LIVESTOCK IMPROVEMENT

This is the improvement of the animals genetic potential(makeup)and the environment in which they are kept to determine their productivity

NB;The term environment in this case refers to all non-genetic factors like climate,diseases etc that are exposed to the animals.

OBJECTIVES/AIMS OF LIVESTOCK IMPROVEMENT

1. To maintain desirable qualities in animals like increased number of eggs produced in chicken, high number of off springs born per animal
2. Produce animals with a good mothering ability
3. To produce animals that are highly prolific i.e. animals that give birth to many offspring at once e.g. in pigs and goats
4. To produce animals with a high growth rate hence maturing early
5. To produce animals that are high yielding in terms of milk, meat, eggs etc.
6. To come up with breeds that produce high quality products like meat, milk and eggs
7. To produce breeds of animals that are resistant to parasites and diseases
8. To produce animals with a good temperament for easy handling during milking, ploughing etc.
9. To produce animals with a high resistance to harsh environmental conditions e.g prolonged drought,
10. To produce animals that can provide products for a long period of time

SELECTION

This is a practice of allowing some animals to be parents of future generations while depriving others of that privilege.

Animals with good/desirable characteristics are allowed to pass on their traits offspring while those with undesirable characteristics are removed from the farm through slaughter or sale a process called culling

Types of selection

There are mainly two types of selection i.e. **natural selection** and **artificial selection**

Natural Selection

This is one which always takes place through random mating and its influenced by natural forces e.g. the ability of one individual to survive and reproduce in a certain environment.

In such a selection only the fittest animals are able to survive hence survival of the fittest in the struggle for existence.

Artificial Selection

This is the type of selection controlled by man and doesn't allow random mating but mating is based on desired characteristics

<u>Methods used in artificial selection</u>

- Individual / mass selection
- Pedigree selection

- Collateral relatives selection
- Progeny tests
- Tandem selection
- Independent culling
- Selection index

Individual Selection
- This is done basing on the information about the animals performance as well as the performance of its progeny.

Pedigree Selection
- Here animals are selected basing on the performance of their ancestors.

Collateral relatives Selection
This is selection done basing on performance records of close relatives like brothers, sisters, half brothers etc.

Progeny Testing
This is where selection is made basing on the performance of an animal's offspring (progeny)

Tandem selection
This where a desired trait is selected among many and improved before going for another

Independent culling
The breeder lays down a minimum standard for several traits and any animal that does not measure up to standard is culled

Selection index
Here, numerical values are given to potential parents basing on their characters and one with the highest value is selected

Factors considered in selecting animals for breeding
- Poductivity of parents; Select animals whose parents are good producers of animal products
- Adaptability; The animals chosen should be able to adopt to environmental conditions without losing weight
- Age; Select animals which are still young but have attained sexual maturity
- Physical appearance; Select animals that conform to the characteristics of either beef, dairy etc.
- Feed conversion ratio; The chosen animals should have the ability to convert feeds eaten into desired products
- Health status; Chose animals whose parents have no inheritable diseases
- Disease resistance; Select animals that show resistance to common diseases since can survive in case of an outbreak
- Productivity; chose animals that can yield enough products and for a long period of time.
- Maturity period; Select animals with a high growth rate to reach puberty earlier.
- Fecundity; Chose animals that can give birth easily and regularly

- Temperament; Chose animals with a good temperament for easy handling during milking and ploughing in case of oxen

BREEDING
This is the process through which mature animals give rise to offspring through mating.

Methods of breeding
Inbreeding
This is that mating of closely related animals like brother and sister, son and mother, e.t.c.

Advantages of in breeding
- It helps to maintain a high relationship with the desirable ancestor.
- It increases the degree of uniformity in the herd
- The less desirable recessive genes are easily brought to light and therefore culled.
- The good qualities of a particular breed can be easily maintained

Disadvantages
- It may lead to loss of hybrid vigour
- It leads to a reduction in survival chances of offsprings
- Leads to a reduction in the fertility of animals
- It encourages hereditory diseases

Line Breeding
This can be defined as the mating of animals of the same breed or distant relatives e.g. cousin, grandson and grandmother
- It's actually practiced in order to conserve the good traits of a certain outstanding sire or dam.

Cross breeding
This is the mating of unrelated animals but which are pure breeds.The offspring as a result of crossbreeding are called hybrids
The offspring have the characteristics of both parents and their productivity is usually better that of both parents and this is referred to as **heterosis/hybrid vigour**

Out breeding /out crossing
- This is the mating of unrelated animals/Mating of animals without a family connection. Sometimes such animals can be of the same breed but show no close relationship in the first four generations

Male **lion** and female **tiger** results in a **Liger**
Male **donkey** and female **Zebra** results in an **Asbra**
Male **Horse** and female **Zebra** results in a **Zebroid**
Male **horse** and female **Donkey** results in a **Mule**
Bull and female **buffalo** results in a **Beefalo**

Grading Up/upgrading
This is a system whereby pure exotic male animals are mated with the local female animals to improve the characteristics of local animals.

BREEDING EFFICIENCY
This is the ability with which the herd is able to reproduce and multiply. It covers the entire period of breeding i.e. mating, conception, gestation and calving.

Ways of measuring breeding efficiency

1. Calving interval**;**This is the period between calving. Normally it is about 12 -13 months. In order to get a good calving interval, a rest period of 60 days should be given for the animal.

2. Age of heifer at first calving; A higher age indicates a low breeding efficiency

3. Services per conception; The ideal ratio should be 1.6-1.8 and is measured by $\frac{\text{Number of services}}{\text{Number of animals that conceive in a herd}}$
4. Percentage of cows that calve within a year; A high percentage indicates a high breeding efficiency

5. Number of days a cow is pregnant in a year;The more the days, the higher the breeding efficiency

6. The percentage of non-returns; Non-returns arise when the service is done and pregnancy does not occur. A low percentage of non indicates a high breeding efficiency.

Causes of a low breeding efficiency

- Breeding/venereal diseases like brucellosis that affect the reproductive systems of the animals leading to a low breeding efficiency
- Poor feeding of the animals that retards the growth and development of the reproductive systems of the animals
- Excessive fattening of the animal as fats are deposited around the ovary affecting egg formation and ovulation
- Poor management e.g failure to detect animals on heat on time leading which may lead to infertility
- Physiological factors e.g a retained corpus luteum that prevents the animal from coming on heat
- Free martins i.e heifer cows which are born with co-twin bulls but when her sexual organs are underdeveloped
- Cryptorchidism i.e. a condition when a bull is born with both its testis retained in the abnorminal cavity and such a bull is sterile because it can't produce sperms
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Ways of maintaining a high breeding efficiency

1. **Good feeding**: Breeding animals should be fed well but excessive fattening should be avoided as it may reduce the fertility.

2. **Observing the rest period**: Animals should be given a rest period of about 60 days to allow the uterus to return to normal

3. **Insemination at the right time**: In case of artificial insemination, the cow should be inseminated towards the middle and late part of heat period as ovulation occurs 14 hours after the beginning of oestrus so as to ensure conception

4. **Observation of animals on heat**: This should be done as early as possible more especially where A.I is being used to avoid the animal missing service.
5. **Veterinary Attention:** Animals that fail to conceive should be identified and examined to find out the causes and treated if possible.
6. **Pregnancy diagnosis:**Animals should be diagnosed to find out whether they have conceived or not so that appropriate measures can be taken in time.
7. **Keep accurate breeding** records for the herd to be used as reference where necessary
8. **Use teaser bulls** for early detection of heat in farm animals for early service
9. Maintain a good ratio of bulls to females to avoid over working the bulls which lowers fertility
10. Use correct **techniques of artificial insemination** to ensure successful fertilization.

MATING IN ANIMALS

Animals can be mated using two main methods i.e. **natural service** and **artificial insemination**

NATURAL MATING/ SERVICE

This is where a male animal is allowed to mate with the female animal which is on heat on their own/directly. It is the most common method of service in Uganda

Advantages of natural service

1. Less costly since collection and processing of semen is not involved
2. Best method of serving animals with silent heat
3. Conception rate is higher than artificial insemination
4. It's a quick method of service
5. Does not require special skills and training
6. The animals are given an opportunity to enjoy mating in a natural way

Disadvantages of natural service/Mating

1. Reproductive/venereal diseases can be easily spread
2. It's difficult to practice controlled breeding under this method
3. Heavy bulls can easily injure weak females
4. There's wastage semen on one female that would otherwise serve many females
5. Breeding records are difficult to keep
6. The bull may be overworked incase the number of females is high
7. It is expensive to keep a bull for breeding or mating

ARTIFICIAL INSEMINATION

- It's a method of breeding in which semen is obtained from proven bulls and artificially introducing it into the female reproductive tract by means of an inseminating equipment.

Advantages of Artificial insemination

- Its easier and cheaper to transport semen from distant places than transporting a bull
- Semen from good males may be stored for use in future years even after the death of such animals
- This enables controlled seasonal and planned breeding on farms
- Its easy to keep accurate breeding records since the time of service is always known
- Its easy to control venereal diseases e.g. contagious abortion and trichomoniasis in a herd since semen used is first examined
- Poor breeds or bulls can be easily eliminated from the breeding programme giving room for better sires
- Semen from lame/physically disabled bulls and those that are dead but of good quality can be easily used in the breeding programme
- Injury to small and weak females by heavy bulls can be controlled using artificial insemination.
- It reduces the cost and the risk of keeping a bull on the farm since bulls are usually aggressive.
- Semen from good sires can be easily made available to farmers in rural areas through artificial insemination.
- Artificial insemination is economical since one ejaculation can serve over 100 cows after dilution.

Factors limiting use of artificial insemination services by farmers in Uganda

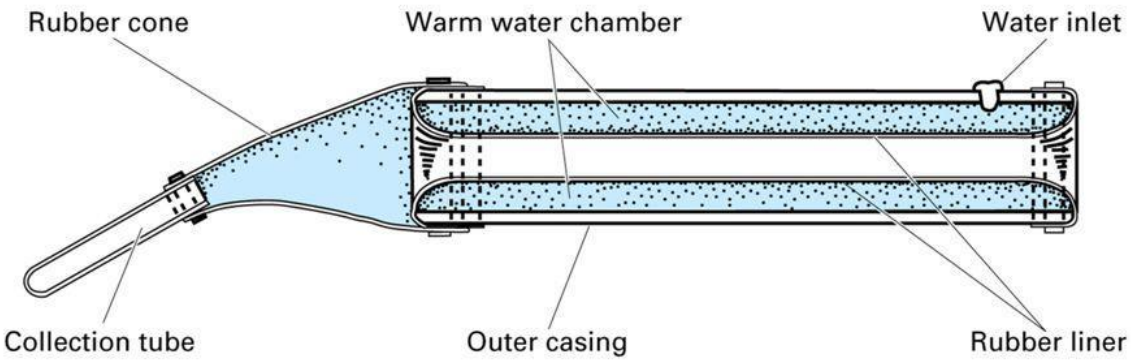
- Lack of vehicles to facilitate movement of AI officers; this brings about delay in reaching the farmers when the service is needed
- Scattered farm holdings; this makes it difficult for the inseminators to reach farmers in time
- Poor communication; makes it difficult for the farmer to inform the inseminator in time
- Poor road network; this makes it difficult for the inseminators to reach farmers in time
- Silent heat in some animals; it makes it difficult to identify animals on heat
- Lack of enough skilled man power; this makes insemination difficult
- Poor extension services; farmers are not sensitized on the usefulness of artificial insemination
- Few AI centers; this makes it difficult for the farmers to access AI services
- Conservativeness of some farmers; some farmers are not willing to adopt the use of AI services
- Fraudulent inseminators; these discourage farmers from using AI
- Expensive AI storage equipment; this discourages farmers from using AI

- Ignorance of farmers about AI; this makes difficult for them to use AI
- Lack of capital; most farmers cannot afford the high cost involved in AI
- Some animals have short heat periods; this makes timing of AI difficult

SEMEN COLLECTION

This is commonly done using an equipment called an artificial vagina

Figure 11.1 Longitudinal section of an artificial vagina. *Source*: Colorado State University.



Procedure of semen collection using an artificial vagina

- The cow on heat(teaser)is placed on the crush for the bull to mount
- As the bull attempts to mount the teaser,the semen collector holds the base of the penis and directs it into the artificial vagina where the bull ejaculates and the semen is collected in the tube.

NB; After collecting the semen, it is taken to the laboratory for examination to determine its suitability for insemination. The semen is then diluted and stored under liquid nitrogen at a temperature of -196^0C

Methods/Techniques of carrying out artificial insemination

There are two main methods of AI i.e. **recto-vaginal** method and **speculum** method

Recto-vaginal method

This is where the rectum and vaginal are manipulated in order to have successful insemination. The hand is pushed into the rectum to remove dung and locate the cervix at the end of the vagina

Procedure

1. Restrain the animal in a crush to restrict its movement during the operation
2. Wash your hands with clean water and soap to reduce infection
3. Put on clean gloves
4. Thaw the semen in a basin of warm water at room temperature to reactivate the sperms
5. Sterilize all the equipment to be used
6. Insert the semen straw in the inseminating syringe
7. Lift the animal's tail and insert one of the hands into the rectum to remove dung
8. Clean the anus and vulva using clean water and soap
9. Insert the hand in the rectum to locate the cervix in the reproductive system
10. Insert the inseminating syringe through the vagina and gently direct it to the cervix
11. Release the semen to the cervix
12. Massage the cervix after releasing semen so that it can be sucked into the uterus
13. Gently remove the inseminating syringe from the vagina and the hand from the rectum
14. Release the animal from the crush and monitor it for 21 days to ensure that it has conceived

Speculum method

This is where special equipment called **a speculum** is used in locating the cervix by inserting it in the vagina.

Procedure

1. Restrain the animal on heat in a crush
2. Wash your hands using clean water and soap and dry it with a hand towel
3. Sterilize all the equipment to be used in inseminating
4. Thaw the semen in a basin of water at room temperature
5. Insert the semen straw in the inseminating syringe
6. Wash the vulva with clean water and soap
7. Wear clean gloves
8. Insert the speculum into the vagina to locate the cervix
9. Insert the inseminating syringe into the speculum and release the semen
10. Gently remove the inseminating syringe from the speculum
11. Remove the speculum gently from the vagina
12. Release the animal from the crush