

Course	Agricultural Science I
Unit	Introduction to Animal Reproduction
Lesson	Genetic Improvement Management Practices
Estimated Time	50 minutes
Student Outcome	

Compare management practices for genetic improvement.

Learning Objectives


1. Identify management practices that can be used for genetic improvement.
2. Describe the various kinds of breeding systems.
3. List the advantages and disadvantages of artificial insemination.
4. List the advantages and disadvantages of embryo transfer.

Grade Level Expectations

SC/LO/3/D/09-11/a	SC/LO/3/D/09-11/b	SC/LO/3/D/09-11/c
SC/EC/3/C/09-11/b	SC/EC/3/C/09-11/c	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

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. Activity Sheet
 -  AS 1 – Selecting a Boar for Breeding
2. *Introduction to Animal Reproduction (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1996.
3. *Introduction to Animal Reproduction Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplemental Information

1. Internet Sites
 - ☐ Animal Science Publications. MU Extension. University of Missouri-Columbia. Accessed April 12, 2007, from <http://extension.missouri.edu/explore/agguides/ansci/>.
 - ☐ Massey, J. *Culling the Commercial Cow Herd: BIF Fact Sheet*. MU Extension. University of Missouri-Columbia. Accessed June 19, 2007, from <http://extension.missouri.edu/explore/agguides/ansci/g02036.htm>.
 - ☐ Seidel, Jr., G. E. and S. M. Seidel. *Training Manual for Embryo Transfer in Cattle*. Colorado State University. Accessed June 19, 2007, from <http://www.fao.org/DOCREP/004/T0117E/T0117E00.htm#TOC>.
 - ☐ Selk, G. *Embryo Transfer in Cattle*. OSU Cooperative Extension. Oklahoma State University. Accessed June 19, 2007, from <http://osuextra.okstate.edu/pdfs/F-3158web.pdf>.
 - ☐ Sterle, J. and T. Safranski. *Artificial Insemination in Swine: Breeding the Female*. MU

Extension. University of Missouri-Columbia. Accessed June 19, 2007, from <http://extension.missouri.edu/explore/agguides/ansci/g02312.htm>.


- ❑ Webb, D. W. *Artificial Insemination in Dairy Cattle*. IFAS Extension. University of Florida. Accessed June 19, 2007, from <http://edis.ifas.ufl.edu/DS089>.
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Interest Approach


Ask the students to imagine that they are showing a lamb in a market lamb show at the county fair with 20 lambs in the class. The judge places the class, and the lamb comes in 15th place. The lamb is correctly placed, since it has less muscling, size, and overall appeal than those placed ahead of it. For the county fair next year, the students want to breed a better market lamb and place higher in the class. Ask the students how they are going to improve next year's market lamb. Have the students realize that in order to have a better market lamb they need to know the various genetic improvement management practices.

Communicate the Learning Objectives

1. Identify management practices that can be used for genetic improvement.
2. Describe the various kinds of breeding systems.
3. List the advantages and disadvantages of artificial insemination.
4. List the advantages and disadvantages of embryo transfer.

Instructor Directions	Content Outline
Objective 1 <i>Ask students to name some genetic management practices. Describe the various practices that can be used to improve the genetics of the market lamb. Have students complete AS 1.</i>  AS 1 – Selecting a Boar for Breeding	Identify management practices that can be used for genetic improvement. Genetic selection <ol style="list-style-type: none">1. Tandem selection - selecting breeding stock for one or two traits2. Culling - removing less desirable traits by removing individuals with those traits from a breeding program3. Selection index - comparing the possible animals for breeding by using a scoring system in which the animal with the lowest number based on the criteria of the index is selected for breeding Evaluation of pedigrees, individual appearances, performance records, and progeny tests (which cannot be used for a young sire) Artificial insemination - improves genetics through sire selection Embryo transfer - improves genetics through selection of the female
Objective 2 <i>Ask the student what is meant by a breeding system. Discuss the responses and describe a breeding system. Describe the two main</i>	Describe the various kinds of breeding systems. Straight breeding - mating animals of the same breed <ol style="list-style-type: none">1. Purebred breeding system - both parents purebred and of the same breed

Instructor Directions	Content Outline
<p><i>breeding systems and what they entail.</i></p>	<ol style="list-style-type: none"> 2. Inbreeding - mating of animals that are more closely related than the average of the population using either close breeding or line breeding to improve genetic purity 3. Outcrossing - mating of parents from the same breed but different families to bring in new traits 4. Grading up (upgrading) - breeding of a non-registered, or grade, female to a purebred male <p>Crossbreeding - mating of two animals from different breeds</p> <ol style="list-style-type: none"> 1. Two-breed cross - mating of a male and female from two different breeds 2. Three-breed cross - mating of a crossbred female to a male of a different breed 3. Rotational cross - using males of different breeds for several succeeding generations of females, ending with a male of the same breed as the first female used and then repeating the series 4. Backcrossing - mating a crossbred female to a male of one of the same breeds of the female
<p>Objective 3</p> <p><i>Review the procedure used in AI. Have the students write down what they think one advantage and one disadvantage of artificial insemination might be. Ask them what they wrote down and discuss the advantages and disadvantages of artificial insemination.</i></p>	<p>List the advantages and disadvantages of artificial insemination.</p> <p>Advantages</p> <ol style="list-style-type: none"> 1. Allows extensive use of outstanding sires to improve genetics 2. Produces more offspring than natural mating since semen from one collection can be frozen and stored 3. Allows injured sires to be used in a breeding program 4. Controls diseases 5. Makes traditional sire ownership unnecessary 6. May lower sire costs <p>Disadvantages</p> <ol style="list-style-type: none"> 1. Requires careful handling and storage of semen 2. Cannot refreeze semen that has been thawed, since sperm cells are destroyed 3. Requires additional management practices and facilities and more time and labor to ensure pregnancy 4. Requires special training to perform the procedure 5. May overly stress females
<p>Objective 4</p>	<p>List the advantages and disadvantages of embryo transfer.</p>

Instructor Directions	Content Outline
<p><i>Have students list some advantages and disadvantages of embryo transfer for a breeding program. Discuss the advantages and disadvantages.</i></p>	<p>Advantages</p> <ol style="list-style-type: none"> 1. Allows a greater use of superior females to improve genetics 2. Can freeze collected embryos and keep them dormant for months or years 3. Can mechanically divide an embryo so identical twins can be produced 4. Allows females that are unable to produce offspring themselves due to some condition to be used in a breeding program <p>Disadvantages</p> <ol style="list-style-type: none"> 1. Requires extensive management to perform 2. Requires special management for estrous synchronization to transfer the embryo to the host female 3. Requires the producer to keep more stock, with several recipients for every donor female, which increases costs 4. Expense of the process 5. Has a lower confirmed pregnancy rate for frozen embryos 6. May require surgery if the embryos cannot be removed from the donor female
<p>Application:</p> <p> AS 1 – Selecting a Boar for Breeding</p>	<p>Answers to AS 1</p> <ol style="list-style-type: none"> 1. Leanness and the number of days to 230 2. Boar 1 3. Boar 1 4. Boar 2 5. Boar 1 <p>Other activities</p> <ol style="list-style-type: none"> 1. Have students select the best sire for a breeding system for a cow-calf operation that raises purebred beef. Give students a cow herd and a choice between two bulls and have them select the bull for the breeding program. 2. Visit a producer who practices estrous synchronization and embryo transfer. Have him or her discuss the management practices required.
<p>Closure/Summary</p>	<p>Genetic improvement management practices involve the</p>

Instructor Directions	Content Outline
	<p>selection or rejection of an animal for breeding based on an evaluation of the animal. Breeding systems consisting of straight breeding and crossbreeding can be used to improve the genetic makeup of offspring. Artificial breeding techniques such as AI and ET can also improve stock genetically, although their use has both advantages and disadvantages.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ol style="list-style-type: none"> 1. a 2. a 3. a 4. c 5. b 6. d 7. Straight breeding is breeding animals of the same breed. The purpose is to keep purebred stock for commercial producers. Crossbreeding is the mating of two animals that are of different breeds. Many breeders use this system to attain hybrid vigor, with the offspring being superior to the average of the parents. Crossbreeding also results in animals that combine desirable traits not found in any one breed. 8. Answers should include three of each of the following advantages and disadvantages. <p>Advantages</p> <ul style="list-style-type: none"> • Extensive use of outstanding sires • Storage of semen for later use • Use of injured sires in a breeding program • Control of diseases • Makes traditional sire ownership unnecessary • May lower sire costs <p>Disadvantages</p> <ul style="list-style-type: none"> • Difficulty of handling and storage • Sperm cells destroyed when semen is thawed • Additional management practices and facilities and more time and labor needed to ensure pregnancy • Requires special training to perform the procedure correctly • May overly stress females

Instructor Directions	Content Outline
	<p>9. Answers should include three of each of the following advantages and disadvantages.</p> <p>Advantages</p> <ul style="list-style-type: none"> • Greater use of outstanding females • Storage of frozen embryos for the producer's later use • Splitting of embryos to create identical twins • Use of superior females that have some condition that prevents them from producing their own offspring <p>Disadvantages</p> <ul style="list-style-type: none"> • Requires extensive management • Necessitates special management for estrous synchronization • Increased costs due to keeping more stock to serve as hosts for embryo transfer • Cost of the process itself • Low pregnancy rate when using frozen embryos • May require surgery to extract embryos