Common Breeding Systems for Livestock Production

EVERY ANIMAL PRODUCER uses some type of breeding system to produce new offspring. A variety of systems can be used depending on the production goals of the operation. Some producers sell their offspring into specialty markets where they must be bred in a special way. Others sell their offspring to be marketed as replacement animals for other breeders. These animals must have superior genetics to aid in the purchaser's herd improvement.

A producer must be careful when selecting a breeding system. A breeding system can cause a rapid improvement within a group of animals or wreck a production system.

Objective:

List and explain common breeding systems used in livestock production.

Key Terms:

closebreeding
crossbreeding
grade animal
grading up
heterosis
hybrid
hybrid vigor
inbreeding
linebreeding
outcrossing
purebreds
purebreeding
straightbreeding

Animal Breeding Systems

Animal producers determine how to breed their animals depending on the goals of their operation. They select the breeding system that most closely meets the requirements of the market into which they sell their animals. Breeding systems can be divided into two basic groups: straightbreeding and crossbreeding. **Straightbreeding** is the mating of animals of the same breed. **Crossbreeding** is the mating of animals of different breeds. When producers use straightbreeding, their animals typically have registration papers issued by a national breed organization. When producers use crossbreeding, they typically have animals that are a combination of breeds, or they use two different breeds to create offspring that are not registered as a recognized breed.

A crossbreeding producer may have crossbred females but utilize a male from one breed, or vice versa. An offspring born to a mating of two different breeds is called a **hybrid**. The advantages of producing hybrids are that they typically grow faster, mature quicker, and utilize the superior traits of each breed. These advantages are referred to as **hybrid vigor** or **heterosis**. The offspring from crossbreeding contain the genetics from both breeds and, when paired, typically produce superior animals or unique traits. Crossbreeding of dogs has become popular in recent years. New crosses, such as Labradoodles and pugles, have been developed. A Labradoodle is the cross of a Labrador retriever and a poodle. A pugle is the cross of a pug and a beagle. These crossbreeds have created characteristics that dog owners desire and resulted in elevated puppy prices.

FIGURE 1. These crossbred cows most likely have high milk production and superior growth genetics that are passed to their offspring. (Courtesy, USDA)

Straightline breeding operations utilize only one breed. A traditional straightline breeding program is called purebreeding. **Purebreeding** is the mating of two animals registered to the same breed organization. The animals are called purebreds. **Pure-**

FIGURE 2. The dairy cow in the foreground is registered to the American Holstein Association, making her a purebred cow. (Courtesy, USDA)

breds are animals with extensive pedigrees that can be traced back through one breed. Purebreds are typically marketed to other purebred breeders who want to introduce new genetics or to crossbreeders who want to utilize heterosis. Purebreds normally bring a premium for their offspring because of their superior genetics and tracked background. The utilization of straightline breeding and crossbreeding can be broken down further into subcategories.

The mating of an animal to a related animal is called **inbreeding**. Inbreeding has its advantages and disadvantages. The two parents have closely related genetics and may capitalize on their superior traits. For example, a producer might try inbreeding to increase milk production. In this situation, the producer might mate his or her best-producing cow to a bull that happens to be a relative of the cow and that also has high milk production genetics. In theory, this may seem like a brilliant idea, but if the milk production trait is not expressed by the offspring, the results would be a failure.

The amount of inbreeding determines how closely the animals are related. A producer who practices **linebreeding** is intentionally mating animals that are distantly related. The animals might be distant cousins or share a relative three or four generations back. The process is called linebreeding because if you were to draw a straight line from the original relative, both would be linked to the line.

Another example of intensive inbreeding is called closebreeding. **Closebreeding** is the most intensive form of inbreeding because the two animals share more than one close relative. This could include mating half brothers and half sisters or even brothers and sisters. It is the most risky of the inbreeding systems. Inferior genetics and even deformities can be expressed by using the closebreeding system.

Other subcategories of crossbreeding and straightbreeding are called outcrossing and grading up. **Outcrossing** is the mating of animals of different families within the same breed. The animals are not related. **Grading up** is the mating of a purebred male to a grade female. A **grade animal** is any animal not eligible for registration but of high genetic caliber. An example would be a purebred animal without registration papers. Outcrossing allows a producer to introduce new genetics while staying within the same breed. The new genetics may bring a superior trait to fix a problem within the producer's foundation animals. Grading up allows producers still to raise superior animals without the investment in purebred animals. This is most common in food production animals, where a producer wants superior offspring but cannot make a profit by using the purebreeding system.

Summary:

An animal breeder must pick the breeding system that best fits the goals of his or her operation. This is determined by how the producer plans to market the offspring and how much risk the producer is willing to take in possibly dealing with inferior genetics. Typically a producer uses either the straightbreeding or crossbreeding system. This can be further refined by using the inbreeding, linebreeding, closebreeding, outcrossing, and grading-up subcategories. Each has its advantages and disadvantages but may improve a group of animals.

Checking Your Knowledge:

1. What is straightbreeding?
2. What is crossbreeding?
3. What are the advantages and disadvantages of inbreeding?
4. What is the most risky of the inbreeding systems? Why?

Expanding Your Knowledge:

Go online and further research the possible results of inbreeding animals. Identify five advantages and five disadvantages of using this breeding system. You may also use other resources, such as textbooks and research journals. Ideally, you will determine whether the risks of inbreeding outweigh the rewards.

Web Links:

Purebred Beef Cattle Associations
http://www.cattletoday.com/associations.shtml

Crossbreeding Dairy Cattle
http://www.traill.uiuc.edu/dairynet/paperDisplay.cfm?ContentID=373

American Mixed Breed Obedience Registration
http://www.amborusa.org/

Agricultural Career Profiles
http://www.mycaert.com/career-profiles