

Breeding Systems

- Type of breeding systems depending on the production goals of the operation.
- Breeding goals may be;
 - Lifetime Productivity – focuses on survival, fertility and prolificacy, udder characteristics and milk production, growth rate and ability to maintain body condition
- 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.

Animal Breeding Systems

1. Inbreeding
2. Outbreeding

Inbreeding

- Mating closely related animals (for example, parent and offspring, full brother and sister or half brother and sister) is inbreeding.

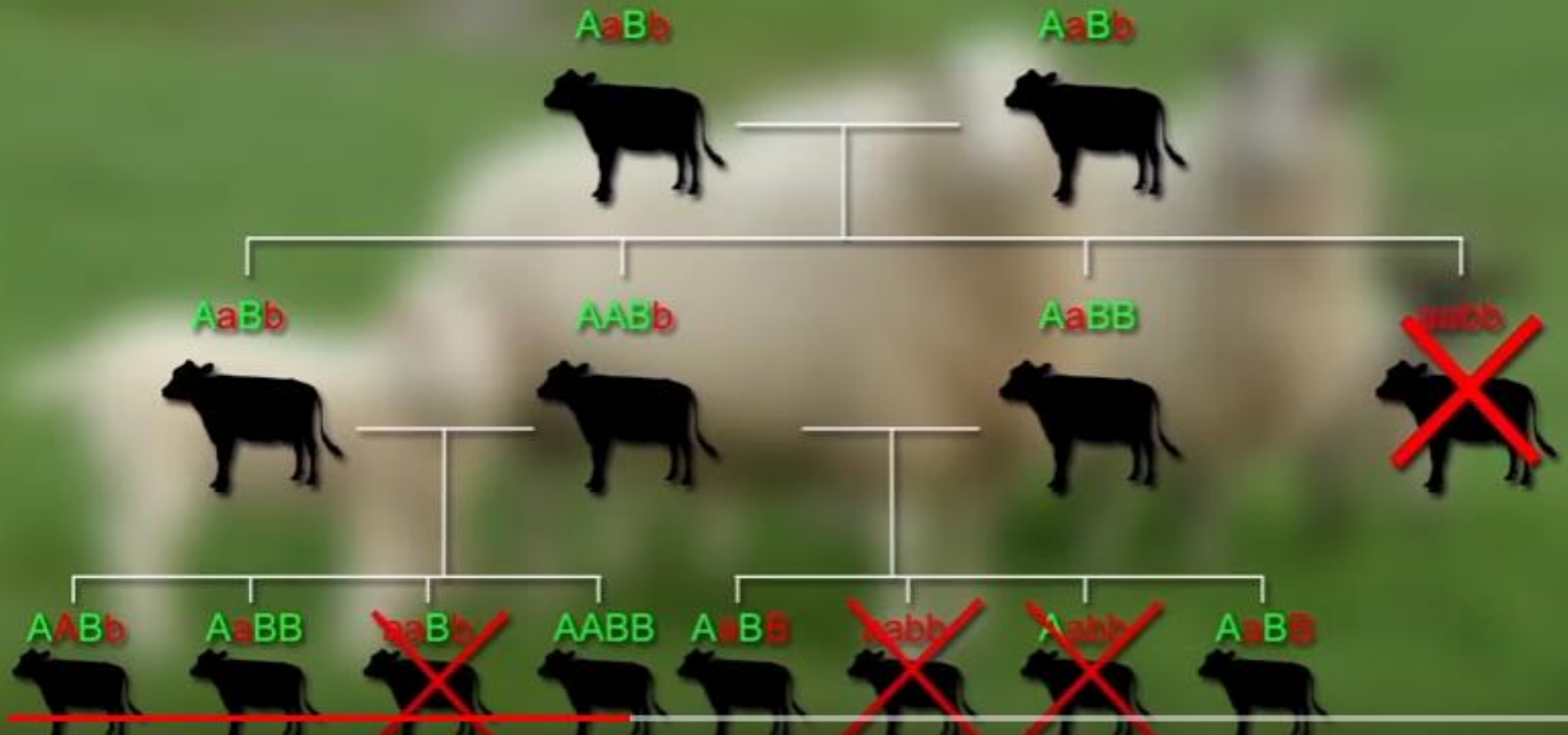
Inbreeding or outbreeding	Coefficient of relationship between mates	Biological relationship between mates
Inbreeding	50 percent	Parent × offspring; full sibs
Inbreeding	25 percent	Half-sibs; double first cousins; aunt × nephew; uncle × niece

- Inbreeding is often used when a new breed, strain, or variety is founded.
- If two mated individuals have no common ancestor within the last five or six generations, their progeny would be considered outbreds.
- The basic genetic consequence of inbreeding is to promote homozygosity.
- This means there is an increase in the frequency of pairing of similar genes.
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Inbreeding methods

1. Selection of a superior male and a superior female
2. Mating between selected animals
3. Progeny evaluation
4. Again select superior male and superior female from progeny
5. Again mating of the selected animals

INBREEDING



Inbreeding - advantages

- The two parents have closely related genetics and may capitalize on their superior traits.
- Development of highly productive inbred lines of domestic livestock is possible.
- It enables the breeder to uncover and eliminate harmful recessive genes within the population.
- Preserving the desired properties

Inbreeding - disadvantages

- For example, a producer might try inbreeding to increase milk production. 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 most obvious effects of inbreeding are;
 - poorer reproductive efficiency
 - Higher mortality rates
 - lower growth rates and
 - higher frequency of hereditary abnormalities.

Outbreeding

- The process of continuously mating unrelated females males of the same breed or between different breeds or between different species.

Forms of Outbreeding

- Outcrossing- the mating of unrelated animals
- Grading up- the mating of purebred sires to nondescript or grade females and their female offspring generation after generation
- Crossbreeding- the mating of animals of different established breeds
- Species cross- the crossing of animals of different species

Outcrossing

- This refers to the mating of animals within the same breed but having no common ancestors on either side of their pedigree up to 4 – 6 generations.
- The progeny is called an outcross.
- Helps to overcome inbreeding depression
- Outcrossing produces a higher level of heterozygosity.
- Outcrossing allows a producer to introduce new genetics while staying within the same breed.

Cross breeding

- Crossbreeding is the mating of animals of different breeds.
- Crossbreeding is used in order to take advantage of the different and complementary strong points of two or more breeds and to utilize hybrid vigor.
- An offspring born to a mating of two different breeds is called a **hybrid**.
- The advantages of producing hybrids are;
 - grow faster
 - mature quicker
 - and utilize the superior traits of each breed
- These advantages are referred to as **hybrid vigor** or **heterosis**.

Heterosis refers to the superior phenotypes observed in hybrids relative to their inbred parents with respect to traits such as growth rate, milk production etc.

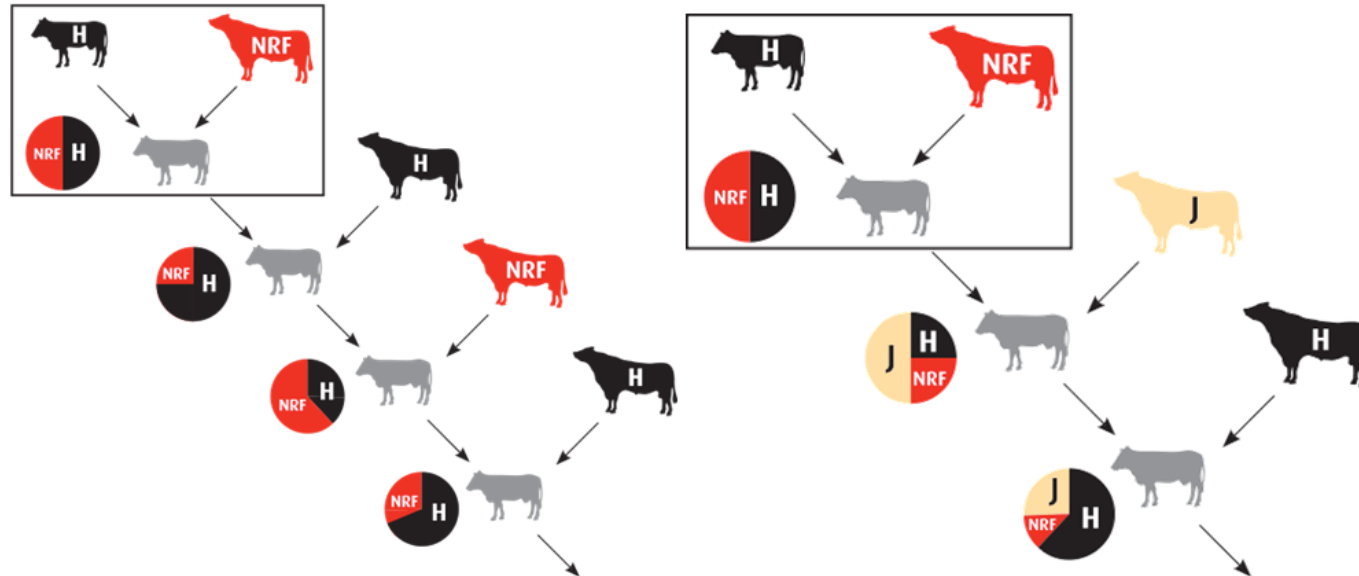
Advantages of crossbreeding

1. Weaknesses can be improved or eliminated by breeding an animal “strong” in a particular trait to an animal that is considered to be lacking or “weak” in that trait;
2. The average productivity of the offspring is increased over either parent;
3. Crossbreds are more fertile than their purebred parents;
4. Crossbreds wean heavier offspring than purebreds; and
5. Crossbreds are more vigorous than purebreds.

- Several crossbreeding methods are in use
- Crossbreeding is the most popular breeding system practiced by commercial livestock operations.
- However, some methods work better for certain species than others.

Rotational crossbreeding

- A rotational crossbreeding system is where sires of a recognized breed are mated on a rotational basis to crossbred females derived from earlier matings within the crossbreeding system.
- It is referred to as “criss-crossing” when two breeds are involved with the backcross derived from consecutive matings of sires from the same breed

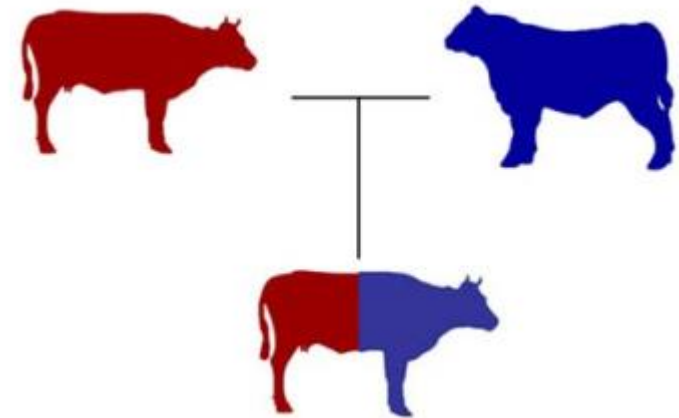


Terminal crossing

- Terminal crossing is the simplest form of crossbreeding.
- The continuous production of F1 stock known as terminal crossing.
- In this system, all offspring are marketed and replacement heifers are purchased from outside.
- Replacement heifers can be purchased and bred to terminal or high growth breed bulls.
- Terminal crossing can be done either using two breeds (two breed terminal) or three breeds (three breed terminal).

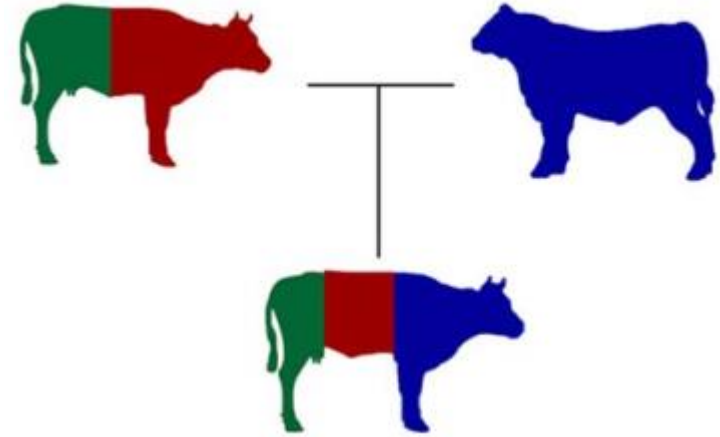
Two-breed terminal crossing

- The two-breed terminal system is the most basic crossbreeding system available
- The system crosses straight bred females with the bulls from another breed and the resulting offspring known as F1.
- All of the offspring from this initial cross are marketed, and replacement heifers are purchased.
- The progeny produced are uniform
- This is not a desirable system because it does not realize any heterosis in the cow since she is straight bred.



Three-breed terminal crossing

- The three-breed terminal system is identical to the two-breed terminal system except that the females are crossbred females (AxB) mated to sires of another breed (T).
- It produces maximum hybrid vigor in the cow and calf.
- Hybrid vigor is realized for both growth rate and maternal ability.



Grading up

- “Grading up” is the gradual improvement of a breed (local) through repeated matings with an exotic (improver sire).
- The purpose of grading-up is to improve quality, develop uniformity, and increase performance in the offspring.
- If local female used in the grading up process, it will become a member of exotic breed (improver breed) after four matings.
- The offspring after matings are more genetically similar to the purebred sire
- Grading up of local breeds to 100% improver is rarely desirable.

Cross breeding for local breeds

- In cross breeding program, it is important to retain advantages of local breeds;
 - Adaptation to harsh local environment
 - Resistant to diseases
 - higher prolificacy
- Improved breed through cross breeding program has potential for higher production
- To obtain advantages of cross bred animals, it is important to improve management practices

Cross breeding for local breeds

- Genetic gains from cross-breeding come from two sources.
 1. Superior adaptation of local breeds
 2. Better productivity of exotic breed (improver breed)
- The gain is additive – adding some of the characteristics from one breed to another.
- It is hard to maintain hybrid vigour when the offspring themselves go on to mate.