LIVESTOCK IMPROVEMENT

Refers to the process carried out to upgrade the genetic potential and performance of an animal.

Reasons for livestock improvement

1. To produce better yielding animals.
2. To get animals that are prolific i.e. animals that give birth too many off springs at once.
3. To produce animals that are resistant to diseases.
4. To produce animals that are resistant to adverse environmental conditions for example prolonged drought.
5. To produce animals which are early maturing.
6. To get animals with good quality products such as wool.
7. To produce animals with good temperament for easy handling during milking or ploughing.
8. To improve conformation of the animal.
9. To produce animals with better feed conversion ratio.

 Selection

 Refers to choosing of certain animals which possess the desired characteristics to serve as parents of the next generation.

Factors to consider when selecting / choosing animals for breeding

* 1. Physical appearance and size.
	2. Body conformation. Animals chosen should conform to the characteristics of either beef or dairy. Dairy animals can be identified by their wedge shape and a blocky shape for beef animals.
	3. Fecundity. This is the ability to calve regularly. Animals chosen should be able to calve down easily and regularly.
	4. Temperament. In case of dairy breeds, choose those which have good temperament. This enables easy handling during milking.
	5. Longevity. This is the ability to stay in production for a long time.
	6. Maturity period. Select animals which have a high growth rate. This means they can reach production or the breeding stage quickly.
	7. Productivity. Choose animals that can produce enough products and for a long time in terms of milk, eggs and large amounts of beef.
	8. Climatic adaptability. The animals chosen should be able to resist environmental conditions.
	9. Age. Too old animals should not be selected as future parents. Select animals which are still young but have reached sexual maturity.
	10. Feed conversion rate. Choose animals which have the ability to change food eaten into useful products such as eggs.
	11. Resistance against diseases. Animals which show resistance to common diseases should be selected. This enables them to survive in case of an outbreak.

Methods of selection

* + 1. Pedigree selection.

This refers to selection method that is based on the performance records of the individual animals’ ancestors.

* + 1. Family selection

This is the method of selection where the performance of individual animals’ close relatives is considered.

* + 1. Individual performance

This is the selection of animals basing on their performance or appearance.

* + 1. Progeny selection

This is the selection that is done basing on the offspring of the individual animal.

 **NB. Factors to consider when selecting animals basing on individual performance**

1. Physical appearance and size
2. Body conformation
3. Fecundity
4. Disease resistance
5. Temperament
6. Yield potentials
7. Hardiness especially for work animals
8. Litter size more so in pigs
9. Age, too old animals should not be selected for breeding
10. Quality of products
11. Carcass quality

BREEDING

This refers to the mating of animals that have been selected in a planned manner.

Objectives of livestock breeding

1. To improve on the quality and quantity of products like meat, milk and wool.
2. To improve on animal resistance to diseases.
3. To give rise to animals that are adapted to local climate.
4. To improve on the growth rate of animals.
5. To improve on the physical characteristics of cattle e.g. body conformation.
6. To produce animals that are better feed converters.

METHODS OF BREEDING

1. Inbreeding

This is the mating of closely related animals e.g. sire and its daughters.

Advantages

1. It helps to maintain the desirable characteristics of the animal in the herd.
2. It exposes animals with bad traits so they can be culled from the herd.
3. Improves on uniformity of animals in the herd.
4. Inbreeding produces pure breeds that can be used for cross breeding to exploit hybrid vigour.

Disadvantages

1. It encourages hereditary diseases
2. It may lead to loss of hybrid vigour
3. Leads to build up of undesirable traits in the herd.
4. It leads to increased mortality due to loss of resistance to diseases by the animals.
5. Cross breeding

This is the mating of two different pure breeds of animals i.e. two animals belonging to different breeds i.e. zebu cow with exotic bull. The offspring of such a breeding method are referred to as hybrids. The offspring have the characteristics of both parents and their productivity is usually better than that of the parents. The difference in performance is called hybrid vigour or heterosis.

NB. Heterosis or hybrid vigour is the extent to which an animal performs better than parents. Such a situation is achieved through cross breeding

Advantages

1. Leads to introduction of good genes which were formerly missing in the herd
2. This method brings about hybrid vigour
3. Reduces on the spread of inheritable diseases in animals
4. It can be used to develop new breeds

Disadvantages

Good traits can be lost during cross breeding

3. grading up

This is the continuous backcrossing of superior exotic sires with the local types.

Illustration

Advantages

The quality of animals on the farm can be improved without replacing them with improved breeds

It’s a cheaper way of acquiring superior animals without spending heavily on purchasing superior animlas

Disadvantages

The method is slow and may take many years to obtain the results wanted

Can lead to disastrous results if the bull selected is not the best

4. line breeding

This is the mating of distantly related animals. It aims at keeping some desirable characteristics of an ancestor and avoiding undesirable ones at the same time.

5. outcrossing

This is the mating of animals without a family connection.

BREEDING EFFICIENCY

It refers to the fertility of the animals in the herd, i.e. conception, gestation and calving.

**Causes of a low breeding efficiency in cattle**

1. **Inheritance factors:-** some animals inherit certain traits from their ancestors that cause low breeding efficiency or low fertility rate: such traits include:
2. Twinning: twins are small and less vigorous than normal calves.
3. Free martins: is a heifer born a co twin with a bull. During embryonic development, it is contaminated with male hormones and these will interfere with proper growth and functioning of the female reproductive system.
4. White heifer disease: this is when a heifer has a tough hymen which prevents penetration of the bull’s penis.
5. Cryptorchidism: a bull calf is born with one or both testes retained in the abdominal cavity. If both testes are retained, the bull remains sterile.
6. **Infectious diseases:-** these include:
7. Brucellosis: it is caused by bacteria, it is highly infectious and causes abortion.
8. Trichomoniasis: it is caused by protozoa that live in the sheath of the bull and in the uterus of the female. It also causes abortion.
9. **Physiological defects: -** these occur due to malfunctioning of the reproductive tracts of the animals especially that of a cow. They include:
10. Retained corpus luteum: this is commonly found in aging animals. The retained corpus luteum will produce progesterone hormone that will keep the animal in the state of pseudo pregnancy preventing the cow from coming on heat.
11. Cystic ovary: this is when a cyst develops on the ovary and causes repeated heat cycles. Such animals can not produce even when served because there is no ovulation.
12. Penile defects: e.g. when a penis is not straight enough or presence of holes on other parts of the penis e.g. on the urethra.
13. **Nutritional disorders:-** this can be either be:
14. Malnutrition; this is characterised by deficiency of especially vitamin A that is responsible for the formation of the epithelial lining of the reproductive tract.
15. Excessive conditioning: this is due to over feeding which makes the fat deposits to surround the ovary thereby hindering ovulation. In bulls, it makes them become overweight and they will not be able to mount.
16. **Management factors:-** these include:
17. Holding the cow open for too long. If this is done, the animal may become infertile.
18. Breeding too soon or too late in the heat cycle.
19. Failure to recognise that the animal is on heat especially those that undergo silent heat.

How to maintain a high breeding efficiency in a herd.

1. Proper feeding: there should be proper feeding of animals e.g. vitamin A should be included in the feeds to boost the development of the epithelial lining of the reproductive tract.
2. Breeding diseases: e.g. brucellosis, tricomoniasis etc. should be controlled e.g.by vaccination.
3. The farmer should observe carefully the animals that are expected to come on heat so that they are served at the right time for them to conceive.
4. Serve/ inseminate the animal at the right time.
5. Culling animals with a poor breeding efficiency.
6. Keep accurate breeding records
7. Give the animal enough rest period. Animals should be given a rest period after calving before they are bred again to allow the uterus to become normal. The recommended rest period is 60 days.
8. Use trained and experienced personnel’s to carry out the artificial insemination to achieve successful conception.
9. Replacement animals should be bought from reliable sources.

N.B. breeding efficiency can be measured by calculating percentage of non-returns.

Breeding efficiency= number of animals that conceived after servicing x100

 Total number of animals that were serviced

How to asses breeding efficiency of the herd

1. Change in the number of animals in a given period of time
2. Number of returns. I.e. those animals that do come on heat again after service
3. Number of non-returns i.e. number of animals that do not come on heat again after service
4. Number of calves born within a year
5. Number of animals with abnormalities i.e. cryptorchidism
6. Length of calving interval

 **Infertility and sterility in farm animals**

Infertility is a temporary inability to reproduce

Sterility is a permanent inability to reproduce

**Causes of infertility in females**

1. Age: fertility increases with age but diminishes afterwards due to defects in the uterus
2. Persistent corpus luteum: this is commonly found in aging cows. It will produce progesterone that will keep the animal in false pregnancy
3. Poor development of the reproductive tract:
4. Intersexes: these are genetic females that show a considerable degree of masculine in the reproductive tract they show a high degree of masculinity

Causes of infertility in males

Penile defects, such as failure of intromission because the penis is not straight enough

1. Cryptorchidism this is a condition where by a bull calf is born with both testis retained in the abdominal cavity. Such bulls remain sterile
2. Anorchidism, this is a condition when one of the testis emerges from the abdominal cavity
3. Deficiency of minerals and vitamins, such as copper zinc manganese and vitamins such as A and E which are essential for reproduction
4. Over working of males, this leads to ejaculation of semen with fewer spermatozoa and higher proportions of immature spermatozoa
5. Chromosome anomalies,

**Multiple ovulation and embryo transfer**

**Multiple ovulation**

This is where a female animal is induced to produce several ova simultaneously which are then fertilised to form embryos

**Embryo transfer**

Is the process by which an embryo is collected from the donor and transferred into an induced recipient.

Objectives of MOET

1. To increase the number of offspring’s in the lifetime of a female farm animals
2. To enable cows with good traits to produce more offsprings for breeding beyond their natural capacity
3. To ease transport of embryos than live animals
4. To enable weak and sick animals participate in breeding programme by donating embryos
5. To enable sexing of embryos that leads to production of only a given sex of animals

 Limitations of MOET

1. It’s expensive to carry out as it necessitates use of special equipment
2. It requires a lot of skills to be carried out
3. The success rate is often low due to incompatibilities between the donor and recipient
4. Poor selection of recipients can result into problems during birth especially if embryos from heavy breeds are transferred into smaller breeds.

**SYSTEMS OF MATING**

**These include;**

1. Natural mating
2. Artificial insemination
3. **Natural mating;** is when bulls are allowed to mount the cow on heat.

**Advantages of natural mating**

1. It’s quite cheap and affordable to most of the farmers.
2. No timing and planning of breeding programme is involved.
3. Cows with silent heat can naturally be served.
4. The animal can be mounted early before the farmer detects signs of heat
5. Conception rate is higher than in artificial insemination
6. Less laborious since the bull detects the female on heat

**Disadvantages of natural mating**

1. Cost of maintaining the bull on the farm is very high.
2. It encourages inbreeding on the farm.
3. Big heavy bulls can break small cows/ heifers.
4. Breeding diseases can be easily transmitted on the farm.
5. Wastage of semen unlike in artificial insemination
6. Its costly to transport good bulls for mating
7. Lame bulls that find difficulties in mounting cannot be of much use under this system
8. **Artificial insemination;** is when semen is obtained from a bull and served to a cow on heat by an inseminator.

**Collection of semen from the bull**

**Equipment used include;**

* An artificial vagina (AV)
* A teaser animal (female)
* The bull

**Structure of the AV**

**Procedure**

The teaser animal is brought close to the bull .The bull gets stimulated and as it attempts to mount the animal, the operator swiftly gets the protruding penis and diverts it into the artificial vagina. Due to the warmth created by the warm water in the AV which is almost the same as one in the natural vagina, the bull will ejaculate and semen is collected.

**N.B:-**.

The inside of the AV is well lubricated to prevent friction that would cause injury to the penis.

After collection, the semen is well examined for fertility and STDs, then diluted before its stored for future use.

**Introduction of semen into the cow (methods of insemination)**

The rectal vaginal method

* + 1. The animal on heat is restrained in a crush.
		2. The inseminator washes hands before the operation using soap and water.
		3. The inseminators put on clean gloves.
		4. The inseminator pushes one of his/ her hands in the rectum to remove the dung.
		5. A straw of semen is removed from the nitrogen flask and thawed by putting it in warm water to activate the sperms.
		6. Sterilised equipment such as a catheta tube is assembled.
		7. The straw of semen is put in the catheta tube.
		8. The inseminator pushes one of the hands threw the rectum to locate the cervix.
		9. The inseminator uses the other hand to gently push the inseminating equipment through the vagina up to the cervix.
		10. The semen is then released at the entrance of the cervix.
		11. The inseminating equipment is removed and cleaned the animal is then let free.

 **The speculum method**

1. Restrain the animal.
2. Wash hands with soap/ detergents and put on gloves
3. Thaw the semen in warm water at room temperature.
4. Sterilise the equipment before use
5. Insert the straw into an inseminating syringe.
6. Wash the vulva with clean water and soap.
7. Insert the inseminating syringe through the speculum.
8. Push the semen when the syringe reaches the semen.
9. Remove the inseminating syringe.
10. Remove the speculum gently.
11. Release the animal.

**Advantages of A.I**

1. It controls in breeding in the herd.
2. It eliminates or reduces the spread of venereal diseases.
3. Semen from a variety of bulls can be used, giving the farmer a chance of improving on his herd.
4. It reduces the risk of heavy bulls injuring small cows.
5. Semen from old bulls, heavy bulls and those that died a long time ago can be used.
6. It eliminates the cost of keeping and maintaining the bull.
7. Many animals can be served from a single ejaculation thus avoiding wastage.
8. It facilitates easy programming and control of breeding on the farm.
9. It is easier to keep records when A.I is used than for natural mating.
10. It facilitates easy detection of infertility and sterility among animals.
11. Chances of fertilization are increased since semen is deposited at an appropriate place in the rep. tract.
12. It leads to introduction of new breeds in the herd.
13. Semen can be stored for a long time

**Disadvantages of AI**

1. It is difficult to detect heat period especially in animals that have silent heat.
2. It requires experienced inseminators to carry out the operation.
3. There’s a risk of injury and wounding of the female animal in the process of insemination.
4. A lot of labour is involved in with drawing, testing and serving semen to the animal.
5. The process is expensive and may not be afforded by most of the farmers.
6. Sperms can die due to poor storage and transportation.
7. Insemination of a pregnant animal may lead to miscarriages.
8. If semen is not well examined, it can lead to a wide spread of diseases.