i></p>	<ol style="list-style-type: none"> 2. The crops produced pass an inspection for mixtures, weeds, and diseases in the field. 3. The harvested crops attain the standard of quality set by the seed association.
<p>Objective 4</p> <p><i>Research has shown marked benefits from using certified seed. Although the cost of certified seed may be higher than uncertified seed, the benefits outweigh the cost difference.</i></p>	<p>Describe the benefits of using certified seed.</p> <ol style="list-style-type: none"> 1. Guaranteed to be the variety advertised 2. Guaranteed minimum germination rate 3. Guaranteed to meet weed, mechanical injury, disease, and insect contamination standards
<p>Objective 5</p> <p><i>When selecting a crop variety, there are many factors to consider. Environmental factors such as growing season length, soil type, and annual precipitation are important considerations. However, many of these factors cannot be controlled by the farmer. One factor that the farmer can control is the choice of seed to be used.</i></p>	<p>Identify factors that should be considered in selecting a crop variety.</p> <ol style="list-style-type: none"> 1. Cost 2. Adaptability of the variety to local growing conditions 3. Yield potential 4. Purity of variety 5. Quality of crop (protein content, resistance to lodging) 6. Disease and insect resistance 7. Maturity date
<p>Application</p> <p> AS 1 – Seed Information and Germination Test</p>	<p>Answers to AS 1 Answers will vary and should be determined by the instructor.</p> <p>Other activities</p> <ol style="list-style-type: none"> 1. Have students run some germination tests on different seed lots/varieties to see if the stated germination rate is met. 2. If possible, visit a certified seed processing operation. 3. Invite a certified seed producer to visit with the class about the production of quality seed.
<p>Closure/Summary</p>	<p>Through the use of certified seed, farmers can be assured that the seed is guaranteed in yield ability, purity, quality, and ability to resist diseases and insects. The first step to ensuring a quality crop is selecting quality seed.</p>

Instructor Directions	Content Outline
Evaluation: Quiz	Answers: 1. a 2. b 3. a 4. c 5. d

Unit: Crop Science

Name _____

Lesson 4: Certified Seed and Variety Selection

Date _____

Evaluation

Circle the letter that corresponds to the best answer.

1. In addition to being free from disease organisms, insects, and weeds, good seed should be uniform in size and shape.

- a. True
- b. False

Correct answer is a.

2. Why is certified seed superior to uncertified seed?

- a. It is guaranteed to contain inert matter.
- b. It is guaranteed to have varietal purity. (correct answer)
- c. It is guaranteed to have equal germination rate.
- d. It is guaranteed to be of equal cost.

Correct answer is b.

3. What is certified seed produced from?

- a. Foundation seed
- b. Breeder seed
- c. Certified seed
- d. Either a, b, or c

Correct answer is a.

4. What is the color of a "Registered Seed" tag?

- a. White
- b. Blue
- c. Purple
- d. No color

Correct answer is c.

5. What is the purpose of certifying seed?

- a. Keep good tax records on quality seed
- b. Limit the number of seed producers
- c. Keep price controls on seeds produced
- d. Guarantee the quality of seed

Correct answer is d.

Course	Agricultural Science II
Unit	Crop Science
Lesson	Stand Establishment
Estimated Time	50 minutes

Student Outcome

The student will be able to explain the requirements for establishing a crop stand.

Learning Objectives

1. Describe the purpose of tillage.
2. Explain how different tillage methods affect the environment.
3. Explain why different seeding methods are used.
4. Identify the factors that affect the proper depth of planting.
5. Identify the major nutrient elements that are needed for stand establishment.
6. Identify the factors that influence the optimum seeding rate.

Grade Level Expectations

SC/LO/2/B/09-11/c SC/ES/3/A/09-11/g SC/ST/1/C/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
2. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Ant farm or view box
- Eight seeds of any field crop

Supplemental Information

1. Internet Sites
 - Crops Publications. University of Missouri Extension. Accessed January 16, 2008, from <http://extension.missouri.edu/explore/agguides/crops/>.
 - Seeding by Plant Population – Crop Production. Manitoba Agriculture, Food and Rural Initiatives, Canada. Accessed January 16, 2008, from <http://www.gov.mb.ca/agriculture/crops/cropproduction/faa03s00.html>.
 - Suitable Methods of Tillage for the Farm. Corporate Document Repository, Food and Agriculture Organization of the United Nations. Accessed January 16, 2008, from <http://www.fao.org/DOCREP/006/Y5146E/y5146e08.htm>.
 - Sustainable Practices for Vegetable Production in the South, North Carolina State University. Accessed January 16, 2008, from <http://www.ncsu.edu/sustainable/tillage/tillage.html>.

Interest Approach

Use an ant farm (or view box) to show emergence of seeds. Plant seeds from 1/2 inch to 4 inches deep in 1/2-inch increments. Prepare the demonstration about 7 to 10 days before the anticipated date of presentation to the class.

Communicate the Learning Objectives

1. Describe the purpose of tillage.
2. Explain how different tillage methods affect the environment.
3. Explain why different seeding methods are used.
4. Identify the factors that affect the proper depth of planting.
5. Identify the major nutrient elements that are needed for stand establishment.
6. Identify the factors that influence the optimum seeding rate.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>Proper preparation of a field for planting is vital to the success of the crop. Selecting the appropriate tillage method is dependent on the intended purpose.</i></p>	<p>Describe the purpose of tillage.</p> <ol style="list-style-type: none">1. To prepare a suitable seedbed2. To eliminate competition from weeds3. To improve the physical condition of the soil
<p>Objective 2</p> <p><i>Soil is a precious natural resource. Each year over 1.6 billion tons of U.S. farm land soil is washed away due to soil erosion. The type of tillage used in crop production influences the amount of soil lost through erosion.</i></p>	<p>Explain how different tillage methods affect the environment.</p> <ol style="list-style-type: none">1. Conventional tillage leaves the soil surface relatively free of crop residue and vulnerable to erosion.2. Minimum tillage methods maintain crop residues on the soil surface and reduce soil erosion.3. No-till methods leave all crop residue on the soil surface and nearly eliminate soil erosion.
<p>Objective 3</p> <p><i>Seeding practices vary, and care must be taken when performing this task to ensure the proper seeding method is used.</i></p>	<p>Explain why different seeding methods are used.</p> <ol style="list-style-type: none">1. Row method – for planting evenly spaced seeds in parallel rows, allows for mechanical cultivation2. Drill method – for planting seeds in narrow rows in high population rates, reduces need for mechanical cultivation3. Broadcast method – for scattering seeds in a random pattern across the top of the seedbed, does not allow for mechanical weed control, cheapest method, faster coverage for erosion control

Instructor Directions	Content Outline
<p>Objective 4</p> <p><i>Several factors should be considered when deciding on the appropriate rate and depth of planting.</i></p>	<p>Identify the factors that affect the proper depth of planting.</p> <ol style="list-style-type: none"> 1. Type of soil 2. Size of seed 3. Type of emergence 4. Soil moisture 5. Soil temperature
<p>Objective 5</p> <p><i>After planting, other factors affect the growth and establishment of the crop. Specific nutrients are needed to enable the plants to grow to their potential.</i></p>	<p>Identify the major nutrient elements that are needed for stand establishment.</p> <ol style="list-style-type: none"> 1. Nitrogen 2. Phosphorus 3. Potassium
<p>Objective 6</p> <p><i>Proper stand establishment will increase the chances of a good yield, provided the weather is conducive to proper plant growth. The desired plant population is dependent on several factors, one of which is the seeding rate.</i></p>	<p>Identify the factors that influence the optimum seeding rate.</p> <ol style="list-style-type: none"> 1. Type of crop 2. Use of crop 3. Pure live-seed ratio or percent 4. Seed quality 5. Soil moisture 6. Soil productivity 7. Time of seeding 8. Method of seeding 9. Row width 10. Expected average rainfall
<p>Application</p>	<p>Other activities</p> <ol style="list-style-type: none"> 1. Take a field trip to a local farm to observe the process of seedbed preparation. Discuss the type of tillage used. 2. Arrange for a demonstration of several methods of tillage on the school land laboratory. 3. Conduct experiments with different seeds planted at different depths and calculate emergence time and rates.
<p>Closure/Summary</p>	<p>Proper preparation of the seedbed and planting seed at the proper depth will increase the emergence rate. Tillage during stand establishment can influence the amount of soil lost due to erosion. Tillage, seeding methods, seeding</p>

Instructor Directions	Content Outline
	depth, seeding rate, and nutrient availability are factors which greatly influence the crop yields.
Evaluation: Quiz	Answers: 1. True 2. False 3. False 4. False 5. True 6. a 7. a 8. c 9. b 10. c 11. a

Unit: Crop Science

Name _____

Lesson 5: Stand Establishment

Date _____

Evaluation

True/False (Place the correct response in the blank provided.)

- T 1. Proper tillage improves seed germination.
- F 2. Conventional tillage methods minimize soil erosion.
- F 3. Conventional tillage results in less soil loss than does minimum tillage.
- F 4. Broadcast seeding involves planting seeds in narrow rows.
- T 5. Seed planting depth should be adjusted according to the soil type and seed size.

Select the tillage method on the right that corresponds best with the statement on the left. Answers may be used more than once.

- a 6. Leaves the soil smooth
 - a 7. Uses the moldboard plow, disk, and harrow to prepare
 - c 8. Plant seeds directly into previous crop's residue
 - b 9. Soil to seed contact is increased while decreasing soil erosion
 - c 10. Requires good management practices to control insects and diseases from previous crop
 - a 11. Requires more trips across the field
- a. Conventional
 - b. Minimum till
 - c. No-till

Course	Agricultural Science II
Unit	Crop Science
Lesson	Managing the Crop
Estimated Time	50 minutes
Student Outcome	

The student will be able to describe good crop production practices.

Learning Objectives

1. Identify the three nutrient elements that are applied to most crops.
2. Identify when fertilizer can be applied.
3. Describe why soil pH is important in crop production.
4. Describe how soil pH can be altered.
5. Explain how plant residues should be managed.
6. Explain how plant pests can be controlled.
7. Identify the irrigation methods that are used in crop production.

Grade Level Expectations

SC/EC/1/B/09-11/a	SC/EC/1/B/09-11/b	SC/ES/3/A/09-11/b
SC/ES/3/A/09-11/c	SC/ES/3/A/09-11/g	SC/ST/1/B/09-11/a
SC/ST/1/C/09-11/a	SC/ST/3/B/09-11/a	SC/ST/3/B/09-11/b
SC/ST/3/B/09-11/c	SC/ST/3/D/09-11/a	

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
2. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplemental Information

1. Internet Sites
 - Crop Fertilizer Recommendation Calculator. Department of Agronomy, Purdue University. Accessed January 16, 2008, from <http://www.agry.purdue.edu/mmp/webcalc/fertRec.asp>.
 - Crop Nutrition and Fertilizer Requirements. Alberta Agriculture and Food, Canada. Accessed January 16, 2008, from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex3791](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3791).
 - Crop Production/Field Crops. University of Nebraska-Lincoln Extension. Accessed January 16, 2008, from <http://www.ianrpubs.unl.edu/epublic/pages/index.jsp?what=subjectAreasD&subjectAreasId=9>.
 - Crops Publications. University of Missouri Extension. Accessed January 16, 2008, from <http://extension.missouri.edu/explore/agguides/crops/>.

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- ❑ Missouri Irrigation. Agricultural Electronic Bulletin Board, University of Missouri. Accessed January 16, 2008, from <http://agebb.missouri.edu/irrigate/index.htm>.
 - ❑ Missouri Pest Management Guide: Corn, Grain Sorghum, Soybean, Winter Wheat, 2008. University of Missouri Extension. Accessed January 16, 2008, from <http://extension.missouri.edu/explore/manuals/m00171.htm>.
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Interest Approach

Ask students what the term “management decisions” means to them. Briefly discuss the effects of good and poor decisions on crop production. Describe how crop yields have changed over the past century due to commercial fertilizers, hybrid seeds, and other technological advances.

Communicate the Learning Objectives

1. Identify the three nutrient elements that are applied to most crops.
2. Identify when fertilizer can be applied.
3. Describe why soil pH is important in crop production.
4. Describe how soil pH can be altered.
5. Explain how plant residues should be managed.
6. Explain how plant pests can be controlled.
7. Identify the irrigation methods that are used in crop production.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>In order for plants to grow properly and produce good yields, they need to have essential nutrient elements for proper growth and development. Ask students to identify the kinds of fertilizers and the amount that should be applied to locally grown crops.</i></p>	<p>Identify the three nutrient elements that are applied to most crops.</p> <ol style="list-style-type: none">1. Nitrogen (N)2. Phosphorus (P)3. Potassium (K)
<p>Objective 2</p> <p><i>The most common method of maintaining adequate levels of essential nutrients in the soil is through application of commercial fertilizers. After a soil test is taken, analyzed and recommendations are made, appropriate amounts and grades of fertilizers can be applied.</i></p>	<p>Identify when fertilizer can be applied.</p> <ol style="list-style-type: none">1. At planting time, starter fertilizer2. After plants have emerged from soil, side dressing3. After plants are established, top dressing

Instructor Directions	Content Outline
<p>Objective 3</p> <p><i>Optimum plant growth is dependent on the presence of essential nutrient elements. Optimum plant growth also depends on the degree of acidity or alkalinity of the soil, commonly referred to as soil pH. Extremely acid or alkaline soils reduce crop yields. Crop production is usually maximized when soil pH is near neutral or slightly acidic.</i></p>	<p>Describe why soil pH is important in crop production.</p> <ol style="list-style-type: none"> 1. Crops grow and produce the best within a pH range of 5.0 to 7.5. 2. Soil pH affects the availability of nutrients for plant uptake.
<p>Objective 4</p> <p><i>Soil nutrient deficiencies can be corrected through application of fertilizers. Soil pH can also be adjusted to improve plant growth.</i></p>	<p>Describe how soil pH can be altered.</p> <ol style="list-style-type: none"> 1. Application of lime reduces soil acidity. 2. Application of sulfur or aluminum sulfate will reduce soil alkalinity.
<p>Objective 5</p> <p><i>Once a crop is harvested, the producer is left with the decision of what to do with the plant residue left on the field. Plant residue can be beneficial in several ways depending on how it is managed. Sometimes plant residues are also removed for use as animal feed or bedding.</i></p>	<p>Explain how plant residues should be managed.</p> <ol style="list-style-type: none"> 1. Mixed/tilled into the soil to provide organic matter 2. Left on the field surface to reduce soil erosion due to wind and water
<p>Objective 6</p> <p><i>Pest control in crop production is important. Crop pests cost producers billions of dollars annually. Control measures should be taken to reduce the damage caused by crop pests.</i></p>	<p>Explain how plant pests can be controlled.</p> <ol style="list-style-type: none"> 1. Mechanical pest control 2. Cultural pest control 3. Biological pest control 4. Genetic pest control 5. Chemical pest control
<p>Objective 7</p> <p><i>In many states, rainfall may be inadequate to reach a crop's</i></p>	<p>Identify the irrigation methods that are used in crop production.</p> <ol style="list-style-type: none"> 1. Aerial sprinkler systems (center pivot) 2. Surface (flood, drip, furrow)

Instructor Directions	Content Outline
<p><i>potential yield. Water is vital for plant growth. Irrigation is a mechanical technique of supplying water to plants. Farmers use specialized techniques of irrigation to supply water for growing crops.</i></p>	
<p>Application</p>	<p>Other activities</p> <ol style="list-style-type: none"> 1. Using several examples of fertilizer bags (different grades), demonstrate to the students how to calculate the amount of nutrients in each bag. 2. Demonstrate or have students demonstrate a soil pH test. Then demonstrate how to alter the soil with agricultural lime, sulfur, or aluminum sulfate as needed.
<p>Closure/Summary</p>	<p>Proper crop management involves taking a soil test to analyze and determine the nutrient needs and pH of the soil. Once these facts are known, more informed management decisions can be made. Decisions that involve pest control measures and the use of irrigation depend on factors such as the crop grown, geographical location, and soil type.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ol style="list-style-type: none"> 1. False 2. True 3. False 4. True 5. a 6. b 7. b 8. c

Unit: Crop Science

Name _____

Lesson 6: Managing the Crop

Date _____

Evaluation

True/False (Place the correct response in the blank provided.)

- F 1. A complete fertilizer contains nitrogen, phosphorus, and manganese.
- T 2. Taking a soil test is a good management practice.
- F 3. Pest control has little impact on crop yields.
- T 4. Most crop plants grow best between pH 5.0 and 7.5.

Circle the letter that corresponds to the best answer.

5. In order to reduce soil acidity
- a. Lime should be applied
 - b. Sulfur should be applied
 - c. Aluminum sulfate should be applied
 - d. Crop residue should be plowed under

Correct answer is a.

6. In order to reduce soil alkalinity
- a. Lime should be applied
 - b. Sulfur should be applied
 - c. Crop residue should be plowed under
 - d. Crop residue should be left on soil surface

Correct answer is b.

7. Soil erosion can best be controlled by
- a. Plowing all the plant residue into the soil
 - b. Leaving all the plant residue on the soil surface
 - c. Liming the soil before planting
 - d. Adding animal manure to the soil

Correct answer is b.

8. Furrow irrigation is a form of

- a. Pivot irrigation
- b. Aerial irrigation
- c. Surface irrigation
- d. Sprinkler irrigation

Correct answer is c.

Course	Agricultural Science II
Unit	Crop Science
Lesson	Harvesting and Storing Grains
Estimated Time	50 minutes

Student Outcome

The student will be able to explain factors related to harvesting and storing quality grain.

Learning Objectives

1. Identify the factors that determine the proper time to harvest grain crops.
2. Describe the factors that are used in federal grain grading.
3. Describe the factors that affect grain quality.
4. Describe the methods that are used to harvest grain crops.
5. Explain the factors that affect the quality of stored grains.
6. Describe how crop quality can be maintained during harvest and storage.
7. Identify the methods of drying grain.

Grade Level Expectations

SC/ME/1/G/09-11/a SC/ST/1/C/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
2. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Glass jars
- Samples of commonly stored grain (e.g., corn, wheat, soybeans)

Supplemental Information

1. Internet Sites
 - Crops Publications. University of Missouri Extension. Accessed January 16, 2008, from <http://extension.missouri.edu/explore/agguides/crops/>.
 - Extension Publications from Purdue University Cooperative Extension Service and from other institutions. Accessed January 16, 2008, from <http://cobweb.ecn.purdue.edu/~grainlab/exten-pubs.htm>.
 - General Information on Grain Drying, Storage and Management. Agricultural Electronic Bulletin board, University of Missouri. Accessed January 16, 2008, from <http://agebb.missouri.edu/storage/economic/crmanual.htm>.
 - Grain Storage Tips: Factors and Formulas for Crop Drying, Storage and Handling. University of Minnesota Extension. Accessed January 16, 2008, from <http://www.extension.umn.edu/distribution/cropsystems/M1080-FS.pdf>.

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- ❑ Planning Grain Drying, Handling, and Storage Facilities. University of Minnesota Extension Service. Accessed January 16, 2008, from <http://www.bbe.umn.edu/extens/postharvest/planningfacilities.html>.
 - ❑ USDA Grading Standards and Moisture Conversion Table for Corn. Agronomy Guide, Purdue University Cooperative Extension Service. Accessed January 16, 2008, from <http://www.ces.purdue.edu/extmedia/AY/AY-225.pdf>.
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Interest Approach

Collect several samples of commonly stored grain (e.g., corn, wheat, and soybeans). Divide each sample of grain into two small glass jars. Take one of the samples of each grain and add additional moisture to the jar to stimulate heat and mold damage. (This should be done in advance of the lesson to produce mold.) Use this for discussion.

Communicate the Learning Objectives

1. Identify the factors that determine the proper time to harvest grain crops.
2. Describe the factors that are used in federal grain grading.
3. Describe the factors that affect grain quality.
4. Describe the methods that are used to harvest grain crops.
5. Explain the factors that affect the quality of stored grains.
6. Describe how crop quality can be maintained during harvest and storage.
7. Identify the methods of drying grain.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>It is important to harvest a crop at the optimum time in order to ensure the greatest yield and highest quality.</i></p>	<p>Identify the factors that determine the proper time to harvest grain crops.</p> <ol style="list-style-type: none">1. Plant characteristics<ol style="list-style-type: none">a. Stage of maturityb. Tendency to lodgec. Tendency to shatter2. Climatic factors<ol style="list-style-type: none">a. Rainfallb. Humidityc. Temperature3. Harvesting methods
<p>Objective 2</p> <p><i>Grain quality is important to both the producer and the purchaser. To the producer, a better quality grade for the crop can mean a higher return for the investment. For the purchaser, grain quality is important to ensure that the grain can be processed into consumer products.</i></p>	<p>Describe the factors that are used in federal grain grading.</p> <ol style="list-style-type: none">1. Class2. Test weight per bushel3. Percentage of damaged kernels4. Percentage of foreign material5. Percentage of other classes

Instructor Directions	Content Outline
<p>Objective 3</p> <p><i>Grading agricultural products requires special skills. Grain quality is influenced by several factors.</i></p>	<p>Describe the factors that affect grain quality.</p> <ol style="list-style-type: none"> 1. Purity of crop and variety 2. Percentage of weeds and other mixtures 3. Percentage of diseased and damaged kernels
<p>Objective 4</p> <p><i>Harvesting the grain crop is an important step in the process of grain production. The decision of which harvesting method to use is important.</i></p>	<p>Describe the methods that are used to harvest grain crops.</p> <ol style="list-style-type: none"> 1. Direct combine method 2. Windrow-pickup combine method
<p>Objective 5</p> <p><i>The potential for profit from high yielding crops can be decreased if the grain is improperly stored. When storing grain, consideration should be given to those factors that affect grain spoilage and deterioration.</i></p>	<p>Explain the factors that affect the quality of stored grains.</p> <ol style="list-style-type: none"> 1. High moisture content 2. Heat damage 3. Rotting 4. Improper drying (too dry, too wet) 5. Foreign material present 6. Insect and rodent infestation
<p>Objective 6</p> <p><i>Steps to prevent stored grain deterioration should be taken in advance in order to prevent problems.</i></p>	<p>Describe how crop quality can be maintained during harvest and storage.</p> <ol style="list-style-type: none"> 1. Harvest grain at proper moisture content 2. Properly construct and maintain storage bins 3. Protect against pests (insects, rodents, birds) 4. Provide proper ventilation 5. Secure from fire and wind damage 6. Inspect grain frequently
<p>Objective 7</p> <p><i>Ask students to give reasons for drying grain on the farm (reduce machine and field losses through early harvest, improved market price by more timely marketing, better market grade, reduced storage losses, etc.). Then, discuss the methods of drying stored grain.</i></p>	<p>Identify the methods of drying grain.</p> <ol style="list-style-type: none"> 1. Drying with forced, unheated air 2. Drying with forced, heated air 3. Field drying

Instructor Directions	Content Outline
Application	<p>Other activities</p> <ol style="list-style-type: none"> 1. Take a field trip to a farm or local grain elevator and have students observe facilities used to dry and store grain crops. 2. Visit a grain harvesting operation and allow students to observe the process.
Closure/Summary	<p>Harvesting and storing quality grain involves harvesting in a timely manner, using appropriate methods for harvesting and storage, and maintaining stored grain to prevent losses due to spoilage.</p>
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. True 2. True 3. False 4. False 5. True 6. a 7. c 8. b 9. c

Unit: Crop Science

Name _____

Lesson 7: Harvesting and Storing Grains

Date _____

Evaluation

True/False (Place the correct response in the blank provided.)

- T 1. Premature harvesting usually results in smaller yields and reduction in quality.
- T 2. The percentage of moisture in the grain varies with the stage of maturity.
- F 3. Wheat is usually harvested by direct combining when the grain moisture is above 16%.
- F 4. Direct combining works best when the crop ripens unevenly and the grain moisture is low.
- T 5. Excessive moisture usually results in the deterioration of stored grain caused by mold growth and heat damage.

Circle the letter that corresponds to the best answer.

6. Drying grain with unheated air should be used when grain moisture content is no more than
- a. 15% moisture
 - b. 30% moisture
 - c. 45% moisture
 - d. 60% moisture

Correct answer is a.

7. For final drying, unheated air should contain less than
- a. 10% to 15% humidity
 - b. 20% to 25% humidity
 - c. 50% to 60% humidity
 - d. 80% to 90% humidity

Correct answer is c.

8. One benefit of drying with unheated air is

- a. Discounts on fuel costs
- b. Lower initial equipment costs
- c. Increased supervision
- d. Overdrying

Correct answer is b.

9. What is one disadvantage of drying grain with heated air?

- a. Wetter grain can be dried
- b. Less time is required to dry grain
- c. More supervision is needed
- d. Weather conditions have little effect on drying time

Correct answer is c.

Course	Agricultural Science II
Unit	Crop Science
Lesson	Harvesting and Storing Forages
Estimated Time	Two 50-minute blocks

Student Outcome

The student will be able to describe factors related to harvesting and storing quality forages.

Learning Objectives

1. Describe the factors which determine the appropriate time to harvest forages.
2. Explain how forage quality is determined.
3. Identify when forages should be harvested.
4. Explain the methods which are used to harvest forages.
5. Explain what causes the quality of forages to deteriorate.
6. Describe how forage deterioration can be prevented.
7. Identify the basic storage requirements of forages.
8. Explain the ways to improve field drying.

Grade Level Expectations

SC/ME/1/G/09-11/a SC/ST/1/C/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slide
 - PPT 1 – Yield and Quality in Forages
2. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
3. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Forage samples

Supplemental Information

1. Internet Sites
 - Crops Publications. University of Missouri Extension. Accessed January 16, 2008, from <http://extension.missouri.edu/explore/agguides/crops/>.
 - Dry Round Hay Bale Storage Costs. University of Wisconsin Extension. Accessed January 18, 2008, from http://www.uwex.edu/ces/crops/uwforage/LRB_StorageCosts-FOF.htm.
 - Hay Making and Handling Made Easier. AgrAbility Project. Accessed January 18, 2008, from <http://www.agrabilityproject.org/assistivetech/tips/HayHandlingTipSheet.pdf>.
 - Hay Storage – Planning and Design Guidelines. Alberta Agriculture and Food, Canada. Accessed January 18, 2008, from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/eng2610](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/eng2610).

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- ❑ Managing Missouri's Hay Prairies. Missouri Department of Conservation. Accessed January 18, 2008, from <http://mdc.mo.gov/landown/grass/hay/>.
 - ❑ Preserving the Value of Dry Stored Hay. University of Minnesota Extension. Accessed January 18, 2008, from <http://www.extension.umn.edu/distribution/cropsystems/DC7404.html>.
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Interest Approach

Bring in several samples of forages. Have students inspect and identify them. Discuss the harvesting and storage methods used with each sample.

Communicate the Learning Objectives

1. Describe the factors which determine the appropriate time to harvest forages.
2. Explain how forage quality is determined.
3. Identify when forages should be harvested.
4. Explain the methods which are used to harvest forages.
5. Explain what causes the quality of forages to deteriorate.
6. Describe how forage deterioration can be prevented.
7. Identify the basic storage requirements of forages.
8. Explain the ways to improve field drying.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>As plants mature, yield increases but quality decreases. Selecting the appropriate time to harvest is an important factor influencing crop quality. In order to ensure high quality forages, harvesting must be completed at the appropriate time. Display PPT 1.</i></p> <p><input type="checkbox"/> PPT 1 - Yield and Quality in Forages</p>	<p>Describe the factors which determine the appropriate time to harvest forages.</p> <ol style="list-style-type: none">1. Balance between quality and yield (appropriate time)2. Weather conditions – avoid rain, which leaches nutrients from cut forages
<p>Objective 2</p> <p><i>The quality of hay or silage is directly related to the level of milk production in dairy cattle and rate of gain in livestock production. Producing and harvesting quality forages is important to enable farmers to provide quality feed to livestock.</i></p>	<p>Explain how forage quality is determined.</p> <ol style="list-style-type: none">1. Physical appearance<ol style="list-style-type: none">a. Visual appearance<ul style="list-style-type: none">- Leafy- Fine texture- No foreign materialb. Color (bright green)c. Odor (pleasant)2. Chemical analysis<ol style="list-style-type: none">a. Crude protein contentb. Fiber contentc. Digestibilityd. Lignin content

Instructor Directions	Content Outline
<p>Objective 3</p> <p><i>In order to store and feed hay, silage, or haylage of high quality, the forage crop must be of quality. Harvesting must be done at the appropriate time to produce a quality feed product.</i></p>	<p>Identify when forages should be harvested.</p> <p>Harvest when the crop is fully mature</p> <ol style="list-style-type: none"> 1. Alfalfa – first flower to 1/10 bloom 2. Alsike clover – 1/2 to full bloom 3. Bird’s-foot trefoil – 1/10 bloom 4. Cowpeas – when first pods have started to ripen 5. Corn silage – harvest when kernels are fully dented and glazed 6. Crimson clover – 1/2 bloom 7. Fescue – boot to early heading 8. Ladino clover – full bloom 9. Lespedeza – early bloom 10. Medium red clover – 1/4 to 1/2 bloom 11. Small grains – boot stage to early dough stage 12. Soybeans – when beans in the pod are half developed 13. Sweet clover – when first blooms appear 14. Brome grass – early bloom (anthesis) 15. Orchard grass – fully headed but before bloom 16. Reed canary grass – when first heads appear 17. Timothy – early bloom (anthesis)
<p>Objective 4</p> <p><i>Mechanization has improved forage harvesting and handling. Forage harvesting methods vary depending upon how the forage will be stored and used.</i></p>	<p>Explain the methods which are used to harvest forages.</p> <ol style="list-style-type: none"> 1. Grazing 2. Dry hay systems <ol style="list-style-type: none"> a. Conventional bales b. Large round bales c. Large rectangular bales d. Portable haystack e. Field cubes 3. High moisture systems <ol style="list-style-type: none"> a. Green chopped b. Haylage (40-60%) c. Silage (60-70%) 4. Special forage processing systems <ol style="list-style-type: none"> a. Stationary cubers b. Pelleting machines
<p>Objective 5</p> <p><i>Forage deterioration can be a costly problem. Deterioration of forages decreases quality and profit. Deterioration in some</i></p>	<p>Explain what causes the quality of forages to deteriorate.</p> <ol style="list-style-type: none"> 1. Improper harvest time (early or late) 2. Improper baling time (wet or too dry) 3. Improper harvesting methods 4. Improper storage

Instructor Directions	Content Outline
<p><i>forage crops can be harmful to animal health.</i></p>	
<p>Objective 6</p> <p><i>Forages provide an excellent source of nutrients to livestock. If deterioration of forages is permitted, the feed value decreases. Measures to prevent forage deterioration should be taken in order to ensure quality.</i></p>	<p>Describe how forage deterioration can be prevented.</p> <ol style="list-style-type: none"> 1. Harvest at proper time 2. Use proper harvest methods 3. Ensure proper moisture content at harvest 4. Maintain proper storage facilities
<p>Objective 7</p> <p><i>Proper storage techniques are just as important to forages as to grains. If storage is improper, deterioration of forages due to mold, heat damage, rotting, and spoilage will occur.</i></p>	<p>Identify the basic storage requirements of forages.</p> <ol style="list-style-type: none"> 1. Dry hay <ol style="list-style-type: none"> a. Protection from weather b. Protection from insects, animals, and birds c. Adequate ventilation 2. Silage and haylage <ol style="list-style-type: none"> a. Protection from weather b. Protection from insects, animals, and birds c. Air tight facility d. Provisions for proper filling, emptying, monitoring, and cleaning
<p>Objective 8</p> <p><i>Most forage crop deterioration is caused by excessive moisture content, which leads to reduction in quality, heat damage, and molding. Methods of drying forages can reduce moisture levels, improve storage, and ensure quality.</i></p>	<p>Explain the ways to improve field drying.</p> <ol style="list-style-type: none"> 1. Swath drying 2. Windrow drying 3. Crushing or conditioning 4. Chemical additives
<p>Application</p>	<p>Other activities</p> <ol style="list-style-type: none"> 1. Take a class field trip to a local farm to observe a forage harvesting operation (e.g., cutting, baling, or storing). 2. Display samples of several grades of forages that have been baled. Discuss the quality (e.g., color, odor, leafiness, and stems) of each. 3. Display a bale that was baled at too high a moisture content. Break open the bale and discuss the molding

Instructor Directions	Content Outline
	and heat damage along with the possible hazard from fires caused by improperly stored hay.
Closure/Summary	Forage crops are vital feedstuffs for livestock and dairy operations in the U.S. Quality forages are an excellent source of essential nutrients that increase weight gain in livestock and milk production in dairy cattle. Harvest time, method of harvesting, and proper storage are all important factors in producing quality forages.
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. True 2. True 3. False 4. False 5. False 6. c 7. d 8. c 9. b 10. d

Unit: Crop Science

Name _____

Lesson 8: Harvesting and Storing Forages

Date _____

Evaluation

True/False (Place the correct response in the blank provided.)

- T 1. Proper harvesting time is important to ensure the quality of a forage.
- T 2. Soybeans can be considered a forage crop.
- F 3. Nutrient value and palatability increase once the forage passes the optimum harvest point.
- F 4. Weather conditions are not a consideration during harvest.
- F 5. Chemical analysis is the most common method of determining forage quality.

Circle the letter that corresponds to the best answer.

6. Shattering is a result of
- a. Early harvest
 - b. High moisture content
 - c. Late harvest
 - d. Improper storage

Correct answer is c.

7. Lodging is a result of
- a. High moisture content
 - b. Improper storage
 - c. Early harvest
 - d. Delayed harvest

Correct answer is d.

8. What is the moisture content of silage?
- a. 25% to 30%
 - b. 40% to 60%
 - c. 60% to 75%
 - d. 80% to 95%

Correct answer is c.

9. What is the moisture content of haylage?

- a. 25% to 30%
- b. 40% to 60%
- c. 60% to 75%
- d. 80% to 95%

Correct answer is b.

10. Leaching of nutrients from forages is caused by

- a. Overdrying in the sun
- b. Improper storage
- c. Early cutting
- d. Rain damage

Correct answer is d.

Course	Agricultural Science II
Unit	Crop Science
Lesson	Controlling Crop Pests
Estimated Time	50 minutes

Student Outcome

The student will be able to describe methods of plant pest control.

Learning Objectives

1. Identify the types of pests which affect plant growth.
2. Describe the methods which are used to control weeds.
3. Describe the methods which are used to control insects.
4. Describe the methods which are used to control plant diseases.
5. Explain how pesticides can be handled and applied safely.
6. Explain how “integrated pest management” is used in agriculture.

Grade Level Expectations

SC/ME/1/B/09-11/c	SC/LO/3/D/09-11/b	SC/EC/3/C/09-11/a
SC/ST/1/B/09-11/a	SC/ST/1/C/09-11/a	SC/ST/3/B/09-11/a
SC/ST/3/B/09-11/b	SC/ST/3/B/09-11/c	SC/ST/3/D/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
2. *Crop Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Flour infested with weevils

Supplemental Information

1. Internet Sites
 - Crops Publications. University of Missouri Extension. Accessed January 16, 2008, from <http://extension.missouri.edu/explore/agguides/crops/>.
 - How to Manage Pests. University of California Integrated Pest Management Online. Accessed January 18, 2008, from <http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>.
 - Insects and Diseases Publications: Livestock and Crops. University of Missouri Extension. Accessed January 18, 2008, from <http://extension.missouri.edu/explore/agguides/pests/#Livestock>.
 - Missouri Pest Management Guide: Corn, Grain Sorghum, Soybean, Winter Wheat, 2008. University of Missouri Extension. Accessed January 16, 2008, from <http://extension.missouri.edu/explore/manuals/m00171.htm>.

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- ❑ The Bulletin: Pest Management and Crop Development Information for Illinois. University of Illinois Extension. Accessed January 18, 2008, from <http://www.ipm.uiuc.edu/bulletin/>.
 - ❑ Weed ID Guide. Weed Science Program, College of Agriculture, Food and Natural Resources, University of Missouri. Accessed January 18, 2008, from <http://weedid.missouri.edu/>.
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Interest Approach

Locate some flour that is infested with weevils. Have the class inspect the flour. Ask them if they would like to eat cake or bread made from this flour. Point out the weevils and describe the problem of crop insects in the U.S.

Communicate the Learning Objectives

1. Identify the types of pests which affect plant growth.
2. Describe the methods which are used to control weeds.
3. Describe the methods which are used to control insects.
4. Describe the methods which are used to control plant diseases.
5. Explain how pesticides can be handled and applied safely.
6. Explain how "integrated pest management" is used in agriculture.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>Crop producers must continually work to control plant pests. Damage to crops from pests is a major problem in the U.S. Many developing countries have very low levels of production due to competition from plant pests.</i></p>	<p>Identify the types of pests which affect plant growth.</p> <ol style="list-style-type: none">1. Weeds2. Insects3. Plant diseases
<p>Objective 2</p> <p><i>Weeds cause considerable damage and loss to crops annually. Crop growth can be hindered because of weeds. Crop quality can also be reduced by weed seeds in the crop at harvest.</i></p>	<p>Describe the methods which are used to control weeds.</p> <ol style="list-style-type: none">1. Hand2. Mechanical cultivation3. Chemical methods4. Biological methods
<p>Objective 3</p> <p><i>Insects continue to challenge crop producers and scientists to find new ways to control them and the damage they cause.</i></p>	<p>Describe the methods which are used to control insects.</p> <ol style="list-style-type: none">1. Genetic2. Cultural3. Biological4. Chemical
<p>Objective 4</p> <p><i>Prevention of plant diseases is preferable to trying to cure it after it has begun.</i></p>	<p>Describe the methods which are used to control plant diseases.</p> <ol style="list-style-type: none">1. Genetic (disease-resistant varieties)2. Cultural (crop rotation, cultivation methods)3. Chemical (fungicides, etc.)4. Isolation (quarantine stations, etc.)

Instructor Directions	Content Outline
<p>Objective 5</p> <p><i>In 1988, over 820 million pounds of pesticides were used at a cost of over six billion dollars in the U.S. Pesticides are toxic to crop pests, but may also be hazardous to humans and other animals. Pesticides should be handled and applied safely.</i></p>	<p>Explain how pesticides can be handled and applied safely.</p> <ol style="list-style-type: none"> 1. Be properly trained in pesticide application 2. Read and follow pesticide label directions 3. Understand the toxicity ratings, signal words, and symbols 4. Wear protective clothing and use protective equipment 5. Provide proper storage
<p>Objective 6</p> <p><i>Pest management is a concern of every crop producer. A great deal of research has gone into developing methods of pest control. Concern for the environment and the effects of chemicals on food products have prompted producers and researchers to work at developing different strategies to control crop pests. IPM (integrated pest management) is one of those strategies.</i></p>	<p>Explain how “integrated pest management” is used in agriculture.</p> <p>Integrated pest management (IPM) uses multiple techniques of pest control once economic thresholds have been established.</p>
<p>Application</p>	<p>Other activities</p> <ol style="list-style-type: none"> 1. Have students compile a list of pesticides they have at home and record the label information. 2. Have a commercial pesticide applicator speak to the class on safety procedures. 3. Have students select a crop pest from a teacher-generated list and research the pest’s life cycle, crops affected, control methods, etc. 4. Collect and mount specimens of crop pests (e.g., weeds and insects), which can be used for future study and reference.
<p>Closure/Summary</p>	<p>Preventing crop pests is more efficient than trying to get rid of them after they become a problem. Methods used to control crop pests include the safe use of pesticides, good cultural practices, and the incorporation of integrated pest management strategies.</p>

Instructor Directions	Content Outline
Evaluation: Quiz	Answers: 1. False 2. True 3. False 4. False 5. True 6. True 7. d 8. c 9. a 10. b

Unit: Crop Science

Name _____

Lesson 9: Controlling Crop Pests

Date _____

Evaluation

True/False (Place the correct response in the blank provided.)

- F 1. Crop pests include all species of insects.
- T 2. Preventing crop pests is more efficient than controlling pests once they appear.
- F 3. Mechanical methods can be used to control diseases in a growing crop.
- F 4. Genetic pest control involves the use of chemicals.
- T 5. Integrated Pest Management incorporates multiple control techniques.
- T 6. Pesticides should never be transferred to glass food jars for storage.

Match the management practice with the type of control.

	<u>Management Practice</u>	<u>Type of Control</u>
d	7. Crop rotation	a. Genetic
c	8. Using predator insects	b. Chemical
a	9. Using pest-resistant cultivars	c. Biological
b	10. Aerial dusting of crops	d. Cultural

Agricultural Science II

Curriculum Guide: *Crop Science*

Unit Objective:

Students will demonstrate an understanding of crops and crop production by creating, organizing, and participating in a mini Agronomy Career Development Event.

Show-Me Standards: 1.8, CA6

References:

Crop Science. University of Missouri-Columbia, Instructional Materials Laboratory, 1992.

Missouri CDE Handbook. Accessed March 4, 2003, from http://www.dese.state.mo.us/divoced/ag_cde_guidelines.htm.

Instructional Strategies/Activities:

- Students will engage in study questions in lessons 1 through 9.
- Students will complete WS 3.1, Parts of a Bean Seed; WS 3.2, Parts of a Grass Plant and Leaf; WS 3.3, Characteristics of Selected Crop and Weed Plants; WS 3.4, Seed Identification Score Sheet; and WS 4.1, Seed Information and Germination Test.
- Additional activities that relate to the unit objective can be found under the heading "Other Activities" in the following locations: p. 20 (1, 2) and p. 83 (2).

Performance-Based Assessment:

Students will work in groups to create, organize, and participate in a mini Agronomy Career Development Event. Each group will be responsible for one class of seed or plant samples in the overall event and will also compete as a team in the whole event.

Assessment will be based on the overall content and presentation of the class in the event and on performance in the contest. At the instructor's discretion, students will contribute to the assessment process by providing a brief evaluation of their teammates' performance in designing and setting up their class in the event.

Crop Science Instructor Guide

The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. Divide students into groups and assign each group a class of seed or plant samples to organize in a mini Agronomy Career Development Event.
 - a. Each group will also compete in the whole event as a team.
 - b. The event will follow, as closely as possible, the format and guidelines of a larger event but will be scaled to the size and time constraints available for the project.
2. Explain or review event format, guidelines, and scoring as needed. Refer to the *Missouri CDE Handbook* for guidelines regarding Agronomy Career Development Events. The *Missouri CDE Handbook* is available from the Missouri Department of Elementary and Secondary Education at http://www.dese.state.mo.us/divvoted/ag_cde_guidelines.htm.
3. Students will be responsible for the content of their display and its overall presentation.
4. Sample classes could include, but are not limited to, seed identification, wheat judging, soybean judging, and alfalfa hay judging.
5. Students may consult the instructor for assistance if they have difficulty locating materials, but they must be responsible for the overall content, design, and presentation of their class in the event.
 - a. Seed samples are available from the Instructional Materials Laboratory, University of Missouri-Columbia, at <http://iml.coe.missouri.edu/subj/subj.htm> and from NASCO at <http://www.nascofa.com/prod/Home?seqid=0>, both accessed April 30, 2003.
 - b. Classes to be judged should only include seeds or plants or use judging factors that have been discussed by the instructor with all the students as a group.

Agricultural Science II

6. Scale down or divide classes as needed so that all groups do an equal amount of work.
 - a. For example, for seed identification, students could present 10 crop or weed seeds discussed in class, or seed identification could be assigned to more than one group.
 - b. If a class is assigned to more than one group, guide students as needed to ensure that each group presents different material.
7. Verify the students' placement of their assigned class prior to the contest and suggest corrections as needed.
8. If desired, have students contribute to the assessment process by completing a short evaluation of their teammates' performance in helping to design and set up their portion of the event. A peer evaluation form is included following the scoring guide.
 - a. Have students complete the peer evaluation form by following the instructions listed at the top. Students should base their assessment on how much each person contributed to the project.
 - b. If tasks are divided so that students do only one type of task to contribute to the project, have students adjust their peer evaluation form by disregarding the category that does not apply to a particular teammate. Instead of assessing teammates on two categories worth 0 to 3 points, students will assess teammates on one category worth 0 to 6 points.
 - c. To determine the final peer evaluation score, add up the scores that a student receives from the other members of the group and divide the total by the number of scores received. The maximum number of points possible for each student is 6.
9. The final assessment score will be a combination of the student's class display score, contestant score, and final peer evaluation score.
10. Present an appropriate award to the high-scoring team and individual, if desired.

Crop Science Student Handout

1. You will work with a group to organize a class of seed or plant samples to be judged in a mini Agronomy Career Development Event.
2. Your group will also compete in the whole event as a team.
3. The contest will follow the format and guidelines of a full-scale Agronomy Career Development Event.
4. You will be responsible for the content and presentation of your class of seeds or samples.
5. The instructor will verify your placement of your class of samples prior to the contest.
6. If requested, you will contribute to the assessment process by completing a short evaluation of your teammates' performance in helping to design and set up your class of seeds or samples in the event.
 - a. Following the event, fill out the peer evaluation score sheet.
 - b. Give the completed score sheet to your instructor.
7. Your final assessment score will be a combination of your class display score, your contestant score, and your final peer evaluation score.

Agricultural Science II

Crop Science Scoring Guide

Name _____

Assessment Area	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Thoroughness and Accuracy of CDE Project	Project includes all required seeds or samples and placement is correct	Failed	Poor	Fair	Good	Excellent	X 10	
Presentation of CDE Project	Project is well organized and eye-appealing	Failed	Poor	Fair	Good	Excellent	X 2.5	
TOTAL								/50 pts.

◆ Page 7 ◆

Assessment Area	Seed Identification 0-11 Points	Wheat Judging 0-11 Points	Soybean Judging 0-11 Points	Alfalfa Hay Judging 0-11 Points	Total
Agronomy Career Development Event					
Peer Evaluation				6 pts. maximum	
TOTAL					/50 pts.

Final Assessment Total _____/100 pts.

Comments:

**Crop Science
Peer Evaluation**

Name _____

Write your name on the line above. Fill in the names of your teammates in the spaces provided below. For each category listed below, give each teammate a score from 0 to 3 based on his or her contribution to the project. Use the following guide.

- 0 – no contribution
- 1 – minimal contribution
- 2 – average contribution
- 3 – excellent contribution

Add the person's score in each category and place the total in the column at the right. Give the completed score sheet to your instructor.

Project development includes tasks such as planning and research. Project completion includes writing, assembling, or presenting the project. If tasks are divided so that you or your teammates do only one type of task to contribute to the project, consult the instructor about how to adjust your evaluation form.

Name of Teammate	Project Development 0-3 Points	Project Completion 0-3 Points	Total (6 Points Max.)

