

LIKUNI BOYS OPEN SECONDARY SCHOOL

AGRICULTURE

STUDENTS NOTES

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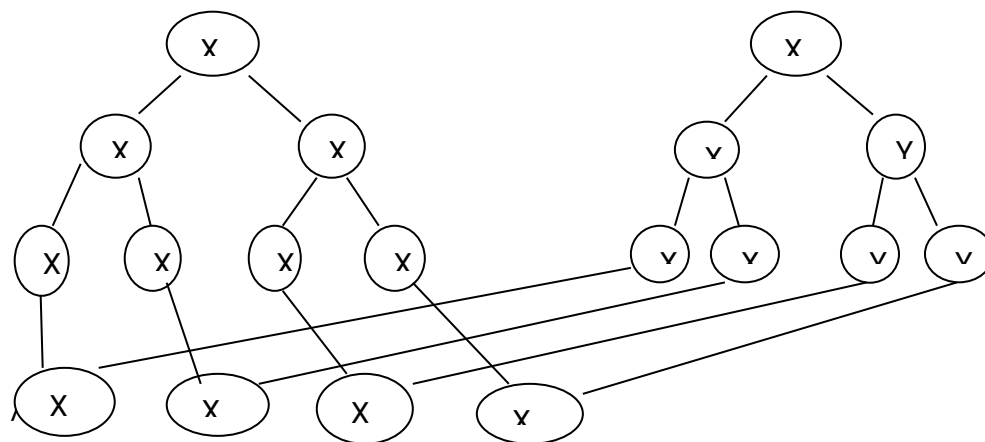
LIVESTOCK IMPROVEMENT

- Livestock improvement refers to the attempt to modify the genetic makeup of

livestock and the environment in which they are kept, in order to increase production.

- The ability of an animal to produce milk, meat or eggs is influenced by the environment and inherited characteristics from parents.
- It is known that the mechanism of inheritance is controlled by definite structures called genes which are located in the chromosomes.
- Chromosomes are contained in the nucleus of an animal cell.
- During fertilisation, each parent contributes an equal number of genes (haploid chromosomes) to the offspring.
- The haploid chromosomes unite to form the correct (diploid) number of chromosomes in an offspring.

PASSING ON OF CHROMOSOMES DURING FERTILISATION



AIMS OF LIVESTOCK IMPROVEMENT

The aims are:

- To increase livestock yield of milk, meat or eggs.
- To improve quality of animal products. For example butter fat content in milk, size and colour of egg yolk, hardness of shells, quality of wool, etc
- To increase disease resistance in animals.
- To breed animals that may easily adapt or resistant to harsh environmental conditions.
- To improve the rate of growth in animals.

METHODS OF LIVESTOCK IMPROVEMENT

There are three main methods;

- Introduction
- Selection
- Breeding

1. INTRODUCTION

- This is the practice of bringing exotic, pure bred animals with desirable characteristics into one's own country.
- Dairy breeds such as Jersey and Fresian were introduced into Malawi from Europe and America for milk production.

2. SELECTION

- Selection means choosing animals with desirable characteristics for breeding.
- Farmers choose these animals basing on phenotype and genotype of the animals.
- Selection of male animals based on their performance of their offspring is called progeny testing.
- Selection of female animals based on egg or milk production is called sib selection.

METHODS OF SELECTING LIVESTOCK FOR BREEDING

There are two main methods

- Artificial selection
- Natural selection

ARTIFICIAL SELECTION

- This is the selection of animals by farmers based on the desirable characteristics. Artificial selection helps to fix desirable characteristics in animals.

NATURAL SELECTION

- This is a selection for breeding those animals within a group that are better favoured by the environment than others.

CHARACTERISTICS OF ANIMALS TO BE SELECTED FOR BREEDING

The following are good characteristics of animals that are selected for breeding;

- High rate of egg laying and good size of eggs produced.
- Good brooding habit. This is the ability of birds to produce chicks from the laid eggs.
- Good mothering ability. This is the ability of animals to give birth to live young ones and take care of them until they are weaned.
- Low infant mortality rate.
- High fertility. This is the ability of animals to produce more litter, kids or lambs per parturition.
- High milk yield and quality.
- High meat quantity and quality.
- Efficient in converting pastures to high quality prducts. For example, milk and meat.
- Resistant to diseases
- Healthy and strong looking animals.
- Ability to work. Eg oxen.

- Docile.

3. BREEDING

This involves mating of animals to produce young ones.

BREEDING SYSTEMS

This is a mating system in which a breeder decides which sire (male) is going to mate which dam (female).

There are three breeding systems. Some of these are;

- Inbreeding
- Out breeding
- Artificial insemination

INBREEDING

- This involves mating sires and dams of the same herd (family) to transmit desirable characteristics of individual animals.
- This brings about uniformity in animals because the likelihood of passing the same genes to the offspring is very high. This lead to pure breed production.
- Inbreeding however, leads to loss of vigour and performance in animals.

OUT BREEDING

- This involves mating of sires and dams which are not closely related. They pass on different but desirable genes to the offspring.
- The offspring resulting from cross breeding performs better than either parents. This superiority in performance is referred to as "hybrid vigour" or "heterosis"

ARTIFICIAL INSEMINATION

- This is artificial introduction of sperms into the reproductive tract of a dam.
- This method does not involve mating of a dam and a sire. Semen is collected from a bull using an artificial vagina and a teaser animal.
- The semen collected can be diluted using diluents consisting of egg York, milk and glucose. It is stored in liquid nitrogen until it is needed to inseminated a cow wwhich is on heat.
- During insemination, the semen is inserted directly into the uterus.

ADVANTAGES OF AI

- The cost of buying and keeping a sire is eliminated since mating is not involved.
- The spread of sexually transmitted diseases such as brucellosis is eliminated since semen is inserted artificially.
- Sperms can be stored for some time and used when required.
- Semen from one bull can be diluted and used to serve many cows.
- It is easy to plan breeding programme since semen can be kept for some time.

- It is easy to track which dams have been served through keeping of records.

DISADVANTAGES OF AI

- It is difficult to setup and maintain AI programme.
- Timing for AI administration may be a problem since it is difficult to detect when dams are on heat.
- The chances of conception are not 100 percent.
- Communication from farms to AI headquarters may be a problem because of distances involved.

REPRODUCTIVE SYSTEM OF CATTLE AND POULTRY

Reproductive system of a bull

PARTS AND FUNCTIONS OF A REPRODUCTIVE SYSTEM OF A BULL

- Scrotum. – This is a sac that holds the testes. It hangs in between hind legs.
- Testicles/testes. – The two oval shaped testes produce sperms.
- Sperm duct/vas deferens. – These are channels that carry sperms from testicles to seminal vesicle.
- Epididymis. – It is a coiled tube that surrounds each of the two testicles. It stores mature sperms.
- Accessory glands. – These consist of a prostate gland, Cowper's gland and seminal vesicle. – These produce a sticky liquid (semen) that carries the sperm.
- Urethra. – it is a passage for urine and semen to the penis
- Penis. – This is an organ used for mating. Sperms are released into vagina through a process called ejaculation.

PARTS AND FUNCTIONS OF A REPRODUCTIVE SYSTEM OF A COW

- Ovaries. – the main function of ovaries is to produce ova (eggs)/ovum(egg). Ovaries are also responsible for secreting sex hormones (Oestrogen and progesterone).
- Oviducts/fallopian tube. – This is a passage of ovum to the uterus.
- Uterus/womb. – It is where the embryo formed develops into a zygote.
- Cervix. – These are thick muscles that separates uterus from the vagina. It is opened during oestrus and parturition.
- Vagina. – It a mating organ that receives sperms from a bull.
- Vulva. it is a muscular exit which aids expulsion of foetus at birth.

REPRODUCTIVE PROCESS

- To reproduce is to bear a young one or produce a young one.
- Reproduction starts with mating of a male and female animal. Through mating, egg cells from a female are fused with a sperm from a male.
- The fusion of egg cells and sperms result into fertilisation and formation of a zygote which develops in the uterus.
- Animals that give birth to live young one are called viviparous. For example, mammals.
- Animals that lay eggs and hatch within a specific period in order to produce young ones are called oviparous.

PUBERTY

- This is time when male and female animals reach sexual maturity. During this time, males produce sperms and females produce ova, heat periods are set in, ovulation starts and uterus develops.
- The hormone that facilitates production of sperms, accessory organs and desire to mate is called testosterone.
- The hormone that facilitates reproductive process in females is called oestrogen.
- A bull reaches puberty when it is 8 months old while a cow reaches puberty when 9 months old.

FACTORS THAT HASTEN PUBERTY

- Environmental factors. Puberty may be delayed due to unfavourable climatic conditions. For example, drought.
- General management. Animals that are well fed, house and protected from parasites and diseases will reach puberty earlier than those that are poorly managed.
- Type and breed of animals. Some animal breeds reach puberty earlier than others.
- Mating of young animals. When young animals are mating, they reach sexual maturity earlier.

OESTRUS

- This is a term used to describe heat period. This is the time when female animals have desire to mate.

SIGNS OF OESTRUS IN COWS

The following are the signs of heat period in cows

- Cow becomes restless.
- Cow bellows (frequent mooing)
- It mounts other cows and stand still when it is mounted by others.
- The vulva becomes red and enlarged.
- There is mucous discharge from the vulva.
- Increase in urination
- Milk production in lactating cows reduces.

OESTRUS CYCLE

- This is the interval between one heat period and the next.

PHASES OF OESTRUS

- Proestrus. This stage last for three (3) days. Reproductive tract is prepared and vaginal wall thickens under the influence of oestrogen.
- Oestrus. This is a stage when animals have a strong desire to mate. The follicles grow to reach maturity.
- Metoestrus. During this stage, corpus luteum is formed, progesterone is secreted by the body which suppresses the growth of follicles.
- Diostrus. Corpus luteum is retained if fertilisation takes place.

FERTILISATION

- Fertilisation takes place when male and female gametes unite. The fertilised egg forms a zygote which travels down the oviduct and attaches itself to the wall of the womb. This takes about 15 days in cows and **30 days after ovulation**.
- The zygote undergoes rapid cell division to form the embryo and later a foetus.
- A single ejaculation from the bull contains 2 – 3 million sperms in the semen but only one sperm fertilises an egg.
- Sperms can live in a female reproductive tract for 20 – 30 hours. An ovum remains viable for five to six hours. This is the reason farmer ensure that coitus takes place 7 – 10 hours after the beginning of oestrus.

GESTATION PERIOD

This is a period from time of fertilisation has taken place to the birth of a young one.

TYPE OF ANIMAL	DAYS
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COW	283
NANNY	150
EWE	150
SOW	115
RABBIT	31

Length of gestation

FOETUS DEVELOPMENT

- The first organ to be formed is a heart, accompanied by the circulatory system and later a placenta.
- The placenta is surrounded by three fluid filled membranes which cushion and protect the foetus. The membranes also keep the foetus warm and serve as lubricants during parturition.
- The three membranes are;
 - o Amnion which is a water sac.
 - o Chorion. It surrounds the water sac.
 - o Allantois. It is formed as urinary bladder forms and it is filled with urine from the foetus.

FEEDING

The foetus gets nutrients from the mother. The nutrients diffuse through the blood of the mother to that of the foetus. This is made possible because of finger like structure called **villi** which is present in the placenta.

RESPIRATION

This is made possible through diffusion in blood. Oxygen is taken in and out of the body.

EXCRETION

The foetus eliminates waste products for example, urea and carbon dioxide by diffusion from its blood back to the mother's blood.

PARTURITION

This is a process of giving birth to a young one by an animal.

SIGNS OF PARTURITION

- Cow becomes restless and looks for a quiet place for parturition.
- Udder becomes large because at this time, it is full of milk for unborn calf.
- Mucous discharge from the vagina. This is because of the breaking of

amniotic membranes as a result of uterus contractions. As the uterus continues to contract, the calf is pushed out with front feet first. This is called normal presentation. When a calf is born in a wrong position (with tail first), it is called breech presentation. The term used to describe difficulties in giving birth is called dystocia.

- Pervic ligaments relax and become soft

MILK PRODUCTION

Milk let down

- This is a process where milk is removed in the alveolar cavities to the lower part of the udder under the influence of a hormone called **oxytocin**. Oxytocin is secreted by a small gland at a base of a brain.
- Alveoli are main structures responsible for manufacturing and secretion of milk.
- When udders are washed, basket cells or nerve fibres in the udder send a message to brain through spinal chord. This message discharges the hormone oxytocin into blood system.
- When the hormone gets into an udder, it causes contraction of muscle fibres surrounding alveolus. This forces milk into gland and teat cistern.
- Small ducts carry milk from alveolus to large ducts.
- Large ducts carry milk to gland and teat cistern.
- Teat canal/streak is where milk is ejected.
- Sphincter muscle controls amount of milk to be ejected.

REPRODUCTIVE SYSTEM IN POULTRY

Reproductive system of a cock

PARTS AND THEIR FUNCTIONS

- Testes. Oval shaped structures responsible for production of sperms.
- Vas deferens. These carries sperms from testicles to copulating organ.
- Papillae. This serve as copulating organ
- Cloaca/vent. An opening at the dorsal of an animal.

REPRODUCTIVE ORGANS OF A HEN

- Ovaries. A hen has two ovaries. The left ovary is functional and develops while the right ovary is not functional.
- Infundibulum/funnel. This is where sperms are stored and where fertilisation takes place.
- Magnum. This is where albumen is added.
- Isthmus. Egg membranes, mineral salts and water are added.
- Uterus /shell gland. This is where egg shell is added.
- Vagina is where the pores in the egg are sealed.

- Cloaca/vent is where an egg is passed out or oviposited.

STRUCTURE OF AN EGG

There is a myth that hen cannot lay eggs without mating with a cock, hens do lay eggs without mating with a cock. However, a cock is needed if the ova are to be fertilised.

BEEF PRODUCTION

BREEDS OF BEEF CATTLE

BREED	COLOUR	ORIGIN
Malawi Zebu	Mixed – black, brown or white	Indigenous
Afrikander	Black	South Africa
Boran	Mixed – red, white, white grey, brown	Kenya
Charolais	White	France
Hereford	Deep red with white face and legs	United kingdom
Brahman	White or greyish	India
Simmental	Light red with white patches and white head	Switzerland

CHARACTERISTICS OF BEEF BREED

- Beef breeds are blocky (rectangular and square shaped)

- They have heavy bodies with a lot of flesh.
- The body should be compact and deep.
- The legs are short to support the heavy body.
- They are good foragers and are efficient in converting pastures to high quality beef.
- The animals grow fast and mature quickly.

MANAGEMENT OF BEEF CATTLE

There are two methods of managing cattle. These are extensive and intensive systems.

EXTENSIVE SYSTEM

- Under this system, beef cattle are grazed on communal grazing areas especially in dambo areas where there is fresh grass.
- Ranching is another form of extensive system of managing cattle. Some beef ranches include Dzalnyama in Lilongwe and Kuti ranch in Salima.

ADVANTAGE

- It is cheap to keep animals on a communal land.

DISADVANTAGES

- This can lead to overgrazing since many cattle are kept in a small area.
- Control of parasites and diseases is difficult because animals share a common ground where infections are common.
- It takes time for animals to reach slaughter weight since some of the energy is used for walking in search for food and water hence low productivity.

INTENSIVE SYSTEM

- In this system, beef cattle are kept in stalls or paddocks where rotational grazing is practiced.
- Under stall feeding, animals are confined in stalls where feed in form of grass, concentrates and water are given to animals.

ADVANTAGES

- Animals fatten up quickly since animal movement is restricted.
- Disease and parasite control is easy

DISADVANTAGES

- It is expensive
- It requires a lot of labour to provide animals with feed.

Management of beef cattle involves the following aspects; housing, feeding, breeding, disease and parasite control.

HOUSING

The kholo for beef cattle should be

- Well ventilated
- Well thatched/roofed
- Spacious or roomy
- Provided with enough beddings on the floor
- Sited on a high, well drained ground

BREEDING

Malawi zebu can be improved for beef production by cross breeding with other exotic breeds, for example Brahman, charolais and Hereford.

- Bulls are used for mating when they are 18 months old.
- Heifers are used for mating when they are 24 months old

The best time for calving is about two months before rains start. This is to ensure that calves get plenty of feed.

CARING FOR CALVES

WEANING

Calves are weaned after **six** months. This is the time they can be given solid feed.

Some of the husbandry practices that have to be carried out before calves are weaned are; disbudding, dehorning, castration and branding.

DISBUDDING

This is a process of stopping the growth of horn buds

IMPORTANCE OF DISBUDDING

- Animals without horn are safer/easy to handle.
- It prevents animals from hurting each other.

HOW TO DO IT

- Use caustic soda to stop the growth of the horn buds.
- Use a dehorning iron.

DEHORNING

This is removal of the horns from cattle.

IMPORTANCE OF DEHORNING

- It protects other animals and people looking after the cattle from being hurt.

HOW TO DO IT

- Use a hot dehorning iron and a saw to remove the horns.

BRANDING

This is a process of placing an identification mark or number on the skin of animals.

IMPORTANCE OF BRANDING

- For easy identification of animals.

HOW TO DO IT

A hot branding iron is pressed onto the skin of the animal, thereby burning members into the skin.

CASTRATION

This is the removal of testes in sires. This should be done before the calves are weaned.

IMPORTANCE

- It prevents inbreeding among the breeds.
- It makes the animal docile.
- It fattens the animals quickly.
- It improves the quality of the meat.

HOW TO DO IT

- Testes are removed using a knife or elastic band.
- Burdizzo is used to crush the spermatoc cords
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PROTECTING CATTLE FROM PARASITES AND DISEASES

Parasites are organisms that depend on other organisms. Parasites can be internal or external.

EXTERNAL PARASITES

The most common external parasites on cattle are ticks, tsetse flies.

EFFECTS OF TICKS ON LIVESTOCK

- Ticks suck blood and cause cattle to suffer from anaemia.
- Ticks damage the hides of cattle biting of wounds.

- Ticks are a source of infections. E.g, mastitis in dairy cows.
- Ticks weaken cattle.
- Transmit tick borne diseases. For example, east cost fever, heart water, red water and gall sickness.

EFFECTS OF TSETSE FLIES ON LIVESTOCK

- Tsetse flies suckle blood
- Irritate the skin of cattle.
- Transmit diseases called trypanosomiasis

INTERNAL PARASITES

PARASITE	SIGN OF ATTACK	CONTROL
Round worms	Attack the intestines and absorb digested feed from the animal. Enlarged stomach (pot belly) especially in calves Continuous diarrhea (scouring)	Regular deworming, i.e dosing or drenching with thenothiazine. Rotational grazing helps to reduce build up of worms
Tape worms	Attack small intestines and suck digested feed. Larvae enter the blood stream and settle in the muscles making the meat look measly.	Dosing with suitable drugs Practice rotational grazing
Liver fluke	Attack the liver and makes the animal to loose weight Watery swellings may appear on the lower parts of the body. Cause internal bleeding in animals	Destroying snails which are intermediate hosts using copper sulphate. Avoid grazing in wet dambos. Rotational grazing

DISEASES OF CATTLE

DISEASE	CAUSAL ORGANISM	SYMPTOMS	CONTROL /PREVENTION
East Coast fever	Protozoa	High temperature, loss of appetite, excessive salivation, diarrhea	Restrict animal movement, dipping animals to control ticks
Foot and mouth	Virus	High fever, lameness, difficult in eating because of blisters on the tongue, in the mouth and on the skin	Restrict animal movement, slaughter and burn infected animals, vaccinate all animals
Mastitis	Bacteria	High fever, swollen udder and teats, blood/pus stained milk	Treat with antibiotics, practice hygiene during milking
Tuberculosis	Bacteria	Temperature fluctuation, diarrhea, persistent coughing, thick vaginal discharge, animal may become sterile	Slaughter animals that are positive, vaccinate animals
Brucellosis	Bacteria	Genital organs in cows are inflamed, swollen testicles in bulls and abortion	Slaughter affected animals, vaccinate remaining stock
Trypanosomiasis	Protozoa	Frequent fever, dullness, anaemia, death may occur	Treat with suitable drugs, control ticks by spraying, slaughter badly infected animals
Milk fever	Low level of calcium in the blood stream, excessive production of	Paralysis and unconsciousness, death may occur in severe cases	Administer calcium – phosphorus solution through the jugular vein, feed dairy cows with calcium rich feed or bone

	milk soon after calving		meal two months before calving
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DAIRY PRODUCTION

Dairy production refers to the raising of animals meant for milk production

IMPORTANCE OF DAIRY PRODUCTION

- Dairy products are nutritious. Milk is a balanced food which contains water, carbohydrates, proteins, fats, minerals and vitamins.
- Dairy products are a source of income as farmers can sell milk all year round.
- Cows provide a source of manure, hides and bones.
- Dairy cattle are also a source of employment.

CHARACTERISTICS OF DAIRY BREEDS

- The body of a cow is lean (without too much flesh) and angular.
- The body is wedge shaped. It should be deep at the rear than at the front.
- Dairy cow has a large udder with teats which are evenly spaced. The udder is well suspended but tightly attached to the body.
- The legs are short and strong

BREEDS OF DAIRY COWS

BREED	ORIGIN	COLOUR
Friesian	Holland	Black and white
Guernsey	England	Fawn
Jersey	England	Brownish
Ayrshire	Scotland	Red and white

Malawi zebu	Malawi	Black
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FACTORS AFFECTING MILK YIELD

- Age of an animal. The milk increases with each calving up to fifth lactation.
- Nutrition or feeding. Dairy cows need concentrates and additives on top of roughages to produce more milk.
- Character of a cow. A dairy cow should have a quiet temperament as this is essential for milk production. Highly irritable cows give less milk.
- Health of cows. Diseases such as mastitis and milk fever affect quantity and quality of produced milk. Therefore, the cow must be in good health.
- Season/time of the year. Availability and high quality of pasture increases milk yield.
- Period of lactation. The cow dries off after 305 days after calving.
- Milking frequency. The recommended frequency for milking in cows is twice a day. The more frequent a farmer milk the lesser the quantity of milk produced.
- Milking techniques. Milking is efficiently done when using machine than hands.

MANAGEMENT OF DAIRY COWS

1. HOUSING

A dairy cow house should have the following structures;

- It should have a milking shed and a shelter for moderate exercises.
- It should have beddings
- The floor in the milking shed should be made of rough concrete for easy cleaning.
- There should be a separate room for storing feed, drugs and utensils
- Should have a neck yoke for restraining the cow during milking

MILKING HYGIENE

Milk can be easily infected by bacteria. It is therefore very important to observe hygiene during milking. The following should be followed;

- The farmer should wash hands with soap before milking cows.
- The farmer should wash milking utensils with warm water.
- The farmer should wash the udder and teats of a cow using warm water and mild disinfectants.
- The farmer should give some concentrates to the cow while it is being milked.
- Milk the cow gently and quickly to ensure that all the milk is taken out'
- Pour the milk through a filter fitted on a funnel to remove any dirt and impurities.
- Draw a little milk from each teat into a strip cup to check mastitis signs.
- Pour milk into a cooler to slow down growth of bacteria.

2. BREEDING

- The Malawi Zebu should be cross bred with Friesian to increase milk production. AI can be used in absence of a bull.
- Cows should be "steamed up" two months before calving to allow it build its body to sustain the foetus and be ready for calving.
- A cow comes on heat every 21 days. The gestation period is about 283 days.
- The lactation period lasts for 10 months and it dries up 2 months before calving.

CALF REARING

- Since cows are raised for milk production, calves should be allowed to suckle their mothers for the first 3 – 4 days so that they get colostrum milk.
- After 4 days, the calves should be fed with milk or milk substitutes from a bucket up to 3 months. This is the time they are weaned.

- Sometimes a dairy cow is spared from dairy production to be a foster mother where it can suckle two or three calves.

3. FEEDING

- If feeding is well timed, the cow should give birth when the rains begin. At this time there is plenty of fresh grass which provide nutrients for its maintenance.
- During dry season, it is necessary to supplement the grass with crop residues (like maize stems, g/nuts haulms, been and pea straw, sugarcane tops and sweet potato vines) and conserved hay (like hay and silage)
- Concentrates are also provided in form of maize meal, cotton seed cake, g/nut cake, maize bran, bone meal. Salt should be added to the concentrates.
- Clean water should be available at all times.

4. DISEASES AND PARASITES

The diseases and parasite outlined under beef production also attack dairy cows. However, there are two diseases that specifically attack dairy cows. These are mastitis and milk fever.