

STANDARD HIGH SCHOOL ZZANA

S.2 AND S.3 WORK

Instructions: Write these notes starting from where we stopped.

ANIMAL PRODUCTION

LIVESTOCK MANAGEMENT

Livestock includes all animals kept on a farm for economic purposes e.g pigs, cattle, goats, sheep, camel, chicken, ducks; bees, pigeons, turkeys e.t.c.

Importance of Livestock.

- It's a source of income more especially when the animals are sold wholly by the farm.
- The livestock industry provides market to the agro chemical industry through the sell of drugs and feeds.
- Live stock are a good source of proteins for man in form of eggs, milk, meat e.t.c
- The livestock industry provides employment both directly to people working in leather turning industries and milk processing plants.
- Livestock provides manure which is rich in nitrogen and phosphorus to be used in crop gardens.
- Livestock have found a place in cultural and traditional ceremonies where they are being used as sacrifices.
- Some animals like the cattle, donkeys and the horses are being used as a source of Labour in transporting farm produce and ploughing.
- On the national level, live stock products like hides and skins are a good source of foreign exchange for the country which improves the economy.
- The live stock industry is a source of government revenue when taxes are levied on live stock and their products.

FACTORS DETERMINING THE TYPE AND BREED OF LIVE STOCK TO BE KEPT.

Climate:

The high temperatures of the day tend to discourage most of the exotic animals of European origin and such animals are limited to particular areas of Uganda with favourable environmental. Conditions

Pests:

The presence of pests like ticks and tsetse flies has limited the rearing of exotic animals since they are more prone to tick borne-diseases like: East Coast fever, Red water, etc.

Availability of Feeds:

Animals like pigs require high protein feeds which are expensive for most of the farmers. This may discourage the rearing of such animals where feeds are not available.

Diseases:

Like swine fever in pigs, coccidiosis and new castle in poultry tend to limit the distribution of livestock in many parts of Uganda.

Risk bearing capacity of the farmers:

Most farmers in Uganda are peasants with low income. This means that such farmers can not easily take high risks of looking after high value exotic animals like Friesian cattle.

A low level of skills and education among farmers:

Most farmers in Uganda are illiterate and have little knowledge on how to manage live stock to look after. This will affect their choice of live stock and hence distribution.

The expected additional function of the animals:

Animals that have many functions will always be liked and their distribution in an area is high e.g. Cattle. Cattle can provide meat, milk, manure and Labour which other animals may not

Religion and traditional beliefs:

Some animals are viewed as unclean by certain religion and traditions e.g. The pigs among the Muslims. This meant that such people can't look after the pigs.

Capital:

In the presence of enough capital, a farmer can look after the highly productive exotic animals with less problems since he can raise all the necessary infrastructure like dips, perimeter fences, spray races e.t.c.

Government policy:

Enabling policy has led to an increase in the distribution of livestock in some places e.g. restocking of cattle some areas in Uganda like Teso with cattle.

Market:

The availability of market for certain livestock or their product in a particular area will increase their distribution and vice versa.

CHARACTERISTICS OF THE LIVESTOCK INDUSTRY IN UGANDA

- The number of animals kept is unrestricted with most farmers preferring quantity to quality.
- There is very little attention given to the improvement of the pastures since they are grazed communally.
- The grazing time is limited as the animals are taken out to graze during the day and brought in the kraal at night.
- There is little planned mixed farming i.e. crop and animal units are rarely integrated.
- Breeding is rarely controlled e.g. animals mate when they are still very young and there is a lot of inbreeding.
- The watering places are very far away from the grazing places and animals spend a lot of energy walking.
- Generally the standard of livestock management in Uganda is very poor with no records kept at farms.

PROBLEMS OF THE LIVESTOCK INDUSTRY IN UGANDA.**Pests and diseases:**

The tropical conditions favour the multiplication of the pests like tsetse flies and internal worms. These have caused a lot to farmers.

Lack of enough capital:

Most farmers in Uganda are poor and therefore can't afford expensive inputs like drugs, animal feeds e.t.c.

Breeding:

In Uganda most animals are mated when they are still young and there is a lot of inbreeding which will affect the quality and quantity of livestock products.

Poor Housing:

There is no proper housing for livestock in Uganda and the animals are left to sleep outside where they are exposed to advanced environmental conditions which will affect their products.

Poor Record Keeping:

Most farms in Uganda lack records of individual animals and the farms in general. This makes selection for breeding and culling difficult (removal of unproductive animals in the farm)

Limited Extension Services:

Most farmers do not receive enough information on livestock management from extension staff. This is because extension workers are far and are not well facilitated.

Poor Marketing System:

The markets for livestock and their products are still few and scattered with fluctuating prices which discourage the farmers.

Poor Pastures:

Most of the pastures graded by the animals are of poor quality which lowers animal production

Insecurity and cattle rustling;

Some places in Uganda are politically insecure which leads to loss of life and property hence discouraging live stock production.

Harsh Climatical conditions

Long drought leads to inadequate water and pasture which lower animal production

SOLUTIONS TO THE LIVESTOCK PROBLEMS.

- Extension workers should be facilitated so that they can give services to the farmers more especially those who are in remote areas.
- Provision of loans, farmers should be provided with loans more especially soft loans so that they have enough capital to improve on their infrastructures like fences, dips e.t.c.
- Artificial insemination should be encouraged so that farmers can maintain high quality animals which are more productive through the importation of semen.
- Marketing of livestock and their products should be organized so that farmers can easily get the information through the internet, news papers and farmers journals about the markets and the available prices.
- Settled grazing should be encouraged so that more attention is given to the animals for better production.
- The land ownership laws should be improved so that farmers can get access to land easily with fewer costs involved. Proper land ownership also encourages the development of that particular land.
- The paddock system of grazing animals should be introduced so that animals can be controlled to reduce over grazing, encourage mixed farming and improvement of the pastures.
- Routine vaccination of animals against killer diseases e.g rinder pest, ant swine fever, foot and mouth diseases. N.B: should be done by the Government to reduce the incidence of such diseases.
- Government should endeavour to subsidize agricultural inputs so that the farmer can enjoy a higher profit margin that can encourage them to develop their farms.

- Security should be maintained in all areas so that livestock farmers are encouraged by reducing risks of property and life loss
- Valley dams should be constructed so as to solve the problem of inadequate water during drought

CATTLE.

DIAGRAM OF A COW

Classification of cattle

Phylum; Chordata

Class; Mammalia

Order; Artiodactyla

Genus; Bos

Species; *indicus* (humped cattle)
taurus (hump less cattle)

- The immigrant cattle (long horned and short horned) are considered as ancestors of **Bos taurus** (European type of cattle) and the **Bos indicus** (zebu) type.
- These mixed at different times in different ways to create the sanga cattle which is the predominant type of cattle today.
- In East Africa, the sanga have been displaced by the zebu.

DIFFERENCES BETWEEN **Bos taurus** AND **Bos indicus** CATTLE

<i>Bos taurus</i> /Exotic	<i>Bos indicus</i> / Indigenous
Don't have a prominent hump.	Have a prominent hump.
Rounded ears held at right angles with the head.	Have long dropping pointed ears.
Have a short and wide head.	Have long and comparatively narrow head.
Relatively large with the bull weighing up to 1000kgs	Relatively small with the bull rarely weighing exceeding 700kg.
The dewlap, umbilical cord and the brisket are small or absent.	Dewlap and brisket are extensively developed.
Have thick skin which is relatively tight.	Have a thin and loose skin.
Have large amounts of subcutaneous fat.	Have small amounts of subcutaneous fat.
Hair tends to be relatively long and rough	Hair is relatively short and smooth.
Legs tend to be short and are slow moving.	Legs are long and fast moving.
Mature more easily and reach full maturity at 4 years.	Slow maturity and reach full growth at 5½ years

Back line is straight	Backline is high at the shoulders, low behind the hump and higher over the pin bones.
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Indigenous cattle

These are humped cattle of tropical origin. Examples are; Zebu, Brahmin, Sanga, Nkole and Boran

Characteristics of indigenous cattle

1. They are resistant to adverse Climatical conditions like high temperatures and drought
2. They can walk for long distances without losing condition
3. They easily convert poor pastures into milk and meat
4. They are tolerant to tick borne diseases like east coast fever
5. They have few problems of reproduction
6. They are cheap to buy and maintain
7. They are less productive in terms of milk and meat

The indigenous cattle are being kept for meat and milk by the communities in Uganda. Improvement of these animals is being carried out through upgrading with exotic cattle

Exotic cattle

These are hump less cattle that have been imported into east Africa from European countries. They are kept for milk and meat or both

- Examples of exotic dairy breeds; Friesian, Jersey, Guernsey and Ayrshire
- Examples of exotic Beef breeds; Galloway, Hereford, Charolais, Sussex, Aberdeen Angus, Lincoln Red, e.t.c.
- Examples of dual purpose exotic breeds; Red Poll, Dexter, Short horn, South Devon and Welsh Black

Characteristics of exotic cattle

1. They have a high growth rate
2. They are not resistant to tick borne diseases
3. They may reproductive problems
4. They cannot tolerate high temperatures and drought
5. They require high quality feeds for high production
6. They lose condition after walking for long distances
7. They require a high level of management
8. They are highly productive in terms of milk and meat

MANAGEMENT OF CATTLE

This is the care given to cattle to improve and maintain a high production.

A stockman is the person entrusted with the work of caring for livestock on a farm

Qualities of a good stock man

- a) Should be kind to the animals by avoiding rough treatment that can cause injury and death to animals
- b) Should know well the monthly or routine operations on the farm like drenching, vaccination to reduce risks of disease and death of animals
- c) Should have a high ability of identifying sick animals and those on heat for prompt action.
- d) Should be able to identify and remove dangerous objects from the farm to reduce injury to livestock
- e) Must be able to keep good up to date records for reference purposes

- f) Should be able to take correct decisions as and when required to reduce losses on the farm
- g) Should be honest to reduce losses to the farm
- h) Should be healthy and energetic so as to carry out work as and when required
- i) Should be highly knowledgeable in livestock management to ensure high animal production
- j) Should be able to do work on the farm under minimum supervision from the high officers

MANAGEMENT PRACTICES IN CATTLE

These are operations done on cattle to ensure high production. They include the following:

- Feeding.
- Branding
- identification
- Housing.
- Castration
- Dehorning.
- Restraining
- Grooming
- Casting / putting animals down
- Vaccination
- Hoof trimming
- Drenching / dehorning

1. DEHORNING:

This is the removal or suppression of horns on animals. Suppressing horn growth at an early stage is called **Disbudding**

Importance

- To make the handling of the animal move easy especially during drenching, castrating, ploughing e.t.c.
- To allow more animals to fit in space during transportation of the animals and even in kraals.
- To reduce injury which is may be caused by horned cattle to others.
- To prevent the destruction of farm structure like fences by animals that are horned.
- To beautify animals hence making them more appealing.
- It introduces uniformity in a herd
- Makes animals to grow faster as nutrients meant for horn development are used in growth

METHODS OF DEHORNING

The method used will depend on the age of the animal, farmer's skill and to some extent capital. Methods used in dehorning are;

- Use of caustic pencils or chemical dehorning
- Use of hot iron
- Use of dehorning saw
- Use of a rubber ring
- Use of dehorning wire
- Use of dehorning clippers

i) Chemical Method:

This is where caustic pencils or sticks are used in suppressing horns by rubbing it against the horn buds. It's done to young animals between 3-14 days of age.

Procedure

- i. Restrain the calf using ropes and cast it down
- ii. Clip the hair around the horn bud to expose it
- iii. Rub the caustic sticks or pencils against the horn bud until bleeding occurs
- iv. Apply fly repellants and antibiotics on the wound created
- v. Release the calf after the operation
- vi. Do not allow the calf into rain for a few days for faster healing of the wounds.

ii) Hot iron method:

This is where a hot iron is applied on the horn bud to burn and kill the growing cells.

Procedure

- i. Restrain the calf using ropes and cast it down
- ii. Heat the iron in fire or gas until it's red hot.
- iii. Apply the hot iron around the horn bud for about 10 seconds to burn the growing cells.
- iv. Care should be taken not to go deep as it can damage the brain
- v. Apply fly repellants on the wound created to keep away flies and stop the wound from becoming septic respectively
- vi. The animal should be released after the operation
- vii. Monitor the animal to ensure that it does not go under rain

iii) Use of a rubber ring;

A rubber ring is placed at the bottom of the horn bud which will stop blood supply to the horn and cut it off with in three to six weeks depending on the size of the horn. It is done on small horns at early age

Procedure

- Restrain the animal in a crush or using ropes
- Use an elastrator to stretch out the rubber ring
- Place the rubber ring at the base of the horn and remove the elastrator to release the rubber ring
- Release the animal after the operation

iv) Use of dehorning saws:

- This is used where the horns have grown up and is long enough. The horns are cut off near the base after restraining the animal.

Procedure

- i. Restrain the animal using ropes and cast it down
- ii. Administer a localized pain killer in the skin surrounding the horn
- iii. Tie a piece of thin rope around the base of the two horns to control bleeding
- iv. Cut off the horn at the base using a dehorning saw

- v. Repeat the same procedure to remove the second horn
- vi. Use a hot iron to seal the wound to stop bleeding.
- vii. Apply insect repellants and antibiotics on the wound
- viii. Release the animal after the operation and closely monitor it to assess the healing process
- ix. Remove the ropes around the base after two days

v) Use of dehorning wire

This where a brittle wire is stretched and rubbed against a horn until it is cut off. The animal is restrained and the operation carried out

vi) Use of dehorning clippers

Dehorning clippers are tools with open blades that remove horns by cutting.

They are used in the removal of large horns

2. CASTRATION:

It's the practice of rendering male animals sexually un functional. In female animals, the practice is referred to as spaying

Reasons for castration:

- To prevent the bad smell especially in the Billy goats.
- To prevent undesirable males from breeding.
- To make the animal docile and easy to work.
- Castrated animals grow faster and produce quality meat.
- Castration increases the quality of wool in sheep as more nutrients are channeled to the development of the wool.
- It helps in the control of venereal diseases like contagious abortion.
- It controls in breeding on the farm when males born on the farm are castrated.

Methods of Castration.

There are two main methods of castration namely:

- Open operation/ castration.
- Closed castration

1. Open castration:

This is where the scrotum is opened to remove the testicles. It can also be referred to as surgical operation.

This requires a sharp knife or blade to split the scrotum vertically up to the bottom for better bleeding.

Advantages of open castration

1. Ensures complete castration of the animal
2. It's a cheaper method of castration since can be done using local implements like the knife

Disadvantages

1. It requires a lot of skill to be carried out
2. There is a high risk of infection due to the wound created
3. It is slow to be carried out
4. There is risk of over bleeding more especially in mature bulls

Procedure of carrying out open castration:

1. The animal should be restrained first using ropes.
2. Wash your hands using clean water and soap or wear clean gloves.
3. The scrotum of the animals should be washed and disinfected using clean warm water and soap
4. Dry the scrotum using a clean hand towel
5. Apply a localized anaesthesia a round the scrotum to reduce pain
6. Pull and squeeze the scrotum to locate the testes
7. Use a clean blade or knife to cut the scrotum vertically in order to remove the testes.
8. Pull the spermatic cords out and tie it using a clean string
9. Cut the spermatic cord just below the knot to release the testis
10. Repeat the same procedure to remove the second testis
11. Seal the wound to stop bleeding by using a hot iron
12. Apply fly repellants on the wound to keep away flies
13. Apply antibiotic cream to stop the wound from becoming septic
14. Release the animal and keep it in reach for easy supervision

2. Closed castration;

This is a type of castration which is done without opening the scrotum. It can be done using the burdizzo/**burdizzo method** or using a rubber ring/ **rubber ring method**

A burdizzo is an instrument with handles which exerts pressure on closing its jaws while a rubber ring is a thick round rubber which is stretched using an **elastator** before being placed on the “**neck**” of the scrotum.

Advantages of closed castration

1. It's a fast method of castration
2. Does not require a lot of skill
3. No bleeding experienced
4. Less risk of infection since no open wound is created

Disadvantages

1. Chances of a failed castration are common
2. It is expensive to buy a burdizzo

3. Castration using a rubber ring is very painful

Castration using a burdizzo

1. Restrain the animal using ropes and cast it down
2. Pull the scrotum down wards to locate the spermatic cords, ducts and nerves
3. Open the jaws of the burdizzo by pressing the handles out wards
4. Place the burdizzo at the “neck” of the scrotum
5. Press the handles of the burdizzo in wards to lock the jaws and crush the spermatic cords, ducts and nerves
6. Open the jaws of the burdizzo and remove it from the crushed area
7. Release the animal after the operation
8. Keep the animal within reach for easy supervision

Castration using a rubber ring:

Here a strong rubber band is straightened using an **elasticator** and fixed around the “neck” of the scrotum. This cuts off blood supply to the scrotum and the testes which eventually degenerate and fall off after sometime. It’s the most painful method of castration though very effective. The farmer doesn’t expect any development of the scrotum for a life time.

3. IDENTIFICATION:

This is done in order to:

- Enable a farmer to recognize his animal in case it’s lost.
- To facilitate record keeping.

Methods of identification:

The main methods of identification are:

- Branding
- Ear tagging
- Tattooing
- Ear notching
- Naming

A. BRANDING

This involves sealing numbers, letters, designs or a combination of this on the skin of the animal.

Methods of branding

These include:

- Hot iron branding
- Chemical branding
- Freeze branding

1. Hot Iron branding

This is done using a **branding iron** which is heated and stamped on the animal skin to leave marks for identification. Branding is done on the less valuable part of a hide like lower part of the thigh, jaw and hump

Procedure of hot iron branding

- Restrain the animal in a crush
- Heat the branding iron in fire or gas until red hot
- Stamp the hot iron on a less valuable part of the animal to burn the skin and leave marks
- Remove the iron from the skin after a few seconds
- Release the animal from the crush

2. Chemical branding

In this method, corrosive chemicals are applied on the skin causing leaving marks on the skin.

- Restrain the animal in a crush
- Clean the area to be banded
- Dip the branding equipment in the branding chemical
- Apply the chemical to the less valuable parts of the hide.
- Release the animal from the crush

3. Freeze Branding

This involves applying liquid nitrogen to the skin which freezes the hair follicles so that they die and stop hair growth in that area.

A branding iron can be dipped in liquid nitrogen and then applied on the skin. The method is good since the skin / hide is not damaged and hence can be applied to any part of the animal.

B. EAR TAGS

They are made of light metals or strong plastics written on with different numbers, letters or designs.

The ear tags are of two types.

- piercing (self – piercing tags)
- non-piercing

The self fixing tags will be fixed on to the ear with force while a non – piercing ear tag, a hole must be made where it is fixed. An ear **tag applicator** can be used in stapling piercing ear tags on the ear

C. EAR NOTCHING

This involves cutting V – shaped notches on the edge of the ear using sharp scissors or pincers. This method is popular in pigs because of their soft skin. The number and location of notches on the ear can be used for identification

D. TATTOOING

A special ink is used to inflict marks on the skin of the animal more especially inside the ear. The hair must be removed from that place before tattooing.

E. NAMING

Animal are given specific names for identification depending on a number of things like origin, coat colour, e.t.c.

4. RESTRAINING

This is the hindering of movements of animals by physical force. It's done so as to perform operations on the animals like: dehorning, castration, de-worming, identification, vaccination and drenching with minimum disturbance.

The amount of force applied during restraining depends on the temper, size and type of the animals. Cattle are not restrained in the same way as goats.

5. CASTING

This is a practice of putting animals down and it's done when animals are to be controlled for a long time during operations like castration, dehorning and identification.

6. GROOMING

This involves brushing off loose hair, dung, dirt and lice from the skin of an animal

Reasons for grooming

- To stimulate blood and lymph circulation in the body of the animal
- To remove loose hair, lice and other external parasites
- To facilitate mating in animals
- For cleanliness and good appearance for the animals
- For production of clean milk in lactating animals

7. FOOT TRIMMING

This involves removing overgrown parts of the foot which impairs movement of the animal. It controls lameness in animals

8. CULLING

This involves removing un-productive and sick animals from the herd for slaughtering / selling. It controls disease spread and wastage of feeds on the farm

9. VACCINATION

This is done in order to control highly infectious diseases in livestock e.g. Swine fever, foot and mouth disease, New castle, rabies etc.

10. DRENCHING

This involves administering oral treatment as supposed to animals. Its done using a drenching gun/bottle to control internal parasites like liver flukes, round worms, tape worms, hook worms.

11. ROUNDING UP

This is done in beef animals and it involves bringing all animals on ranch in the centre of the kraal for the following reasons:

- Castrate and vaccinate animals
- Physical assessment of the animals
- To separate animals according to age, sex, type etc.
- To cull and market un productive animals
- To wean calves of at the right age

- To carry out pregnancy diagnosis

12. HOUSING

The main reasons why animals are housed are

- To protect animals from bad weather condition mostly young ones
- To provide animals with a good opportunity of being fed well
- To provide an area for special handling of the animals e.g. Crushes, dips, spray etc.
- To provide a conducive environment for production and temporary storage for milk (quality milk)
- To provide conducive working conditions for the farmer

Qualities of a good animal house

1. Provide an adequate floor space to avoid overcrowding
2. Should be water proof to avoid damp conditions that breed pathogens
3. Should have a concrete floor which is easy to clean
4. Should provide adequate light since it affects the productivity and behaviour of animals
5. Should have adequate ventilation to control respiratory infections
6. The floor surface should have a gentle slope to allow urine to drain off easily
7. Should be built in such a way that animals can easily see each other

LIVESTOCK BREEDING:

This is the mating of selected animals in a planned manner

AIMS OF ANIMAL BREEDING

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 high mothering ability i.e. low temperament and high milk production
3. Produce highly fertile animals
4. Produce animals with a High growth rate
5. Produce animals that can give a lot products like milk and eggs
6. To come up with breeds that produce high quality meat, milk and egg
7. To produce breeds of animals that are resistant to parasites and diseases
8. Elimination of undesirable qualities in livestock
9. To produce animals with a high resistance to harsh environmental conditions
10. To produce animals that can provide products for a long period of time

TERMS USED IN ANIMAL BREEDING

- a) **Allele:** These are different forms of a gene at a particular locus e.g. Tt
- b) **Back Cross:** This is a cross between an animal offspring and one of the parents
- c) **A breed:** This is a large group of animals developed by the efforts of man having a common ancestry and possessing similar morphological, physiological and economic characteristics.
- d) **Breeding:** This is a technique involved in mating selected animals because of their desirable characteristics.
- e) **Chiasma:** This is a place of connection between two chromosomes seen during prophase I of meiosis.
- f) **A clone:** This is the population of organisms reproduced by a sexual reproduction from a one individual.
- g) **Crossing over:** This is the process of exchange of genetic information between two homologous chromosomes during meiosis.
- h) **Diploid:** It's an individual cell having 2 complete sets of chromosomes.
- i) **Epistasis:** This is where a gene masks the effect of another. The gene which masks is called **epistatic** gene. The masked gene is called a **hypostatic gene**.
- j) **Dominant gene:** Its one which can express itself phenotypically in both homozygous and heterozygous states e.g. a gene for tallness (TT) in a garden pea.
- k) **Inheritance:** It's a mechanism by which characteristics are passed on from parents to offsprings. If a character is 20% heritable. It means that the 20% is determined by the genes while the 80% depends on the environment.
- l) **A hybrid:** These are the offsprings resulting from a cross between two parents of different breed or stock.

- m) **Hybrid Vigor:** (heterosis) this is an unusual growth and healthiness (better performance) of organisms resulting from the cross between two different parents or better performance of a hybrid beyond that of parents
- n) **Inbreeding:** This is the mating of closely related animals
- o) **Locus:** This is the physical position of the gene on a chromosome
- p) **Linkage:** This is the tendency of genes located on the same chromosome to be inherited together in a successive generation
- q) **Out Breeding:** This is the mating of unrelated animals and is sometimes called crossing
- r) **Pedigree:** It's a chart showing the ancestry history of an individual
- s) **Progeny:** These are offsprings resulting from a mating
- t) **Recessive Gene:** A gene whose expression is only seen when in a homozygous state only.
- u) **Heterozygous:** It's a situation where an organism has two different alleles e.g. Tt
- v) **Homozygous:** It's a situation where an organism has two like alleles e.g. TT
- w) **Sex chromosomes:** These are chromosomes that determine the sex of organisms e.g. X and Y chromosomes in animals.

SELECTION

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

Types of selection

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

Natural Selection

This is one which always takes place through random mating and is 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

Methods used in artificial selection

- 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. It measures the likelihood of a trait being passed onto the next generation.
- A comparison of animals based on their own individual performance is called the **performance test**. It's used for traits of high heritability such as growth rate, fertility, mothering ability and feed conversion efficiency.

Pedigree Selection

- Here animals are selected basing on the performance of their ancestors. This method is used for traits that can't be measured in life e.g. quality of beef.
- This method is not highly recommended because it can be easily manipulated by leaders and farm managers.

Collateral relatives Selection

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

The transmission of traits (characteristics) with known importance between relatives can be measured using subtests.

The accuracy of sub testing depends on;

- Family size
- Heritability of a character i.e. the ability of a trait to be transmitted from one generation to another
- Intra family genetic relationships

Progeny Tests

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

It determines the value of an animal breed and performance reflected in the following

- Milk and butter fat production incase of dairy animals
- Carcass quality in beef animals
- Belly length in pigs

Advantages

- Weakly inherited traits are easily noted and decisions made
- Its easy to know practically the productive qualities for both the bull and the cow
- It's more suitable for traits which are exposed after slaughter such as the carcass quality.

Disadvantages

- It's a very expensive method of selection because it involves a lot of consideration before reaching the final judgment
- It needs a lot of time hence its time wasting

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

1. Adaptability of the animal to environmental conditions
2. Availability of the breed with in the environment
3. Availability of market for animal products for the animal being bred
4. Animal temperament should be low for easy handling
5. Animal resistance to pests and diseases should be high
6. Animal body conformity should confirm the breed and type
7. History of success of the breed in the environment
8. Feed conversion ratio of the breed i.e. should have a high ability of converting feeds into products like milk , meat and eggs
9. Growth rate of the breed
10. Availability of quality feeds for the animals
11. Fertility of the animal being considered
12. Productivity of the animal in terms of milk, meat and eggs

BREEDING METHODS

This refers to those methods which deal with how the breeds that have been selected as parents for the next generation are mated.

Breeding methods are classified into two broad groups namely:

- **Close breeding**
- **Out breeding/ cross breeding**

Close Breeding

This is the mating of related animals e.g. a daughter and a father, a son and a mother, brother and a sister, grandparents and grand offspring.

Close breeding involves **inbreeding** and **line 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 requires a lot of skill in making planned mating and rigid selection
- It leads to a reduction in survival chances of offsprings

- Leads to a reduction in the fertility of animals
- The offsprings got are usually of poor size

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.

Out breeding /out crossing

- This is the mating of unrelated animals. Sometimes such animals can be of the same breed but show no close relationship in the first four generations
- Out breeding results in the production of offsprings that are of better performance than the parents i.e. hybrid vigor.
- Crossing can be done between breeds, species and lines. Examples of crosses between species are;

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

This is a system whereby pure exotic sires are mate with the local animals to improve the characteristics of local animals e.g.

	Local female	x	100% pure sire/ male
F ₁	50% pure female	x	100% pure sire/ male
F ₂	75% pure female	x	100% pure sire/ male
F ₃	87% pure female	x	100% pure sire/ male
F ₄	93.7% pure female	x	100% pure male

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.

It measures the following;

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** which should be 24 months. 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 Number of services
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 and vice versa

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:** Incase of A.I, the cow should be inseminated towards the middle and late part of heat period as ovulation occurs 14 hours after the beginning of oestrus
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 were 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 hence high breeding efficiency
11. Females with abnormal discharges should examined and treated early enough
12. Know a complete breeding history of the animals before buying it into the farm

Mating animals

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

NATURAL SERVICE

This is where a male mates with the female 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 methods serving animals with silent heat

3. Conception rate is higher than artificial insemination
4. Its a quick method of service
5. Does not require special skills and training

Disadvantages

1. Reproductive 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. Wastes semen on one female that would otherwise serve 100 female
5. Breeding records are difficult to keep

ARTIFICIAL INSEMINATION

- It's a method of breeding in which semen is obtained from the male and introduced into the female reproductive tract by means of an instrument without direct contact between the males.

Advantages

- 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 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.

PROBLEMS OF ARTIFICIAL INSEMINATION (A.I)

- Silent heat
Some female animals do not show signs of heat hence it's very difficult to carry out A.I on such animals
- The method of communal grazing in Uganda does not easily allow A.I since poor bulls from different herds can mount animals.
- There is a danger of disease outbreak more especially if contaminated semen are used.

- Special skills are required to carry out A.I which may be lacking among the farmers
- Semen requires special equipment and conditions for storage which may not be easily available to the rural farmers.
- Poor roads in rural areas make the transportation of semen to such places difficult and expansive.

Methods of carrying out AI

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 in 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 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

REPRODUCTION IN FARM ANIMALS

- This is a process that determines the existence of any animal species and the profitability of that animal. Reproduction is responsible for the number of organisms / animals which will lead to increased animal products, employment and diversification of the economy.

Hormonal control of oestrus

- Oestrus is a period of high sexual desire in female farm animals. It is characterized by physiological and behavioural changes.

The female oestrus cycle

- The anterior pituitary gland secretes a hormone called follicle stimulating hormone (**F.S.H.**) which stimulates the growth of graffian follicles in the ovary
- It also stimulates the ovary to secrete a female sex hormone – **oestrogen**.
- **Oestrogen** causes the signs of heat in females and also stimulates the anterior pituitary glands to produce another hormone called **Lutenising hormone (LH)**.
Oestrogen makes the female animal more receptive to the male and increases sex urge in females.
- **Lutenising hormone** causes the rapture of mature follicles to release the ova in the process of ovulation.
- After ovulation, lutenising hormone stimulates the development of the yellow body (corpus luteum) from the remains of the follicles.
- The corpus luteum produces a hormone known as **progesterone** which stimulates the growth of the endometrium in preparation for implantation.
- Progesterone also inhibits the release of follicle stimulating hormone and lutenising hormone from the anterior pituitary gland.
- After a successive fertilization, the progesterone stimulates the growth and improves blood supply to the endomentrium for successful implantation.
- After implantation, the **corpus luteum** degenerates and the placenta becomes the new source of **progesterone**.

Multiple Ovulation and Embryo Transfer (MOET)

This is the ability to make female animal simultaneously produce several ova which are fertilize to form embryos

Objectives of MOET

1. Increases the number of offsprings in the life time of a female farm animal
2. Makes cows with good traits produce more offspring for breeding beyond they natural capacity

3. Can be used in preserving endangered species since multiplication of offspring is high
4. It is easier to transport embryos than a live animal
5. Enables offspring to acquire better immunity from surrogate mothers
6. Weak and sick females can participate in the breeding programme

Limitations

1. It is very expensive to carry out
2. It requires a lot of skill to be carried out
3. Success rate is very low

Important reproductive events in farm animals

Animal	Age at puberty in months	Length of heat in hours	Length of heat cycle in days	On set of heat after giving birth In days	Length of pregnancy in days
Cow	9-18	18-24	21	30-60	280
Ewe	7-8	24-48	21	17	147
Sow	5-6	48-72	21	7-56	110-118
Nanny / female goat	7-10	48-72	21	Next season	150
Dog	7-9	18-25 days	6 months	6 months	63
Horse	12-36	2-12 days	18-28	5-15	335
Rabbit	3-7				31
Buffalo	10-20	2-24	11-30	40-60	320
Camel	24-36	3-6 days	20-28	20	390

SIGNS OF HEAT IN CATTLE

- The vulva swells and becomes red in colour
 - The animal urinates frequently
 - An animal on heat mounts other animals and allows others also to mount on it.
 - There is a reduction in milk yield for lactating cows
 - The animal becomes restless i.e. moves up and down in search for the male
 - It sniffs the vagina of another cow
 - Licking and rubbing of each other has also been noted amongst animals on heat.
 - There is less feeding as more time is spent in walking
 - There is a slight rise in the body temperature
 - There is mucous discharge from the vagina
 - The animal will stand still to be mounted by a bull (standing heat)
- Note:** Production of bloody mucus from the vagina means that heat has been missed.

SIGNS OF HEAT IN SHEEP

- The female pays close attention to the male
- The female wags its tail more vigorously
- It stands still when mounted by the male but its hard for it to mount others.

Signs of heat in pigs

- There is an intense search for the male by the female
- The female pays little attention to food
- The vulva becomes congested and swollen
- The sow emits short grunts
- It stands still when pressure is applied to the back
- There is reddening of the vulva more especially in the white breeds
- The sow can mount others and also allows others to do so.

Infertility in farm animals

This is a temporary failure of an animal to reproduce which can be corrected

Sterility is a permanent and irreversible failure of an animal to reproduce

Causes of infertility in cattle

- **Inheritance** : some families of animals inherit low fertility from their parents
- **Twinning in cattle**: Although its rare in cattle, but when it happens, heifers born co-twin with males (free martins) can be sterile.
- **White heifer's disease**: This is infertility which is caused when the hymen is too strong and thus preventing natural mating or artificial service of the cow.
- **Cryptorchidism**: This is when the male animals is born with both testes retained in the abdominal cavity making it un able to produce sperms.
- **Retained corpus luteum**: this prevents the development of the eggs in the ovary by continuous production of progesterone (maintains pregnancy)
- **Cystic ovaries**: This is when follicles fail to rupture in order to release the ova causing a condition called **Nymphomania** (excessive desire for sex) and the cow is set on prolonged heat.
- **Nutritional deficiency** : Lack of vitamin A which is responsible for the formation and maintenance of membranes in the reproductive system lowers the fertility of cattle
- **Excessive conditioning (fattening) animals**: Heavy fat deposits on the ovary affects its functioning and cause low fertility / infertility.
- **Management** : Mating the animal too soon after calving , too early or late after on set of heat and failure to recognize heat signs will lead to infertility.
- Venereal diseases like brucellosis and Trichomoniasis can also cause low fertility in farm animals.
- Un favourable conditions in the reproductive tract of a female can cause infertility
- Use of defective sperms during service lowers animal fertility

SIGNS OF PREGANANCY

- Failure of the animals to have heat after 21 days.
- Increase in the size of the belly more especially on the right hand side.

- A higher concentration of progesterone in milk and plasma 21 – 24 days after conception
- The cervix opening is sealed and closed by a gelatinous and tough secretion
- Udder tissues develop and enlarge especially in heifers at the 6th month of pregnancy
- At the later stage, the signs of life in the foetus can be felt after applying slight pressure on the right hand side of the belly
- Laboratory analysis of blood shows a higher level of progesterone in it

Care for a pregnant cow

1. Provide clean water to the animal without any restriction
2. Carry out pregnancy diagnosis two month after service to confirm pregnancy
3. Dry off the animal at the 7th month of pregnancy to prepare it for the next lactation
4. After drying carry out dry cow therapy to control mastitis
5. Regularly deworm the animal to control internal parasites that may affect the unborn calf
6. Provide adequate feeds through out the period to cater for high nutrient demands
7. Steam up in the last 2 month of pregnancy to prepare the animal for lactation
8. Regularly control external parasites by spraying Atleast twice a week
9. Vaccinate the animal against killer diseases so as to protect the un born calf
10. Isolate the animal in the last 2 month from the general herd in put it in a nurse paddock
11. Provide a clean dry calving pen for the cow
12. During calving, assist the animal with difficulties
13. Milk the animal a little to reduce the udder pressure
14. If the after birth is retained, call in a vet for help

Steaming Up

This is the practice of giving extra nutritious feed to a pregnant cow two months prior to calving.

Importance of steaming up

1. It prevents nutritional disorders associated with milk secretion like milk fever
2. It allows the heifer to get used to the milking place when steamed in a milking parlour.
3. Replaces the nutrients that have been used in the development of the foetus
4. It prepares the cow/ heifer physiologically for the next lactation period.
5. Allows the animal to put on weight in preparation for calving
6. Makes a heifer get used to feeding on concentrates
7. Stimulates the development of mammary glands for milk production
8. Encourages the production of high quality colostrums for the calf at birth
9. For proper growth of the foetus

Signs of calving

1. The cow / heifer stays away from the general herd and lies down rather than standing.
2. The udder becomes extended as well as the teats
3. The cow becomes increasingly uneasy
4. Loss of appetite
5. The vulva becomes flabby (becomes soft and loose)
6. There is frequent urination
7. Repeated arching of the back and raising of the tail

Care of the cow at calving

1. The animal should be taken to the calving paddock or stall
2. The place where the cow is to calve should be clean and free from sharp objects
3. The animal should be let to deliver by itself for at least 1 hour
4. In case of failure, the veterinary officer should be called in for help.
5. Remove the after birth as soon as possible

Care after calving

1. The calf should be left with the mother so that it can clean it by licking.
2. Normally, the calf removes the mucus membrane from the nostrils by sneezing
3. In case the calf fails to breath, artificial respiration should be initiated by:
 - mouth to mouth respiration
 - handling the calf with the hind legs and lifting it up then releasing it gently
 - tickling the nostrils with a piece of straw to initiate sneezing
4. Give the cow warm water to drink so as to assist in the digestive system
5. Disinfect the naval cord of the calf with iodine to reduce infections
6. Milk the cow a little to release the pressure in the udder
7. Allow the calf to stay with the mother for 2 – 3 days to ensure that it takes colostrum.

Management of calves from birth to weaning

1. Clean the calf by removing the mucus membranes from the calf in case the mother fails
2. Disinfect the umbilical cord using dettol and tie it to stop tetanus infection
3. Incase the calf fails to breath normally, artificial respiration should be initiated
4. Leave the calf with the mother to ensure that it takes colostrum
5. Incase of artificial rearing, the calf should be trained to drink from the bucket with in two days after birth
6. Feed the calf on clean milk Atleast twice a day
7. Provide plenty of clean drinking water at all times of the day
8. Provide roughage to the calf at the age of about 2 weeks to facilitate rumen development
9. Towards weaning, introduce milk replacers to save milk for the market
10. Carry out identification of the calf Atleast 2 weeks after birth
11. Male calves that are not going to participate in the breeding programme should be castrated in the 4th week from birth
12. From extra teats fro female calve at the age of 2 weeks
13. Calves should be dehorned using the hot iron method in the second week
14. Deworm calves regularly to control internal worms that affect growth
15. Vaccinate calves against killer diseases to reduce mortality
16. Clean the pen regularly by removing dirty litter so as to reduce infections
17. Wean the calves at about 2 month after attaining the right weight

Major causes of calf mortality

1. Calf scours characterized by diarrhea with a foul smell
2. Calf pneumonia; this caused by poor housing conditions
3. Navel infection; this caused by bacterial attack of the navel creating septic conditions

4. Internal worm infections resulting into stunted growth and diarrhea
5. Calf coccidiosis characterized by faeces with foul smell. It is caused by bacteria
6. East Coast Fever which is transmitted by ticks and caused by protozoa. It is the leading cause of death in exotic calves. It is characterized by swollen lymph nodes of the parotid and diarrhea

Feeding calves

After calving, the calf should not be removed from the mother for the first 2 – 3 days in order to ensure colostrum intake.

Colostrum:

This is the milk produced by a cow for the first 3 – 4 days after calving. It is different from normal milk in the following ways:

- i) It contains very high antibody content about 5 times more than normal milk.
- ii) It has a high protein and vitamin content

Reasons for giving the calf colostrum

1. Contains antibodies which help the calf to fight disease
2. Removes sticky materials from the alimentary canal of the calf
3. It contains a lot of nutrients which are needed highly by the calf.

Methods of feeding / rearing the calves

1. Natural rearing/ Suckling: This includes single suckling (natural suckling), restricted suckling and foster mothering (multiple suckling)
2. Artificial rearing / bucket feeding

A. Single Suckling

This is where a calf is left to suckle from the mother without any restriction until it is weaned at about 4 – 6 months. This method is restricted to beef production and places where there is little market for milk.

Advantages of single suckling

1. It is the simplest and best way of producing large healthy calves
2. It is a suitable method for the beef farmers who have a little interest in milk but more in the beef of the animals.
3. It is Labour saving as compared to the artificial rearing
4. Diseases due to unhygienic conditions eg. Calf scours observed in bucket feeding are rare in this system.
5. Calves get milk at the normal body temperature which enhances proper digestion
6. This is the most suitable method of raising calves in places with low market for milk.
7. There is low mortality rate under this method of raising calves.

Disadvantages of single suckling

1. It is very difficult to keep feeding records in this system since the amount of milk taken by the calf is not known.
2. Injury to the teats is common as the calves suckle

B. Restricted suckling

The calves are allowed to suckle at certain periods of the day e.g. after the morning and evening /afternoon milking. Supplementary feeds can be easily introduced.

Advantages

1. Well grown calves can be realized with proper management
2. There is a tendency of getting a high milk yield from the dam as it is milked in the presence of the calf.
3. There is low mortality rate since calves get clean milk at the right temperatures
4. Less cases of mastitis are noted under this method
5. It saves both Labour and time.
6. Provision of supplementary feeds to calves would greatly improve their growth.

C. FOSTER MOTHERING

In this method, a substitute mother is used in providing milk to the calves. The calf is first allowed colostrum for three days then allocated to the foster mother.

Advantages

1. The dam will give more milk when the calves are left to suckle it.
2. The method gives good calves as compared with bucket feeding.
3. The method uses less Labour since supervision is little
4. The calves are able to get the milk at the normal body temperatures
5. There are fewer cases of calf scours
7. Case of mastitis in cows is rare
8. Milk from other dams can be saved for the market

Disadvantages

1. In case of an infectious disease, a farmer may lose a good number of calves.
2. Weak calves are denied a chance of suckling at most times by the strong aggressive calves.
3. Injury to teats caused by the calves is more common
4. It is very difficult to keep feeding records in this system.

ARTIFICIAL REARING (BUCKET FEEDING)

In this method, calves are removed from the dams three days after birth and reared by feeding them on milk or milk substitutes from a bucket.

Training the calf to drink from the bucket

1. The calf should be removed from the dam three days after birth to ensure colostrum intake.
2. Immediately After milking, the bucket with the milk should be presented to the calf for training.
3. Wash your hands with clean water and soap and dry iy using a clean hand towel
4. The trainer should dip the index and middle fingers in the milk and later place it in the calf's mouth to suckle.
5. The calf suckles the fingers as the trainer lowers the hand in the bucket containing milk.
6. As the mouth of the calf approaches the milk in the bucket containing milk, the fingers are removed slowly to allow the calf to drink milk.
7. The calf begins slowly to drink the milk and later learns
8. The calf should not be allowed to drink in large quantities at ago as the milk can choke it or enter the undeveloped rumen where it would ferment causing digestive disturbances.
9. Training can be repeated until the animal learns

Advantages of bucket feeding

1. It is easy to keep feeding records that can be referred to in any case since the amount of milk taken is known
2. Calves can be easily rationed according to their body needs
3. The farmer can introduce milk substitutes easily and therefore save milk for market.
4. The method permits early weaning which can save milk
5. The dam will give milk even when the calf dies
6. It encourages better management of the herd since the lactating cows are fed according to their production.

Disadvantages

1. The mortality rate in this system is high since in most cases calves are given less or dirty milk.
2. Calves are more prone to diseases due to unhygienic conditions associated with feeding the calves
3. The method requires more labour and attention which are expensive to the farmer.
4. Incase of an infectious disease, the farmer may lose a good number of calves.

DIARY CATTLE

These are cattle reared specifically for milk production.

Examples of exotic dairy breeds

Friesian, Ayrshire, Jersey, Guernsey and Kerry

Characteristics of a good dairy breed

- a) Should be a high milk yielder
- b) Should be resistant to pests and diseases
- c) Should have a high fertility
- d) Should be docile hence easy to be milked
- e) Should have a large udder
- f) Should be able calve easily

- g) Should have a big milk vein
- h) Should be able calve regularly for long time
- i) Should have a well suspended udder with four functional teats
- j) Should have a long lactation which ensures continuous milk production
- k) Should have strong hind legs for supporting a big udder

Factors to consider before establishing a dairy herd

1. **Capital**
This is needed in the construction of farm structures, purchase of land and the animals.
2. **Land**
There should be enough land to accommodate farm buildings and paddocks where animals can graze from
3. **Labour**
Both skilled and unskilled Labour is required for performing specialized work and manual Labour respectively.
4. **Reliable source of water:** Water is needed by the animals for drinking and also in other farm operations like cleaning and mixing of drugs.
5. There should be a ready market for milk and milk products which is easily accessible to reduce the costs incurred in looking for market.
6. **Pastures:** The place in consideration should have good pastures since the production of the animals is greatly affected by the quality of what they eat.
7. There must be reliable transport so that the farmer can easily move farm products to the market and bring back inputs.
8. The breed selected should fit the market demand and the Climatical conditions of the place in consideration.
9. Security is a very important factor for any business since insecurity results into loss of property and life
10. Government policy in place should be encouraging dairy farming through the provision of good breeds of cattle
11. Climate in the area should be good for dairy farming

Importance of Dairy farming

- a) Provides income to the farmer all year round since animals produce at any given period of the year
- b) They can provide dung used for making farm yard manure

- c) Can provide quality meat at the end of milk cycle after fattening
- d) Provide food to the farmer in form of milk
- e) Provide market for industrial products like meat
- f) They are good converters of inedible pastures into milk

Strength of the dairy industry in Uganda

- a) High demand for dairy products in Uganda
- b) Integrated farming practices can accommodate dairying
- c) Suitable climate in most areas of Uganda that favours animal production
- d) Availability of quality fresh pastures through out the year
- e) Improved infrastructure that make transportation of milk to the market easy
- f) Increased research and development in dairy farming
- g) Improved extension services in dairy farming
- h) Historical factors like a long history of cattle keeping among tribes in Uganda

Introducing exotic dairy cattle in an area

- a) Fence off the whole grazing area to keep out intruders and pests
- b) Partition the grazing land into paddocks for easy pasture management
- c) Remove all weeds and injurious objects from the grazing land
- d) Install water points in all paddocks for the animals
- e) Introduce bait animals to the paddock to control ticks 3-6 months before bringing in the exotic animals
- f) Spay or dip the bait animals regularly over the whole period
- g) Remove the bait animals after a specified period and introduce the exotic animals
- h) Regularly spray or dip the exotic animals to control external parasites

MANAGEMENT OF DAIRY CATTLE

1. **Regularity of care:** The operations done on these animals should be performed regularly without abrupt interruptions as those may affect the production of animals.
2. **Kindness to animals:** Rough handling of animals like beating reduces the productivity and can even cause injuries that may be expensive to treat.
3. **Exercise:** Animals need light exercise for good health but long distances of movement should be avoided as these require a lot of energy lowering animal production.
4. **Grooming :** Keeping hind quarters of animals off dung, loose hair and any dirt by brushing and dipping leads to production of high quality milk.
5. **Hoof trimming:** Overgrown hoofs should be trimmed to avoid difficulty in movement and lameness
6. **Dehorning:** Apart from introducing uniformity in the herd, handling of dehorned animals is easy and less risky

7. **Identification:** For record purposes, dairy animals should be identified by ear tagging notching, branding and tattooing.
8. Provision of adequate water; Animals need enough water since the biggest percentage of their body is water. Excessive loss of water from the body reduces milk produced.
9. **Breeding:** A farmer should aim at breeding of his herd to increase animal number and productivity by incorporating good breeds in the breeding programme.
10. **Proper feeding;** dairy animals should be given enough and highly nutritious feeds to improve and maintain a high level of production

MILK SCIENCE

This is the way how milk is harvested from a cow.

Structure of the udder

Milk secretion

1. Milk is secreted by the secretory cells called **alveoli secretory cells** in the udder under the influence of **prolactin** hormone from the anterior pituitary gland
2. Milk is made from the nutrients eaten by the animal like blood sugar, amino acids and fatty acids
3. Vitamins and minerals can be added to milk from blood
4. The manufactured milk can be stored in cavities of the alveoli and small ducts

Milk composition

Component	Percentage
Fat (Butter fat)	3.7
Sugar (Lactose)	4.8
Protein (Casein)	3.2

Mineral	0.7
Water	86.6
Solids	1.0

MILK LET DOWN

This is down flow of milk from the udder to the lowest part of the teat or it is process by which milk is removed from the alveoli and small duct systems to the lower part of the udder i.e. gland cistern and teat canal.

Process of milk let down

1. When the udder is stimulated, by **washing with warm water** or **suckling** by the calf, a message is sent to the **anterior** part of the brain through the **spinal cord**.
2. A hormone called **oxytocin** is released in the blood stream from the anterior pituitary gland.
3. When the hormone reaches the udders it causes contraction of muscles surrounding the **alveoli**
4. The squeezing action forces the milk into the **gland** and **teat cisterns**
5. The action of suckling / milking will bring the milk outside.

Ways of stimulating milk let down

1. Taking the cow to the milking parlour
2. Massaging the udder or washing it with warm water
3. Noise or rattling of milk buckets
4. Feeding of the on concentrates cow in the milking parlour
5. Approach of milking time
6. Presence of the calf at the milking place

Rules of good milking

1. Avoid exciting the animal before and during milking
2. Prepare and assemble the milking equipment before hand
3. Milking tie should never be interrupted
4. Milk at the same time every day
5. Prepare the cow for milk letdown by washing the udder with warm water
6. Use a strip cup to test for mastitis
7. Begin milking soon after preparing the cow to utilize short period of milk letdown

Milk hold up

This is the opposite of milk let down where the cow holds up milk due to the production of adrenaline. Adrenaline limits blood supply to the udder therefore preventing oxytocin from reaching the muscles surrounding the alveoli. Adrenaline is produced when:

1. Presence of strangers around the milking parlour like dogs and cats
2. Rough handling of the animal by beating
3. Too much noise at the milking parlour
4. Improper dressing and change of the milking person
5. Pain during the milking process caused by mastitis or injury to the teats.

Milking Procedure

1. Assemble all milking equipments like buckets, cans and milking strainer in the parlour to avoid time wastage.
2. The cow to be milked should be restrained while in the parlour by tying the hind legs with a milking rope.
4. Wash the udder with warm water and soap and dry it using a hand towel.
5. Milking salve should be smeared on the teats to reduce friction and injury to teats
6. A strip cup should be used to test milk from each teat for mastitis
7. Cows suspected of mastitis should be milked last and the milk poured away
8. Follow the right milking technique of applying pressure to the outside of the teat while holding it between the index finger and thumb.
9. Weigh and record milk from each cow immediately after milking
10. Milk should be filtered using a milking strainer before being put in the can for cooling to remove all dirt and any foreign material like hair.
11. All the milking equipment should be washed after milking and hanged upside down in the sun to dry.

Note: The milking should be done in seven minutes to utilize the time for milk let down.

GUIDELINES TO CLEAN MILK PRODUCTION

Milk is said to be clean if:

1. It is free from dirt and any other visible matter
2. Has normal composition
3. Has desirable flavour
4. Free from harmful bacteria

In order to produce clean milk, the following points are important:

1. Clean, healthy cows must be maintained free of brucellosis and tuberculosis
2. Regular grooming and washing of animal is important for removal of dirt and loose hair that can contaminate milk.
3. All the equipments used during milking must be kept sterile by washing and drying.
4. The milking parlour should be kept spotlessly clean to reduce contamination of milk by microbes
5. Personnel handling milk should be clean by having clean clothes, short hair and finger nails
6. Milk should always be covered when in containers to stop foreign material from entering it.
7. The person milking should not be suffering from any contagious disease e.g. Tuberculosis.
8. Cows suffering from mastitis should be milked last and the milk poured away to reduce the spread of the disease.
9. Regular tests for tuberculosis in the herd should be carried out regularly and animals found with tuberculosis should be cull
10. Before milking, the milker should wash his hands thoroughly and dry it with a hand towel to reduce contamination of the milk with dirt.

11. The milking parlour should be far away from poultry houses, piggeries, manure pits and latrines which may pollute the air and provide a breeding ground for flies.
12. The milking parlour should be built on a high ground to permit good drainage
13. Wild plants which have an odour that can taint milk should be removed from the milking place.
14. Milk should be cooled from the normal temperature of 37°C to 4°C to reduce bacteria multiplication.
15. Proper milking techniques should be followed to reduce injury to teats and contamination of the milk.

FACTOR AFFECTING THE QUALITY (COMPOSITION) AND QUANTITY (YIELD) OF MILK

1. Breed

Friesians produce large amounts of milk but of low butter fat while the indigenous produce less milk of high butter fat.

2. Age

Older cows produce more milk than the young. However, the butterfat of the milk produced by the older cows is lower than that of the young cows.

3. Period of lactation

Milk yield increases until the 7th week then it starts declining up to drying off.

4. Animal Health

Sick animals give less milk which may also contain antibodies and drugs more especially after treatment.

5. Animal Temperament

Quiet animals are the best milkers while nervous cows which kick about give less milk.

6. Water Supply

Water is needed for the health of the cow and also in the manufacture of milk since it is 87% water. Provision of enough water increases milk yield

7. Food eaten

Animals fed on concentrates will produce more milk which is of better quality than those feed on the ration full of roughages.

8. Season of the year

During the rainy season cows produce milk with high butter fat content. The quantity of milk is also high due to the abundant pastures and water.

9. Heat Period

Oestrus causes a slight decline in milk production which may be due to the reduced feed intake. The butterfat content of the milk can also fluctuate by 1% above / below normal.

10. **Temperature**

High temperatures reduce milk yield due to the increased evaporation of water of water from the animal's body.

11. **Management**

Proper feeding of animal and better handling during milking will increase the quality and quantity of milk produced. Rough handling leads to the increase of adrenalin and hence milk hold up.

12. **Milking Interval**

The greater the number of milking times, the higher the amount of milk produced. However, morning milking produces milk with higher butter fat content.

METHODS OF MILKING

There two main methods of milking

1. hand milking
2. machine milking

Hand milking

Advantages

1. Spread of mastitis is limited as compared to machine milking where mastitis is easily spread through the teat cups.
2. Hand milking has a low initial capital and therefore peasants can afford it.
3. It can not be limited by power therefore more applicable to rural areas with no power.
4. Injury to teats is not common as witnessed in machine milking due to faulty machines.

Disadvantages

1. It is very slow in operation and therefore can not cope with large herds.
2. Efficiency declines with increase in the time worked
3. It is difficult to produce clean milk under this method
4. It is difficult to have complete milking hence a farmer stands to lose.
5. It increases Labour costs as more people are employed.

MACHINE MILKING

Advantages of machine milking

1. It produces clean milk more easily than hand milking
2. Complete milking is easily achieved
3. There is reduction of Labour cost since one person can handle more than 1000 cows in a short time.
4. It is faster in its operation hence saving time for animals to graze.
5. Can easily cope up with a large piece of work without getting tired.

Disadvantages

1. Needs skilled Labour to operate the machine which may be difficult to attain.
2. Its limited by power supply and can not work in places with no power.
3. Faulty machines can cause injury to teats
4. Diseases like mastitis are easily spread since the animals share the same teat cups
5. The initial cost of buying and installing the machine is high for most of the farmers in Uganda
6. It is only economical on farms with very large numbers of lactating animals.

DISEASES ASSOCIATED WITH LACTATING COWS

1. Mastitis

This is an inflammation of the udder caused by a number of bacteria and the most common are: - Streptococci and staphylococci

TYPES OF MASTITIS

a) Acute Mastitis:

This is sudden in occurrence, marked with changes in the udder.

b) Chronic Mastitis:

This is slow in onset without obvious signs

Spread of Mastitis:

Can be spread through:-

- The milkers' hands,
- Teat cups of milking machines
- Udder towels

Signs of mastitis

1. Blood stains in milk
2. Flakes and clots in milk
3. Discoloured milk

Treatment of mastitis

Use intra mammary which are antibiotics injected into the affected teats.

Control of mastitis

- The milker must ensure that his hands are clean before milking
- A strip cup should be regularly used to test for mastitis
- Before milking, the udder should be washed with warm water and dried using a towel
- The farmer should pay more attention to sores on teats and prevent the plucking by using a milking salve
- The teat cups should be rinsed and disinfected immediately after milking each cow
- Animals suffering from mastitis should be treated promptly to stop the spread of the disease
- Infected animals should be milked last and the milk poured away.

Factors predisposing lactating animals to mastitis

- Stage of lactation; it is more common at the beginning of lactation

- Age of cattle; older animals are more prone to mastitis due an ageing immune system
- Level of milk yield; high milk yielders are more prone to mastitis than the low yielders
- Injury to teat and udder; this makes animal more prone to mastitis
- Unhygienic practices; milking infected animals with health ones increases the chance of mastitis spread

2. **Milk Fever (Parturent Paresis/ Hypocalcaemia)**

It affects cattle, sheep and occasionally goats

Causes

- Low blood calcium and phosphorus level with an increase in magnesium concentration. The normal ratio of calcium phosphorus should not be above or below 2:1.
- Too much calcium in the ration

Symptoms

- It occurs in high milk producing cows soon after calving
- Loss of appetite
- Constipation and general depression
- Muscular spasms (convulsions)
- Uncoordinated movement and inability to stand
- Nervousness is experienced by the animal
- Paralysis and turning of the head back

Prevention

- Feed the cow on a ration containing 0.5 – 0.7% calcium and 0.3 – 0.4% phosphorus
- Calcium shock treatment; feed the pregnant animal 10 – 14 days before calving on a calcium deficient ration to activate the animals calcium mobilizing mechanism.
- The pregnant animal should be fed on a ration with high vitamin D, six days before calving

Treatment

- The animal should be injected with calcium salts in form of calcium chloride, calcium lactate, and calcium gluconate.

Drying a cow

- The dry period is when a cow is left without giving milk immediately after lactation period. The dry period should be for at least 60 days.

Reasons for observing the dry period

- Allow the cow to restore udder tissues before getting back to lactation
- Allow the cow to replace the minerals depleted during lactation
- To give the foetus enough time to develop and also enough nutrients

- To maintain a high future milk yield in the next lactation
- Enable the cow to gain weight before delivering
- To ensure high quality colostrum at birth

Methods of drying a cow

- Incomplete milking :
This involves milking the cow half way its production capacity so that the remaining milk in the udder exerts pressure on the milk secreting cells which will stop secreting milk.
- Intermittent milking:
The cow is milked at intervals of days and later left completely after 5 days or more.
- Cessation Milking
This is when milking stopped once for all. It causes a lot of pain to the animal and can easily result into mastitis
- Dry cow therapy:
Here antibiotics are included in feeds which will control mastitis.

BEEF PRODUCTION

- The main objective of beef production is to produce healthy young stocks, fatten them and sell for slaughter as meat.

Breeds of beef cattle in East Africa

The main indigenous breeds are the boran and small short horned zebu

The exotic breeds are Hereford, Aberdeen Angus, charlols short horn and Galloway

Characteristics of a good beef breed

- Should have a high ability to mature early
- Should have a high ability to grow fast i.e. put on weight quickly
- Should have thick muscles to increase the quantity of beef produced (have a deep body)
- It should be able to breed regularly so as to increase the herd
- Should have a high ability of converting herbage into beef
- Should have a high resistance to pests and diseases common in the environment
- Should be able to survive long drought periods without losing excessive weight
- Should show a high degree of tolerance to heat

FACTORS LIMITING BEEF PRODUCTION IN UGANDA

1. Climate

Long droughts that are rampant in many places of Uganda have led to the scarcity of pastures and water hence decreasing animal productivity.

2. Poor Soils

Potential areas for beef production have poor soils which cannot support quality pastures for the animal.

3. **Diseases**

There are a number of diseases which attack livestock in Uganda. The most notable diseases are those transmitted by the vectors e.g. ticks and tsetse flies.

4. **Inadequate Extension Services**

Most farmers live in rural areas which are difficult to reach by the extension staff. This denies them an opportunity of acquiring knowledge about beef production.

5. **Conservation**

Most pastoral communities in East Africa look at cattle number rather than the quality hence low production from the large number of poor quality animals in terms of beef.

6. **Poor Markets**

Animal markets are poor and far from the production areas making transport to be difficult and expensive.

7. **Poor Animal Breeding**

Animals are mated while young and little time is spent on selecting the right breeds that are productive.

8. **Poor Management**

This can be reflected in the way records are kept and referred to if necessary. Most farmers do not keep update records and therefore animal production is difficult to judge.

9. **Inadequate land**

Most areas do not have enough grazing land due to competition between crops and animal production

FACTORS DETERMINING ANIMAL PRODUCTIVITY

Inheritance

This is the most important factor since as the animal received genes of high productivity, and then it can always have the potential. However, productivity is affected by environmental factors which include:

Management

This involves proper care for the animal and observation of signs of ill health

Feeding

Animals that are underfed will have low production and are more prone to diseases.

Diseases

Irrespective of the animal's potential of production diseases will always lower the animal's production.

Climate

Under this, the most important factors are temperature rainfall and humidity. High temperatures of the day increase evaporation of water from the animals body which reduces milk production in lactating animals.

Humidity

High humidity reduces evaporation of water from the animals body hence conserving it for other productive purposes like milk secretion.

Parasites

A part from transmitting pathogens, animal parasites can extract a lot of nutrients that are supposed to be used by the animals' body.

FACTORS TO CONSIDER BEFORE ESTABLISHING A BEEF HERD

Beef cattle may be raised under the farm herd system similar to having a dairy farm, or under the range / ranch cattle system. Under any of these systems, when establishing a beef herd there are a number of factors a farmer may need to consider.

Type of stock

Uniformity

Size of the herd

Health

Condition

Age and longevity

Reproductivity / fertility

Size of cattle

Adaptability

SYSTEMS OF BEEF PRODUCTION

There are a number of systems for beef production requiring different levels of skill and management and some of the systems serve different purposes

Breeding pure bred animals

This is a specialized undertaking and requires great skill and experience in breeding and selection of animals. The purpose is to provide pure breed bulls / replacement stock to other breeders.

Cow and calf systems

Calves are left with their dams until weaning and the cows are not milked . It requires plentiful pasture and little supplementary feeding except in severe dry seasons.

Growing Stockers

Stockers are mainly steers and heifers or thin animals. They are only kept for one year and are fed on pasture. Progressive farmers and ranchers can adequately manage the

undertaking. The purposes are to recondition steers and prepare them for fattening and heifers are conditioned for breeding.

Baby Beef Production

This is the production of tender meat from young stock. It involves breeding, rearing and fattening all done on the same farm.

At 4 – 6 months, all the calves are fed on concentrates.

The cows need full feeding in order to produce good calves.

The purpose is to finish the baby beef animals when they are 12 – 18 months old.

Fattening or growing

This involves the fattening of bought in animals after being fed on high energy feeds before selling

Aims of ranch management

1. To decrease the animal fluctuations in stocking numbers
2. To reduce the seasonal fluctuation in live weight of stock
3. To minimize reproductive performance towards the ideal of one calf per cow per year.
4. To minimize calf mortality and losses due to diseases
5. To maintain and improve breeding efficiency.

Factors that determine the size of the herd

- The type of pasture species; high nutritive value of pastures therefore high carrying capacity
- The productivity of the pasture species; high rate of dry matter or forage for grazing means high number of stock
- The type of stock e.g. hardy types which can survive well in drier conditions and scarce pasture can be kept in large numbers.
- Availability of reserve feeds which enable a large herd to be carried through dry periods when pasture is scarce.
- Economic considerations which are usually of a long term nature e.g. Whether the farmer requires cash immediately and the cost of keeping a large number of animals.
- Topography of the land where over – stocking in hilly areas could result into a serious case of soil erosion.
- Availability of water, sufficient and available at all times
- The presence of poisonous plants and trees that should render portions of the ranch useless.

BEEF CATTLE HEALTH

a) The Buildings

- The buildings should be big enough to avoid over crowding
- Should be well ventilated to avoid respiratory infections.

- The floor should be made of concrete which is easy to clean.
- All buildings should be kept clean and be washed out regularly control disease.
- The calf pens should have adequate bedding which should be changed regularly.
- Flies and lice can be controlled by spraying / dusting.

b) **The Grazing Area**

All shrubs and trees which hinder good growth of grass of which could Harbour tsetse flies should be removed.

c) **Water Troughs**

These should be cleaned out twice a week. Murrum should be put around them to avoid muddy conditions that would encourage foot rot.

d) **Breeding**

Cows should be serviced by healthy bulls to control diseases which can be transmitted by breeding or A.I should be used.

e) **Dispensary**

This is mainly for animal drugs that should be kept at hand although some should not be kept by qualified veterinary personnel.

Drugs equipment and material that need to be kept at hand in the ranch dispensary include:

- Healing oil which can be applied on wounds i.e. after castration and dehorning
- Cotton wool for dressing wounds
- Syringes for injecting drug in the bodies of animals
- Sulphur drugs such as sulphurdimidine which is a general drug for oral treatment or injection
- Stilboestrol used in injections on cows after calving, if the after birth is retained and has to be removed.
- Spirit for cleaning wounds and sterilization of instruments
- Terramycin spray for skin wounds
- Terramycin injectable solution which has a wide spectrum and can be used as a general drug against bacterial infections
- Chlorohexidine for disinfecting e.g. cow's udders

BUTCHERY

PROCEDURE OF SLAUGHTERING AN ANIMAL

a) **Before Slaughter**

The animals should at all times be handled humanly, rested and starved for 24 hours. This allows emptying of the gut and reduces spoilage and contamination of meat.

The resting also conserves stored body glycogen. After slaughter, glycogen is converted into lactic acid which has a preserving effect on the meat.

Inspection of the animal to check for any deformities, injuries, sex etc. is done at this stage.

- b) **Stunning**
This renders the animals senseless just before slaughter to reduce pain. Painless killing of animals is human and it is strongly recommended.
Stunning can be achieved either by use of a hammer gun or electric shock.
- c) **Slaughter**
The neck of the animal is cut and its allowed to bleed by hoisting it up. Adequate bleeding is essential to reduce meat spoilage. Skinning is then followed by **devisceration** which is the cutting open of the carcass to remove the internal organs.
- d) **Inspection**
This is the postmortem inspection for infection by tuberculosis, cysts etc.
The carcass has to be passed for public consumption. Condemned carcasses are buried / burnt.
- e) **Grading**
The products looked for are fat, degree of marbling, texture of meat and colour. A pale colour indicates poor quality

Factors leading to poor quality of meat from animals

1. Poor feeding of animals leading to disease and nutritional deficiencies
2. Poor meat preservation causing putrefaction
3. Diseases in animals that contaminate meat
4. Parasitic infection in animals causing cysts and eggs in meat
5. Age of animals i.e. very young and old animals produce poor quality
6. Poor animal breed that may produce poor quality meat
7. Chemical poisoning of meat by drugs administered shortly before slaughter
8. Harsh treatment of the animal before slaughter through beating

HIDES AND SKINS

Uses

- Used in the leather tanning industry for making shoes, belts, bags etc.
- Source of government revenue when the government taxes the products.
- Making musical equipments e.g. drums
- Decorations in cultural centers
- Used as clothing for traditional ceremonies.
- Sources of food in some communities e.g the karamajong

PREPARATION OF HIDES AND SKINS

Washing

This is done in running water to remove dung, dirt and blood

Draining

The hides and skins are hanged over poles to remove water and some blood after washing

Fleshing

This involves the removal of fat and meat from the hide using a knife or scrapper

Trimming

Here, odd flaps at the edge of the hide / skin are removal with an aim of making a regular in shape.

Flaying**drying****Curing Preserving**

This can be done by wet/dry salting or hanging them in frames using ropes to dry.

Tanning

This is the process of soaking hides and skins in chemicals such as tannic acid to soften and turn them into leather.

SOURCES OF DAMAGE TO HIDES AND SKINS**a) During the animals life:**

- i) Injuries / wounds that may be caused by rough handling and sharp objects such as barbed wire.
- ii) Some parasites like ticks can cause wounds which will eventually lower the quality of the hide or skin
- iii) Diseases like ringworms in cattle and goats can also damage their skins by causing open wounds
- iv) Bad branding more especially at the thigh and back will lower the quality of hides and skins
- v) Bad roping can cause calluses and wounds which will eventually lower the quality of hides and skins

b) During slaughter

- i) Incomplete bleeding which causes blood to remain in a hide or skin attracting microbes that may lead to putrefaction.
- ii) Dragging carcass on the floor or over sharp objects can damage the hide

c) During Flaying

- i) Delay in flaying after killing the animal will make the whole process more difficult hence prone to more mistakes during flaying
- ii) Use of pointed knives which may accidentally make holes in the hide/skin
- iii) Mixing the hide with dung or blood during the process of flaying the carcass attracting microbe that speed up putrefaction
- iv) Failure to wash and dry the skin immediately after flaying can encourage rapid decomposition hence reduction in quality.
- v) The fresh skin should not be folded with the hair inside as these create anaerobic conditions that speeds up putrefaction

- vi) An even removal of flesh from the hide causes distortion and damage of the pattern during flaying.

d)Drying of the skin on the ground can cause the following

- a) Causes flaking due to over drying since temperatures are high on the ground
- b) The fat on the skin/hide will melt and spread all over increasing chances of microbial attack.
- c) Rain drops can collect on the hide/skin which may easily encourage decomposition and hence loss in quality
- d) The outside of the hide/skin is hard while the inside is soft ie.
 - There is uneven drying
- e) There is putrefaction of the hide/skin more especially in spots which touch the ground

e) Damage during transportation

- i) Bad packing causes the hide/skin to rub against each other which may lead to damage
- ii) During transportation, rain can soak the hides/skin encouraging microbial action on them

f) Damage during storage

- i) Pests like the rodents and insects can attack the hides while in store more especially if stored in poor houses
- ii) Moisture from leaking stores can soak the hide/skins thus speeding up decomposition

SMALL RUMINANT PRODUCTION

Small ruminant are kept for milk, meat and skins.The main animals here are sheep and goats

Systems of small ruminant production

In East Africa, there are two main systems i.e. **tethering** and **open grazing** though zero grazing is also being practiced in the breeding stock.

Tethering

Here, sheep or goats are tethered using ropes of about 3m long that allows grazing in a limited area.

The animals can be given green supplements on top of tethering.

Open Grazing

The small ruminants are allowed to graze freely in uncultivated land or a garden with crop residues. This system is common in arid and semi arid areas with low human population.

Breeds of goats in Uganda

1. Small East African Goats:

This is the largest breed in Uganda making up to 42% of the total goat population.

Characteristics

- i) they are small in size
- ii) they mature early reaching a live weight of about 23 – 30kg
- iii) they reach sexual maturity at about 4 months

- iv) they have a fine hair coat with various colour
- v) Most of them are horned and they are mainly kept for meat.

2. **Mubende Goat**

This is found in areas of North and North West of Lake Victoria.

Characteristics

- i) It is a larger breed than the small East African goat.
- ii) The mature live weight ranges between 30 – 35 kg for males and 25 – 30kg for the females
- iii) It has straight and short hairs
- iv) it is predominantly black in colour though black and white are other colour.
- v) It has a long neck
- vi) The body conformation of the female is angular

3. **Kigezi**

This is usually found in the highlands of south Western Uganda

Characteristics

- i) it has a thicker hairy coat than the other two breeds
- ii) it has spaced long hair around the hind quarters
- iii) It is small, more compact with short legs.
- iv) They have black and grey hair coat
- v) At maturity, they can weigh between 25 – 30kg

SHEEP

The main breeds of sheep reared in Uganda are:

- i) Red Masai sheep
- ii) East African black head sheep
- iii) East African long tailed sheep

Advantages of rearing small ruminants

- They require small initial capital so poor people can easily start such a venture without much external financial assistance.
- Their reproduction turn over is high i.e. they have short gestation period and frequently deliver twins
- They can be easily managed by family Labour i.e. women and children
- They can be easily kept in mountainous and dry areas where cattle can't do well
- They can be combined with beef cattle utilizing the same land and farm facilities with less competition for food
- Indigenous breeds of these small ruminants are resistant to the number of diseases which affect cattle including East coast Fever.
- They have a big genetic variation giving room for improvement by selection
- There is ready market for their product more especially meat locally and for export.
- It is safer to keep small ruminants in areas with cattle rustlers since little interest is accorded to them.

- They can tolerate contamination of drinking water
- Can survive in a wide range of environmental temperatures
- Need limited land for grazing hence good for densely populated areas

Constraints to small ruminant production in Uganda

- Lack of sound breeding males and defective breeding practices
- Most farmers in Uganda have poor management skills
- The animals are attacked by internal parasites which are difficult to control
- The indigenous breeds are being threatened by neglect in preference for the highly productive exotic breeds
- Inadequate extension services amongst farmers limiting information about small ruminants
- The marketing system in Uganda is still poor where animal prices are determined by their size rather than actual weight.

POULTRY

These are birds that have been selected and domesticated by man, e.g. Domestic fowl, chicken, ducks, Turkey, geese, guineas fowl.

Diagram of a bird Volume 2 (109)

Importance of poultry

- Provide meat and eggs that are of high nutritive value to the human diet.
- They are a source of income when sold wholly or after selling the eggs.
- Some poultry add beauty to places and therefore are kept for environmental purposes e.g. pigeon. Parrots.
- They provide market for industrial products like feeds, drugs etc.
- They are used for various traditional functions and ceremonies.
- They give quick returns since they grow fast and reach productive stage early.
- Poultry products serve as raw materials for industries e.g. feathers are used in feeling pillows and sofa sets.
- Some poultry especially the chicken provide entertainment in the old game with which fighting practiced in Asia.

Advantages of Poultry over other enterprises

- Poultry does not require a lot of land as compared to cattle.
- It gives faster returns e.g. broilers mature in about 8 weeks and layers in 24 -21 weeks

- Provides many areas of specialization such as egg selling, old chick selling, broiler production etc.
- Chicken meat has low cholesterol and is highly nutritious.
- Poultry are highly prolific
- Poultry farming requires less initial capital

Challenges to poultry farming

- ✓ Inadequate capital needed for raising farm structures
- ✓ Lack of reliable source of poultry feeds
- ✓ Poor poultry housing in relation to environmental conditions
- ✓ Inadequate market for poultry products
- ✓ Inadequate skills in poultry management
- ✓ Poor breeds of poultry being kept
- ✓ Presence of pests and diseases that reduce bird production

Commercial poultry farming.

There are more than 300 breeds of chicken in the world. Commercial breeds can be divided into 3 groups.

1. Egg producers e.g. leg horn.

These have the following characteristics:-

- i. consume less feeds
- ii. produce more eggs
- iii. Produce white eggs mainly.
- iv. They do not go broody

2. Duo-purpose breeds

- i. They have characteristics
- ii. They produce brown eggs
- iii. Consume more feeds than egg producers
- iv. They are better meat producers than the white leghorn.

Example Rhode Island Red, New Hampshire.

3. Meat producers

Characteristics

- i. They have a low egg production capacity.
- ii. They show much broodiness than the other two.
- iii. Produce fast growing chicks
- iv. Have a high weight at maturity

Examples white Cornish, white Plymouth.

Characteristics of a good poultry house.

- It should be water proof to avoid damp conditions in the house that can easily invite pathogens.
- It should have proper ventilation to control respiratory infections.

- It should have a concrete floor which is easy to clean.
- Should be rodent and wild bird proof to avoid spread of diseases.
- Should be located within outer of the owner for security
- House should be well sheltered from direct sunshine and strong winds.
- The place where the house is to be constructed should be well drained.
- Should be an accessible place so that birds and eggs are easily removed when necessary and taken to the market.
- Should have enough laying boxes in case of layers to reduce rises specifically egg eating.
- Should have enough litter in relation to the bird population.

THE DIGESTIVE SYSTEM

1. Beak

Its composed of two horny parts i.e. the upper and lower beak. It picks food and passes it to the crop via the gullet.

2. Gullet

These acts as a passage for food from the mouth to the crop.

3. Crop

Stores food before proceeding to the glandular stomach. It also softens the food.

4. Glandular stomach.

This is an enlarged part just before the gizzard. Its wall contains many glands that secrete hydrochloric acid. Its also referred to as the first stomach.

5. Gizzard / muscular stomach

This is the real stomach of the chicken with very muscular walls. It grinds down the feeds to increase action by gastric juice enzyme. It contains grease which is taken up with food.

6. Small intestines.

The 1st part forms the duodenal loop where most of the digestion takes place. Its about 1.5 long in an adult chicken.

Digestion of fats, proteins and carbohydrates takes place here.

7. Caeca

This lies between the small and large intestines and it's also called the blind gut. Digestion of crude fibre takes place here due to the presence of bacteria.

8. Large intestines / colon.

Its relatively short of [about 1cm] and its were absorption of moisture takes place.

9. Vent / cloaca /Common sewer

The digestive, urinary, and productive trait empty here their products.

REPRODUCTIVE SYSTEM OF POULTRY

It comprises of the following: infundibulum, magnum, uterus, vagina, and isthmus.

Infundibulum

Its where fertilization takes place and also the formation of yolk sac takes place here.

The egg takes about $\frac{1}{4}$ an hour while here.

Magnum

This is where 45% of the albumen and the chalazae are formed. The egg takes about 3 hrs here.

Isthmus

This is where 10% of the egg white is added. The egg membranes are also formed here and the egg takes between $1\frac{1}{4}$ hr while here.

Uterus / shell gland

In this place the outer calcium shell is added to the egg and 45% of the albumen is also added.

The egg spends 18-22hrs while here.

Vagina

The egg is inverted in this place and vaginal fluid is secreted to reduce friction. The egg spends about one minute before moving to the cloaca.

ABNORMALITIES THAT OCCUR IN EGGS DURING FORMATION

Meat spots; a piece of tissue is torn off the ovary during ovulation. It comes down with the yolk resulting into a blood spot

Blood spots; a drop of blood is shed off the ovary during ovulation and comes along with the yolk resulting into blood spot.

Double yolk; two ova are shed at ago by the ovary later being enclosed in the same shell.

Shell less eggs; nutritional imbalances and defects in the shell gland cause failure of the shell to be deposited on the egg during formation

Thin shell; disease and nutritional imbalances lead to the laying of eggs with thin shells

Deformed eggs; eggs with abnormal shapes due to defects in the isthmus where the shape of the egg is determined

Eggs with rough surface; uneven deposition of the shell on the egg leads to the formation of such eggs

Soft shelled eggs; failure of shell gland to deposit a hard shell due to inadequate calcium in the diet or other defects

Small sized eggs; these may be due to poor feeding or hormonal imbalances

Abnormal smell of the yolk; it may be due to diseases of poor feeds eaten

Factors that determine the level of laying in birds

1. Level of feeding; giving adequate amount of feeds leads to high level of laying
2. Quality of feeds give; well balanced ration ensure high production of eggs
3. Health of birds; sick birds will lay less eggs of poor quality
4. Pest attack; pests cause stress in birds which lowers egg production
5. Temperature in poultry house; high temperature reduce feed and water intake which will lower egg production
6. Breed; high laying breed produce more eggs than the meat producers
7. Provision of enough water; giving less water affects body metabolism which may lower egg production
8. Ventilation; poor ventilation in the poultry causes stress which reduces egg production

SYSTEMS OF POULTRY PRODUCTION

They can be divided into three major groups i.e. extensive system, [free range], semi intensive [fold system and poultry run] and Intensive system [cage and deep litter system]

EXTENSIVE SYSTEM

In this system the birds are allowed to move freely over large area of grass land where they experience nearly natural or wild conditions.

The birds are not confined and during bad weather the birds can find shelter under natural covers like trees.

Advantages of free range

- Manure is spread all over the field or in any place where the birds eat from.
- The system is less expensive as compared to the deep litter and battery system since it requires little initial capital
- Birds will be able to get enough exercise which is good for their health as they move all over the place.
- Birds get almost all the nutrients required in their diet from the environment more especially vitamins.
- Vices are not common in this system as observed in deep litter system.

- It's a good system for the management of the breeding stock because it enables the birds to become hardy and strong
- Birds are able to get vitamin A and D from the environment.
- Requires less Labour which reduces operational costs hence increasing profits

Disadvantages

- Birds can easily be attacked by wild animals
- It's very difficult to collect the eggs since sometimes they are laid in bushes.
- The birds are more prone to parasitic attack from the environment.
- It's very difficult to keep feeding and production records under this system since birds cannot be easily monitored.
- Birds can easily get diseases from others of a different stock in the neighborhood.
- The production from these birds is low since they spend a lot of energy meant for production in movement.
- The system cannot easily support exotic birds that cannot tolerate harsh conditions.

POULTRY RUN

In this system birds are rotated in paddocks for a particular period of time during day. They are later confined at night.

Advantages

- It requires far less land than the free range system
- It's suitable for commercial egg production as compared to the free range since clean eggs are easily produced.
- It doesn't require expensive equipment therefore has a low initial capital.
- Birds are protected against thieves and wild animals.
- Spread of diseases from outside stocks is under control.

Disadvantages

- There is a high risk of disease as land becomes contaminated with parasites.
- The eggs may be dirty and therefore of low quality.
- Costs are high in terms of feeding, fencing, and housing.

FOLD SYSTEM

Here birds live most of the time in a simple design and partially roofed structure which is movable. The fold unit is systematically moved daily over an area and therefore must be of size and weight which is easily moved.

Advantages

- It's easy to inspect birds and isolate sick ones.
- Manure is distributed evenly on the farm
- Birds are well protected against predators and thieves.
- The system can be used for commercial egg production.

- It's a more ideal system of raising breeding stock since birds are exposed to natural conditions that makes them hardy.
- Production is higher than the free range since birds spend less energy.

Disadvantages

- It may not be used easily on a ground which is not flat because the unit may be difficult to move.
- The system can accommodate a few birds so as to allow easy movement of the unit.
- The unit is quite expensive therefore may not be affordable to peasants.
- Birds' performance is affected by change in the environment.

BATTERY / CAGE SYSTEM

This is an intensive system of poultry production where birds are kept in individual cages indoors of about 0.14m².

Feeders and drinkers are arranged at one side.

The wire making up the floor is slatted to allow eggs roll to one side for easy collection.

Food and water may be mechanically provided or using computerized system.

The floor beneath the cages is made of concrete slanting at one side for easy drainage and cleaning

Advantages of cage system

- Reduce chances of vices like cannibalism since birds are confined in individual cages.
- Feed and water contamination with droppings is reduced since water and feed troughs are located higher at one end.
- Clean eggs can be easily produced.
- It is easy to keep individual feeding and egg production records.
- Disease spread easily controlled since birds are confined.
- Bullying amongst birds is easily controlled since birds are under confinement.
- It requires less Labour for management of large flocks.
- A large number of birds can be kept on a small piece of land
- Bird production is high since they spend less energy in movement.
- Culling out of birds is to carry out since they are in close observation

Disadvantages

- It requires a high initial capital for installing cages and other equipment.
- Birds lack exercise which may affect their health
- It may require skilled Labour to run the system
- There is a danger of concentrating parasites in the poultry unit
- Birds may not get vitamins like D from the environment

DEEP LITTER SYSTEM

This is the most common and popular modern system of keeping commercial poultry. Birds are confined in a house on litter of about 20cm deep which has to absorb moisture from the droppings. Materials used for litter are coffee husks, wood shavings and chopped straw and rice husks.

Litter is turned frequently to mix it with droppings thoroughly and more materials added

Advantages

- It requires a small area of land to raise large number of birds.
- Its easy to control birds since they are confined in one place
- Birds are protected from predators and thieves.
- It gives comfort to both attendant and the birds since there is little wastage energy and time in feeding and collection of eggs.
- Manure obtained under this system is of high quality
- Records of stock and egg production are easy to keep under this system.
- It's easy to observe sick birds in the flock hence easy to cull out such birds.
- Spread of disease from the neighborhood is easily controlled since birds are confirmed.

Disadvantages

- The system encourages the build up of parasites in the litter unless turned, treated and replaced regularly.
- Its may require more Labour in terms of feeding and collection of eggs as compared to the free range system.
- Its difficult to control diseases incase of an outbreak within the deep litter house.
- Birds easily develop vices more especially due to over crowding within the deep litter house.
- It's difficult to keep individual production records.
- It's expensive to establish since money is needed for the construction of houses and purchase of the necessary equipment.
- Feeders, waterers, and nesting boxes are easily contaminated with litter and droppings which may lead to disease.
- Comfortable litter in poultry house may induce birds to go broody.

MANAGEMENT OF LAYERS IN A DEEP LITTER HOUSE

- Provide enough space in the house to control overcrowding that result into vices and disease outbreak
- Keep the litter dry by continuous raking and removal of wet spots to control dampness that encourages disease outbreak
- Provide enough perches for the birds and they should be well spaced
- Provide enough water and feed troughs to reduce overcrowding at the feeding and drinking place which increase feed and water contamination
- Provide clean drinking water at all times for proper bird health and high production
- Keep feeders and drinkers clean to reduce disease outbreaks due unhygienic conditions
- Provide adequate feeds to birds to maintain a high production level
- Collect the eggs regularly to reduce chances of breaking and occurrence of egg eating vice
- Supply grit in feeds to help birds to digest grains in the feeds provided
- Cull poor layers and diseased birds to reduce wastage of feeds and disease spread in poultry
- Vaccinate birds against killer diseases in time to reduce losses

- Spray birds with pesticides to control external parasites like mites and ticks that may lower production
- Avoid stressing factors that may affect bird production
- Repair equipment and house to reduce accidents
- Provide enough feeds to ensure high production from birds
- Isolate and treat sick birds to reduce disease spread in poultry
- Keep proper records for easy management of poultry
- Promptly dispose off dead birds by burying or burning to reduce disease spread and vices
- Maintain a disinfectant at the door for any body entering the poultry house to disinfect himself.

Causes of disease outbreak in poultry houses

- Introduction of sick birds in poultry house
- Mating between sick and health birds
- Contaminated vaccination equipment
- Contaminated water and feeds given to birds
- Poor disposal of dead birds
- Visitors and attendants who move from one farm to another
- Introduction of disease carriers to the poultry farm
- Direct contact between health and diseased birds
- Through infected eggs to chicks
- Vectors and wild birds that may come into contact with poultry
- Through contaminated drinkers and feeders
- Overcrowding in poultry house
- Poor ventilation in the house leading to respiratory infections

Control of disease outbreaks in poultry houses

- Regular vaccination of birds to control killer diseases
- Provision of coccidiostats in feeds to control coccidiosis
- Providing clean feeds and water
- Regular deworming to control internal parasites
- Provide enough high quality litter for to control respiratory infections
- Do not mix young and old birds since the former are more prone to disease
- Avoid unnecessary visitors in the poultry houses
- Provide a disinfectant at the door way
- Dead birds should properly disposed
- Isolate the sick birds to control disease spread
- Raise feeders and drinkers to reduce contamination by litter
- Regular cleaning of feeders and drinkers
- Buy birds from reliable sources that show less instance of disease
- Provide a balanced diet to control nutritional deficiency diseases
- Keep proper records on vaccinations
- Provide adequate feeds to birds

MAINTANANCE OF GOOD LITTER IN A POULTRY HOUSE

1. Periodic racking to remove feathers and spreading of droppings.

2. Removal of wet litter spots
3. Addition of agricultural lime at a rate of 4g/10m² to increase moisture absorption.
4. Removal of litter after the laying cycle.

Characteristics of good litter

- ✓ It should not cake up
- ✓ Should be cheap to the farmers to afford
- ✓ It should not be dusty
- ✓ Should not be poisonous to the birds
- ✓ Should be pest free
- ✓ Should not be bulky
- ✓ Should be a good moisture absorber
- ✓ Should not be too dry

Causes of wetness in litter

1. Drinking water that may splash over the litter as birds drink it
2. Moisture from chicken droppings
3. Rain water from leaking roof
4. Capillary water from underground in poorly drained places
5. Rain water through the windows during storms due to a short overhang of the poultry house
6. Flooding of the site
7. Overcrowding of birds that increases humidity
8. Accumulation of bird dropping
9. Poor ventilation that increases humidity

VICES IN POULTRY

A vice is a bad behavior practiced by birds e.g. egg eating feather pecking, cannibalism.

Causes of vices

1. Heredity: some line of birds show more vices like cannibalism than others.
2. overcrowding in the poultry houses can cause vices like cannibalism as birds become more close to each other
3. Introduction of new birds in a flock with unique characters of the body and size may cause cannibalism and feather pecking.
4. Exposure of wounds and smell of blood can cause cannibalism
5. Lack of enough laying boxes which causes breakage of eggs and exposes eggs to the birds can easily result into egg eating.
6. Improper feeding of the birds that encourages mineral deficiency can lead to cannibalism
7. Bright light in the poultry house can stimulate feather and toe pecking.
8. Insufficient drinking and eating place may also lead to pecking as birds struggle to get near to feeds and water.

9. Irritation of the skin through direct sunlight and lice infection can result into cannibalism and pecking.
10. Diseases like gumboro can easily cause cloaca pecking since the droppings usually stick in that area.
11. Introduction of birds that are moulting (shedding feathers) in a flock can easily encourage cannibalism due to exposure of bare skin to other birds.

Control of vices

1. The farmer should provide enough laying boxes that should be placed in easy to reach dark places.
2. The birds should be debeaked between 9 – 12 weeks in order to control egg eating.
3. Give the birds balanced feeds to reduce the laying of soft shelled eggs that easily break and cause egg eating.
4. Over crowding of the birds in the poultry house should be avoided by reducing the stocking rate.
5. Greens to be fed to the birds should be hanged over their heads so that birds are kept busy.
6. Sick birds and weak ones should be isolated from the general flock to control cannibalism.
7. The farmer should remove all the slow moulting birds from the general flock since such birds encourage cannibalism.
8. The breeding stock should be selected from the birds that do not show any sign of vices.
9. The nests should be enough and must be well positioned to reduce accidents that can cause breaking of the eggs resulting into egg eating.
10. There should be enough feeds and water troughs for the birds.
11. Birds with lice infection and gumboro disease should be culled.
12. The farmer should treat external parasites and prevent diseases in the flock through vaccination.

STRESS IN BIRDS;

This is the response of birds to a situation that troubles it

Causes of stress in birds;

1. Change of feeds i.e. from layers mash to growers mash
2. Change of feeding routine
3. Starving birds or inadequate feeding
4. Vaccination of birds leading to pain
5. Debeaking birds
6. High temperatures in the poultry house
7. Presence of parasites on the birds
8. Overcrowding in poultry house
9. Change of the environment around the birds i.e. moving birds to a new place
10. Noise of predators around the poultry house

Effects of stress

1. Reduce egg production in birds
2. Reduce bird appetite
3. May cause disease in birds
4. can reduce growth rate in young birds

Question; explain how a farmer may control stress in birds

Characteristics of a good laying bird:

	Good layer	Bad layer
Comb / wattle	They are large, red in colour and full	They are dry pale and scaly
Eyes	They are keen and sparkling	They are sunken and dull
Beak	It is short and colourless in most cases	Beak is long and yellow
Distance between the pelvic bone	3 -4 fingers can fit in the space	It narrow allowing between 1 -2 fingers
Skin	Its smooth and warm	Hard and dry
Cloaca / vent	It is oval, large and moist	It is round small and dry
Weight	Normal in accordance with breed	Too heavy because of too much fat and light due to illness
Belly	Normal size, soft and smooth	To big or too small

SELECTION OF HATCHABLE EGGS

1. Eggs selected should be fertilized therefore to ensure this a hen should stay with a cock for Atleast a week before laying at a ratio of 1 cock -12 hens.
2. Eggs of uniform size and shape should be selected for uniform distribution of heat during incubation.
3. Ensure that you select clean eggs.
4. Ensure that eggs selected have thick shells with no cracks to prevent breakage during turning and attack by microbes.
5. Eggs with abnormalities like meat and blood spots should not be selected.
6. Hands handling those eggs should be clean to avoid transmission of diseases.
7. Eggs should be from healthy birds [i.e. not from infected birds with coccidiosis, bacillary white diarrhea] which can easily be transmitted.

INCUBATION OF EGGS

This is the embryonic development of fertilized egg into a chick. The period Varies between different birds.

METHODS OF INCUBATION

There are two main methods of incubating eggs i.e.
Natural incubation

Artificial incubation

Natural incubation

This is where a broody hen seats on a clutch of eggs to provide conditions suitable for hatching to occur. Like humidity optimum temperature and adequate air supply.

In order to achieve the above conditions the hen does the following:-

1. It changes / turns her eggs using its beak so that all the sides of the egg get the same temperature.
2. The hen moves out quite often to allow the eggs cool down when the temperature rises and also to allow air circulate around the eggs.
3. The hen may sunbath and may get its chest wet so that when it goes back it can give the required humidity to the eggs.

Improvement of natural incubation

1. Make a good nest for the hen to guard against egg breaking.
2. Place the nest in a quiet corner at ground level for easy reach.
3. Provide plenty of clean water and enough food so that the hen does not spend much time looking for them
4. Protect the hen from parasites like mites and vermin by dusting the nest with doom or any other pesticides.
5. Dump the nest daily during drought to provide the required humidity.
6. Ensure that the hen is with the cock during and before laying time to ensure that the eggs laid are fertilized.
7. Remove oversized and undersized eggs or these with abnormalities before the hen starts incubating.

ARTIFICIAL INCUBATION

Under the modern machine called an incubator is used in the incubation of eggs.

Factors essential for incubation and proper hatching of eggs:

1. Temperature:

This has to be effectively controlled between 32.2°C – 37.2°C . Higher temperatures can cause death of embryos especially from the 19th day of incubation onwards.

Chicks hatched from high temperatures are smaller, lack alertness, have crooked toes, and necks. While low temperatures cause late and poor hatchability of eggs.

2. Humidity:

Chicken eggs require humidity of 60% during the 1st 18 days then 70% later. Low humidity causes excessive loss of moisture from eggs resulting into small and hard chicks. High humidity may result into large chicks and may delay hatching.

3. Air supply

21% oxygen is required in the incubator to allow adequate gas exchange between the embryo and out side

4. Turning of eggs.

Eggs should be turned for the first 18 days of incubation once every 3hrs. After 18 days there must be no turning. This prevents embryos from sticking to one side

5 Egg must not have any defects like cracks and double yolks since such may not hatch

6 Providing a good nesting place to avoid breakage of eggs

7 Ensuring that the place of incubation is free from pests and vermin

8 Providing a balanced diet for the broody hen in natural incubation

MANAGEMENT IN A HATCHERY

Hatchery sanitation is required to prevent infection in younger chicks. Diseases that can affect chicks in mismanagement hatcheries are new castle, Coccidiosis and other respiratory diseases. It's advisable to do the following:-

- i. Clean and fumigate the incubator / hatchery before setting in eggs.
- ii. Select clean eggs and fumigate them before incubation.
- iii. The hatchery should be located far away from any nearby poultry farm.
- iv. Have the incubator in a separate room from where you meet people.
- v. Do not allow visitors in the hatchery except the hatchery attendant.
- vi. Vaccinate chicks against new castle immediately after hatching.

SEXING OF CHICKS

Sexing is the grouping of chicks according to their sex.

Methods of sexing

1. Vent method

This is based on observation of the vent where the male chicks have three Protuberances (round part that sticks out) from the vent while the female have only two.

2. Chick – sexing machine.

The machine uses magnifying lenses to see through the vent of the chicks in order to determine their sex by observing the internal reproduction systems.

3. Auto-sexing method.

This takes advantage of the sex linked genes that depict the external traits of the offspring according to sex. E.g. the cross between a light Sussex hen [white] and a brown Rhode Island cock will produce brown females and white males in F₁ generation.

BROODING

It's the provision of warmth for growing chicks. A brooder is a structure where chicks are reared from day old up to 6 or 8 weeks of age.

Types of brooders.

1. Warm floor brooder
2. Infrared brooder.
3. Tier brooder

4. Hot-room brooding.
5. Cold-room brooding.

PREPARATION TO RECEIVE DAY OLD CHICKS

a. A week before arrival.

1. Clean and disinfect the house thoroughly
2. Install all necessary equipments after cleaning has been done e.g. water troughs, food, litter etc.
3. Prepare the disinfected bath at the entrance
4. Keep rats, mice and other pests out of the house by sealing off all entrances.
5. The brooder house should be made wild bird proof to reduce spread of diseases.
6. Reduce air flow into the house by placing curtains or mats in the windows.
7. The house should be locked to keep out any intruder.

24 hours before arrival of chicks.

1. Ensure that the temperatures are not below 28⁰C by providing a heat source.
2. Set up a brood guard around the heat source to protect chicks from the heat source.
3. Hung a thermometer in each brooder guard to monitor the temperatures of the heat source.
4. Check all bulbs to ensure that they are in good order to provide light intensity of about 4W/M² of floor area.
5. The bulbs should be hanged atleast 2m high so that they can give enough light over a wide area.
6. Put / lay down mold free litter to a minimum depth of 5cm and cover it with paper.
7. Put clean feeders around the brooder guard like spokes of a wheel.
8. Provide 2 – 3 drinkers for every hundred chicks depending on the type.
9. The bird population per brooder preferably shouldn't exceed 200 as management becomes very difficult.

Arrival of chicks up to 1st week.

1. Observe strict sanitation during the un loading of the chicks.
2. Chicks should be removed from boxes as promptly as possible to reduce mortality.
3. Put filled drinkers in space so that the chicks can start drinking water mixed with glucose.
4. Chicks should be given good quality starter mash ration.
5. The temperatures of the brooder should be maintained between 33-34⁰C.
6. Seal off all cavities around the brooder and corners to prevent chicks from crowding there.
7. Clean water should be provided continuously through out the day and night.
8. Provide grit [chick size] from 2nd day onwards to help in digestion.
9. Relative humidity in the brooder should range from 60 – 80%
10. Gradually expand the brooder area as the chicks grow.
11. Room temperatures should be maintained at 32⁰C within the 1st week.

12. Check whether there are chicks soiled with faeces on the vent area and remove such to prevent constipation.
13. Dead chicks should be removed as soon as the possible to control vices and spread diseases.
14. Paper covering the litter should be removed as soon as chicks learn to identify the feeds.

Second week

1. Room temperatures should be gradually reduced to about 30°C as chicks develop feathers.
2. Remove the brooder guards completely.
3. Start ventilation at a low rate when atmospheric conditions are favourable.
4. Put in additional feeders and locate them far away from the heat source.
5. If mortality is higher than normal, a specialist should be called in for advice.
6. The mats in the windows should be removed gradually and the farmer should be aware of dust storms, strong winds and cold.

3rd week

1. The room temperature should be lowered to about 28°C or even lower than this up to 25°C.
2. Changing to automatic feeders and drinkers must be done gradually.
3. Reduce light intensity to about 2.8W m² of floor area.
4. Provide plenty of clean fresh drinking water for the birds.
5. All birds with deformities / abnormalities should be culled at this level.
6. Ensure that there is no left over food in the troughs over night.

4th week

1. Light intensity should be reduced to 2W/M² of floor area and should be followed strictly.
2. Weight of the birds should be taken in order to determine the growth rate.
3. Make a change from starter mash to growers mash gradually.
4. Adopt an established feeding programme and stick to it for economic purposes.
5. Should cannibalism occur, try to stop it by debeaking the birds.

5 – 10 weeks

1. The stocking rate of the poultry house should be 9 – 12 birds per metre squared of floor space depending on the housing system.
2. Switch over from chick size grit to grower size.
3. Select the breeder birds for meat production.
4. Ensure that the feeding space per bird is 10cm and the drinking space is 2cm per bird.
5. Debeaking should be done for birds kept in cages.
6. Compare the bird's weight record with standard body weight for the same age.

Qualities of a good breeding stock

1. Should be free from defects like lameness etc.
2. It should be of good colour.
3. It should be able to mature sexually early.
4. It should have a high laying rate.

5. It should not have pauses in egg laying.
6. It should be non broodiness.
7. It should produce eggs with no abnormalities.
8. It should be able to lay eggs for along period of time.
9. Should be able to produce good quality chicks.
10. Should have a good body size incase broilers
11. Should have a rapid growth rate.
12. Eggs produced should have high hatchability.
13. It should produce chicks with low mortality
14. It should be early feathering to reduce the chances of cannibalism.

Factors to consider when planning a vaccination programme for birds.

1. Age of the bird
Some vaccines are administered to day old chicks e.g. new cattle diseases or After a week.
2. Genetic resistance of the flock.
If a flock is resistant to a certain disease naturally then vaccination may not be needed.
3. Health status of the bird.
Vaccines should be administered to healthy birds not sick ones since it may not serve the purpose.
4. Feeding and management practices followed.
5. Methods of administration of the vaccine.
6. Methods of storage and available facilities.

Precautions to take during vaccination of birds.

1. Follow the manufacturer's instructions regarding the use of vaccines.
2. Avoid exposing vaccines to high temperatures during transit.
3. Store vaccines in a deep freezer before use.
4. Do not vaccinate birds when they are under stress.
5. Do not mix two vaccines together while administering
6. Use distilled water incase you want to reconstitute the vaccine.
7. Anti stress medicine like antibiotics and vitamins should be given to birds before vaccination.
8. All birds in the poultry house should be vaccinated at one time.
9. Vaccination should be carried out in the cool hours of the day.
10. The equipment to be used in the vaccination process should be disinfected.

PIG PRODUCTION

Terms used

1. **Sow;** This is a female pig, which has already farrowed

2. **Boar;** It's a male mature pig.
3. **Gilt;** A young female pig, which has not yet farrowed.
4. **Piglet.;** The young of a pig [newly born pigs]
5. **Farrowing;** The act of giving birth in pigs.
6. **Runt;** The last born among piglets.
7. **Farrowing pen;** This is a special place where pigs farrow from
8. **Pigsty;** This is a house where pigs stay
9. **Pork;** Fresh meat from pigs.
11. **Bacon;** This is meat taken from sides and back of the pig and cured in the factory.

SYSTEMS OF PIG REARING

Intensive system; this is where the pigs are confined in houses through out their life

Semi-intensive system; this is where the pigs are confined in houses at most period of the day and allowed out for a short time

Extensive system; pigs are allowed roam the place in search for water and feeds

Question; *explain the merits and demerits of each system*

Advantages of rearing pigs.

1. Pigs require a small area since they can be confined under the intensive system of management and do not require a large area of grazing as ruminants do.
2. Little initial capital is required as compared to dairying and fish farming.
3. They consume most of the food remains reducing wastage of feeds on the farm and lowering feed costs.
4. Pigs grow very fast which enables the farmer to get income in a short time when sold.
5. It is adapted to specialized and diversified farming system
6. They produce high quality manure which can be used in the gardens.
7. Pig rearing creates extra employment for the family and the population especially in places with established pig industries.
8. Pigs produce hard fat that can be used in the manufacture of soap.
9. Pork is easily marketable
10. Pigs are highly prolific which increases profits faster

Factors to consider before starting a pig enterprise.

1. **Type of breed.**

The breed chosen should be the one needed in the market and one adopted with the environment

2. **Food supply**

A constant supply of feeds is necessary since pigs quickly respond to inadequate feeding.

3. **Capital**

This is needed for purchasing the breeding stock, constructing pig houses, buying feeds etc.

4. **Labour.**

Skilled Labour is required for proper carrying out of management practices like feeding pregnancy diagnosis and gilt, removing chick.

5. **Housing**

Good housing improves pig production hence it should be put into consideration.

6. **Transport facilities**

There must be reliable transport in the area from breeding centres to the market

7. **Market.**

There must be ready market for the animals and their product to reduce losses.

8. **Economy of production**

Large scale production requires high initial capital therefore a farmer must be ready to meet it.

9. **Pest and diseases.**

The history of pests and diseases in a particular place should be considered since some diseases like swine fever can cause a lot of losses.

Problems facing the pig industry.

1. **Diseases**

A serious disease like swine fever / hog cholera has caused serious losses to farmers in the pig industry.

2. **Pigs are non ruminant hence compete with man for the little food available.**

3. **Social beliefs.**

A number of societies in Uganda look down at a pig as a an unclean animal therefore they cannot rear or eat products from the animal.

4. **Pigs have a vice of uprooting plants and destroying farm structures which makes their rearing expensive.**

5. **Pig production requires a special kind of fence which may be expensive for most farmers.**

6. Inadequate organized market.

Most of the pork / pig butchers are located in restricted places which makes marketing difficult.

7. Poor breeds of pigs.

Most of the breeds being kept are of poor quality and hence they are of low production.

8. Poor management

Most of the farmers have little knowledge about pig management.

This reduces growth rates hence a low level of production.

PIG BREEDS IN UGANDA

1. Large black
2. Large white / Yorkshire
3. Land race
4. Saddle back.

SELECTION OF BREEDING PIGS.

1. Boars

- It should be vigorous and healthy
- It should have well developed feet
- It should be free from defects that can be transmitted to off springs.
- Should have a long, deep and strong body.
- It should be easy to handle i.e. should have good temperament.
- They should be able to weigh about 100kg at six months of age.
- The appearance and condition of the pig /boar should confirm the breed type.
- It should be able to mature sexually early.
- It should be able to produce large quantities of viable sperm

Qualities of good gilt

- Should have well developed feet to enable her feed the litter even when standing.
- It should have good mothering quality i.e. a low temperament.
- It should be healthy and having a vigorous build
- The appearance should be in conformity with the breed
- It should have atleast 12 functional teats to enable her raise a large number of litter.
- It should be able to farrow without any problem
- Should have a high ability to utilize feeds efficiently.
- Should be able to produce atleast 8 piglets per farrow
- Should produce piglets with a high growth rate.

CARE FOR A PREGNANT SOW

- Feeding

The saw of gilt should be given a feeds/ sow and weaner meal which is 2% of its weight per day.

- Individual feeding troughs should be encouraged to reduce competition between the pregnant animals.
- In the 1st month of pregnancy give about 2.4 – 3.5 kg of sow and weaner meal per day.
- Do not over feed the animal during pregnancy to avoid over feeding and stocking of the udder which causes mastitis.
- During the second and 3rd month sow and weaner feeds should be reduced to about 1.5 per saw per day.
- Bulky feeds like sweet potatoes and cassava should be given to make a balanced diet and improve digestion.
- Clean fresh water must be made available at all times which can be mixed with feeds or given after eating.
- The pregnant animal should be dewormed before farrowing to control internal worms e.g. tape worm.
- Minerals and vitamins should be given in correct amounts e.g some vitamins which are important in embryo development.
- A sow should be taken in a clean farrowing pen two weeks to farrowing.
- Supply 10-15kgs of dry grass to the farrowing pen which can be used by a pregnant animal uses a nest.
- Administer an iron injection to the pregnant animal to control anemia in the piglets about to be born.
- The gilt also should be washed especially the udder with clean water and soap a few minutes to farrowing to remove dirt and worm eggs.

SIGNS OF FARROWING:

- i. The sow/ gilt becomes restless
- ii. Presence of milk with in teats 12 – 24 hrs before farrowing
- iii. Enlarged teats of the gilt or sow.
- iv. The vulva becomes swollen and enlarged.
- v. Muscles on either side of the tail slacken
- vi. The sow prepares a nest from the dry grass.
- vii. Arching of the sow's back.

Preparation for farrowing

- a. Clean and disinfect the farrowing pen
- b. Wash and disinfect the pregnant animal
- c. Treat the animal against internal parasites
- d. Move the animal to the farrowing pen
- e. Secure the animals feed a day before farrowing
- f. Provide heat in the farrowing creep area
- g. Provide clean beddings

MANAGEMENT OF PIGLETS FROM BIRTH TO WEANING

1. Feeding
 - i. Piglets should be left with the mother to ensure that they take colostrum which is important to their bodies.
 - ii. They should be provided with feeds rich in proteins and carbohydrates [creep feed] in a special place only accessible by piglets [creep]

iii. Clean water should be provided to the piglets at all times.

2. Control of piglets anaemia.

Piglets should be given an iron injection or anthill soil rich in iron.

3. Identification

Two main methods are used in the identification i.e. ear notching and ear tattooing.

4. Teeth clipping/ removal of cheek teeth.

The sharp canines should be removed since they become dangerous at a later stage to the managers

5. Deworming

The piglets are more prone to internal worms like liver-fluke, tape worms and round worms. They should be dewormed early to ensure fast growth.

6. Castration

The male piglets that are not going to participate in breeding should be castrated at about 2 weeks of age

7. Vaccination

The piglets can be vaccinated against killer diseases like foot and mouth etc.

8. Weaning

The piglets are weaned at about six weeks after delivery and thereafter they should be fed normally on concentrate feeds

Management of gilts from weaning to farrowing

- Feed the gilt on Atleast 3kg of sow and weaner meal every day
- Provide clean water without any restriction
- Vaccinate the gilts against killer disease regularly
- Control external parasites like lice by spraying or washing using pesticides
- Sick gilts should be treated immediately to avoid loss
- The gilt should be mated at about 12 month after attaining 45 kg.
- Flush the animal 3-4 weeks before mating to increase rate of ovulation and successful fertilization
- Keep the pen clean to reduce disease outbreaks by regular washing
- Once ready, the gilt should be taken to the boar and left there for 12 hours
- Observe the gilt to ensure that it has conceived if not, take it back for service
- Steaming up should be done 1 month to farrowing
- Wash the gilt prior to calving to remove worm eggs from the teats

METHODS OF FEEDING PIGS.

Ad-lib

This is where pigs are allowed to eat as much as they want since feeds are

always available.

Semi adlib feeding

This involves feeding pigs 3 times a day by hand as much as each would eat in 20 – 30 minutes

Restricted feeding

Pigs are fed once or twice a day.

SYSTEMS OF FEEDING PIGS.

1. Automatic feeders

This is where feeds are provided to pigs in their stores by a computerized system

2. Trough feeding

Here feeds are given in troughs.

3. On floor feeding

Here feeds are poured on the floor more especially the dry feeds for pigs to eat.

ADVANTAGES OF FEEDING PASTURES TO PIGS.

1. Improve functioning of the digestive system
2. They are the cheapest source of animal feeds
3. They are a good source of minerals and vitamins for grazing animals
4. They easily satisfy the animal's appetite since they are abundant and taken in large quantities.
5. They protect and restore fertility in the soil.

ANIMAL NUTRITION.

Nutrition is a process by which living things receive food necessary for them to grow and be healthy.

A nutrient is a substance that is needed to keep a living thing alive and help it Grow

Terms used in animal nutrition.

Ration. This is the amount of food needed by an animal in a day.

Balanced ration This is a ration that contains nutrients needed for both maintenance and production

Maintenance ration This is the amount of food required by an animal to keep it healthy and alive in good health without gain or loss of weight.

Production ration. This is the food required by an animal over and above maintenance ration for additional output / performance e.g. milk production, egg production, fattening, growth etc.

Digestibility. This is the measure of that proportion of food eaten by an animal less that lost through faeces or the proportion of food absorbed in the body less that lost in faeces.

Digestible crude protein This is the measure of N₂ in the feed consumed and retained in the body of the animal after subtracting that lost through faeces, urine and gasses.

Starch equivalent. This is the amount of pure starch which has the same energy as a 100 kg of a particular feed

Total digestible nutrient. This is the sum total of all digestible nutrients in a feed.

Crude protein The rough measure of the amounts of protein in a feed expressed as a percentage of dry matter or this is the product obtained between total nitrogen in a feed and a factor of 6.25 i.e. total nitrogen x 6.25

Roughage. These are feeds that have high fibre content, low energy and protein usually constituting the main diet for ruminants e.g. green fodder, hay, e.t.c.

Concentrates These are feeds with a high protein and carbohydrates, low fibre, and are highly digestible e.g. ground nut cake, fish meal, molasses, cotton seed cake etc.

Protein supplements. These are feeds with a high protein content of over 30% e.g. fish meal cotton seed cake, Soya beans, etc.

Basal feed. These are feed with a high content of carbohydrates that can provide energy e.g. maize bran, rice bran, mainly cereals and wheat bran.

Bulk feeds. These are feeds that contain a limited amount of nutrients in a given weight and usually have a high fibre content e.g. forages / roughages.

Minerals. These are food stuffs found in small amounts in all feed stuffs consumed by the animals and are able to supply irons like calcium, phosphorous, sodium etc.

Examples of animal mineral sources are oyster shells, bone meal, and mineral lick.

Biological efficiency; it is the measure of the amount of out put per feed eaten by an animal. In lactating animals it can be amount of milk give per kg dairy meal consumed

Economic efficiency; it is the measure of the cost of animal products to that of inputs like feeds e.g.

Output X price

Feeds taken X price

Gross energy efficiency; energy output of an animal per energy intake i.e.

Energy output in products

Energy taken in feeds

Net energy efficiency; the measure of real energy output in products fro feeds eaten i.e.

Energy out put in product

Energy taken in – maintenance energy cost

Determining feed digestibility

In practice, digestibility is determined for dry matter, proteins, fats and crude fibre. Digestibility is just a proportional of food absorbed in the body less faecal nutrient. Therefore

Digestibility =
$$\frac{\text{Nutrient intake (NI)} - \text{Nutrient in faeces (NF)}}{\text{Nutrient Intake (NI)}} \times 100\%$$

=
$$\frac{\text{NI} - \text{NF}}{\text{NI}} \times 100\%$$

Example

A fattening animal was given a feed containing 500g of proteins and later 150g of the same protein was found in the faeces.

Calculate the digestibility of such a feed.

$$\text{Digestibility} = \frac{\text{NI} - \text{NF}}{\text{NI}} \times 100$$

$$= \frac{500 - 150}{500} \times 100$$

$$= \frac{350}{500} \times 100$$

$$= 70\%$$

Methods of determining feed digestibility

1. Conventional total collection

This involves giving an animal a constant daily feed intake and recording amount taken and faecal output.

2. Indicator method

In this method an inert substance is mixed with feeds and used as an indicator in determining the digestibility of a particular feed.

Characteristics of a good indicator

- It should be harmless to the animal
- It should not be digested by the animal
- It should be harmless to rumen microbes
- It should readily mix with feeds.
- It should be able to pass through the alimentary canal uniformly.

The indicators are of two types i.e. external indicators which are not part of the feed e.g. chromic oxide and internal indicators which are part of the feed e.g. chromogens, ash etc.

Factors affecting feed digestibility

1. Difference between species.

Ruminants are more efficient in utilizing feeds than non ruminants due to their long digestive system hence will digest most of the feed taken.

2. Age of the animal

Very old and young animals have insufficient digestive systems hence show low digestibility of feeds.

3. Individual differences

Animals of the same species have shown differences in their digestibility of the same kind of feed as much as 25%.

4. Exercise

A light exercise improves digestibility of a feed while heavy exercises depress it.

5. Addition of molasses to animal feeds

These will improve digestibility of feeds since they contain highly digestible carbohydrates.

6. Type of feed.

Proteins and carbohydrates are more digestible as compared to other types of feeds.

7. Associated effect of other feeds.

Increased intake of proteins will improve digestibility of fibre.

8. Time

The whole process of digestion needs time for it to be complete hence its important to allow enough time for digestion to take place.

9. Presence of anti metabolites.

Some feeds may contain anti metabolites e.g. trypsin inhibitor in raw Soya beans.

10. Health of the animal

Sick animals will have a low digestibility of feeds due to the abnormal physiology.

RATION FORMULATION

In making any ration, the following considerations should be made:-

i. The cost of the feed

Expensive feed stuff should always be limited in this ration since they may be uneconomical.

ii. Availability of feeds.

The feeds that make up the ration should be readily available in the environment to reduce transport costs.

iii. The nutrient requirements of animals in consideration.

If the animals under consideration need a lot of proteins the ration should answer their nutrient requirements.

iv. The palatability of the feeds used.

Feeds that are used in ration formulation must be highly palatable for animals to gain from it.

v. The skills of a farmer.

The person formulating the ration should be highly skilled to produce what is required by the animal.

vi. The nature of the final product.

The ration made should be in a state that can be utilized by the animal.

vii. The age of the animals.

Animals at different ages require rations in different forms in a particular nutrient.

FORMULATIONS:

Proteins are the main criterion in determining the proportions of the ration components since they are more expensive and can't be replaced as carbohydrates.

The main method used in the person's square.

Examples

1. A dairy farmer wants to formulate a ration containing 16% of crude protein. Using maize bran which is 8% crude protein and fish meal which is 40% crude protein into 5 bags each weighing 100kgs. Show the quantity of maize bran and fish meal used.

Maize bran 8% C.P

Fish meal 40% C.P

Amount of maize bran needed

$$\text{Maize bran } \frac{24}{32} \times 500$$

Amount of fish meal needed in 500kg

$$\text{Fish meal } \frac{08}{32} \times 500\text{kgs} = 125\text{kgs}$$

2. A poultry farmer wants to make a ration of 18% crude protein using maize bran which is 15% crude protein, rice bran which is 20% crude protein, cotton seed cake 30% crude protein and ground nut cake 38% to make 500kgs of Feed. Maize bran and rice bran are mixed in a ratio of **2:1** and ground nut cake mixed with cotton seed cake in a ratio of **2:1**

1. Basal feeds

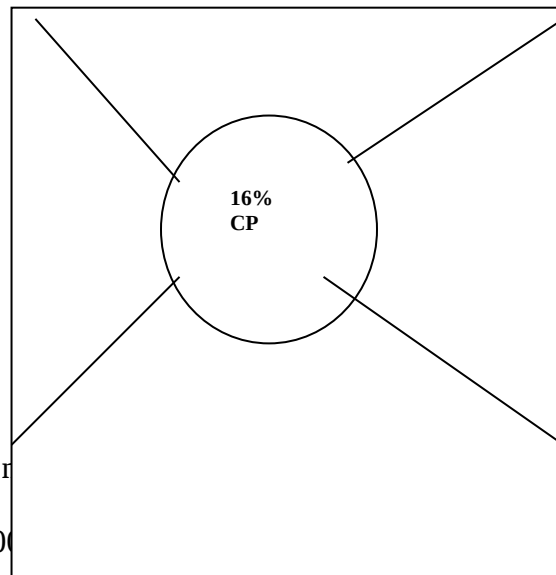
Maize bran	15% C.P	x	2	=	30
Rice bran	20% C.P	x	1	=	20
TOTAL			3		5

$$\frac{50}{3} = 16.6\%$$

2. Protein supplements

Ground nut. Seed cake	30%	2	60
Cotton seed cake	38%	1	38
TOTAL		3	98

$$\frac{98}{3} = 32.6\%$$



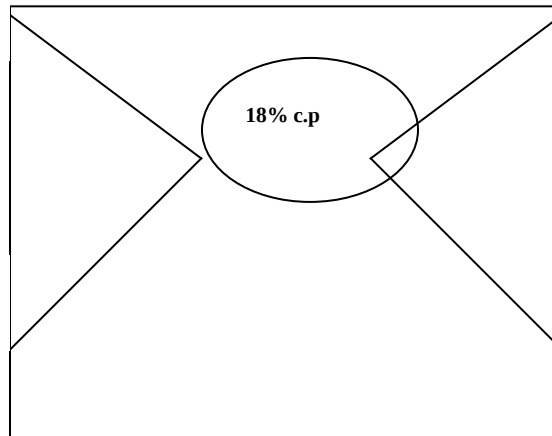
24 parts of maize bran

08 parts of fish meal

3

Basal feeds
16.6%

Protein supplement
32.6%



14.6 parts of Basal feeds

1.4 parts of protein
supplement

16.0

$$\text{Basal feeds needed} = \frac{14.6}{16} \times 500 \text{ kg} = 456.25\text{kgs}$$

$$\text{Protein supplement} = \frac{1.4}{16} \times 500 \text{ kg} = 43.75\text{kgs}$$

Amount of maize bran needed
 $2/3 \times 456.25 = 304.2 \text{ Kg}$

Amount of rice bran needed
 $456.25 - 304.2 = 152.05$

Amount of G.nut cake needed
 $2/3 \times 43.75 = 29.2 \text{ Kg}$

Amount of Cotton seed cake needed
 $43.75 - 29.2 = 14.55 \text{ Kg}$

3. Using the following data.

Maize bran 15% C.P

Elephant grass 12% C.P

Soya bean meal 38% C.P

Fish meal 40% C.P

Formulate a ration which is 16% c.p with an allowance of 2% minerals.

N.B Minerals do not contain any protein hence cannot contribute to 16% C.P of the feed being formulated

$$100 - 2 = 98$$

Therefore $\frac{16 \times 100}{98} = 16.3\% \text{ c.p of the final ration}$

Basal feeds

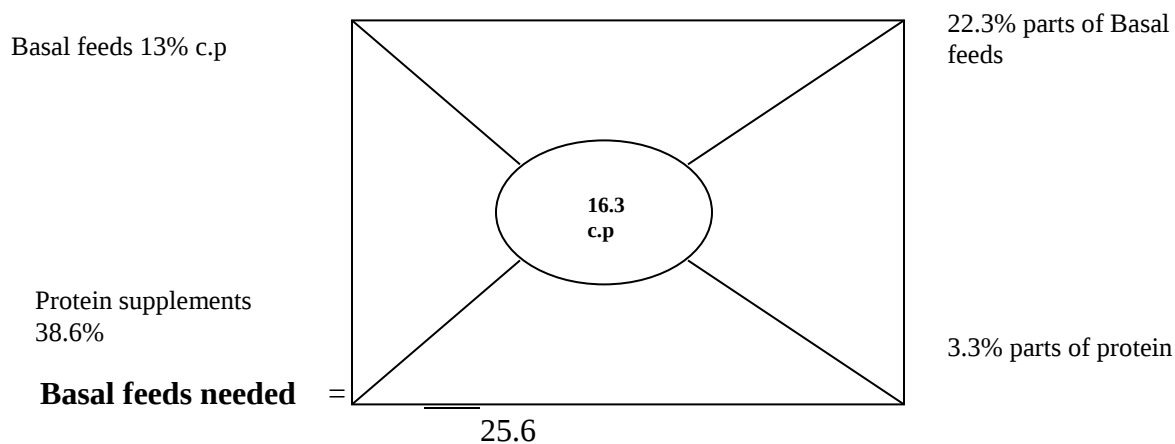
Maize bran	15% c.p	1	15	=	13%
Elephant grass	12% c.p	<u>2</u>	<u>24</u>		
		3	39		

Protein Supplement

Soya bean meal	38% c.p	2	76	=	38.6%
Fish meal	40% c.p	<u>1</u>	<u>40</u>		
		3	116		

116

3



Protein supplement = $\frac{3.3}{25.6} \times 98 = 12.6\%$

Minerals **02%**

Given the following

Wheat bran 22%C.P, cotton seed cake 35% C.P, Soya meal 38%C.P, fish meal 40% C.P
Make a ration of 18% C.P. giving an allowance of 3% minerals. Mix fish meal, Soya meal and cotton seed cake in a ratio of 3:2:1

$100 - 3 = 97$

$\frac{18 \times 100}{97} = 18.5\%$

Basal feeds

Wheat bran 22%

Protein supplement

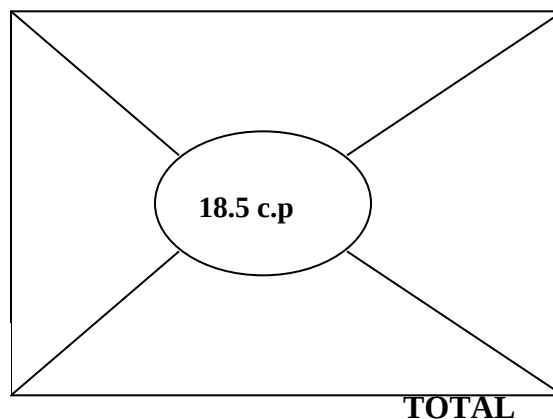
Cotton seed cake	35%	1	35
Soya meal	38%	2	76
Fish meal	40%	<u>3</u>	<u>120</u>
		6	231
		<u>231</u>	= 38.5%

6

Basal feeds 22% c.p

20.0 basal feed parts

Protein supplement 38.5

**3.5 parts of protein supplements****23.5 parts**

$$\text{Basal feeds needed } \frac{20}{23.5} \times 97 = 82.55 \%$$

$$\text{Protein supplements } \frac{3.5}{23.5} \times 97 = 14.44 \%$$

Mineral**03%****MAJOR CLASSES OF FEEDS**

There are 8 major classes of animal feeds according to Harris and Crampton. These include:-

- Roughages and dry forage e.g. hay.
- Pastures – These include range plants, grasses or legumes fed green.
- Silage – This is fermented fresh grass.
- Basal feeds or energy feeds – maize bran, rice bran, maize grains etc.
- Protein supplement e.g. fish meal, blood meal, cotton seed cake, g/nut cake, sunflower, Soya bean meal etc.
- Minerals – These are a good source of minerals like ca, phosphorous, cobalt, mg, zn, etc copper etc.
- Vitamins e.g. A, B, C and B-complex

- h) Additives: These are added to feeds to meet various requirements e.g. **hormones** that stimulate growth, antibodies to control disease, **drugs** to control disease, **antibiotics** to kill pathogens, heat **synchronizing hormones**, **anti-oxidants** to control oxidation of oils in feeds and **flavourings** to improve feed flavour.

MINERALS

Importance of minerals in Animal production.

- They are responsible for tissue irritability e.g. calcium and magnesium.
- Some are important for the physical and chemical reactions in the body e.g. magnesium that activates enzymes.
- They are important in the clotting of blood e.g. calcium.
- They play a structural role more especially in the skeleton e.g. calcium and phosphorous.
- They maintain the osmotic pressure of blood and lymph fluid at the cell membrane e.g. potassium.
- Some are important in the reproductive system e.g. Manganese which increases sex libido.
- Some are important in the capture and harvesting of energy in the body e.g. phosphorous which is used in the combustion of Adenine diphosphate (ADP)

WATER

About 80 % of the animal's body is water. Water performs a number of functions in the bodies of animals like;

- Being part of body fluids like blood, semen, and vaginal fluids
- Gives support to body tissues
- Regulates body temperatures through evaporation to reduce heat
- Acts as a solvent for many solutes in the bodies of animals
- Acts as media for many body reactions
- Can be used in hydrolysis reactions of the body
- It's a medium of transportation of body nutrients

Sources of water for the animal's body

- Food eaten by the animal
- Water taken in directly
- Metabolic water resulting from chemical reactions
- Water stored in various forms in the animal's tissue

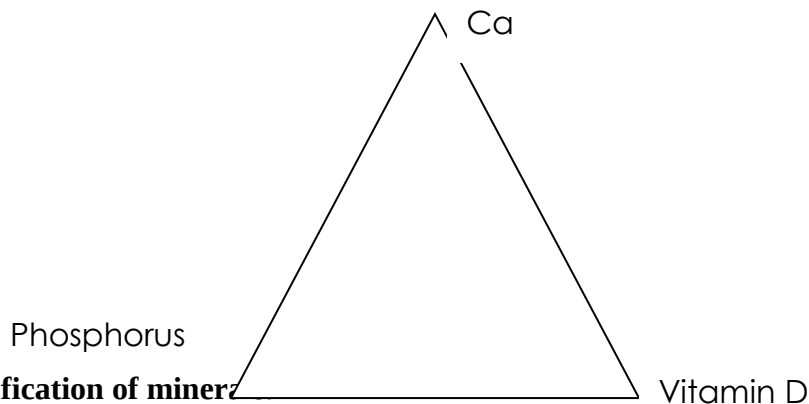
Factors that determine the level of water intake by livestock

- Amount of feed eaten**; animals eating a lot of feeds with less water will drink more water as compared to those eating less of such a feed.
- Water quality**; animals will take more of fresh water as compared to salty stinking water
- Availability of water**; animals drink more water once readily available at all times
- Increased environmental temperature**; this increases water intake as animals lose more water by evaporation
- Animal health**; sick animals may take less water than expected

6. **Level of animal production;** high milk yielders take a lot of water to compensate for that lost through milk secretion
7. **Type of animals;** cattle will take more water than goats due to their size
8. **Age of animals;** young animals will take less water as compared to mature animals
9. **Water temperatures;** animals will take less of cold water as compared with warm water

N.B

Some of the minerals do not function independently but in combination with others e.g. the anti rickets triangle which is made up of Ca, P and Vitamin D.



Classification of minerals

Minerals are classified into two major groups i.e. micro and macro elements.

The macro minerals are; Ca, K, P, Na, Cl, S, Mg, etc. The micro elements are Fe, Zn, Cu, I, Co, Mn, Mo, etc.

1. Iron

This is responsible for the synthesis of haemoglobin and the red blood cells.

It's also a co-enzyme in the cytochrome system. Iron is stored in the liver and spleen of animals.

Deficiency symptoms

- It leads to anaemia, however anaemia may be hereditary and also lack of Cu, Co, and proteins can cause anaemia.
- Parasitic attack can cause anaemia due to bleeding in the guts
- Iron deficiency mainly occurs in young mammals because milk is a poor source of iron and also animals kept on concrete since they have no access to soil which is a good source.

2. Copper

This is essential in the synthesis of haemoglobin and also as an enzyme activator. It occurs in pigments of hair and its deficiency leads to **anaemia** and **depigmentation** of hair.

3. Iodine.

This is a constituent of thyroxine responsible for regulation of metabolism in the body. Its deficiency leads to **Goiter** or enlargement of the thyroid gland.

In pigs iodine deficiency causes giving birth to piglets without hair.

N.B

Cabbage and Soya beans contain substances which prevent the secretion of thyroxin.

4. Manganese

This is an activator of most enzymes and its deficiency leads to reduced reproductive processes like spermatogenesis, reduced sex libido, and **star gazing** in chicks i.e. (chicks die with their heads facing upwards)

5. calcium

- Strengthens bones
- Helps in blood clotting
- Important in nerve transmission

Deficiency

- Weakened bones
- Low milk production in lactating animals
- Milk fever in lactating animals
- Slow growth

Lameness

6 phosphorous

- Strengthens bones
- Improves growth
- Improves fertility

Deficiency

- Poor growth
- Reduced appetite
- Poor milk yields
- Low fertility

7. Potassium

Maintains concentration of body fluids

Helps in nerve transmission

Deficiency

- Slow growth
- General weakness
- Nervous disorders

8. Salt (Sodium chloride) Na^+ and Cl^-

Used in nerve transmission

Deficiency

- Reduced appetite
- Loss of weight
- Reduced milk yield
- Death after prolonged deficiency

NUTRITIONAL AND METABOLIC DISORDERS IN LIVESTOCK

Nutrition deficiency disease may be caused by:-

- i. Giving the animals too little feeds
- ii. Having a diet that is low in one or more nutrients.
- iii. Imbalance of nutrients provided to the animals.

1. Milk fever

2. Grass tetany

This is also called grass staggers/ hypomagnesaemia. It affects cattle and sheep mainly and it's caused by magnesium deficiency.

Symptoms:

- i. Animal becomes nervous
- ii. There is twitching of the muscles more especially those around the head and the neck.
- iii. The head of the animal is lifted high
- iv. There is accelerated respiration
- v. There is increase in body temperature and gashing of the teeth.
- vi. Abundant salivation which is followed by death.
- vii. It occurs during the 1st week of the pasture season.

Control

- i. Animals should be given mineral lick which contains magnesium sulphates, calcium and phosphorous.

3. Bloat

This is the distention of the rumen which may occur in all ruminants due to excessive gases produced by fermentation of feed stuffs.

Causes:

- i. Feeding of animals on young succulent grass with high protein content.
- ii. Rumen microbes interfering with normal release of gases
- iii. Some animals are more susceptible to bloat than others naturally.
- iv. Some plants contain compounds which tend to form lather (foam) once eaten by animals.
- v. Feeding animals on feeds that are known to cause bloat.

Symptoms:

- i. Extension of the rumen
- ii. Difficulty in breathing
- iii. Loss of appetite / animal stops to eat
- iv. Death of the animal
- v. Animal lies down and sticks its legs out.

Treatment:

- i. Affected animal should be treated using a trocar and cannula which is used in piercing the rumen to release the gases.
- ii. The animal should be given mineral oil orally to open up the system so as to allow gases out.
- iii. Use of the broom stick method where a small piece of stick is laid across the mouth of the animal to keep it open and allow gaseous out.

Control / Prevention

- Feed animals in good quality forage
- Provide anti bloat drugs to animals

4. Ketosis (acetonemia / pregnancy toxaemia)

- A disorder of animals caused by high production exceeding feeding capacity. Occurs in high milk yielders during the first month of lactation.

Symptoms

- Low blood glucose levels (hypoglycemia)
- Rapid loss of body weight / emaciation
- Nervousness may develop in the animal
- Drop in milk yield for lactating animals
- Apparent blindness
- Walking in circles.

Cause

- Inadequate feeding for yields
- Unsuitable feeds / inadequate roughage
- Malfunctioning of the liver leading to increased keto acids in blood.

Preventions

- Adequate and proper feeding of lactating animals
- Animals should have enough green pastures.
- Animal should be exercised
- For treatment, call a vet.

ANIMAL HEALTH

Health is a situation in which all body organs and systems are normal and functioning normally or it's a state of well being where by all the vital processes of life related activities are functioning satisfactorily.

Disease is any deviation from normal health or it's a structural disorder and physiological abnormality which is harmful to the animal.

Signs of good health in animals

1. The skin of the animal is clean, smooth and shinny

2. The animal is alert and easily responds to stimuli like touch.
3. The animal has a normal appetite i.e. feeds greedily leaving no food in the trough.
4. Body temperatures should be normal i.e. 38.6⁰ in cattle, 39.1⁰C in goats, 39.2 in pigs and 38.9 in sheep.
5. The dung should be soft, neither excessively hard nor watery.
6. The urine should be clear pale yellow with no blood stains or bad smell.
7. The mucus membrane in the nose, mouth, eyes, and reproductive tract should be moist and pink in colour.
8. Animal production, in terms of eggs, meat and milk should be normal and consistent with the stage of production.
9. Lameness or abnormal movement is an indicator of disease.
10. Continuous coughing and sneezing is an indication of disease.

Causes of ill health in animals

1. Heredity;

Some diseases are transmitted through genes e.g. curved limbs in cattle.

2. Microorganisms;

These invade the body's animals and cause various diseases e.g. T.B. East coast fever, New castle, etc

3. Mechanical injuries

These can be caused by sharp objects and sometimes rough handling of the animal like beating.

4. Nutritional imbalances

Lack of certain nutrients in the animal's diet may cause disease e.g. lack of iron, causes anaemia.

5. Poisoning

Some pastures contain chemicals which can poison the animals e.g. hydrocyanic acid (HCN) found in cassava blocks respiration once taken in large amounts.

6. Starvation

Under fed animals in relation to their production are likely to suffer from a disease like Ketosis more especially lactating animals.

7. Exposure to extreme conditions of the environment like high temperature or very low temperatures can cause stress.

Factors that expose animals to disease (Predispose)

- **Age;** Young animals have un developed immunity while the old ones have a worn out immune system which exposes both more to disease easily.
- **Climate;** Very cold weather and humid conditions would expose the animals to respiratory infections like pneumonia.
- **Pollution;** Air and water pollution exposes the animals to many infections and may also cause poisoning.
- **Hereditary;** Inheritance of large and pendulous udders in dairy animals predisposes such animals to disease like mastitis.

- **Breed;** exotic breeds of cattle are more prone to tick borne diseases than indigenous cattle
- **Communal grazing;** this brings herds of cattle together with those that are diseased hence predisposing the health animals
- **Mechanical injuries;** these may act as entry points for the pathogens
- **Poor hygiene;** this encourages pathogens to contaminate feeds and water hence easy spread of disease
- **Improper disposal of dead animals;** animals that have died due to disease once disposed poorly may lead to easy disease outbreaks

Classification of disease

1. Infectious disease

This is a disease caused by living organisms like bacteria, protozoa, fungi and virus.

2. Non-infectious disease

This is a disease caused by something else other than living organisms' e.g. blot, milk fever, goiter, grass tetany, e.t.c.

3. Contagious disease

This is a disease transmitted by contact between infected animals and healthy ones e.g brucellosis.

4. Communicable disease

This is a disease that is transmitted from one animal to the other by both direct and indirect contact e.g. T.B, foot and mouth disease.

5. Notifiable or reportable disease

This is a very contagious disease, which spreads fast in herds or flocks and usually affects humans e.g. tuberculosis and anthrax.

Spread of disease on the farm / disease outbreak

1. Introduction of sick animals to the farm, which can transmit disease to the healthy ones by contact.
2. Introduction of healthy animals that are carriers of certain diseases.
3. Diseases can also spread through contaminated water and feeds.
4. Vectors like tsetse flies and ticks can also transmit disease.
5. Wild birds and rodents may carry disease to the domestic animals through contaminating feeds and water.
6. Contaminated equipment like vaccination equipment, drenching guns, insemination syringe may spread disease.
7. Shoes and clothing of any one who moves from flock to flock or in animal quarters can spread disease.
8. Airborne organisms like bacteria spores may be spread through air and cause disease.
9. Soil can Harbour resting stages for anthrax spores which can survive for up to 40 years.

10. Diseases can also be spread through infected animal products like eggs in birds can spread new castle to chicks
11. Improper disposal of dead animals that have died due to a certain disease.
12. Dung or excreta incase of cows and other young stock can also spread disease.

Control of disease

1. Farmers should make sure animal quarters are clean to keep off pathogens.
2. There should be adequate ventilation in the houses to control respiratory infections like pneumonia.
3. Ensure adequate spaces for each animal hence discourage over crowding.
4. Animals to be bought should be selected from reliable source with less risk of disease.
5. Institute quarantine measures incase of a disease outbreak in an area.
6. Practicing rotation grazing in cattle in order to control vectors like ticks.
7. The farmer should follow vaccination programmes for livestock in order to control disease.
8. Visitors to the farm should be restricted and those allowed in should be disinfected.
9. Sick animals should be isolated from the general herd or flock to reduce disease spread.
10. Dead animals should be properly disposed by either burning the carcass completely or burying it 3m deep in the soil.
11. Animals with highly infectious disease should be culled by slaughtering and burning the carcasses completely.
12. Newly bought in animals should be isolated from the general herd for Atleast 14 days to ensure that they are healthy.

QN; Explain the Cause, symptoms, mode of transmission, animal attacked and control of the following diseases.

a. Bacterial diseases

- Contagious abortion or brucellosis.
- Anthrax
- Mastitis
- Black quarter
- Foot rot
- Calf pneumonia
- Fowl typhoid.

b. Viral diseases

- Foot and Mouth Disease
- Rinder Pest
- New Castle
- Swine Fever (Hog Cholera)
- Fowl Pox

- Rabies.
- c. **Protozoan diseases**
- Nagana (Trypanosomiasis)
 - Coccidiosis
 - Anaplasmosis
 - East coast fever
 - Red water
 - Heart water

PARASITES

This is an organism that derives benefit from another (host) while inflicting pain on it.

Types of parasites

1. Obligate parasites

These live their entire life as parasites and cannot survive without a host e.g. the tape worms.

2. Facultative parasite

These can live freely in the absence of a host and as a parasite in presence of the host i.e. fleas.

3. Endo parasites

They live in the bodies of the host and get their nourishment from there e.g. Liver Flukes, tapeworms, round worms, gape worms etc.

4. Ecto parasites / External

These live on the outer surface of the host and derive their nourishment from there e.g. ticks pig lice, mites.

5. Ecto-endo parasites.

These live in the outer skin surface of the host e.g. jiggers and mange in pigs.

Economic importance of parasites.

1. They increase cost of production since money must be spent in trying to control parasites.
2. They make keeping of highly susceptible exotic stock very difficult e.g. ticks.
3. Some parasites are vectors of important diseases like East coast fever, Nagana red water etc
4. Some may suck a lot of blood from the animal leading to anaemia.
5. They can cause retarded growth in the host after extracting a lot of nutrients.
6. They reduce the quality of animal's products like meat, hides and skins.
7. They can cause loss of weight / emaciation/ loss of condition in the animals.
8. Some can cause open wounds to the host which may give way to other pathogens.
9. They can cause irritation to the animal leading to low production

1. TICKS.

Classification of ticks

Kingdom : **Animalia**

Phylum : **Arthropoda (jointed appendages)**

Class : **Arachnida. (4 pairs of legs) the body is divided into 2.**

Order : **Acarina**

Super family : **Oxodoidae.**

Sub families 1: **Oxodidae (hard ticks)**

Sub families 2: **Argasidae (soft ticks) mainly in chicken**

Hard ticks.

These include the following;

- a. Bont tick – (*Amblyomma variegatum*)
- b. Blue tick – (*Boophilus decoloratus*)
- c. Brown ear tick (*Rhipicephalus appendiculatus*)
- d. Red legged tick (*Rhipicephalus evertsi*)

General life cycle of ticks.

1. After matting, the female sucks blood to full engorgement.
2. It later detaches off from the host and finds a suitable protected environment on the ground where it lays the eggs.
3. Depending on temperature and humidity, the eggs would hatch into larvae at least after two weeks.
4. The larva climbs on top of grass to try and find a host.
5. After finding a host, the larva feeds for 3-4 weeks then moults into a nymph.
6. The nymph feeds for 4-6 days before moulting into an adult.

NB:

The hard ticks are classified into three distinct types according to their life cycle i.e. **one** host tick, **2** host tick and **3** host tick.

1 host tick.

- This type of tick utilizes one host for all the three instars i.e. larva, nymph and adult lifecycle.
- The larva feeds on a host until it moults into a nymph.
- The nymph feeds on the same host until it moults into an adult.
- The adults mate and take in blood up to full engorgement then drops off to the ground to lay eggs.
- After two weeks, the eggs hatch into larva and climb grass to wait for the host.
- This is the shortest life cycle covering up to three weeks. An example of such is the **blue tick** which transmits protozoa that causes **Anaplasmosis (Gall sickness).**

2. Host tick.

- In this life cycle, the larva feeds on a different host while the nymph and adult feed on the same host or the larva and nymph feed on the same host while the adult on another.
- Larva climbs to the host, feeds on blood and after engorgement drops down to moult into a nymph.

- The nymph feeds on the same host until it moults into an adult while still there e.g. **red legged tick** that transmits **Red water (Babesiosis)**.

3 Host tick.

- In this life cycle each instar feeds on a different host and all the immature instars i.e. larva and nymph moult on the ground.
- It's the longest life cycle taking a minimum of three months.
- The larva climbs on the first host where they feed on blood up to full engorgement and later drop to the ground.
- While on the ground they moult into a nymph which climbs to another host.
- The nymph feeds on blood up to full engorgement and drops to the ground where it moults into an adult.
- The adult climbs another host and the cycle continues e.g. **brown ear tick** and **bont tick**

	Tick vector	Agent	Disease caused.
1	Brown ear tick	<i>Theileria parva</i>	East coast fever (E.C.F) (Theileriosis)
		<i>Anaplasma marginale</i>	Anaplasmosis.
2	Blue tick	<i>Anaplasma marginale</i>	Anaplasmosis
3	Bont tick	<i>Rickettsia ruminantium</i>	Heart water
		<i>Theileria mutans</i>	East coast fever
4	Red legged tick	<i>Babesia bigemina</i>	Red water

Control of ticks:

1. Dipping and spraying animals with acaricide e.g. Dicatix, spona extra, and cooperthion. Order of spraying: Back, Brisket, Belly, rear and head.
2. Hand dressing of the animals using pye grease (yellowish jelly) on the most important parts like udder, ear, vulva, underneath the tail, in between the hooves, and around the horns.
3. Practicing rotational grazing in order to avoid areas infected with ticks.
4. Raising a perimeter fence around the farm to reduce entry of ticks into the farm
5. Old pastures in the farm should be burnt during the dry season to kill ticks.
6. A farmer can hand pick ticks from the animal more especially from small herds.
7. Pastures should be ploughed on a routine basis to bury eggs, larva and nymph.

LIVER FLUKE. (*Fasciola hepatica* and *Fasciola gigantica*)

This parasite is found in sheep, goats, cattle and occasionally in man.

Diagram of a liver fluke.

The liver fluke mainly attacks the liver and sometimes the spleen of domestic animals. It's an hermaphrodite though cross fertilization has also been observed.

The life cycle of a liver fluke

1. Eggs are laid in the liver and carried to the alimentary canal
2. Eggs come out with the faeces and are deposited in water
3. The eggs develop into larva called miracidium.
4. The miracidium swims in water to find the intermediate host which is the water snail (*Liminaea trancatula*)
5. While in the water snail, it moults into a sporocyst.
6. The sporocyst ruptures to release a new type of larva called redia while in the snail.
7. The redia migrates into digestive gland of the snail where it grows and produces the cercaria.
8. The cercaria leaves the snail and enters water where it can swim until it's taken by the animal while drinking water.
9. The cercaria while in the body of the animal can develop into adult flukes and the cycle continues.

Damage caused by the liver fluke in the liver and spleen.

1. It can make tunnels in the liver and spleen hindering their functions.
2. They can block the bile duct hence affecting digestion of fats in the animal.
3. It makes the liver unsuitable for human consumption.
4. It causes death of tissue in the liver and spleen.

Characteristics of animals having liver fluke (symptoms).

1. Swellings under the jaws.
2. Death of the animals without prior signs.
3. Emaciation / loss of weight / loss of condition.
4. The mucus membrane turns yellow.
5. Passing out of watery faeces / diarrhea.
6. General weakness of the animal.
7. Coughing and sneezing.
8. Reduction in milk production for lactating animals.
9. Reduced growth rate in young animals.

Control of liver fluke

1. Practice rotation grazing by keeping animals away from swamps more especially on rainy seasons.

2. Remove the grass and any vegetation from water points where the cercaria can attach itself.
3. Animals should be given water from bore holes or fast moving water from rivers with no snails.
4. Spray copper Sulphate in the grazing area to kill the water snail.
5. Pastures in swampy places should be burnt during the dry season to kill the snails.
6. Animals should never be grazed in flooded areas that are likely to have snails.
7. Swampy places should be drained so that excess water is removed to discouraged water snails.
8. Routine deworming of the animals using drugs like levafas, endospec 10% every after two months.
9. As a biological control, farmers can rare ducks which feed on the snails.

WORMS:

Livestock is attacked by internal worms, tape worm, gape worms. The most common are the round worms and tapeworms which attack cattle, sheep, goats, pigs and man.

Signs and symptoms of internal worm attack in livestock

1. Rough hair coat/ standing hair.
2. Stunted growth in young animals.
3. Emaciation / loss of weight / loss of condition.
4. Diarrhea.
5. Loss of appetite.
6. Pot belly / extended belly.
7. Worms or segments of the worms or eggs can be seen in feaces.
8. Coughing by the animal which can be occasional.

Adaptations of gut worms to their mode of life.

1. Degeneration or loss of unwanted organs and structures like eyes, legs and ears.
2. They have penetrative devices for gaining entrance into the host and attaching themselves in the gut walls so that they cannot be dislodged
3. Presence of sacking devices like in the tape worm which helps in sucking nutrients.
4. Possession of hard cuticle which can resist the host's digestive enzymes.
5. Production of large quantities of mucus against the host's digestive enzymes.
6. They have more than one host which increases their chance of survival.
7. Production of a large number of eggs to increase their survival chances.
8. Possession of muscular pharynx in round worms for sucking nutrients from the host.
9. Most gut parasites are able to tolerate low levels of oxygen common in their environment.
10. Some are hermaphrodites like the tape worm which increases the chance of survival by ensuring fertilization and reproduction.

11. A large surface area has been observed in the tape worm and liver flukes which increases diffusion of oxygen and nutrients.

12. The eggs of most of these worms are covered by a thick cuticle which helps them to resist harsh conditions of the environment before hatching.

Round worm	Tape worm
Scolex absent	Scolex present
Short in length and small	Long and big
Round	flat
No segments	Segmented
No suckers	Has suckers
Tapering ends	Has no tapering end
Has no hooks	Has hooks

Life cycle of a tape worm

- a. Adult tape worm in the intestines of man lays fertilized eggs
- b. Eggs are passed out with faeces
- c. Eggs develop into oncosphere which are eaten by grazing pigs or cattle
- d. Each oncosphere contains six hooked embryo called hexacanth
- e. The wall surrounding the hexacanth is digested in the duodenum to release bladder worms
- f. The bladder worms bore through the walls of the intestines and enter blood or lymphatic system
- g. They are taken to the voluntary muscles of the tongue and limbs
- h. Badly cooked meat eaten by man the bladder worm is eaten
- i. The bladder worm attaches it self on the walls of the intestines and develops into a tape worm

DIGESTION IN RUMINANTS

1. Mouth

Food is gathered here with the help of tongue and teeth, a process referred to as prehension.

There is also chewing of food (mastication) and mixing it with saliva (salivation). Chewing of the curd also takes place here.

N.B. The saliva of ruminant animals does not contain any enzyme, but its work is to lubricate the bolus and facilitate passage through the oesophagus.

2. Oesophagus

This is a passage for the bolus from the mouth to the rumen

Rough materials that escaped thorough grinding during preliminary mastication pass back to the mouth through oesophagus.

It allows gases to escape from the rumen to the out in the process of belching.

3. Rumen / pouch

It has a surface with projections like a towel
It acts as a store for food.
It refines the food particles.
It churns and mixes the food thoroughly with the rumen liquids.
Coarse food particles are directed to the mouth for further chewing.
Provides place for fermentation by microbes like bacteria, fungi and protozoa.

4. Reticulum

Its known to have a honey comb structure surface
Regulates passage of food from the rumen to the Omasum and from the rumen to aesophogus.
It allows fine food to enter the Omasum
It stores heavy materials like stone, stick, wire swallowed with food that why its referred to as the hard wave stomach.

5. Omasum

It has a surface with flaps that resembles papers of a book.
Most water and organic acids are absorbed here.
Solid particles left in food are further ground by the muscular leaves of the Omasum.
The leaves form a pumping action that causes food into the abomasum.

6. Abomasum (true stomach)

It has a smooth surface
The walls secrete Hydrochloric acid and gastric juice .
Gastric juice contains enzymes rennin and pepsin which digests proteins.
Rennin curdles milk in young mammals.

7. Small intestines.

Digestion is completed here by the pancreatic enzymes like lipase, amylase, trypsin, maltase and sucrase.

8. Large intestines

It is where the absorption of water takes place.

Conditions that favour rumen microbes.

1. The pH ranging between 6.2 – 6.7 which is maintained by saliva and continuous removal of volatile fatty acids (ethanoic acid (acetic acid), propionic acid and butyric acid)
2. Low levels of oxygen since most of the microbes can respire anaerobically.
3. The temperature of about 39⁰c in the rumen.
4. Enough moisture from water drunk, animal feeds and saliva.
5. Presence of macro minerals and some trace minerals in the rumen needed by microbes.
6. Regular removal of digested material so that fresh materials are in contact with the microbes.
7. Presence of readily fermentable carbohydrates like glucose, sugars and starch in feeds eaten.
8. Adequate supply of energy and nitrogen which enhances microbial activities

Importance of microbes in ruminant alimentary canal.

1. They enable ruminants to utilize fibrous material by hydrolyzing cellulose into monosaccharide.

2. They build up complete proteins from elementary nitrogen which can be used by the host animal.
3. They can upgrade dietary protein to a standard needed by the host animal.
4. They can synthesize vitamins K, B, C and B complex for the host animal.
5. At death, they provide proteins to the host animal.

Factors affecting feed intake by the animal.

1. Environmental temperature; high environmental temperatures reduce feed intake while low environmental temperature stimulate feed intake.
2. Palatability of the feed; feeds that are highly palatable would be consumed in large quantities by the animals as compared with unpalatable feeds.
3. Blood components; a high quantity of glucose and volatile fatty acids in the blood of ruminants will suppress feed intake.
4. High lignin content in feeds will suppress feed intake since it has a low digestibility.
5. Shift in hormonal balance; during pregnancy, foetal displacements of the rumen and reticulum and changes in hormones will affect food intake.
6. The volume of the alimentary canal; when the alimentary canal is filled with feeds fast it will cause distention in the reticulo- rumen restricting further feed intake.
7. Level of animal production; animals that produce a lot of milk will eat more feeds to compensate the loss in milk.
8. Animal health; sick animals will take less feeds as compared with the health ones
9. Amount of feed provided; animals will always strive to eat all what is provided hence giving a lot of feeds increases intake

Improving digestibility of feeds.

1. Selecting animals with high digestibility naturally.
2. Providing feeds with high nutrients value to animals.
3. Avoid excessive exposure of feeds to rain and sunshine in order to maintain their quality.
4. Avoid prolonged exposure of animals to harsh weather conditions by providing a shade.
5. Provide ample salt and plenty of fresh water for the animals.
6. Add molasses to feeds to improve digestibility.
7. chop pasture and crush feeds to increase surface area for enzymatic action

Carbohydrate digestion in ruminants

- a) Ruminants do not have salivary amylase therefore the first enzymes to act on carbohydrates are in the rumen
- b) Enzymes in the rumen for carbohydrates are produced by the microbes
- c) Microbial amylase and cellulase breaks down starch and cellulose respectively
- d) The end products for carbohydrate digestion in the rumen are volatile fatty acids (VFAs-**acetic/ ethanoic acid, propionic acid and butyric acid**), methane and carbondioxide. Formic and lactic acids are produced in small amounts.

- e) The amount of acetic acid produced depends on the amount of fibre and starch in the diet. A diet with high fibre results in production of more acetic acid while consumption of high starch results into production of more propionic and butyric acids.
- f) VFAs are absorbed and utilized for energy production rather than glucose used in non ruminants
- g) Acetic acid is the main source of energy in ruminants.

Nitrogen conservation mechanism in ruminants

- a) Digestion of coarse fodder in ruminants depends on the activity of micro organisms in the rumen.
- b) The micro organisms require supply of energy and nitrogen for their growth and multiplication. In return micro organisms brake down cellulose
- c) Nitrogen is very important in ruminant digestion since it can be used by rumen microbes and in the building up of ruminant protein. Therefore, it must be conserved

It is conserved in the following ways;

- i. Ammonia absorbed from the rumen plus that arising from tissue metabolism is converted to urea.
- ii. In non ruminants, urea would be lost in urine but in ruminants, it is recycled back to the rumen through salivary secretion and across the rumen wall.
- iii. The recycled urea is utilized by the rumen microbes to build up proteins for the host animal.
- iv. The proportion of urea to nitrogen recycled depends on the quantity of nitrogen in the diet
- v. Low dietary nitrogen causes more nitrogen from the liver being returned to the rumen to build protein
- vi. The cycle ensures continuous source of nitrogen for rumen digestion.