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# CRC BEEF STOCKMAN SCHOOL



Unlocking green and inclusive growth in agribusiness, agroforestry and aquaculture

# **Beef cattle production**

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### **Compuls** Overview of the book

#### **Purpose of this book**

The main purpose of this book is to guide and assist owners of domesticated beef cattle with a practical approach to the correct stepwise ways to enhance the profitability and sustainability of their cattle herds.

#### **EVERYTHING STARTS WITH THE MARKET FIRST!**

Farmers must start by understanding the needs of their target market (volumes and quality standards) and find the practices listed in this book that would best assist them in achieving the market requirements. Farmers who apply good stockman and husbandry practices explained in this book will find more success to access and deliver good quality and increased quantities to new and diverse markets. Farmers should constantly engage industry role players, including input suppliers, extension service providers, commercial breeders, government institutions, off-takers and agents to familiarize themselves with changes that take place in the market and opportunities that might arise.

The book is written so that readers can easily understand the explanations of the basic steps of cattle ranching.

The book is divided into three parts.

- Chapter 1 is an overview of beef production. Becoming a successful cattle farmer. We discuss the differences between keeping and farming with cattle, the need for process thinking and doing regarding the activities of livestock farming and the management of the daily basic needs of cattle.
- Chapter 2 goes into more detail regarding producing cattle, the nutritional requirements for different stages and seasons of the year and health inspections. The chapter extensively discusses the diseases that most commonly afflict cattle. We conclude the chapter with a discussion of the different breeds of cattle, each breeds advantages and the need for planned reproduction.
- Chapter 3 takes us to market. These are the final stages before we reach the market, rounding off, basic finances and record keeping and the selling of our production.

#### Chapter 1



### Introduction to successful beef production

#### **1.1 Difference between keeping and farming livestock**

#### Keeping livestock

Over thousands of years people have domesticated livestock (cattle, sheep, goats) to keep them as a source of food, fibre, leather and as needed regarding working as draught animals.

To a very large extent cattle can look after themselves, meaning that most of them will survive diseases (apart from some diseases that can wipe out a whole herd or population of animals), become fat when there is abundant grazing and then become very thin again when there is a shortage, and some will even die due to starvation. They will reproduce with a longer interval since most cows will lose a lot of condition after calving, especially if they calf in the dry season and then they will only become reproductively active after the calf is weaned and they have regained enough body condition to show standing heat and mate with the bull again.

If cattle are kept under such conditions with low management inputs, they normally just survive and reproduce to maintain the herd numbers and there is very little yearly growth in cattle numbers or off take, meaning there is very little cattle extra to slaughter or sell on a yearly basis.

The value for the livestock keeper is mainly just to have his/her number of cattle that have a certain value (monetary or social) or provide draught power and in many cases, it is viewed as their bank.

No or low inputs = no or low outputs.

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#### Farming with livestock

If the livestock keeper is happy with the results obtained by just keeping his/her cattle for own use with the resulting lower production and higher losses, but with minimal management inputs needed from his/her side, any further training and support to decrease losses and improve production will be wasted because the livestock keeper will not be dedicated to change his/her current practices for livestock keeping.

If the livestock keeper has the inherent drive and will to decrease losses, improve production and especially increase offtake (animals or animal products sold) by increasing the management inputs, using the information and support that is provided during and after training, then only can progress be made to support him/her in becoming a livestock farmer.

# The inherent drive is the absolute bottom line for success in improving the health and production of cattle.

The aspiring cattle farmer must commit him/herself to learn and implement the principles of improved health and production and must be willing to make the management changes and add other inputs.



#### **1.2 Successful beef producers follow an improving process cycle**

Cattle production and animal husbandry is the result of numerous micro-processes, feeding, watering, reproduction, checking, and taking preventative and reactive actions regarding pests and diseases. To achieve all the micro-processes, we need to become aware and implement a model of process thinking and action with improvements and lessons being learnt.

To get something done, setting up vaccination programmes, taking up supplemental feed. we need a process. The process that is recommend looks as follows:



Figure 1.1: Process Cycle

**The task** that must be performed must be defined. What are you going to do? Installing water troughs, fence maintenance, moving cattle from one area to another.

**The Plan:** here we create a mental bridge, who must help? When must the task happen? Some tasks must be done more regularly than others. What are you going to need? Pliers, wire, spanners, injections, the task will help you build a kit list for the doing.

**Development:** get the resources, list of equipment and people for the doing of the task.

**Do:** Roll up your sleeves and at the right time do the task.

Assess: How did it go? Was the task completed? Was it done correctly?



You will notice several CHECKLISTS throughout this training material. Each checklist is an Assessment Tool used to make sure that you have completed numerous little process cycles.

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#### Example from the Calving Section in Chapter 2

#### Checklist

- Livestock handlers know how to identify cows close to calving and understand the normal calving process.
- Livestock handlers are trained to rectify the most common calving problems and understand when veterinary assistance is required.
- Calves are monitored to ensure that they take in enough colostrum.
- Bulls selected for breeding are tested six weeks prior to mating.
- Observe and record cows showing standing heat prior to breeding season.
- Score body condition and check teeth of cows to be bred.

Reflect: What can we improve?

**Learn** from mistakes. Learn from your successes so that you can repeat these beneficial actions when doing the task again.

Character: Beliefs, values, attitude, and behaviour.

As we follow this process you will become a better farmer. You will learn to become more **aware** of your cattle and their needs, you will start **anticipating** weather, environmental changes and the needs of your cattle and the people working with you. With good **Awareness and Anticipation** your herd and environment can provide you with **Abundance**. Remember to always remain **adaptable**, you must continually improve and learn from your mistakes, successes, and the changes around you regarding your environment, your herd and the people working with you.



Figure 1.2: Four A's towards effective task completion

And so, as your herd and farm grow and improve you can expand your farm and provide for more people. The provision of your farming is not only in terms of production but also employment and later empowerment as you teach and train others from the lessons you have learnt and the experience you have gained. A good way to see your farming is as several interlocking *Process Cycles*. Feeding, watering, health and safety for yourself and your animals, looking after your environment (avoid over grazing, looking after water sources), reproduction strategy and then the raising of calves for expansion of your herd or sale.



Figure 1.3: Cattle Production Processes Interlock

A good plan of action regarding each aspect of your cattle process can make all the difference. We are not in the business of keeping cattle as pets but rather as a lifestyle, improving our own lives and that of our communities at large.



Figure 1.4: Improvement of self and community



#### 1.3 Basic daily needs of cattle



Figure 1.5: The farm and its location are central to your production

#### 1.3.1. The Farm

For animals, cattle in this case, to survive, certain basic needs need to be met daily. All livestock owners understand the concept and that is why cattle herders spend most of their days to let cattle graze and to get to water which they can drink.

#### Drinking Water

Drinking water is always the first limiting factor in cattle health and production.

Apart from daily grazing to fill the rumen (big stomach), cattle must also drink water at least once a day.

Water will fill the bottom part of the rumen in which the microbes (micro-organisms) live. The course grass that is eaten and swallowed will float on top of this water layer. After rumination the small pieces of grass will sink into the bottom of the rumen where it mixes with the microbes in the water. Therefore, enough water, daily, is needed for the digestion process in the rumen.

Water is then also needed for the rest of the digestion process, uptake of nutrients from the small intestine into the blood circulation, then also for the working of the different organs (metabolic functions).

Finally, water is also needed for the excretion of metabolites (remaining product of nutrients after being utilized by the body's cells) through kidneys in the form of urine and through the intestines as dung.



Sufficient drinking water, about 10% of the animal's weight in kilograms converted to litres, is needed daily by ruminant livestock for digestion of food and other bodily functions.

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A cow weighing 400 kg will need ±40 litres of drinking water per day. If enough clean drinking water is not available, it will have an immediate effect on the digestion process and the production performance of cattle, foetal development, and weight gain.

Water should be available, preferably less than 2 kilometres from the grazing areas to reduce energy consumption when walking to the water source, streams, rivers, or troughs and back to the grazing.

The biggest limiting factor in cattle production, is if there is no drinking water available for the cattle daily within 5 kilometres of the area in which they are grazing.

# In Southern Africa there are large areas of grasslands unutilized by cattle, sheep, and goats because there is no drinking water available for these animals.

In cattle farming a huge sum of capital is spent on the development of water troughs throughout the grazing area. Farmers sink boreholes, build dams (water reservoirs), and lay pipe systems to feed these water troughs (drinking points). Building a water infrastructure unlocks grazing areas far from natural water sources like streams and rivers.

# The first responsibility of the cattle farmer is to ensure that the cattle get enough drinking water daily.

#### • Grazing (grass and other plant material like leaves of bushes and trees)

A cow weighing 400kg will need about 10kg of dry grass (400 X 2.5% = 10kg), for the optimal working of the large stomach (rumen), for the animal to reproduce, grow or to maintain optimal body condition for their stage of production.

Extensive cattle farmers are totally dependent on the environmental cycle (rainfall and temperature) for the growth and production of grass which is the largest variable factor in livestock production.

- 1. During the warm wet season grass will grow and regrow after grazing.
- 2. During the cooler dry season there will be very little or no growth of grass, meaning that for that dry period, just the existing standing dry grass is available for grazing until the next wet season.

This causes a large variation in the availability and the quality of grazing during the yearlong environmental cycle that consist of 4 seasons and a dry and wet period.

This leads to a situation on a yearly basis that there is a period of abundance (lots of good quality grazing) and a period of shortage (little and/or low-quality grazing).

When practicing livestock (cattle, sheep and goats) farming one of the most important management actions is to conserve grazing (rested grazing areas or to cut and bale grass) for the periods where there is a shortage of grazing and to also provide a concentrated supplement (protein or phosphate lick) in order to be able to utilize low quality grazing or to supplement the mineral shortage in green grazing.



The second responsibility of the cattle farmer is to ensure that the cattle get enough grazing each day.

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Figure 1.6: Zambian Cattle under a high density grazing system

#### **Basic Principles of Grassland Management**

#### The carrying capacity of the grazing area or veld

You must remember that the veld is only able to carry a certain number of livestock over a certain period because it can only produce a certain amount of food for grazing. Areas that receive high rainfall normally have a good vegetation cover and higher quality types of grass. These types of environments will be able to supply the most grass for feeding livestock.

Some types of grasses, called unpalatable grasses or grazing, must not be eaten by the animals. These grasses either taste bad or are very tough to bite off, which can wear down the cattle's teeth.

Cattle are grazers, so make sure that there is grass available. You can calculate the number of cattle that can be kept on a specific area of land for grazing. If the number of animals is more than what the grazing can support, the cattle will not be able to get enough energy and nutrition. This will also cause overgrazing and damage the veld.

#### **Sweetveld Compared to Sourveld**

Sweetveld is generally found in warmer and dryer areas and tends to keep its quality throughout the year, although it produces less grass per year. The carrying capacity of a sweetveld is lower and can be overgrazed and damaged easier because of its lower yield. This will lead to encroaching by different types of bush, which might not be edible.

Sourveld is usually found in higher altitudes and cooler areas, which means that the rainfall may be higher, but it may become frosty during the winter. The grass quality declines while the nutrients are reabsorbed by the soil during the resting period to survive the colder and harsher weather. This means that the cattle will require nutrients or supplements such as a urea lick or block to enhance the feed quality in winter. Although these areas supply new and highly nutritious leaves in spring, the veld recovers slowly for use by livestock. Typically, the grass found in sourveld is short.

#### **Resting the Grazing or Veld**

Grazing areas and veld must have a rest period for a full season at regular intervals. This gives the grazing time to recover and restock or replenish energy in the root reserves. Nutrients are taken from the root reserves every time grazing happens, which reduces the growth of leaves. When grazing happens over several seasons, the root reserves cannot replenish themselves and will eventually die or get pulled out by the animals.

Trees can also be over-browsed. This can be seen in the height of the trees, which is called a browse line. When this starts happening, the animals must be withdrawn from the area to allow the trees to regrow branches and leaves that can be used for browsing. With proper pasture control, you will also be able to improve the control of parasites.

#### **Parasites and Pastures**

The following are various ways to reduce parasites with pasture control:

- Hay crop. This type of pasture will mean that cattle will be grazing in one part of a pasture in the early parts of the season and moved to another pasture that was for the purpose of hay cutting.
- Use annual pasture systems. This means planting the pasture first and then using an implement to roughen the stubble.
- Use other types of animals to graze the pasture. Certain parasites cannot survive in the stomach of certain grazers.
- Introduce the cattle to pastures with high nutritional food at certain times, but they should also graze in less nutritional areas.
- Be aware that parasites larvae normally live close to the ground. Therefore, if the cattle graze in high grass, the chances of getting close to the parasites are reduced.
- Rest pastures for at least a full grazing season if possible. This will give the parasite larvae and eggs time to die off.

#### **Controlled Grazing**

Controlled grazing is a system of allowing cattle to graze for shorter periods in one paddock before moving them to another paddock. The smaller the paddock the more evenly it is grazed. The cattle are moved to the next paddock to allow a little growth in the current paddock. This will allow the paddock to recover quicker. If the grazing continues for too long, the brush or grass can be damaged, and this will prevent it from growing back in the same season. Natural grasses appear quicker after controlled grazing.

Starting a grazing programme can be fairly simple. It is usually best for producers to develop a program instead of jumping in and subdividing their farms into paddocks. Dividing existing pastures in half, closing pasture gates, or stringing temporary fencing can be a start to controlled grazing. Watching livestock graze, learning to monitor pastures, and using temporary fencing for subdivisions all advance the system without exposing the producer to large risks.

Some producers will use temporary fencing to help develop a grazing system, and then put in hightensile wire after determining the proper location and frequency of rotation. Some equipment and experience are necessary when working with high-tensile wire. For example, a spinning jenny is a must in unrolling the wire. A crimping tool is necessary when working with lower-gauge (thicker) wire, which should be used if antelope are a problem. Antelope will not break the lower-gauge wire but might break a higher gauge. Some people who work with grazers to establish controlled grazing systems prefer to develop water lines first and then do the fencing.

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The first considerations, however, are the number of paddocks and their size and shape. Paddock size is determined by the number of animals, the frequency of rotation and how much forage is needed by the type of animal being grazed. For example, some cow-calf operations are never stocked heavily enough to justify a daily rotation because their animals do not have high enough nutrition requirements to justify that much control.

#### **Importance of Controlled Grazing**

Controlled grazing is vital for various reasons. These include but are not limited to:

- Increased forage production: The general rule of thumb is that a well-managed, controlled grazing program can increase quality forage production by 30-70% each year. Much of this increase in forage is accomplished by minimizing overgrazing of some plants in the pasture. A grass or clover plant that is nibbled on every few days loses, has little time to recover from the injury insult of grazing before being injured (grazed) again. It loses root mass and energy reserves and has greatly reduced forage production over the grazing season. A plant that can recover from a single grazing incident for three weeks or more before being injured by grazing again has more resources to put into growth and can produce 30-70% more forage.
- Increased soil fertility: Controlled grazing does several things to improve pasture soil fertility and organic matter. Two specific things include (1) Spreading manure around the whole pasture since grazing sheep and cattle typically return to the water tanks or a single favourite shade tree. This results in the mining of minerals and nutrients from the far parts of the pasture and depositing them at the water tanks or shade trees (2) Plants that are over-grazed or less healthy from being grazed every few days have smaller root mass which leads to less soil organic matter. Thus, increased organic matter and soil fertility will reduce needs for purchased fertilizers, and result in increased forage production.
- Increased resistance to drought: Increased soil organic matter and better forage cover due to better grazing management will slow water movement during hard rains and increase absorption of water by the soil. Decreased water run-off and increased soil organic matter keep pastures more resistant to impacts of drought, increase forage production, and maintain forage growth longer into periods of droughts.
- Less wasting of forage. A herd of cattle that are given access to 20 times as much forage as they can eat in a day or two will walk a lot of forage into the ground, defecate and spoil forage as they walk to and from the best forage spots over the 3 weeks or more that they are on the pasture. Providing forage at shorter intervals every day or two will minimise the cattle damaging forage, hoofs and excretions (urine and dung).
- Grazing animals can be used to help prep areas for reseeding. Certain types of grass and clover seeds can be successfully broadcast on top of the ground without tilling the seeds into the soil. A grass manager can use a group of cattle to lightly overgraze an area to expose a little soil and cut down on the grass cover. Then more of the broadcast seeds fall on bare soil and are more likely to germinate. If the cattle are kept on the area with the broadcast for a day or two, their hooves can be used to help press the seed into contact with the soil. This is best done just prior to a rain.
- Limit feeding during times of drought. During a drought, a livestock manager can control the amount of grazing and prevent a herd from eating all of the forage up, before the rains come. With adequate fencing and the ability to manipulate size of paddock with portable electric fencing, a cattleman can postpone buying hay for a few days or weeks and save funds. Of course, certain animals such as late gestation cows or newly weaned calves probably will need that extra forage and cannot be limit fed.

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- Improved animal management. Cattle that are regularly rotated to new pastures every few days in low stress procedures are much easier to manage. Open a gate and call is often all that you need to do to get the cattle to follow you to the next pasture or to the working corrals. They associate the humans with better food. If every time you show up out in the pasture you drive them to the work pens to stick them with needles or stick drench guns down their throat or castrate them, cattle are much less likely to trust you. Stress results in weight losses and increased disease susceptibility.
- Allowing certain species of plants to go to seed. Certain annual plants that reseed usually need a few weeks to develop a seed head and then time for seeds to scatter without grazing animals present. A couple of examples are annual rye grass and hairy vetch. With constant grazing, these plants never have a chance to go to seed. Our cattle eat the annual rye grass seed heads as well as the grass blades. Removing cattle from rye grass pastures in late spring/early summer will allow them to go to seed.

#### Seasonal Supplementation

Ruminants are completely dependent on the microbes in their rumen to digest the grass and a shortage of protein in dry grass, reduces the microbe's ability to replicate. Thus, under conditions where the protein obtained from the grazing is too low, the number of microbes becomes less and it takes more time for the lower quality grass to be digested.

The result is that the rumen doesn't empty fast enough and the daily intake of grazing by the cattle will decrease.

During the summer months there is adequate protein in the grass for optimal digestion at a fast rate but there is a shortage of phosphate which has a negative effect on the use of the digested nutrients by the cattle resulting in a slower growth rate.

 $\sim$ 

Seasonal supplementation is not something that is normally provided by cattle farmers.



Figure 1.7: Annual stages of cattle management and the seasons





Figure 2.1: Production is the first pillar of cattle production

#### **2.1** Increasing cattle reproduction.

The yearly production cycle of cattle consists of 4 Reproduction Periods or Stages.

Calving, breeding, weaning and the dry cow periods.

At each of these stages there are specific Critical Control Points that need specific Management Actions to optimise reproduction.



#### The whole definition of a functionally efficient cow:

A cow that calves without assistance during the spring and reconceives within 3 months after calving during the summer, to produce a live weaner calf 9 months later during the autumn each year on natural grazing, with only supplementing the seasonal nutritional shortages with a phosphate lick during the spring/summer, and protein lick during the autumn/winter.

## **Beef Cattle Yearly Production cycle**



Figure 2.2: 12-month reproduction cycle

#### 2.1.1. The two most important factors that limit the reproduction goal

#### **First limiting factor**

The first limiting factor to achieve the reproduction goal is that the cow is pregnant for 9 months of the year. Thus, in a 12-month period you only have 3 months of the year to get the cow pregnant to produce one calf per cow per year.

# **First limiting factor**



Figure 2.3: First limiting factor for reproduction goals

#### Second limiting factor

The second limiting factor is that the nutritional needs of the cow differ by a 100% during the reproduction cycle and therefore the cow needs to calf and reconceive during the time of the year when the best grazing is available.



Figure 2.4: Second limiting factor for reproduction goals

#### **2.1.2.** The Management of four different reproduction periods of beef cattle

The four major events in the 12-month production cycle that must be managed well to produce one calf per cow per year.

Each of these Reproduction periods is about 3 months long and needs specific management.

# Each of the Production Periods has identified Critical Control Points



Figure 2.5: Four production periods

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#### Calving



#### Figure 2.6: Calving

The livestock handlers who work with and observe the animals daily have a very important role to play during the period before, during and after calving to ensure that problems are addressed as soon as they arise to limit calve losses and get the cows ready for the next breeding session. During calving, very close observation and assistance is required as each calf born has the same value as a weaned calf. Survival and growth up to weaning depends on normal calving and the intake of enough colostrum after birth.

#### Specific needs and appropriate management actions:

- Correct management just before and during calving.
- Survival of newborn and young calves
- Test and prepare bulls for the breeding season.
- Preparation of cows for the breeding season

#### Specific nutritional needs

- Calving normally takes place in the spring when grazing is still limited depending on the start of the rainy season.
- Cows will draw on their body reserves during this period after they calved and will lose at least half a Body Condition Score.

- Livestock handlers know how to identify cows close to calving and understand the normal calving process.
- Livestock handlers are trained to rectify the most common calving problems and understand when veterinary assistance is required.
- Calves are monitored to ensure that they take in enough colostrum.
- Bulls selected for breeding are tested six weeks prior to mating.
- Observe and record cows showing standing heat prior to breeding season.
- Score body condition and check teeth of cows to be bred.

#### Breeding



#### Figure 2.7: Breeding

Specific need and appropriate management actions:

- Management of bulls during the breeding season
- Management of cows, first-calver cows and heifers during the breeding season
- Effective vaccination of calves
- Optimal growth of calves before weaning.

#### Recording of standing heat observations and successful mating:

The reproductive activity of the cows can be recorded and analysed to determine the percentage of cows showing standing heat within the first 3 weeks after the start of the breeding season. The target is that at least 60% of the cows must show standing heat to obtain a high pregnancy percentage during the breeding season.

#### **Definition of cow/heifer on standing heat:**

- This phase of the 21-day heat cycle lasts for 4-24 hours only. That is when the cow/heifer is ready to be mated.
- The cow/heifer will stand dead still when other cows or the bull jump on her.
- This shows that she (the animal being jumped while standing still and not moving away) is on standing heat.

# Heat Cycle



Figure 2.8: Heat cycle

# 21 Day Oestrus Cycle



Figure 2.9: Oestrus cycle

#### **Definition of successful mating**

The bull will jump on a heifer/cow in standing heat (she stands dead still and doesn't move away), mate for a few seconds and then thrusts through, which proves that he ejaculated. The thrust results in the bull's back feet also lift from the ground momentarily.



Figure 2.10: Success full mating

#### Specific nutritional needs

The nutritional need of the cow is the highest during the breeding season. Her uterus must recover after calving to come on heat again, she reaches peak milk production, and she must re-conceive while gaining body condition.

The best possible grazing must be available during the breeding season.

- Live observation of bulls' serving ability and capacity.
- Observe and keep record of cows mated.
- Observe udders of cows to confirm that calves are feeding.
- Score body condition of cows at the end of the breeding season.
- Group and closely manage first calf cows in their second breeding season.
- Group and closely manage heifers in their first breeding season.
- Vaccinate calves against clostridial diseases.
- Weigh calves at 100 days of age to evaluate growth rate.

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#### Weaning



#### Figure 2.11: Weaning

Weaning must be done in such a way that it creates minimal stress to reduce disease and weight loss after weaning. Special attention should be given to lung infections (pneumonia) during this period.

Specific needs and appropriate management actions:

- Vaccinate calves for viruses and bacterial infections.
- Deworm calves for worms and liver flukes.
- Cull animals with defects.
- Preparation for and weaning of calves.
- Pregnancy diagnosis and body condition scoring.
- Selection and management of replacement heifers.
- Marketing of calves, culling heifers and nonproductive cows.

#### Specific nutritional needs

Just after weaning the nutritional needs of the cow fall overnight. She is now a dry cow but early pregnant. She needs to be supplemented with a winter lick to regain condition after weaning on dry autumn grazing.

- Wean calves using methods involving minimal stress.
- Book veterinarian for pregnancy examination.
- Record pregnancy results and condition score.
- Group cows according to pregnancy and condition status.
- Select replacement heifers and commence replacement heifer management plan.



Figure 2.12: Using a nose ring for stress free weaning

#### Dry pregnant cow



#### Figure 2.13: Pregnant cow

Specific need and appropriate management actions:

- Active marketing of cull animals and management of dry cows
- Preparation of the cows for the calving season
- Preparation of replacement heifers for their first calving season
- Rounding off the oxen/bulls on the farm

#### Specific nutritional needs

The cow is now in an advanced state of pregnancy. For her to keep on gaining body condition before calving she needs to be supplemented with a winter lick to maintain intake of the dry winter grazing.

- Condition score pregnant cows prior to calving season.
- Group and manage cows in suboptimal conditions.
- Plan for and provide supplements and/or stored feed to overcome local seasonal nutritional shortages.
- Vaccinate cows annually before calving.
- Group and closely manage heifers before their first calving season.
- Feed and market any animals kept back for sale.

#### **Replacement Heifer**



#### Figure 2.14: Heifer

#### **Key points**

- The fertility and health of a beef cattle herd can be built up in stages over a few years by focusing on the management of replacement heifers.
- Improving fertility is based on selection for functional efficiency and careful management of replacement heifers from weaning until the end of their second breeding season.
- The long-term herd health status is built around a complete vaccination programme that should be followed strictly with replacement heifers.

#### After weaning until first breeding

At or after weaning, select one and a half times the number of heifers that will be required for replacement. The goal of the selection is to select a uniform group of heifers that are functionally efficient. Retain these heifers as a separate group and manage them until the end of their second breeding season. Do this according to a three-year management plan, worked out for this individual group and stretches from weaning until the veterinarian has confirmed them pregnant for the second time.

#### First Calving and second breeding

The most critical period in the life of a female animal is the period between her first calving and second breeding (re-conception). After first calving the cow needs special nutritional support to get her pregnant again within 3 months after calving.

Specific need and appropriate management actions:

- Good nutrition and special care.
- Extra energy and protein to help grow to full maturity.
- Cows generally reach full maturity at 4 5 years which coincides with the weaning of the heifer's second calf.
- Heifers with undesirable traits are culled.

#### Specific nutritional needs

- Extra energy and protein to help grow to full maturity.
- Heifers should be fed to achieve 750g average daily gain (ADG) throughout the heifer development period. To achieve this in developing heifers, the total diet must contain at least 12.5% crude protein and roughly 65% total digestible nutrients, energy in the diet.

- Condition score your heifers
- Feed and licks.
- Manage group and individuals in below optimal conditions.
- Maintain vaccination programme.
- Group and closely manage heifers before their first calving season.



Figure 2.15: Replacement Heifer

#### **2.2. Cattle Nutrition**



Figure 2.16: Nutrition, the second pillar towards cattle production

More than 70% of the Southern African land surface is covered by savannah and grassland. Grass and leaves are high in hemi-celluloses, celluloses and lignin and can't be digested by humans and other monogastric animals like pigs and chickens.

Cattle and other ruminants like sheep and goats have the unique ability to convert grass and leaves (plant material) that can't be eaten by people into products that can be used by people like food (meat and milk), clothing (leather) and draught power (ploughing and transport by drawing a cart).

This ability is because these ruminant animals have a multicomponent stomach that enables them to digest high fibre material like grass which can't be digested by humans.

#### **2.2.1.** Basic description of the digestion of grass by ruminant animals

Cattle will walk and graze grass until the large stomach (rumen) is full.

The amount of grass that cattle can eat on one day (intake), is thus limited to the speed of digestion of the grass that is already in the large stomach.

Cattle can only eat more once that grass is digested.





An **important** point to understand is that the microbes in the rumen (large stomach) do all the digestion of the grass.

The cattle are totally dependent on them to fulfil this action, in other words, if those organisms are not there or die off due to malnutrition the grass can't be digested.



The microbes (microbial protein) that feed on the grass and then multiply are in fact becoming the food of the cattle.

### **2.2.2.** Matching the nutritional needs with the environmental supply of

#### grazing

The availability of grazing (main nutritional source for the cattle) differs largely throughout the year. This has a direct effect on the body condition (fat and muscle reserves) of the cattle.

In order to make management decisions regarding grazing management and supplementary feeding, the body condition of the breeding cows and bulls must be quantified, recorded and analysed at 4 specific points in time (August, November/December, March and Jun) during the 12 month production cycle.



Figure 2.17: 12-month nutritional requirements

#### Evaluate and manage body condition score.

The most important factor that drives survival, normal calving, milk production and optimal reconception of the adult cow herd, is body condition during the 4 Critical Control Points in the 12month production cycle. (As shown in the figures above and below) The following scale is used to determine and quantify **Body Condition Score**:



Figure 2.18: Body Condition Scoring Index

## Body condition scoring is one of the key management tools that needs to be undertaken and recorded:

- Just before the start of the breeding season Bulls (November), Cows (January). These
  inspections also include checking and recording (stick reader) the status of the front incisor
  teeth in cows older than 10 years and cows in a 2 and lower Body Condition Score
- At the end of the breeding season
- Bulls and cows (Mar)
- At pregnancy examination of the cows
- Bulls and cows (Jun)
- 60 Days before the start of the calving season Bulls and cows (Aug)

Period 1 Calving and preparation for		Period 2 Breeding and pre- weaning growth of		Period 3 Weaning and pregnancy diagnosis			Period 4 Dry cow management, preparation for calving				
breeding			calves								
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	BC		BG	BC			BC			BC	
Target	3.0		2.5	2.8			2.5			3.0	
Minimum 2.5			2.0	2.5	8		2.3			2.7	

Figure 2.19: Body Condition Scoring intervals and targets

The information below is used for training. Everyone involved with the cows should be continuously observing the health and condition of the cows. Observation becomes meaningful if everyone understands the optimal Body Condition and the cycle of the changing body condition from heat to calving to nursing to mating again. The goal (task) is to help cows recover enough to have a healthy Oestrus cycle and become pregnant again.

#### Essential body condition score of a healthy cow, Body Score Target for 85% conception



#### Essential body condition score of a healthy cow



Figure 2.20: Body score target for 85% conception

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#### Body Condition Score for a cow struggling or not undergoing a healthy Oestrus Cycle

If a cow calves at a 2.5 BCS she has too little residual fat. If 20% or more of cows calf at a BCS of 2.5 it is due to bad grazing planning or management.	
These cows will also lose at least half a condition score after calving <u>ending up at a 2 BCS at the start of the</u> <u>breeding season</u> .	
These thin cows will also start to regain condition during the three-month breeding season, but they do so <u>from a 2 BCS baseline.</u>	

Undesired body condition score of a healthy cow



Figure 2.21: Body score that will result in 50% conception.



Body Condition Score's during the various Critical Control Points, are a visible indication and measurement of the effectiveness of management of Supplement Feeding, Water and Grazing Management.

#### **2.2.3.** Targeted seasonal nutritional supplementation.

The biggest direct input cost to the beef cattle operation is the supplementary feeding (licks) that is needed during the dry season, to maintain optimal intake of the dry grass and to supplement the phosphorous shortage in the grazing during the wet season.

Ruminants are completely dependent on the microbes in their rumen to digest the grass and a shortage of protein in dry grass, reduces the microbe's ability to replicate and the number present, slowing digestion.

During the summer months there is adequate protein in the grass but there is a shortage of phosphate which has a negative effect on growth rate.

Marginal phosphate shortages during the winter months are also covered by providing the protein lick which includes phosphate.

Through the introduction of licks and planned grazing the limited breeding season can be synchronised with the best grazing available. Calving and breeding require optimal nutrition.



Figure 2.22: Summarized nutritional needs according to production stages.
# **Protein Lick**

Protein supplement is provided in the form of a loose- or hard lick block. It normally contains between 40-50% protein and the intake varies between 350g – 600g per day.

What is the effect of a protein shortage on rumen digestion?



Figure 2.23: Effects of protein shortage on rumen

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#### What is the main purpose of protein lick supplementation?

The supplementation of the cattle's diet with about 350g - 450g protein lick has only one purpose.

The protein lick feeds the microbes by providing the extra protein and other nutritional substances that the microbes cannot get from the low-quality winter grass.

The dry grass will then be digested faster which will lead to faster movement out of the rumen for the cattle to eat more grass (increasing the intake).



Figure 2.24: How protein works with microbes

#### Why protein supplementation must be provided daily:

- When cattle take in their daily amount of lick, it will mix through to the whole rumen full of grass, as the rumen contract and mix the content, when the cattle are ruminating.
- The lick, which is taken in that day, then gets used up by the microbes as part of their own nutrition. This supplement is thus not carried over to the next day and therefore cattle must get the daily required amount of protein lick every day during the dry season.



# **Dangers of protein supplementation**

Protein licks mostly contain some **urea granules** which is a source of elemental nitrogen (N- building block of protein). Therefore, cattle must be adapted to the lick over a period of 3 weeks. If cattle initially eat more that the daily allowance (as stated on the lick label instructions) they can develop **urea poisoning**. Urea poisoning can also happen if it rains and rainwater accumulates in the lick trough. The urea will dissolve in the water and when one or more cattle drink this concentrated urea solution, they will die due to urea poisoning.

To overcome this risk, the cattle that have not received lick for a while must be adapted to the protein lick, by feeding coarse salt for one week before the start of the protein lick. Coarse salt is also used in the protein lick to limit the daily intake, but if animals are "salt hunger" they can still eat too much. The one week of providing **only coarse salt or protein lick mixed with 50% coarse salt** overcomes this risk.



Figure 2.25: Salt in protein lick

#### Four basic components of protein lick:

Protein derived from urea, other nitrogen sources and natural protein in the form of oil cake meal.

Energy in the form of milled grain seeds (e.g. maize meal) or the by-products of the milling or sugar industry like hominy chop or molasses.

Minerals which is mainly phosphorus and calcium.

Salt as a supplement and regulator of intake.

Licks can be bought as ready-mixed preparations or can be mixed on the farm from the different components.

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#### Components for the mixing of protein licks on your farm



**Rice a bran as protein source** Feedipedia.com



Maize bran as protein source Nordfeed.com/animal-feeds



Molasses as energy source https://www.seriouseats.com/what-isblackstrap-molasses



Sunflower cake as protein source Nordfeed.com/animal-feeds



Salt to restrict intake https://www.countryliving.com/fooddrinks/g30689559/salt-types/



**Phosphorus and calcium minerals** https://pestell.com/product/monocalciumphosphate-21-percent/

### **Phosphate Lick**

As ruminant animals, cattle have unique digestive systems that require careful consideration regarding nutrient intake. Phosphate is an essential mineral for cattle as it plays a critical role in several physiological processes. Phosphate licks provide an efficient method of supplementing the required phosphorus levels in ruminant animals. Licks consist of loose minerals that the animals can voluntarily consume as needed.

#### **Importance of Phosphate Licks**

- Phosphorus is particularly important for bone formation, energy metabolism, muscle function, and overall growth and development.
- Phosphorus plays a crucial role in enhancing feed conversion efficiency, which directly impacts the growth and development of cattle, as well as milk production in dairy breeds.
- Adequate phosphorus levels in cattle diets are also known to improve reproductive performance and immune function and reducing the risk of metabolic diseases.

#### **Basic components for Phosphate lick:**

- Rock phosphate: This is the primary and most abundant source of phosphorus in the lick. It is
   essential to ensure the rock phosphate used is free from contaminants and corresponds to the
   nutritional requirements of the cattle.
- Salt: Salt acts as a carrier for the minerals and enhances palatability. Use good quality salt without any additives or anticaking agents.
- Molasses: Adding molasses improves palatability, making the lick more attractive for the cattle.



**Rock Phosphate** https://www.ratnadeepchemicals .in/rock-phosphate-powder.html



Salt https://www.countryliving.co m/fooddrinks/g30689559/salt-types/



Molasses https://www.seriouseats.co m/what-is-blackstrapmolasses

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## How to make your own Phosphate lick or block:

Procedure	Photo
1. Weigh out the dry ingredients according to the recipe.	
2. Mix the dry ingredients and add the molasses.	

3. Mix well.

4. Break up any clots by hand.

5. Form blocks using a bucket. Allow blocks to harden for three days in the sun.



HIT TON DE MAN





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#### Warnings and Precautions:

- Consult a veterinarian or livestock nutritionist to assess the nutritional needs of your specific cattle herd.
- Store the lick mixture in dry and cool conditions to prevent spoilage or degradation.
- Monitor the consumption rate of the lick and adjust the mixture components accordingly to maintain proper mineral supplementation levels.
- Regularly check the condition of the lick to ensure it is clean and free from debris, as well as to replenish the supply as needed.

# Changing over from the protein lick (dry season) to the phosphate lick (wet season).

This is a critical change over due to the possibility of rain which increases the risk of urea poisoning.

The changeover at the start of the dry season depends on the termination of the rainfall and the average Body Condition Score of the cattle at the end of the breeding season.

The planned date for changeover is the beginning of April but it can be moved forwards or backwards depending on the two factors stated above, as well as the decline in the protein content of the grass.

The provision of phosphate lick will continue until management gives a specific instruction that it must be changed to the protein lick.



**Figure 2.26: Cattle feeding from a simple and cost-effective feeding trough** (https://www.africanfarming.com/experts/practical-affordable-feeding-troughs/)

# 2.3 Animal Health



#### Figure 2.27: Animal Health is our third pillar for cattle production

The survival of cattle firstly depends on meeting their daily needs for drinking water and grazing (food). If that is provided the second priority that a cattle farmer must focus on is the management of diseases that can lead to lower production or the death of cattle.

#### The eye of the stockman - powers of observation

#### Identify and prioritise the losses caused by disease and death.

For each geographically different area the most important diseases affecting the survival of cattle must be identified and prioritised.

# 2.3.1. Main causes of disease

There are 5 main causes of disease namely diseases caused by infectious micro-organisms, diseases caused by parasites, diseases caused by poisons, diseases caused by malnutrition and diseases caused by injury.

- By Infectious diseases caused by micro-organisms like bacteria or viruses,
- Parasitic disease conditions caused by external or internal parasites,
- Diseases caused by plant or chemical intoxication,
- Diseases caused by a metabolic disturbance or nutrition.
- Disease conditions caused by trauma or other mechanical factors.

# 2.3.2. The disease development process

# All diseases develop through a development process that can last from a few seconds (eg injury) to a few months (eg malnutrition due to protein shortage).

During the disease development process healthy cattle will start to show signs of disease that can be observed by the livestock farmer. When these sick animals are examined there will also be specific findings (symptoms) that can be found by the cattle farmer.

With a better understanding of the disease developing process specific actions can be taken to prevent disease or treat it early.

To understand this process a model was developed to illustrate this process which is unique to each different disease. Because there are so many different diseases the focus is placed on the 10 most common disease problems within a specific geographical area.



#### Figure 2.28: Disease development in cattle

# 2.3.3. Early identification and treatment of diseases

#### **Daily observation**

Diseases and disease conditions happen daily, and it is impossible to prevent all diseases. As a stock farmer you need to develop a system for early disease identification, treatment and/or other remedial actions.

The challenge with the most deadly or damaging diseases of cattle is that they can cause death or severe damage within 12 to 24 hours after the first signs of disease are observed.

Treatment action can only be initiated when the livestock handler has identified the first signs of disease.

In all cases, **if a disease is treatable**, it must be treated early, as soon as the first signs of disease are observed. It must also be understood that some diseases are not treatable, and these must be prevented by vaccination or management to decrease or prevent exposure to the disease causing organism or factor.

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On the other hand, most deaths are due to not identifying the first signs of disease or not treating in time.

The first resource available to the person looking after the cattle daily (herdsman), for the initial **identification of the first signs of disease is his eyes and powers of observation.** 

A **Daily Observation Card (DOC)** system was developed and field tested by me (Dr Danie Odendal) over many years. It is based on the structured daily monitoring of the health status of each animal in the herd.

The DOC is then used to identify any abnormality or first signs of disease.

It is a structured and logical system for daily observation of 5 main observation points.

The daily task of the herdsman is to:

- Ensure the herds basic needs are met, grazing and drinking water.
- Observe each animal according to the criteria of the Daily Observation Card

There are 5 main observation points that make up the structured approach during daily observation:







Then there are secondary observation points, which logically fit together with each of the main observation points.



Figure 2.29: Secondary observation points

For each secondary observation point, several different signs of disease are described.



These serve as examples, to teach the observer, what to look for when doing a proper closer observation of the sick animal.



Figure 2.30: Observation of head



Figure 2.31: Observation of body condition



Figure 2.32: Observation of movements



Figure 2.33: Observation on intake



Figure 2.34: Observation discharges

# Procedure that must be followed by the Herdsman when doing daily observation.

The herdsman should observe the whole herd every day, preferably first thing in the morning, as part of his daily routine.

Daily observation of the whole herd should be done by the herdsman by walking through the herd early in the morning and observing all the cattle in that herd and visually observe them as follows.

To get a quick overview of the health status of the whole herd, the observer must check three vital observation points that will confirm the general state of health:

- Head up and normal behaviour
- Hunger groove is full
- Normal walking

When all three these observations are normal the observer can be satisfied that there are no major disease problems in the herd for that day. This observation can be continued when doing the daily cattle count. The result of this general state of health must be recorded with the number of animals observed. The record keeping should done by the herdsman who did the observation, either in written format (diary or logbook) or electronically on a cell phone. This written record signed off daily, serves as the most basic system of record keeping.

The reason for good recordkeeping regarding the herd's health and movements is that if something happens, disease, the cause can be found quickly and anticipated the next time the variables arise. A basic example is that with summer rains we get more mosquitoes and ticks. Preventative action can be taken before either pest infects your herd.

# 2.3.4. Examination of sick animals

The 3 main points of examination that make up the structured approach during examination of the sick cattle.



from a distance.

# **Rectal Temperature**

A thermometer is the only diagnostic tool available at farm level to support daily observation in early disease identification.

Fever is the best indicator to distinguish between infectious diseases and other causes of disease.

The normal average temperature of healthy	Fever is identified when the temperature of
cattle early in the morning is 38.5°C	sick cattle is <b>40°C and higher</b> early in the
	morning



Body temperature may increase before other clear signs of disease become apparent and is therefore an essential aid in early identification of infectious diseases.

- By taking temperature, the livestock handler can establish if an animal is showing the slightest sign of disease, has a fever.
- This should be done early in the morning after completing your daily observations and identification of an animal with abnormal behaviour or any sign of disease.
- The start of fever is something that is difficult, if not impossible, to confirm with just observation.
- A fever is the clearest indication of a systemic infection that requires urgent attention and treatment.
- Fever is the result of the body's immune response which increases the animal's core body temperature.

Fever it is the body fighting against the infection and is not the cause of death itself. Death is caused by the damage done to specific cells or organs by the infectious organism. This impacts on the body systems function.

The discovery of antibiotics provided a very effective broad-spectrum treatment against most bacterial and protozoal disease conditions.



However, antibiotics do not kill viruses and therefore cannot be used in the primary treatment of viral diseases.

The livestock handler needs to understand which infectious diseases are caused by a virus, viral diseases, and which are caused by bacteria or protozoa.

Other causes of raised core body temperature that may be confused with a fever are:

- If it is very hot or the animal was in the sun. Therefore, we try to take temperature first thing
  in the morning if possible.
- If the animal was herded or chased before examination.
- If the muscles of the animal are contracting because of a toxin such as poisoning from a dipping compound.

To take temperature:

- Restrain the animal appropriately in a crush pen.
- Insert the clean thermometer into the rectum, lifting the tail and ensuring the thermometer bulb is pressed against the side of the rectum.
- Hold the thermometer there for two minutes for mercury thermometers or until the digital thermometer beeps.
- Take the thermometer out, clean it and read the temperature.
- Store thermometer in a cool, safe place.



Figure 2.35: Rectal Temperature

A lubricated thermometer can be placed in the rectum. The thermometer should be left in place for 2-3 minutes.

# Inside eyelid

Assessing the blood supply (circulation) is an essential examination point because many deadly cattle diseases cause blood loss.

The blood supply cannot be assessed through observation, and thus a closer examination of the animal is always required <u>when the slightest general sign of disease is observed.</u>

The blood supply can only be evaluated by examining the lining (mucous membrane) of the inside eyelid, or vulva in the case of female animals.

These examination points are windows into the blood supply, as the small blood vessels are so close to the skin that they are visible.

We immediately need to include or exclude blood loss as one of the important signs of disease in any examination to establish the cause of disease.

This allows us to narrow our focus in identifying the specific disease to be managed. Just as we look to temperature to include or exclude infectious disease, so we need to assess the blood supply to include or exclude blood loss.

The colour of the mucous membrane (inside lining) of the lower eyelid allows us to assess the blood supply.

The correct technique is essential in both ensuring that we do not injure the animal and that we are able to assess the blood supply at the correct point.

Too often inexperienced handlers force the eye closed and expose the third eyelid, which will always appear whiteish.

We instead must use the correct technique, demonstrated below, which exposes the mucous membrane or inner lining of the lower eyelid.

Lift the thick eye bank with the fingers.	
Close the top eyelid with the thumb.	
Gently push the eye bulb inwards	
With the other thumb pull the lower lid down until the inner eyelid bulge out or is clearly visible.	

The normal colour of the mucous membrane is a healthy pink.

Once again, regular inspection of healthy animals, allows the livestock handler to know what healthy pink refers to and when a change in this colouration has occurred.

The healthy pink colour is a result of enough red blood cells in the blood circulation to transport sufficient oxygen around the body. If there are too few red blood cells, for whatever reason, then oxygen cannot get to where it is needed. Body cells can only function if oxygen is constantly available, if not it will die.

# If the mucous membrane appears pale (tending towards white in advanced cases) there are too few red blood cells to carry oxygen to the body's cells.

This condition is known as anaemia and is always an emergency. Without oxygen the brain cannot function, and the animal will die.

When handling or herding groups of animals suffering from disease conditions causing blood loss, just the extra handling and stress can result in sudden deaths. See the specific signs of disease describing this condition to understand the different causes and how these can be identified and managed.

Other than blood loss resulting in paler mucous membranes, there are also disease conditions which affect the mucous membrane in different ways, causing other colour changes.

A red mucous membrane is an indication of a local infection if observed in one eye and a systemic infection if observed in both. In this instance it would normally be accompanied by a fever.

A purple or blueish mucous membrane is an indication of a lack of oxygen in the blood. This points towards something affecting the ability of the animal to breath effectively.

A yellowish mucous membrane is an indication of advanced disease affecting the liver. Urgent treatment for the cause of liver failure must be done.

A brownish colour mucous membrane is an indication of nitrate poisoning. This is not a common sign of disease and is quite specific.

# Examination of the lymph nodes





# 2.3.5. Treatable diseases

For this manual and for a systematic progression to improve the survival of cattle we will firstly give attention to the priority diseases that cause death within a short period of time, and which are treatable if identified early with products that must be available at farm level.

The list below are the diseases identified as the most important treatable diseases and these diseases are described in a specific format to give the farmer the basic information needed to understand, identify and treat the disease.

The format is the name of the disease, short description of the organism causing the disease, signs of disease (observation and examination), diagnosis, treatment, and prevention of the disease.

Treatable tick-borne diseases identified as causing most deaths in Western Zambia are:

- Theileriosis (East Coast Fever or January disease)
- Heartwater
- Anaplasmosis
- Redwater
- Pasteurella

Secondly, there are also ongoing common disease conditions that that need early identification and treatment on an ongoing basis. We will be discussing the following:

- Sencobo (Dermatophilosis)
- Wounds
- Abscesses (closed wound with accumulation of puss)
- Lameness
- Eye infections and other general disease conditions.



#### **East Coast Fever \* NOT PREVALENT IN WESTERN PROVINCE**

**Figure 2.36: East Coast Fever** (Source: University of Pretoria, 5<sup>th</sup> year Veterinary Sciences)

East Coast Fever (Theileriosis)	

#### Description

A tick-borne infectious blood disease of cattle, caused by the Theileria parva organisms.

The organism is transmitted by the <u>brown ear-tick</u> (Rhipicephalus appendiculatus).

It infects and multiply in the white blood cells and lymph nodes and then it will start to destroy these white blood cells in various organs like the lungs, liver, kidneys and heart.

It then also infect the red blood cells but don't cause sever blood loss like in the case of redwater and anaplasmosis

East Coast Fever has a long incubation period and signs of disease may only be observed from 15 (8-25) days after transmission.

#### Signs of disease

#### Observation

Depressed and slow movement (lethargic).

Tearing of the eyes and swelling of the eyelids

Often hard dung (constipated)

Eat less and loose body condition.

Can develop swelling under the jaw and on the brisket.

In advanced cases the cattle become weak, off balance and then go down.

Examination

Fever ( $\geq 40^{\circ}$  C)

Enlargement of the superficial lymph glands below ear and in front of shoulder

Difficult breathing

#### Diagnosis

Combination of Signs of Disease

Lymph node and blood smear (veterinarian).

#### Treatment

Buparvaquone, Parvexon plus, Butalex at 7ml per 100kg for the treatment of clinical cases.

If the disease is in a very advanced state the treatment can be repeated at 48 hours after the first treatment.

#### Prevention

The disease transmission can be prevented by tick treatments that is applied with a 5-5-4 day interval to prevent the attachment of brown ear-ticks.

#### Heartwater



#### Figure 2.37: Heartwater

(Source: https://www.cfsph.iastate.edu/Infection Control/FADs/Heartwater response package.pdf)

#### Heartwater

#### Description

Also known as "Minyopi ya mwa sibiti"

Infectious, noncontagious, tick born disease of cattle that damages the cells which forms the watertight lining of the blood vessels.

Caused by ricketsial parasite, previously known as Cowdria ruminantium. Molecular evidence led to reclassification of several organisms in the order Rickettsiales, and it is now classified as Ehrlichia ruminantium.

Transmitted by the three-host bont tick, Amblyomma hebraem.

Affect calves mostly from 1 months and older, but also older animals with no immunity.

Usually occurs in summer, but possible all year round.

#### Signs of disease

#### Observation

Calf stops sucking (mother's udder full)

Nervous symptoms e.g. twitching, blinking eyes, shivering, exaggerated respiratory distress.

Exaggerated blinking and chewing movements.

High stepping gait

Paddling movements (lying flat on side with legs moving)

Convulsions

#### Examination

High fever ( $\geq 40^{\circ}$ C)

Congested (dark red) eye mucus membranes.

Symptoms become noticeable 9-29 days, after infection.

#### Diagnosis

The udder of all cows with calves must be checked every day to immediately identify a calf that stopped sucking.

Can diagnose Heartwater on the combination of the Signs of Disease.

Veterinarian can confirm by post-mortem and brain smear.

#### Treatment

Heartwater is one of the most important tick-borne diseases causing the most losses and therefore this disease must be identified and treated as soon as the first signs of disease are observed.

Oxyject, Terralon, Terramycin Lymoxine injectable tetracycline – 1ml/10kg body mass i/m (preferably in the neck area and not more than 20 ml per site in adult animals)

Disturb calf as little as possible.

Provide shade.

#### After care

Observe continuously during the next two days and take the temperature again the next day.

Repeat injectable tetracycline) on day 3 (72 hours) if necessary (not yet fully recovered or if the morning temperature is still above 39°C).

Monitoring of the temperature should always be continued until total recovery.

#### Prevention

This disease occurs naturally where the bont tick occur. Calves can development immunity against this disease-causing organism (Cowdria ruminantium) by natural exposure before the calves are 1 months of age. By using a tactical dipping program (dip when ticks are found during weekly inspection) the immunity is sustained due to continuous challenge by the ticks carrying the disease-causing organism.

Minimal dipping of calves in first 1 month to allow for immunity to develop from tick bites (spot treatment only, when necessary).

If 3 or more calves get Heartwater and are treated within one week from each other, the rest of the calves must receive a preventative treatment (blocking treatment) Oxyject, Terralon, Terramycin Lymoxine LA (tetracycline) at 1ml /10kg body mass i/m.

## Anaplasmosis (Tick-borne gall sickness)



Figure 2.38: Anaplasmosis

(Source: https://indiancattle.com/anaplasmosis-in-cattle/)

Anaplasmosis	(Tick-borne	gall sickness)	

#### Description

Also Known as "Nyoko"

A tick-borne infectious blood disease of cattle, caused by the Rickettsia organisms; Anaplasma marginale and Anaplasma centrale.

The parasite infects and distorts the red blood cells of cattle. These distorted red blood cells are taken out of the blood circulation by the liver causing severe anaemia (blood loss).

It is transmitted by 5 different tick species (R. decoloratus, R. microplus, R.simus, R. evertsi, H. marginatum rufipes), biting flies (S. calcitrans) and infected needles.

Anaplasmosis / Gallsickness are the same; Anaplasmosis was formerly known as Gallsickness.

Anaplasmosis has a very long incubation period and symptoms may only occur 21 to 42 days after transmission.

#### Signs of disease

Observation

Weight loss

Weakness - stay behind when herded.

Not eating

Rumen stop working (contracting to mix the content and to empty rumen)

Dry dung (Constipation)

Dark yellow urine

Decrease in milk production (Dairy animals)

#### Examination

Fever (≥ 40° C)

Anaemia (pale eye mucus membranes)

Jaundice (yellow eye mucus membranes)

#### Diagnosis

Combination of Signs of Disease

Blood smear (veterinarian) This disease can't be differentiated from African Redwater on signs of disease alone and that is why it must be confirmed by a blood smear.

In all cases where Anaplasmosis is suspected a blood smear must be made for microscopic examination by a veterinarian.

#### Treatment

Imisol, (Imidocarb) 2 ml/100kg i/m (once only) is effective against Anaplasmosis and Redwater.

#### Prevention

This disease occurs naturally where blue ticks are present. Immunity can develop against this disease-causing organism (Anaplasma) by natural exposure before the calves are 6 months of age. By using a tactical dipping program (dip when ticks are found during weekly inspection) the immunity is sustained due to continuous challenge by the ticks carrying the disease-causing organism.

In where cattle do not develop or maintain their immunity early identification and treatment of this disease must be done as described in the treatment section.

# African Redwater



#### Figure 2.39: African Redwater

(Source: University of Pretoria, 5th year Veterinary Sciences)

#### African Redwater

#### Description

A tick-borne infectious blood disease of cattle

African Redwater is caused by the Babesia bigemina parasite.

The parasite infects and destroys red blood cells of cattle causing severe anemia (blood loss).

African redwater is transmitted through the bite of two species of blue tick; the Asiatic blue tick Rhipicephalus (Boophilus) microplus and the African blue tick Rhipicephalus (Boophilus) decoloratus. Both are single host ticks. The red-legged tick Rhipicephalus evertsi can also transmit the parasite but its role in transmission is more limited.

African Redwater symptoms become noticeable 7-14 days after infection.

Signs of disease

#### Observation

Slow, reluctant movement

Weak and depressed

Not eating

Light- to dark-brown or red urine may be seen.

Animals likely to separate from herd.

Dry nose

Diarrhoea

Abortion

In advanced cases the animal will become so weak that it will lie down and can't get up.

In some cases, acute death without showing signs of disease and therefore it is always a differential diagnosis for animals that died suddenly.

#### Examination

Fever ( $\geq 40$  C)

Anaemia (pale eye mucus membranes which can become light yellow in advanced cases)

#### Diagnosis

The combination of signs of disease which is very specific in this case - high fever ( $\geq 40^{\circ}$ C) combined with pale or yellowish inside eyelid is very specific for either African Redwater or Anaplasmosis.

Blood smear. This disease cannot be differentiated from Anaplasmosis (gallsickness) on signs of disease alone and that is why it must be confirmed by a blood smear examined by a veterinarian.

In all cases where African Redwater is suspected a blood smear must be made by the examiner for microscopic examination by a veterinarian to confirm the specific cause and to exclude the possibility of Asiatic Redwater.

#### Treatment

Immediate treatment with Imisol at 1 ml per 50kg, Berrinil 0.5ml per 10kg i/m (active ingredient - imidocarb) once only after the first signs of disease are seen and found on examination of the sick animal.

Early treatment is cardinal because cattle will die within 24 hours if not treated in time.

Imisol at 2ml/100kg i/m is effective against both African Redwater and Anaplasmosis.

#### Prevention

This disease occurs naturally (are endemic) on all farms where cattle are kept. That means that most or all of the cattle are permanently infected with the parasite but have immunity and therefore don't become sick.

We rely on the development of the animal's own immunity against this disease causing organism (Babesia bigemina) by natural exposure before the calves are 6 months of age (calves have a non-specific immunity against the disease up to the age of 6 months during which period they will not get sick when infected, but do develop immunity).

By using a tactical dipping program (dip when ticks are found during weekly inspection) the immunity is sustained due to continuous challenge by the ticks carrying the disease-causing organism.

Only in rare cases cattle, that have not developed or maintained their immunity, will get affected.

# Pneumonia



#### Figure 2.40: Pneumonia

(Source: University of Pretoria, 5<sup>th</sup> year Veterinary Sciences)

Pneumonia (Pasturella)
Description
Inflammation/infection of the lungs
Complicated multifactorial disease
Common cause of death in young and feedlot cattle but can also occur under specific conditions in adult cattle.
Pneumonia can be prevented, to a large extent, by implementing yearly vaccination.
Stress and other contributing factors can lead to the development of pneumonia e.g.:
long periods of rain and cold conditions
sudden change in weather (hot days and very cold nights)
change in diet (sudden change from grazing to a high energy feed)
mixing of different herds
very dry and dusty conditions
Viral infection causing damage to the respiratory tract can in many cases also be the primary cause that leads to a bacterial infection especially under feedlot conditions where young cattle from different herds are brought together.
Signs of disease
Observation
Stand with a lowered head (head down)
Poor appetite (eat less or don't want to eat at all)
Rapid breathing and then laboured breathing.
Coughing

First watery-, then thicker mucous and finally a purulent (yellow pus) discharge from the nose.

#### Examination

High fever (>40°C)

The inside eyelid can be red, dark red or even blue/purple in advanced cases

When examined by the Veterinarian with a stethoscope the increase in the lung sounds can clearly be distinguished from normal lung sounds.

#### Diagnosis

When the signs of disease, as described above, are observed and confirmed during the examination of the affected animal, the Veterinarian must be informed immediately.

The reason is that more animals can be infected and because this disease needs effective treatment within 24 hours after the first signs of disease are observed.

#### Treatment

Oxyject, Terralon, Terramycin Lymoxine LA (tetracycline) LA – 1ml/10kg body mass i/m (preferably in the neck area and not more than 20 ml per site in adult animals)

or

Sufatrim, 1ml/20kg i/m daily until the temperature is normal again.

Block treatment of herd can be done when more than 5% of the herd is affected by pneumonia.

#### Prevention

Vaccinate for respiratory disease according to the CP-06. Disease Prevention and Vaccination Protocol.

Ensure calves receive colostrum from vaccinated mothers.

Increase awareness and observation when cattle are under stress for example if wet rainy conditions last for a number of weeks. Control dusty environments for example when calves are weaned in the feedlot.

Isolate and treat sick animals early to prevent infection of other animals.

# Trypanosomiasis



Figure 2.41: Pale mucous membrane (Source: Dr Danie Odendaal)

#### Trypanosomiasis

#### Description

Trypanosomiasis, also known as African Animal Trypanosomiasis or Butuku bwa zeze, is a parasitic disease that affects various domestic and wild animals, including cattle. It is caused by the protozoan parasites of the genus Trypanosoma. Trypanosomiasis poses a significant threat to animal health and agricultural productivity in many sub-Saharan African countries.

#### Signs of disease

## Observation

Signs of disease develop over a period of weeks which is the most important way to differentiate this disease from Theileriosis which have very similar signs of disease.

- Progressive weight loss and emaciation
- Anemia, characterized by pale mucous membranes
- General weakness and lethargy
- Swollen lymph nodes
- Recurrent fever episodes
- Reduced appetite and decreased milk production
- Progressive weakness and inability to perform normal activities

#### Examination

- Pale mucous membranes
- Lymph node enlargement
- Anemia observed by examining conjunctiva or observing the colour of the gums
- Presence of characteristic parasites in blood smears, such as Trypanosoma brucei

#### Diagnosis

Trypanosomiasis can be diagnosed through a combination of clinical signs, examination findings, and laboratory tests including:

- Microscopic examination of blood smears to identify the presence of Trypanosoma parasites

- Serological tests, such as enzyme-linked immunosorbent assay (ELISA) or indirect fluorescent antibody (IFA) test, to detect specific antibodies against the parasites

- Polymerase Chain Reaction (PCR) to detect the presence of Trypanosoma DNA

#### Treatment

Treatment of Trypanosomiasis typically involves the administration of specific drugs, and it is advised to consult with a veterinarian for appropriate treatment options. Common drugs used include:

- Berenil at 0.5ml/10kg or Trypashish at 1ml per 10kg can be used for the treatment of Trypanosomiasis

#### Prevention

Prevention plays a crucial role in controlling the spread of Trypanosomiasis. Here are some measures to consider:

- Vector control: Implement strategies to control the tsetse fly vector population, such as using insecticide-treated traps or targets and clearing areas of dense vegetation.

- Chemoprophylaxis: Use prophylactic medications to prevent the establishment of infection in susceptible animals.

- Genetic resistance: Promote breeding programs that aim to select for trypanotolerance in cattle breeds.

- Movement restrictions: Limit or restrict movement of animals from endemic areas to reduce the risk of disease transmission.

#### **Ongoing common disease conditions**

#### Sencobo Disease

#### **Sencobo Disease**

#### Description

Sencobo disease is also known as dermatophilosis, lumpy wool, strawberry foot, streptothricosis and rainscold.

Caused by the bacterium Dermatophilus congolensis.

Resistant zoospores form and survive in crusts, scabs and in the environment

With hot weather and moisture they become motile.

#### Signs of disease

#### Observation

Matted hair, crusts, and wart-like lesions that can have a wide distribution. Diagnosis is by cytology from lesions or bacterial culture.

#### Examination

Histology of scabs

Examination of fresh lesions

#### Diagnosis

The diagnosis under field conditions is based on the signs of disease as described above. The other disease condition that can be confused with this one is ringworm but the treatment is basically the same.

#### Treatment

Injection with a Oxyject, Terralon, Terramycin Lymoxine LA tetracycline injection (1ml/10kg)

Make up a 10% zinc sulphate solution (mix 1kg of zinc sulphate in 10 litres of water) and apply it with a pack sprayer all over the body of the affected animals. If it is an advanced case with thick crusts the crusts can first be sprayed to make it soft and it can then be brushed with a nylon brush to break up the crust before spraying again. Affected cattle must be sprayed on a weekly basis until the skin lesions/wounds are heald

#### Prevention

Do effective tick control because the wounds caused by ticks create the entry point for this bacterium into the superficial skin.

Treat affected animals early because treatment in neglected cases are not very succesfull

#### Wounds

Wounds

#### Description

Open wounds are always going to be an issue for cattle when they are living outside.

They are at risk to other animals and the environment. Open wounds can be caused by fighting with other animals or running into something that hurts them.

#### Signs of injury

Observation

Blood flow, scabbing

Examination

Break in the skin

Active bleeding

#### Diagnosis

Visual identification of any break in the skin

#### Treatment

Topical wound treatment to keep the wound clean and moist

Repeat treatment on a daily basis until the wound is healed.

If the wound is very deep and injectable antibiotic treatment must also be given.

Inject also with ivermectin at the start of treatment to prevent maggots from forming in the wound

#### Prevention

Check your holding and handling facilities for sharp and protruding points that can damage the skin of the cattle.

Good tick control

Check pasture for broken branches, ditches that can cause tripping.

Be observant and anticipate your cattle's' movement through the field.

#### Abscesses

#### Abscesses

#### Description

An abscess develops when there is a small but deep puncture wound through the skin. Bacteria will enter through this puncture wound, to the area under the skin, where they will start to multiply. The body will try to contain these bacteria by forming a capsule of connective tissue around it, and the animals own white blood cells will also kill of the bacteria which will result in the accumulation of pus (mixture of dead bacteria and white blood cells).

Abscess formation can occur anywhere in the body but there are also specific types of abscesses that form underneath the ear.

#### Signs of disease

#### Observation

Lump developing under the skin which grows in size until it bursts open spontaneously if not already lanced.

#### **Examination and Diagnosis**

Pain, heat, and hard swelling in the early stages.

In later stages, swelling is cold and surrounded by an internal capsule.

When ripe, a soft spot is felt on the swelling.

Insert a 16-gauge disposable needle into the swelling. Pus coming out will indicate an abscess ready for incision and cleaning out.

#### Treatment

Do not apply any treatment unless the abscess is ripe.

Lance into the soft spot of the abscess using a scalpel blade.

Collect all pus into a disposable container eg: plastic glove. Bury or burn to prevent environmental contamination.
Flush lanced abscess with Hydrogen peroxide (mixed 50:50 with clean water). Spray outer surface with F10 wound spray.

Inject Ivomec Super or Virbamec L 1ml/50kg s/c to prevent maggots from forming in the wound. Inject Penstep 1ml/20kg i/m as antibiotic supportive treatment of the wound, only after the abscess has ruptured or has been lanced.

#### Prevention

Exercise good hygiene principles when injecting cattle (clean needles).

Inspect and remove any protruding sharp ends in the handling facilities.

If abscesses occur under the ear it is caused by ticks in the ear which cause the small wounds that give entrance to bacteria. Such abscesses can totally be prevented by good tick control in the ears.

# Lameness

#### Lameness

#### Description

Lameness occurs when an animal has leg or hoof pain that affects mobility. Lameness is a concern to production as the pain often limits growth as animals may be reluctant to eat or drink.

There are several causes for lameness, many causes are interrelated.

The causes may include:

- Genetics
- Environment
- Nutrition
- Injury
- Infection foot rot is often a cause for lameness

#### Signs of injury

#### **Observation, Examination and Diagnosis**

The animal must be constrained in a proper crush pen with a neck clamp.

The affected hoof must be lifted with a rope, washed and examined.

Look for foreign objects under hoof or between claws.

Swelling or wound in the interdigital space (between claws)

Inflammation and swelling where the hoof meet the skin or behind the hooves.

Tick infestation between or behind the hooves.

If chronic, can spread to joints causing swelling of the whole lower leg and severe and chronic or permanent lameness.

#### Treatment

If it is an uncomplicated case of foot rot in cows or calves, with just visible early-stage infection and inflammation between the claws it can be treated by the herdsman under direction of the Foreman using the following treatment protocol.

- Clean the affected hoof/hooves.
- Spray with F10 wound spray.
- In more severe cases inject with Sulmetrim 1ml/10kg i/m daily and repeat up to 3 days if needed. If the condition doesn't improve or recover by three days, the animal must be send to the hospital for follow up treatments.

- Fenidyne 1ml/45kg s/c every 48 hours (in severe cases to reduce pain and inflammation)
- Treatment in hospital cases.
- Daily footbath in **Zinc sulphate** solution

In more severe cases and in all cases involving breeding bulls brought to the hospital the Operations manager must be informed and consulted for direction regarding intensive treatment in the hospital.

Without treatment, inflammation develops into necrosis, which may extent to the surrounding tissues, including even the bone of the digit, leading to chronic arthritis.

#### Prevention

Hoof hygiene, hoof baths, limiting standing water at feed troughs, cleaning out manure, regular monitoring for signs of foot rot

# Eye infections and other general disease conditions.

#### Eye infection and other diseases

#### Description

Eye infections and other diseases can be serious as they affect the mobility of your cattle and if you have an outbreak the entire herd. The cattle might not be able to get to their water or grazing and may be less mobile as a result. Which opens the door for other infections and diseases.

#### Causes

Infectious agents – bacteria (moraxella bovis) or other organism (Mycoplama, Chlamydia and Infectious Bovine Rhinotracheitis)

Environmental causes – excessive sunlight, dust, grasses, pollen, flies

Animal causes – flies

Breed – your choice of breed may be more susceptible to eye infections or diseases. Brahman and Brahman-influenced cattle have a greater resistance to developing pink eye.

#### Signs of infection

#### Observation

**Conjunctivitis** – Redness is the first telltale sign of irritation.

**Tears and runny eyes** – Tearing is an obvious sign of pink eye because dirt will stick to the tears. This is especially noticeable in light-colored cattle.

**Squinting and behavioral changes** – The sensitivity to light caused by pink eye can produce obvious symptoms like squinting, but it might also cause more subtle behavior like spending extended periods in shaded areas or keeping the eye shut.<sup>1</sup>

**Ruptures** – Ruptures result from the increased pressure in the eye due to inflammation.

**Decreased appetite** – If your cattle have decreased vision or pain, they might struggle to find their food and water, resulting in dehydration and weight loss

#### Examination and Diagnosis

Eye discharge, initially watery and may become purulent (pussy) over time due to inflammation and bacterial involvement.

Unilateral (one side) may be due to local infection and inflammation.

Bilateral (both sides) may be due to systemic disease or environmental irritants e.g. dust.

Blindness may be observed. This may be temporary due to infection and sight may return with treatment. Where blindness is permanent, consider culling if unilateral (one eye). Cull if bilateral (both eyes).

Closed or excessive movement of eyelids indicates pain in the eye from inflammation, ulceration, or foreign body.

White spots on the eyeball indicate injury and infection, usually chronic.

#### Treatment

Call the veterinarian if any foreign body is in the eye. Topical anaesthesia and forceps will be used to remove it.

**As first line treatment eyepowder or mastitis ointment or Pentrep (just two drops WITHOUT a needle)** is applied to the eyeball (care must be taken not to physically touch the eyeball). Repeat for 2 days.

If the infection doesn't clear up by day 3 an injectable treatment with an antibiotic must be done. The healing of the treated eye must be re-evaluated in 1 weeks' time and a re-treatment can be done if needed.

## Prevention

Vaccines - prevention is the best practice

Nutrition – healthy cattle can fight off disease better than under nourished animals

Fly control – insecticides, cattle rubs

Environmental control - tall grass and shad



#### Figure 2.42: Stages of Pink Eye

(https://swnydlfc.cce.cornell.edu/submission.php?id=1136&crumb=livestock%7C10)

# 2.3.6. Application methods of treatments

All intravenous (i/v) injections are to be done using a new disposable syringe and needle. It is important to use sterile sharp equipment when entering a vein, to prevent introducing infection directly into the venous system which could result in septicaemia or death. I/v injections should be given slowly, to reduce the risk of shock reactions. Draw back on the plunger if in doubt whether in the vein. Blood coming into the syringe will indicate correct placement of needle in the vein.

All other injections must be administered with sharp, clean equipment, to prevent introduction of infection into the animal. As a guideline, thirty injections can usually be done with a needle before it needs replacement.

Brucellosis vaccine (S19 and RB51) to be injected with CARE, using NEW disposable syringes and needles. These are to be discarded at the end of the same day. Using the same syringes and needles for other applications is banned as vaccine residues in the syringe and needles could cause positive reactions for Brucellosis or abortion in pregnant animals. Take care not to needle prick oneself or others with Brucellosis vaccine as it can affect humans negatively! In the event of mistakenly injecting oneself or someone else, report to management and go directly to clinic for assistance.

**Needles are sharp and dangerous!** Take care when passing loaded syringes around and to others by passing it on, plunger first (needle backwards), as one would pass a knife.

Always rub the injection site gently after the injection to facilitate spread and to prevent fluid leakage from the needle puncture site.

#### Disinfection of the injection site.

- When doing subcutaneous injections on the whole herd, it is not practically possible or indicated (vaccination with a live vaccine) to disinfect the skin. That is why it is important to only inject when the skin is dry and free of mud/dung.
- When an individual animal must be treated using deep intramuscular injection or intravenous injection the good management practice is to disinfect the injection site with methylated spiritus using a soaked cotton ball. Wait for 30 seconds for the disinfectant to act and then proceed with the injections.

#### **Cleaning of equipment**

Reusable and automatic syringes and steel needles must be cleaned at the end of the working day by washing in F10 SCXD Veterinary Disinfectant Cleanser, diluted at 1:100 with clean water. Rinse in clean water and allow to dry.

Disposable syringes and needles to be discarded daily. Collect used disposable needles in a plastic bottle with a lid. Disposable syringes and needles must be buried or incinerated.

#### Equipment

Always use clean equipment with sharp (new or used) needles. Always exclude air from the syringe before injecting.

#### Syringes

Disposable – 4 sizes are available i.e. 5ml,10ml, 20ml and 50ml

Use the syringe on the day the packaging is opened. Discard when used, at the end of the day.

Reusable/automatic – Volume to inject is adjustable and can be set according to the need. This syringe can be reused only if clean.

#### Needles -

- Disposable
  - 15g x 40mm (grey)
  - 18g x 40mm (pink)
  - 21g x 16mm (green)

- Reusable Luer lock (steel)
  - 16g x 15mm
  - 16g x 25mm
  - 18g x 15mm
  - 18g x 25mm

Short needles (15mm and 16mm) are used for subcutaneous (s/c) injection.

Long needles (25mm and 40mm) are used for intramuscular (i/m) and intravenous (i/v) injection.



Figure 2.43: Medical Kit

18g is most used in cattle. 15g and 16g needles are thicker and thus used for thicker, less viscous products e.g. Oxyject 20%

21g needles are thinner and therefor used for viscous products e.g. vaccines.

#### **Injection routes**

See below the injection sites for both subcutaneous and intramuscular injections using the correct sharp needle.

#### **Subcutaneous Injection**

- This is under the skin, using a short needle 15mm or 16mm.
- Best sites to use are on the sides of the neck (in the triangle), behind the scapula (shoulder) or at the base of the tail.
- Lift skin and inject at a 45-degree angle into the lifted triangle area. Make sure to penetrate the hide fully.



Figure 2.44: Intramuscular Subcutaneous

- This is into the muscle using a long needle 25mm or 40mm
- Best site to use is in the neck muscle (triangle). Make sure the animals head is secured (neck clamp) as sudden head or horn movement can lead to injury to the person injecting. The rump muscle may not be used, as this can result in muscle damage and carcass trimming with financial loss.
- Needle should be inserted fully, to its base, at 90 degrees to the skin.

#### Intavenous (i/v) injection

- This is directly into a vein, usually the jugular vein in the neck
- Block the vein at its low point (in this picture (from at the left bottom point of the white circle), allow it to fill and become visible.
- Insert needle at a 45-degree angle into the vein in the lengthwise direction that it runs (from right to left in this picture)

**Figure 2.46: Intravenous** 

Injection site See below the injection sites for both subcutaneous and intramuscular injections using the correct sharp needle.

Intramușcular

Subcutaneous

Figure 2.47: Injection sites







Figure 2.45: Intramuscular injection

Improtant Medication Lists for Treatable Diseases										
Product Name	Active	Dosage:	Intervals	Hartwater	Redwater	Anaplasmosis	East Cost Fever	Trypanosomiasis	Pneumonia	Antiinflamatory
Trypashish	Samurine	1ml/10kg						x		
Lymoxine LA	Oxytetracyclinen 20%	1ml/10kg	Day 1 and 3	x		x	x		x	
Lymoxine 100	Oxytetracyclinen 100%	1ml/10kg	Days 1, 2 and 3	x		х	x		х	
Terramycin	Oxytetracyclinen 20%	1ml/10kg	Day 1 and 3	x		х	x		х	
Terralon	Oxytetracyclinen 20%	1ml/10kg	Day 1 and 4	x		x	x		x	
Berrinil	Diminazine Aceturate	0.5m/10kg	Day 1		x			x		
			No repeat in							
Imisol	Imidocarb dipropionate	1ml/10kg	30 days		x	x				
Parvexon	Parvaquone	7ml/100kg	Day 1 and 3				x			
Parvexon plus	Buparvaquone	1ml/15kg	Day 1 and 3				x			
Butalex	Buparvaquone	1ml/20kg	Day 1 and 3				x			
Sufatrim	Trimethoprim 4 %	1ml/10kg	Day 1 and 3						x	
Intertrim	Trimethoprim and sulphadoxine	1ml/15kg	Day 1 and 3						x	
Bylosin	Tylosin	1ml/50kg	Day 1, 2 and 3						x	
Tollphidine	Tollphidine acid	1ml/20kg	Day 1 and 3							X
Fenidyne	Flunixin Meglumine	1ml/45kg	Day 1 and 3							X
Methadex	Dexamethasone	1.5ml/50kg	Day 1 and 3							x
Penstep	Penicilline	1ml/20kg	Day 1 and 3						х	
Dipen	Procaine benzylpenicillin, Dihydrostreptomycin	4ml/100	Day 1 and 3						x	
Procapen	Benzylpenicillin	1ml/15kg	Day 1 and 3						x	

Figure 2.48: List of locally available treatments

# 2.3.7. Diseases that are challenging or untreatable

There are also many other diseases that causes severe losses and deaths that are not normally treatable and must be prevented through a vaccination programme. These diseases include;

- Foot and mouth disease
- Contagious Bovine Pleuropneumonia (CBPP)
- Lumpy Skin Disease (LSD)
- Anthrax
- Clostridial diseases
- Brucella
- Other reproductive diseases like BVD, IBR and Leptospirosis

# Foot and Mouth (FMD)



#### Figure 2.49: Foot and Mouth Disease

(Source: https://vetmed.tamu.edu/fadr/diseases/foot-and-mouth-disease/)

#### Foot and Mouth (FMD)

#### Description

Foot and Mouth Disease (FMD) is a highly contagious viral disease that affects cloven-hoofed animals, including cattle. It is caused by the Foot and Mouth Disease virus, which belongs to the Picornaviridae family. FMD is a significant concern globally due to its impact on animal health, trade restrictions, and economic losses.

#### Signs of disease

#### Observation

- Presence of painful blisters and sores on the tongue, lips, gums, and inside the mouth
- Excessive salivation, often with drooling of saliva
- Lameness and reluctance to move due to painful blisters on the feet
- Reduced appetite and weight loss
- Increased body temperature
- Decreased milk production
- Ulcerations or blisters on the teats and udder in lactating cows

#### Examination

- Presence of vesicles (fluid-filled blisters) on the tongue, gums, lips, interdigital space, or other areas of the oral cavity

- Lameness and signs of pain during movement

- Increased body temperature, often above 40°C

- Generalized depression and decreased activity levels

#### Diagnosis

Diagnosing FMD requires a combination of clinical signs, examination findings, and laboratory tests including:

- Identification of characteristic clinical signs and epidemiological history

- Laboratory tests, including enzyme-linked immunosorbent assay (ELISA), virus isolation, and polymerase chain reaction (PCR)

#### Treatment

There is no specific treatment for FMD, and no antiviral drugs are currently available. Management focuses on supportive care, including:

- Pain control with non-steroidal anti-inflammatory drugs (NSAIDs)

- Good nutrition and hydration to support recovery and alleviate clinical signs

- Management of secondary infections

- Regular monitoring of the animal's condition

#### Prevention

Prevention plays a crucial role in controlling the spread of FMD. Here are some measures to consider:

- Vaccination: Regular vaccination of cattle using appropriate FMD vaccines to build immunity.

- Biosecurity measures: Implement strict biosecurity protocols, including quarantine, control of animal movements, and disinfection of premises, equipment, and vehicles.

- Surveillance programs: Establish and maintain surveillance systems for early detection and response to FMD outbreaks.

- Public awareness: Educate farmers and stakeholders on the importance of FMD prevention and report any suspected cases promptly.



# **Contagious Bovine Pleuropneumonia (CBPP)**

#### Figure 2.50: Contagious Bovine Pleuropneumonia

(Source: https://www.researchgate.net/figure/Lung-of-CBPP-infected-cattle-at-post-mortemshowing-thickening-of-the-interlobular-septa\_fig2\_351114434)

#### **Contagious Bovine Pleuropneumonia (CBPP)**

#### Description

Contagious Bovine Pleuropneumonia (CBPP) is a highly contagious respiratory disease affecting cattle. It is caused by the bacterium Mycoplasma mycoides subsp. mycoides. CBPP is found in numerous regions around the world and poses a significant threat to animal health and economic stability in affected areas.

#### Signs of disease

#### Observation

- Coughing, sometimes accompanied by blood-tinged discharge
- Rapid and laboured breathing
- Loss of appetite and reduced milk production
- High body temperature (above 40°C)
- Depression and weakness
- Rapid weight loss

#### Examination

- Auscultation of lungs may reveal abnormal lung sounds, such as crackling or wheezing

- Increased respiratory rate and effort
- Palpation of the chest may reveal pain and abnormal lung sounds

#### Diagnosis

CBPP can be diagnosed through a combination of clinical signs, examination findings, and laboratory tests including:

- Polymerase Chain Reaction (PCR) to detect the presence of Mycoplasma mycoides subsp. mycoides DNA

- Serological tests such as complement fixation test or ELISA to detect antibodies against the pathogen

#### Treatment

Treatment of CBPP is challenging, and it is recommended to involve a veterinarian. The following approaches may be considered:

- Administration of long-acting oxytetracycline and florfenicol antibiotics

- Strict isolation to prevent transmission of the disease to healthy animals

- Supportive care, including anti-inflammatory drugs and adequate nutrition

#### Prevention

Prevention is crucial to control the spread of CBPP. Here are some measures to consider:

- Regular vaccination with a live attenuated vaccine

- Cattle movement restrictions in affected areas

- Proper biosecurity practices, including quarantine of new animals and disinfection of equipment and vehicles

- Surveillance programs to detect the disease early and control its spread

- Collaboration with veterinary authorities to implement control strategies

# Lumpy Skin Disease (LSD)



Figure 2.51: Lumpy Skin Disease (Source: Dr Danie Odendaal)

#### Lumpy Skin Disease (LSD)

#### Description

Lumpy Skin Disease (LSD) is a highly contagious viral disease that primarily affects cattle. It is caused by the Lumpy Skin Disease virus, which belongs to the Poxviridae family. LSD is characterized by the development of nodules or lumps on the skin, mucous membranes, and internal organs. The disease can cause substantial economic losses due to decreased milk production, weight loss, and mortality.

#### Signs of disease

#### Observation

- Development of nodules or lumps on the skin, varying in size from small to large
- Swelling of affected areas, including the head, neck, limbs, and genitals
- Skin lesions often progress from red to grey and eventually form scabs or crusts
- Fever and general weakness
- Decreased appetite and weight loss
- Conjunctivitis and nasal discharge
- Reduced milk production in lactating cows

#### Examination

- Palpation reveals the presence of swollen, firm, and well-defined nodules on the skin
- Skin lesions may be painful, warm to the touch, and may cause discomfort during movement
- Enlargement of regional lymph nodes

- Presence of conjunctivitis or respiratory signs such as coughing and nasal discharge

#### Diagnosis

Diagnosing LSD involves a combination of clinical signs, examination findings, and laboratory tests, including:

- Identification of characteristic clinical signs and lesions
- Laboratory tests, such as polymerase chain reaction (PCR) and virus isolation, to detect the presence of Lumpy Skin Disease virus
- Serological tests to detect specific antibodies against the virus

#### Treatment

There is currently no specific treatment for LSD. Management focuses on supportive care to minimize discomfort and secondary infections, including:

- Provision of pain relief with appropriate analgesics

- Maintaining good nutrition, hydration, and proper shelter for the affected animals

- Control of secondary bacterial infections with antibiotics, if necessary

#### Prevention

Prevention plays a crucial role in controlling the spread of LSD. Here are some measures to consider:

# - Vaccination: Implement a vaccination program using an appropriate LSD vaccine to protect susceptible animals.

- Vector control: Implement strict insect control measures to prevent transmission of the disease by insects, especially blood-feeding flies.

- Quarantine and movement control: Isolate and restrict the movement of affected animals to prevent the spread of the disease.

- Biosecurity measures: Practice good hygiene and biosecurity protocols, including disinfection of premises, equipment, and clothing.

# Anthrax



Figure 2.52: Anthrax

(Source: University of Pretoria, 5<sup>th</sup> year Veterinary Sciences)

#### Anthrax

#### Description

Anthrax is an infectious disease caused by the spore-forming bacterium Bacillus anthracis. It primarily affects cattle but can also infect other animals and humans. Anthrax is considered a zoonotic disease, meaning it can be transmitted from animals to humans. It is characterized by sudden death and a high mortality rate in affected animals.

#### Signs of disease

#### Observation

In most cases the animal will die acutely without showing any visible signs of disease.

Signs of disease that can be seen in the dead animal:

- Blood-tinged discharge from natural body openings

- Presence of edema and swelling in specific areas, such as the throat and neck

- In severe cases, signs of respiratory distress and cyanosis (blue discoloration of mucous membranes )

#### Examination

- Blood-tinged discharge from natural body openings

- Presence of edema and swelling in specific areas, such as the throat and neck

#### Diagnosis

Diagnosing anthrax is mostly based on a post mortem examination- History of sudden death in the herd or presence of characteristic signs

- Blood smears or swabs stained with Gram's stain or polychrome methylene blue stain, revealing the presence of B. anthracis rods

#### Treatment

Due to the fast development of this disease there is very little chance for successful treatment. It can anyway just be done under the direction of the state veterinarian

#### Prevention

The only way to prevent this disease is by yearly vaccination with the highly effective vaccine that prevent anthrax.

# **Clostridial diseases**



Figure 2.53: Clostridial diseases

(Source: https://www.agproud.com/articles/49269-clostridial-diseases-in-cattle)

# **Clostridial diseases**

#### Description

Clostridial diseases in cattle are caused by various pathogenic bacteria from the Clostridium genus. These bacteria can produce toxins that affect multiple organs, leading to severe illness and high mortality rates. Clostridial diseases include Blackleg, Tetanus, Botulism, and several other conditions.

#### Signs of disease

#### Observation

The signs of clostridial diseases vary depending on the specific condition. Common signs include:

- Sudden onset of fever
- Loss of appetite
- Depression and weakness
- Difficulty in movement or lameness
- Swelling and pain around affected areas (e.g., limb, throat)
- Muscle stiffness or spasms
- Respiratory distress (in some cases)
- Neurological signs (e.g., inability to swallow, inability to stand, abnormal body posture)

Animals die very suddenly due to this disease and therefore farmers will seldom see signs of disease before the animal die suddenly.

#### Examination

- Palpation may reveal areas of crepitus (crackling sensation) and swelling in affected muscles.

- Neurological examination may show hyperexcitability, muscle spasms, or signs of cranial nerve dysfunction.

- Examination of wounds or areas of trauma may reveal gas bubbles and necrotic tissues.

#### Diagnosis

Diagnosing clostridial diseases involves:

- Clinical signs and history of sudden onset illness

- Examination of affected tissues and fluids for characteristic changes, such as gas production and necrosis

- Laboratory tests to isolate and identify specific Clostridium species

- Toxin testing (if available) to confirm the presence of toxins produced by the bacteria

#### Treatment

Treatment for clostridial diseases primarily involves aggressive support and antimicrobial therapy. Specific treatments may include:

- Administration of a penicillin injectable antibiotic to block the disease in the other animals in the group

#### Prevention

Prevention by vaccination is key in managing clostridial diseases.

- Vaccination: Follow a recommended vaccination schedule for clostridial diseases.

Vaccines are available against specific Clostridium species causing different conditions.

# Brucella



**Figure 2.54: Brucella, Placenta** (Source: University of Pretoria, 5<sup>th</sup> year Veterinary Sciences)

#### Brucella

#### Description

Brucellosis is a highly contagious infectious disease caused by the bacterium Brucella abortus. It primarily affects cattle and can also spread to other animals and humans. Brucellosis is characterized by reproductive disorders, such as abortion, retained placenta, and reduced fertility, leading to economic losses in affected herds.

#### Signs of disease

#### Observation

Signs of brucellosis in cattle may include:

- Abortion or stillbirths, usually occurring in late gestation
- Retained placenta
- Infertility, including irregular heat cycles and reduced conception rates
- Weak or unthrifty calves born to infected dams
- Enlarged lymph nodes, particularly in the inguinal region
- Generalized weakness, weight loss, and decreased milk production

#### Examination

- Physical examination often reveals no specific abnormalities in affected cattle.
- Palpation may identify enlarged, firm lymph nodes in the inguinal region or elsewhere.
- Serous to purulent vaginal discharge may be present in cows with reproductive signs.
- Blood testing may reveal the presence of antibodies against Brucella abortus

#### Diagnosis

Diagnosing brucellosis involves a combination of clinical signs, history, and laboratory tests, including:

- History of abortion or reproductive disorders in the herd

- Serological tests, such as the Rose Bengal Test (RBT) or the Complement Fixation Test (CFT), to detect antibodies against Brucella abortus

- Identification and isolation of the bacterium from blood, vaginal discharge, or milk (rarely used due to handling risks)

#### Treatment

There is no effective treatment for brucellosis in cattle. Infected animals are usually culled or segregated to prevent the spread of the disease. Antibiotics may be used to reduce bacterial shedding, but they do not eliminate the infection entirely.

#### Prevention

- Vaccination: Administer a Brucella abortus vaccine to heifer calves between the age of 4-8 months

- Test and cull: Regularly test and remove animals testing positive for brucellosis from the herd to prevent transmission.

- Quarantine and control animal movements: Restrict the introduction of new animals into the herd and implement strict biosecurity measures.

- Proper disposal: Properly dispose of aborted materials and placenta to prevent environmental contamination.

- Educate farm workers: Raise awareness about the disease, its transmission, and the importance of practicing good hygiene.

# Other reproductive diseases like BVD, IBR and Leptospirosis

#### Other reproductive diseases like BVD, IBR and Leptospirosis

#### Description

Reproductive diseases in cattle, including Infectious Bovine Rhinotracheitis (IBR), Bovine Viral Diarrhea (BVD), and Leptospirosis, can significantly impact herd fertility and productivity.

#### Signs of disease

#### Observation

#### IBR:

- Fever
- Nasal discharge
- Coughing
- Loss of appetite
- Decreased milk production
- Abortion (particularly in pregnant cows)

#### **BVD**:

- Fever
- Diarrhoea
- Poor appetite
- Weight loss
- Respiratory distress
- Infertility
- Congenital defects in calves (if infection occurs during pregnancy)

#### Leptospirosis:

- Fever
- Decreased milk production
- Abortion
- Stillbirths
- Infertility
- Haematuria (bloody urine)

# Examination

#### IBR:

- Respiratory distress (coughing, increased respiratory rate)
- Nasal discharge (may be serous or purulent)
- Conjunctivitis (inflammation of the eyes)
- Ulcerative lesions in the mouth and nose

#### BVD:

- Generalized weakness

- Dehydration
- Ulcerative lesions in the mouth and nose
- Mucosal petechiae (tiny red spots) on nasal and oral mucosa
- Diarrhoea

#### Leptospirosis:

- No specific clinical signs, but reproductive signs such as abortions or stillbirths may be evident
- Haematuria may be observed in some cases

#### Diagnosis

#### IBR:

- Clinical signs and history of respiratory symptoms
- Virus isolation or PCR testing from nasal secretions or conjunctival swabs
- Serological testing for detection of specific antibodies against IBR

#### BVD:

- Clinical signs and history of digestive disorders
- Virus isolation or PCR testing from blood, nasal swabs, or faeces
- Serological testing to detect antibodies against BVD

#### Leptospirosis:

- Clinical signs and history of reproductive disorders
- Serological testing to detect specific antibodies against Leptospira bacteria
- Polymerase Chain Reaction (PCR) testing or culture from blood, urine, or foetal tissues (postmortem)

#### Treatment

#### IBR:

- Supportive care (fluids, anti-inflammatory medications)
- Antibiotics to prevent secondary bacterial infections
- Vaccination to prevent further spread of the disease

#### BVD:

- Supportive care (fluids, anti-diarrheal medications)
- Vaccination to prevent further spread of the disease
- Management practices to minimize the risk of transmission within the herd

#### Leptospirosis:

- Antibiotics (as per veterinarian's recommendation)
- Vaccination to prevent further spread of the disease

- Proper management practices to reduce exposure to Leptospira bacteria Prevention IBR: - Vaccination of susceptible animals following a recommended schedule - Isolation and testing of new animals before introducing them to the herd - Biosecurity measures to prevent transmission (disinfection, hygiene) **BVD**: - Vaccination of all animals, including calves, heifers, and cows - Avoidance of commingling with neighbouring herds - Biosecurity measures to prevent introduction of BVD carriers Leptospirosis: - Vaccination with a suitable vaccine - Control of rodent populations - Monitoring and testing of potential carrier animals

# 2.3.8. Disease prevention

#### Purpose

Most beef cattle diseases can be prevented.

Two approaches can be used unilaterally or in combination to control disease-causing organisms and prevent diseases:

- Increase the animal's general and specific resistance to disease-causing organisms. This is contingent on the animal's own ability to develop immunity or resist infection to be able to remain healthy after being exposed.
- General immunity or resistance
  - Good nutrition and supplementation of nutritional shortages
  - Good parasite control
  - Decrease stress during critical periods in the production cycle.
  - Genetic selection for disease resistance
- Specific immunity
  - Vaccination
  - Natural exposure

Reduce or avoid animals' exposure to disease-causing organisms. This requires specific management actions by the herd manager and the farm's management to combat exposure or avoid exposure in the case of some diseases for which no vaccination or treatment exists.

- Reduce exposure:
  - Identification and culling of animals that are carriers of specific diseases mostly incurable and contagious diseases.
  - Early identification and treatment of sick animals before disease-causing organisms multiply and are transmitted to healthy animals.
  - Early warning of disease problems or outbreaks
  - Good biosecurity
- Total avoidance of exposure
  - Buying in only animals that were tested and free of specific diseases like brucellosis and venereal diseases.

#### **Principles of vaccination**

Specific immunity - This is obtained through planned and regular vaccination.

It is compulsory to vaccinate against some state control diseases which are the vaccinations against Anthrax and Brucellosis in heifer calves. These should be included in your vaccination plans.

This develops the animal's own resistance against specific diseases. Vaccine theory is based on the idea that we give an animal a weaker form of the disease to teach the immune system how to combat the disease. We vaccinate against the most prevalent diseases on the farm like Black Quarter, Botulism and Lumpy Skin Disease.

These diseases mentioned above are impossible to prevent effectively through increasing general resistance or by just trying to reduce or avoid exposure. In many cases, effective treatments against these diseases also don't exist.

When unvaccinated animals get infected, there are two processes that take place simultaneously as illustrated below in the example of lumpy skin disease which is an insect transmittable viral disease.

## Lumpy skin disease in cattle – the disease development process

Graphical illustration of the disease development process for lumpy skin disease from transmission of the virus (infection) by the biting insect, until the first signs of disease are visible in the animal.



#### Figure 2.55: Immunity development in the body

These diseases cause severe production loss or death since the animals own immune system is too slow to protect the animal.

In these cases, it is essential to protect the cattle by way of vaccination, against these diseases for which an effective vaccine does in fact exist.

# The purpose of a vaccine

The animal is vaccinated (injected) with a dead or weakened strain of the disease-causing organisms. The immune system will react against this vaccine organism/s as in the case of a natural infection, except that the organisms don't cause damage like the real disease-causing organism.

After two weeks the animal will have developed protective immunity against the specific disease.

The initial vaccination can protect the cattle for various periods and re-vaccination, or annual vaccination must be done depending on the vaccine and/or disease against which must be protected.

# Time needed for development of immunity after first (initial) vaccination



# Time needed for development of immunity after booster (yearly) vaccination



#### Figure 2.56: Immunity after vaccination

Vaccination plans should be developed in consultation with the local veterinarian who is more aware of the current diseases within the local area, province, and national levels. Veterinarians have their own networks where they compare reports of disease prevalence.

# Important – Disease categories that must be prevented by vaccination.

#### **Deadly bacterial diseases**

These diseases can occur on any farm or premises as the organisms causing the disease, are already present in the soil. In such a case it isn't possible to prevent exposure. The most important diseases in this group are also diseases that can kill livestock quickly without there being time for effective treatment.

All the clostridial diseases are of significance and include, among others: black quarter, botulism, malignant oedema, swollen head, red gut and any other clostridial infection of the intestinal tract. Also included here are Pasteurella which causes pneumonia and then also Anthrax that causes acute deaths.

Because these vaccines don't give long term protection, cattle must initially be vaccinated twice and then on a yearly basis.

# Viral diseases transmitted by flying insects.

No matter how good the biosecurity measures, there are certain diseases that will spread to the farm or premises by flying insects. In most cases, these are also viral diseases for which there are no primary treatments. The only form of protection is to vaccinate the animals.

All insect transmitted viral diseases are of importance and include Lumpy Skin Disease (LSD), Bovine Ephemeral Fever (BEF) - also known as Three-day stiff-sickness (TDS), and Rift Valley fever (RVF).

Young cattle after weaning are initially vaccinated twice and a yearly booster is then given if needed as in the case of lumpy skin disease that occurs on a more regular basis.

#### Diseases that can cause reproduction losses and abortions.

These usually entail latent diseases that normally don't affect animals other than negatively affecting re-conception (embryos dying off) or causing abortions. Management and prevention of these diseases are usually multifaceted and therefore vaccination is but one aspect of disease prevention.

Examples of important diseases are Brucellosis, Bovine Viral Diarrhoea (BVD), Infectious Bovine Rhinotracheitis (IBR) and Campylobacteriosis (Vibriosis). Preventative vaccination is necessary as the vaccines cannot prevent or limit the diseases if abortions are already taking place.

#### **Vaccination plans**

Vaccination plans should be developed by farm management.

The vaccination plans are re-evaluated once a year in July, or when new diseases occur, by the consulting veterinarian.

#### Breeding bulls, cows, and calves up to weaning.

The vaccination plan for the adult herd is very basic because long term herd immunity is established through the elaborate vaccination plan of the replacement heifers.

#### **Replacement heifers.**

The elaborate vaccination plan for replacement heifers, after weaning, is part of the separate 3-year replacement heifer management plan.

The herd immunity is mainly established in the period before they are bred for the first time and some vaccines that give long term protection are only used in the replacement heifers and will only be revaccinated in the adult herd if there is an outbreak or severe increase of the occurrence of those diseases on a provincial or national basis as in the case of Rift Valley fever.

Some live vaccines can also safely be used in these replacement heifers before they are bred for the first time.

#### Young stud bulls

The vaccination plan of the young stud bulls after weaning is aimed at protecting against deadly diseases but also to develop long term immunity when joining the adult herds or when sold as stud bulls.

#### Oxen after weaning.

The vaccination plan of the oxen after weaning is aimed at protecting against deadly diseases because they can be re-vaccinated at any time because pregnancy is not a limiting factor.

# Procedure

The most critical point regarding disease prevention by vaccination depends on the timely ordering of vaccines to have it available to be given on the planned date as per the vaccination plan.

This detailed planning must be done by the Herd Veterinarian as an input to the Operations Manager for the timeous procurement of the vaccines.

Vaccines are kept in the cold storage room under controlled conditions where the cold chain is maintained.

Checking of existing vaccine levels, expiry dates and ordering of vaccines must be done on a quarterly basis for each Production Period (Oct, Jan, Apr, and Jul) – depending on the availability and order lead times.

The Herd Veterinarian is responsible for executing the vaccinations by delegating it to the herd managers. The Herd Veterinarian however stays fully responsible for the correct and effective vaccinations in accordance with all prescriptions.

# **Record keeping of vaccinations and medication**

Record keeping is very important. The herd manager must log each vaccine that has been given and each animal that received an injection. With good record keeping and administration animals aren't skipped. Animals that have been skipped can be identified and corrective action can be taken.

The Herd Veterinarian is to confirm compliance to the vaccination plan and current stock levels and expiry dates, by keeping a record of all vaccination for each herd and report that to the General Manager and Consulting Veterinarian monthly.

The Herd Veterinarian does continuous training and oversees that handling of vaccines, and that vaccination application is done correctly.

The Herd Veterinarian will oversee the standard operational procedures for washing, cleaning and disinfecting of equipment used for vaccination and does regular unscheduled inspections to ensure compliance as described in the Disease Treatment Protocol.

Consulting Veterinarian checks monthly that vaccinations were done according to the vaccination plan for each management group and herd.

Vaccines availebile in Zambia										
Product	Foot and mounth	СВРР	Lumpy Skin	Anthrax	Black Qauter	Botulism	Clostridial	Brucella	Pasteurella	IBR, BVD, Lepto
Government Vaccine	x	x								
Lumpyvax		<i></i>	x	1						
Herbivac				Ü						
Supavax				x	x	x				
Blantrax		0		x	x				_	
One shot Ultra					x	x	x		x	
Covexin					x	x	x	4		
S-19				1				x		
RB-51			l.					x		
Pasteurella			1						x	
Buvilus Vista										x

Figure 2.57: Vaccines available in Zambia



Figure 2.58: Animal being vaccinated (Source: Dr Danie Odendaal)

# Ongoing parasite management and control

# **External parasites**

#### Purpose

Ticks and other external parasites like lice and flies are the most important parasitic problem to control within a cattle operation. This is because the sub-tropical environmental circumstances are ideal for ticks especially during the wet season.

Ticks survive for long periods in the environment and therefore cannot be eradicated. Due to available tick control products and methods used, the cattle need to be inspected and treated if needed, on a weekly basis.

# Tick control with dipping compounds

Most important fact to understand is that most dipping compounds applied as a spot treatment, pour-on, hand spraying, spray races and dip tanks - only kill external parasites (ticks) on contact and protects against a new infestation for a period of up to 1 week.



Figure 2.59: Tick control with dipping compounds

Lice is a limited seasonal problem mostly in young cattle and when identified treatment is given to eradicate the infestation in the herd.

Flies always occur but can become a factor in the transmission of eye infections or fly worry when their numbers become very high. Treatment aimed at fly control is only initiated when very high infestations are identified.

Tick bites are a major cause of wounds leading to maggot and screw worm infestations, teat damage in heifers, sheath damage in bulls, ear damage and the initiation of middle ear infection.

# Ticks also transmit tick borne diseases. The goal is to develop your cattle's naturally acquired immunity against existing tick-borne diseases which are African Redwater, Anaplasmosis and Heartwater.

When calves are born, they are susceptible to all three of these diseases and need to develop immunity after natural exposure during their first year of life.

Due to the immune status of the adult Cattle herd a tactical tick control program (approach 1) is used.



#### Figure 2.60: Treatment approaches

#### Procedure

Weekly inspections for ticks, lice, and flies

All cattle (including calves) are inspected on a weekly basis for ticks and the inspection results are reported on a Tick, Lice & Fly Weekly Inspection Recording Form.

Findings are recorded every week for every herd, even if there are no parasites observed.

#### Rationale

Weekly inspections for Ticks, Lice & Flies does not replace the Daily Observation of the cattle by the herdsmen and daily reporting regarding the specific subsections dealing with ticks and specifically Brown ear-ticks. If a high infestation of ticks (10 and more ticks per animal) are observed by the herdsman at any time during Daily Observation, the Foreman and Operations Manager must be informed.

The Weekly Inspection is a specific procedure that must be followed throughout the year to determine:

- if dipping is needed,
- the intensity of dipping (how much dip solution must be applied) and
- to monitor the effectiveness of the previous dipping.

The first crush pen filled with cattle during the weekly inspection, must be inspected before dipping during the wet season when weekly inspection/dipping is done.

Whenever a crush pen is not available, the herdsman must still do the visual inspection on 10 animals while on the move around the animals.

During the dry season weekly inspection must still be done by the herdsman (alone) or in conjunction with the foreman.

The average number of ticks, type of ticks or other external parasites (for example lice and high numbers of flies) must be identified and recorded for that group of cattle.

The type of product application, product used will depend on the type and number of external parasites present on the animals before dipping.

The most standard product and application generally used for tick control, makes use of Eraditic 250 applied with a knapsack sprayer.

If the previous applied dipping is found not to be effective it must be reported to the Operations Manager to suggest an alternative approach/treatment on consultation with the Consulting Veterinarian.

In cases of severe infestations, follow-up inspections should be done within 4 days after treatment to verify the efficacy of the corrective intervention and/or treatment.

When heifers are inspected, the inspector must specifically bend down and inspect the small udder and teats, which are not visible when just looking at the heifers.

Weekly inspection for each herd, for ticks, lice and flies shall be scheduled for the same day every week and shall be done, recorded, and reported by the Herdsman or Foreman allocated to that specific herd.

If dipping is needed but cannot be done on the same day as the inspection due to rain or other unforeseen events, dipping shall be done the very next day or soonest after the inspection was done.

Guidelines for doing the weekly inspection are provided below:

# Where can I inspect the cattle to see the different types of ticks, lice or flies?



Figure 2.61: The location of different ticks, lice, and flies

# Weekly Structured Inspection of Cattle for Ticks and Lice

As the cattle owner you need to ensure that ticks don't cause damage which is difficult to treat but easy to prevent. If cattle are inspected once a week in a structured way, you will always see when ticks start to attach and the signs of lice infestation. Additional treatment can be done in time before damage is caused.



#### Figure 2.62: Structured Inspection

Ticks always occur right through the year on all the Cattle farms.

The weekly inspection for ticks, lice and flies is implemented for each cattle herd.

The primary focus of the (digital) weekly inspection recording form is to identify and record the infestation level in an easy-to-use format.

All parasite problems e.g. ticks, lice and high fly infestation should be identified and recorded.

The form: Tick, Lice & Fly Weekly Inspection Recording Form, is used to record the Inspection Results, for every inspection for every herd, every week, regardless of no parasites being observed.

Record all the fields on the form and submit only the completely completed form.

Mark the block indicating the number of ticks and the type of ticks, lice, or flies.

# Dipping

Based on the findings at the weekly inspection, cattle will be treated according to the level of infestation.

Dipping must be recorded on the form: Tick, Lice & Fly Weekly Dip Recording Form.

#### **Basic spot treatment**

When cattle are inspected and any ticks are found on the bottom line, udder, and teats (cows and heifers), sheath and scrotum (bulls), dipping is necessary.



Figure 2.63: Spot Treatments of ticks

Cattle must be sprayed with at least a total of 0.5 litre Amitraz based solution (dilution – 1ml per litre of water) on all the areas where ticks are observed.

Spraying of each animal will take a minimum of 30 seconds to make sure that at least 0,5 litre of the Amitraz solution is used.

This will be the most general form of dipping if dipping is done at a weekly (maximum 2 weekly) interval during the wet season.

#### Basic spot treatment plus treatment under the tail, tail brush and the ears.

When cattle are inspected and any ticks are found on the bottom line, udder, teats, sheath, scrotum, <u>underneath the tail, the tip of the tail (tail brush)</u> or <u>in the ears</u> of the cattle, dipping is necessary.

Cattle must be sprayed with at least 1 litre of Amitraz mixture (1ml per liter of water) on all the areas where ticks are observed, which now also include the inside and around the ears as well as the tail brush.

Spraying of each animal will take a minimum of two minutes to make sure that at least 1 litre of Eraditic 250 mixture is used.

Under conditions of high numbers of Brown ear-tick in and around the ears and Bont-legged ticks underneath the tail and on the tail brush, Redline pour-on should be used additionally by applying 10ml between the ears and/or 10ml on the tail root.

Treatment of cattle when large numbers of engorged female blue ticks are found.

When cattle are inspected and in addition to the multi host ticks, many small blue ticks and many engorged female blue ticks are found on the breastbone, neck, sides and area behind the udder, dipping is necessary.



Figure 2.64: Prevalence of ticks

Cattle must get a full body spray (backpack sprayer or using fire fighter) with at least 3 litres of Amitraz mixture (1ml per litre of water).

The Consulting Veterinarian must also be consulted if the Foreman or Operations Manager thinks that an alternative treatment is necessary (use of pirethroid spray, full body pour-on treatment, injectable ivermectin).

The effectiveness of this treatment must be evaluated one week after treatment – there must be no adult blue ticks visible.

If adult blue ticks are still visible the Consulting Veterinarian must be informed and consulted.

Treatment of cattle when biting lice are observed.

When the herdsman sees that cattle are itchy (scratching themselves against bushes or fixed objects like the water or feed troughs) they must be inspected immediately for signs of lice which is hair loss on the neck and over the chest.



Figure 2.65: Itchy cattle

Cattle must be injected with ivermectin (Ivermectin at 1ml/50kg) as well as a full body spray (backpack sprayer or using fire fighter) with at least 3 litres of Amitraz (1ml per litre of water) and this body spray must be repeated a week later.

The effectiveness of this treatment must already be evaluated one week after the first treatment (at the time of the second treatment) – the cattle must not be itching any more.

If cattle are still itching after the first treatment the Consulting Veterinarian must be informed and consulted.

# **Treatment of Calves**

Calves are separated from their mothers before dipping/treating them in the crush pen.

In general calves are not treated against ticks for them to develop immunity against tick borne diseases.

If there are high numbers of ticks (>10 on average) on the calves during tick inspection, these calves must also be dipped. This inspection of the calves must be done every time the cows are inspected, and calves only treated if there are a high number of ticks (>10 on average) on them.

# **Treatment of flies**

If there is a very high infestation of flies the normal Amitraz based dips might not work, after consultation with the Consulting Veterinarian, be replaced with Cypremithen based dip which is a pyrethroid dip with very good efficacy against flies as well as all the ticks.

This treatment will be continued only when there is a high fly challenge.

## **Internal parasites**

#### **Liver Fluke**



#### Figure 2.66: Liver Fluke

I

- 1. Fluke worms occur on farms where the right environmental conditions exist for them to complete their complex life cycle, which includes a developmental phase in freshwater snails.
- 2. These snails live in areas where there is slow-flowing water streams and water holes or areas covered with a shallow layer of standing water during the wet season(pans).
- 3. The presence and effects of low-grade infection of the animals are largely hidden, but under

conditions where there is a very high infection rate over a short period of time, signs of disease can be seen before animals are severely affected or killed by the parasites effects.

- 4. The young and developing flukes cause a lot of damage to the organs in which they mature, leading to the malfunctioning of these organs or body systems.
- 5. Young grazing animals and adult animals in bad condition, are more susceptible to infection.
- 6. There can be effective control over exposure to fluke worms if the life cycle is understood and preventative grazing management practices are followed to reduce exposure.
- 7. Very specific parasite control products must be used to control the different fluke worms at the different stages of infection. The use of the wrong product can lead to further losses.



Figure 2.67: Fluke worm lifecycle

#### Liver fluke – detailed understanding of the disease process that takes place inside the animal

#### Start of infection

The signs of disease will depend on the number of infective worms (high, medium or low) taken in by the animal. The signs that will be seen with a medium to high infection are described here.





#### >12 Weeks

Affected cattle can fall behind when herded or develop bottle jaw, a sign of slow blood loss. Continued weight loss esp. when grazing area is poor.

#### Examination of dead cattle

When the veterinarian cuts the dead animal open he will look for signs of liver damage (thickened gall tubes) and flukes in the gall tubes



Diagnosis of infection in the live animals.

# **Development of liver flukeinside cattle**

When the animals graze in wet areas they take the immature worms in which are attached to plants.

Inside the animal, these immature flukes penetrate through the wall of the small immature flukes feeding intestine, migrate to the liver on the liver tissue. and penetrate the liver.

The immature flukes will then start to eat liver tissue, forming small tunnels in the process.

Immature flukes feed on the liver for the next 6-8 weeks while they are growing the liver.Liver damage depends on the number of with the dung.

flukes which will now enter the hard (fibrotic) due to thebodies small bile ducts (tubes) and migrate to the larger bile ducts.

This adult flukes attach to the wal of the bile ducts and feed by drinking blood. After a month which causes severe damage to each adult starts to produce eggs (20 000 per day) which go with the bile into the intestine and out

The thin walls of the bile ducts now become thickened and white By 8 weeks they become adult and the whole liver can become reaction to this infection.

To confirm infection in the live animal, dung must be collected and sent to the veterinarian for tests to determine if there is a liver fluke infection. The newest tests can identify the infection early (from 4 weeks after infection), which will be at the time when the first signs of disease are observed in the case of a very severe infection.

#### Figure 2.68: Fluke's development in cattle

#### Products to treat against liver flukes.

#### 1. Treatment against the immature worms that tunnel through the liver.

There are very few products that are effective against immature flukes. Products containing the active ingredient triclabendazole can be used as a treatment against immature flukes as they start migrating through the liver.

#### 2. Treatment against the mature worms in the liver.

There are many other products that can be used to kill the adult flukes in the gall tubes. Some of them may also influence the worms at later stages in their life cycle.

#### Animal parasites / Worms in cattle

All cattle are susceptible to worms. Zambian cattle are more at risk due to the country's climate. The climate of our country is very beneficial for causing worm diseases. In Zambia, 100% worm infestations can be observed in cattle and farms suffer a lot of damage due to worm infestation. Attacks of roundworms, tapeworms and leaf worms are most common.

#### **Symptoms**

When the worms attack in cattle, the animal dries up day by day. He doesn't eat much. Milk production decreases, the animal suffers from anemia, thin stools, animal fur does not have a shiny feeling, indigestion, enlargement of the stomach, occasional abdominal pain, etc.
#### Treatment

Cattle can have many types of worms. Therefore, deworming should be used as if it is effective for almost all types of worms in cattle. For example: Ivermectin group medicine for 50 kg should be given 1 ml under the skin. It works great for all types of worms. Ivermectin group drugs work well in all cases of round worms, leaf worms, tapeworms, and parasites in cattle.

If you can detect if your animal is infected with any worms through dung test or any other means then it is better to give specific treatment. Here you can give medicines of Nitroxynil, Albendazole, Triclabendazole group for liver worms in cattle.

Internal Parasites Treatments								
			Round Worms		Taper Worm		Liver fluke	
Product	Active	Dosage	Immature	Adult	Immature	Adult	Immature	Adult
Trinex plus	Levamizol + triclabendazole	1ml/10kg	x	x			x	x
Flukazole C	Oxfendazole + Triclabendazole	1ml/10kg	x	x	x	x	x	x
Ecofluke	Triclabendazole	1ml/10kg					x	х
Prodose Orange	Albendazole + Closantel	2ml/10kg						
Prodose red (powder)	Albendazole + Closantel	2ml/10kg	x	x				
Nilzan	Levamisole + Oxyclozanide	1/150kg		x				x
Albendazole bolus	Albendazole	1/120kg	1		x	x		
Valbazen	Albendazole	1ml/10kg			x	x		
Ecomintic	Ivermectin 1%	1ml/50kg	- 18 		x	x		
Peperin	Piperazine	1-2g/10kg			x	x		
Closeco	Closantel	1ml/30kg	x	x			x	x
Ivomec Super	Invermectine + clorsulon	1ml/50kg	x	x			x	x

Figure 2.69: Locally available treatments for internal parasites



Figure 2.70: Liver Fluke in cattle

# 2.3.9 Vet kit and essential equipment

To keep your cattle healthy and be able to treat them quickly, you must have access to some basic equipment and vet essentials.

#### Basic equipment

You might not have all the equipment you need available, but you should be able to get hold of it if required. You should have the following equipment handy:

- Thermometer, preferably digital, to measure the temperature of the cattle
- Cooler box to keep the necessary equipment and vaccines.
- Book with general information about cattle.
- Book with information about cattle health.
- Burdizzo for castration or rubber rings with applicator.
- Applicator for ear tags.
- Knapsack sprayer for dipping, if spray is done with knapsack. The knapsack is carried on the back of the person spraying.
- Equipment to weigh cattle, scale or weighing band
- Knives.
- Face mask for you to wear when applying sprays.
- Gloves to protect hands from chemicals.
- Blades for doing incisions into abscesses.
- Sterilization kit.
- Antiseptic handwash to wash hands after treating cattle.

The items in the basic equipment are list are the minimum items needed to treat and keep cattle healthy.

A thermometer is one of the most import tools keep wit herdsman to detect high temperatures

A simple cattle weight band can help farmers to apply correct dosage of all treatments, but farmers will need to learn the coloration between weight band measurements and actual weight. This takes some practice.



Figure 2.71: Knapsack sprayer, www.sasmallholder.co.za

#### Medicines, consumables, and vet equipment

Some of the more important items a cattle farmer needs are the medicines and the application equipment needed for the treatment of animals. These are:

- Disposable syringes in a minimum of two sizes 5 cc and 10 cc.
- One large syringe for applying cleaning liquid, removing liquids from affected areas, or draining abscesses.
- Non-disposable syringes that can be cleaned and sterilised for repeated use.
- Different size needles for injections. Normally, 19 and 20 gauge are required, but othersizes can also be made available.
- Eye powder antibiotics like Oxytetracycline powder.
- Dewormers for liver fluke, round and tape worms
- Conventional dip that can be mixed with water, like Tritix, Supatraz.
- Tick grease like Coopers
- Wound spray and/or wound oils like Coopers wound oil or Iodine
- Oxytetracycline like Lymoxine, Terramycin or Terralon to use as a long-term antibiotic.
- A short-term antibiotic like Lymoxine 10%.
- An antibiotic range like Sufatrim or Intertrim and a anti-inflammatory like Fenidyne or Methadex
- Solutions that can be injected for mange and lice, like Ivermectin.

- Foot bath solution, such as copper sulphate (CuSO<sub>4</sub>).
- Vitamins supplements like Multivite or Complex AD3E and Minerals, B-Co Bolic

The needles for disposable syringes must only be used once. The syringes must be cleaned by boiling them to kill any germs, before they are used again.



Do not inject more than one animal with the same needle, to prevent any disease from spreading between animals.

#### 2.3.10 Medication: important information, storage, and disposal

All the information you must know about storing medicines will be supplied on the medicine packaging. You must know:

- Dosing rates.
- Expiry dates.
- Storage temperatures.
- Safety to use on pregnant animals.
- Withdrawal times and periods.
- Application.



- Check the expiry date to see if the medicine is not too old to work properly when you buy new medicine.
- Do not use or buy expired drugs because they are useless.
- Buy in smaller quantities or share with other farmers to avoid storing medicine until it reaches its expiry date. However, sharing with other farmers can be risky because hygiene around medicines is very important and the other farmers must also follow the same hygiene standards.

Withdrawal periods are also important. There must be enough time between the last dose of medicine and the time when the cattle will be slaughtered or milked for the medicine to work out of its system. This could be a few days or a few weeks, depending on the medicine, and the withdrawal period will be indicated in the instructions. Medicines can be absorbed by humans if the meat is eaten, or the milk is used before the withdrawal date.

# **2.4 Animal Reproduction and Genetics**



Figure 2.72: Reproduction, the fourth pillar to animal production

In this section we are going to look at the various breeds of cattle commonly found in Zambia. And the main purpose of each breed.



Different breeds have different strengths and weaknesses and this must be anticipated when introducing them onto your farm. A local breed may be lighter but is better adapted to local conditions and may need less medication and feed. Heavier breeds on the other hand will give you greater returns at the market but may cost you more in supplementary feed and medications.

# 2.4.1. Cattle Breeds Found in Zambia

# **Barostse Breed – Traditional Breed**

They are well adapted to the flood plains of the Zambezi and Kafue rivers. The pure Barotse is a large, framed animal with heavy bones and large spreading, lyre shaped horns which can be 2.5m from tip to tip. Typical coat colours are black and brown ranging from fawn to grey and sometimes mixed with white (but never pure white). The most usual colours are brown, black, and dark red; the hump is small, almost absent in the female and is in the neck and chest position. They are multi-purpose animals.



Figure 2.73: Barotse Cattle Breed

# Angoni Breed – Traditional Breed

Angoni breed are short horned zebus found in Zambia around Chipata, Katete, Petauke and Lundazi. They are larger than the other three types and are fairly compact animals of medium size classified as Bosindicus. A mature Angoni cow weighs about 400kg while a bull weighs 500kg. The dark red colour predominates but other colours, particularly black or black and white markings are common. The horns vary widely in size and shape. The hump is prominent on both males and females.



Figure 2.74: Angoni Cattle Breed (Source Altaf Patel)

# **Gyr Breed – Extensive Dual-Purpose Breed (Milk and Beef)**

The Gyr or Gir cattle breed typically weighs around 400 to 500 kg for mature cows and 700 to 900 kilograms for mature bulls. They are renowned for their high milk production, with cows yielding an average of 3,500 to 5,000 litres of milk per lactation, containing a high fat content of around 5% to 6%.

In terms of mothering ability, Gyr/Gir cows are excellent mothers, displaying strong maternal instincts and good protective behaviour towards their calves. This contributes to the breed's reputation for good calving ease and calf survival rates.

Regarding hardiness, Gyr/Gir cattle are well-adapted to hot and humid climates, showing excellent heat tolerance and resistance to common cattle diseases. This makes them ideal for tropical regions where other breeds might struggle.

Regarding fertility, Gyr/Gir cattle are known for their high fertility rates, with cows typically calving regularly and having a relatively short calving interval. Their reproductive efficiency and ability to conceive in challenging conditions further highlight their value in breeding programs and commercial operations.



Figure 2.75: Gyr/Gir cow that is a high milked with 55lt milked in a day.



Figure 2.76: Gyr/Gir Bull

# Sindi Breed – Extensive Dual-Purpose Breed (Milk and Beef)

The Sindi cattle breed is known for its distinctive traits and characteristics. Sindi cattle are typically smaller in size, with cows weighing around 320 to 450kg and bulls weighing around 500 to 700kg when mature. They are primarily found in the Sindh region of Pakistan.

In terms of milk production, Sindi cows are moderate milk producers, yielding an average of 2,000 to 3,000 litres of milk per lactation. While their milk production is lower compared to some other dairy breeds, the milk is of good quality with a higher fat content. Sindi cattle exhibit good mothering abilities, displaying strong maternal instincts and providing good care to their calves. They are known to have good calving ease and calf survival rates, contributing to their reputation as good mothers.

Sindi cattle are well-adapted to hot and arid climates, exhibiting good heat tolerance and resistance to common cattle diseases. Their hardiness and ability to thrive in challenging environmental conditions make them suitable for regions with limited resources. In terms of fertility, Sindi cattle are known for their reproductive efficiency. They often have regular calving intervals and high fertility rates, making them valuable for breeding programs and commercial operations. Their ability to conceive and reproduce in adverse conditions further emphasizes their importance in sustainable livestock management.



Figure 2.77: Sindi cow



Figure 2.78: Sindi Bull

# Brahman Breed – Extensive Beef Breed

Brahmans vary in colour from very light grey or red to almost black. A majority of the breed are light to medium grey. Mature bulls are normally darker than cows and usually have dark areas on the neck, shoulders, and lower thighs. Brahmans are intermediate in size among beef breeds. Bulls will generally weigh from 800kg to 1200 kgs and cows from 600 to 700 kgs in average condition. The calves are small at birth but grow very rapidly and wean at weights comparable to other breeds. Brahmans are intelligent, inquisitive, and shy. They are unusually thrifty, hardy, and adaptable to a wide range of feed and climate.



Figure 2.79: Brahman Cattle Breed

# **Boran Breed – Extensive Beef Breed**

The Boran is medium in size with a short head, small ears, loose dewlap, and a large hump above the shoulders. They can be horned or polled. They vary in height from 114cm to 147cm tall, and in weight bulls weigh approximately 500kg to 850kg. Cows weigh about 380kg to 450kg. Their skin is loose, thick, and extremely pliable for added insect repellence plus it is dark pigmented with fine short hair for heat tolerance. Hair colour can be a range of colours except brindle or solid black.



Figure 2.80: Boran Cattle Breed (Source: https://southafrica.co.za/boran-cattle.html)

# **Beefmaster Breed – Intensive Beef Breed**

Beefmaster cattle are the first American composite breed (combination of three or more breeds) namely 50% Brahman, 25% Hereford, and 25% Milking Shorthorn. Blend strong maternal traits with excellent growth and carcass abilities. The cattle are heat, drought, and insect resistant. They are moderate in size, and while there is no set colour pattern in the breed, they are generally light red to dark red and some will have white mottle on their faces. The females are excellent mothers, raising a heavy calf each year, and the bulls are aggressive breeders. Beef masters are intelligent, gentle cattle that are truly a pleasure to work with. The Breed is also called the Profit Breed.



Figure 2.81: Beef Master Breed

# Fleckvie or Milking Simmental – Intensive Dual-Purpose Breed (Milk and Beef)

Fleckvieh, also known as Simmental, is a dual-purpose breed that excels in both milk production and meat quality. Fleckvieh cattle are known for their medium to large size, with cows weighing around 500 to 600kg and bulls weighing around 900 to 1100kg at maturity. In terms of milk production, Fleckvieh cows are prolific milk producers, yielding an average of 6,000 to 8,000 liters of milk per lactation. The milk has a moderate to high fat content, typically around 4% to 4.5%, making it suitable for cheese and butter production. Fleckvie is a good cross breeding option for advanced farmers who would like to practise Dairy Farming and produce good milk for calves.



Figure 2.82: Fleckvie

# 2.4.2. Cattle Breeding and Selection of Breeding Bulls and Cows

Several managerial practices increase productivity within cow-calf herds when they can be implemented economically and practically. These practices are mostly associated with reproduction because improvements in herd fertility generally offer potential for increased profitability in cow-calf operations. They include a restricted breeding season, identification of the optimal calving season, a good heifer replacement program, heifer reproductive tract scoring, proper nutrition, good herd health, bull breeding soundness examinations, crossbreeding, and maintaining good records.

# **Selection of Breeding Stock**

# **Selection Criteria For bulls**

When selecting a bull for breeding cattle, several factors should be considered to ensure optimal genetic improvement in your herd. Here are some key points to keep in mind:

- Genetic Background: Look at the bull's pedigree and performance records. Consider traits such as growth rate, milk production (if relevant), calving ease, and disease resistance. Choose a bull whose genetics align with your breeding goals. If no records are available look at the bulls calves from previous breeding seasons this will give you a clear picture of the bull's potential.
- Physical Conformation: Evaluate the bull's overall body structure, including its legs, feet, back, and overall muscling. Look for a bull that is well-proportioned, athletic, and exhibits good structural soundness.
- Libido and Breeding Soundness: Ensure that the bull has a strong libido and is capable of mating with cows. Have the bull tested for breeding soundness, which includes evaluating sperm quality and reproductive health.
- Hormonal Masculinity: Consider the bull's hormonal levels and masculine characteristics as they can impact breeding behaviour and fertility. Bulls with appropriate hormonal levels will exhibit typical masculine traits such as aggressiveness, territorial behaviour, and sexual activity.
- Health and Condition: Ensure that the bull is in good health and proper condition. Regular veterinary check-ups are important to assure that the bull is free from diseases and parasites. A well-nourished and healthy bull will be better equipped for breeding and passing on good genetics to the offspring.
- Temperament: Consider the bull's temperament and behaviour. A docile bull is easier to handle and work with, reducing the risk of injuries to both humans and other cattle.
- Breeding History: If possible, inquire about the bull's previous breeding history and the quality of the offspring produced. This can provide valuable insight into the bull's genetic potential and transference of desirable traits.
- Compatibility: Assess how well the bull fits with the females you want to breed and how well he
  fits into your existing breeding program in terms of genetic diversity and avoiding inbreeding.
  Ensure that the bull complements the genetics of your existing herd.



Figure 2.83: Bull with good masculinity



Figure 2.84: Bull with hormonal imbalance

# Selection Criteria and quality of Cow

When selecting cows and heifers for breeding in your cattle herd, it is crucial to consider various factors that can influence the genetic improvement and overall productivity of your herd. Here are some key points to keep in mind when choosing cows and heifers for breeding:

- Genetic Background: Evaluate the cow's or heifer's pedigree, performance records, and lineage.
   Look for individuals with desirable traits such as high milk production, good fertility, calving ease, and disease resistance. Choose cows and heifers that align with your breeding goals and contribute positively to the genetic diversity of your herd.
- Physical Conformation: Assess the body structure, frame size, muscling, and overall conformation of the cow or heifer. Select animals that are well-proportioned, exhibit good body condition, and have structural soundness. Proper conformation is important for reproductive efficiency and overall health.
- Reproductive Health: Ensure that the cow or heifer is in good reproductive health. Check for regular oestrous cycles, proper udder development (for cows), and breeding readiness. Conduct fertility tests, such as pelvic measurements and reproductive tract scoring, to assess the animal's reproductive capacity.
- Health and Condition: Evaluate the overall health, body condition, and nutritional status of the cows and heifers. Ensure they are free from diseases, parasites, and nutritional deficiencies.
   Healthy animals with proper body condition are more likely to conceive, calve easily, and raise healthy offspring.
- Temperament: Consider the temperament and behaviour of the cows and heifers. Docile and easy-to-handle animals are preferred, as they are safer to work with and less prone to stress-related reproductive issues.
- Previous Reproductive History: If available, review the reproductive history of the cow or heifer, including calving intervals, calf survival rates, and any reproductive challenges. This information can provide insights into the animal's fertility and ability to produce healthy offspring.
- Bull Compatibility: Ensure that the cow or heifer is properly matched with a suitable sire for breeding. Consider the genetic compatibility and breeding objectives when selecting mating partners to maximize the potential for desirable traits in the offspring.
- Age and Maturity: Consider the age and maturity of the cow or heifer. Young heifers should be at an appropriate age and weight for breeding to ensure successful conception and calving. Mature cows should have a proven track record of productivity and reproductive success.



Figure 2.85: Feminine cow with calf (Source: Vova genetics)

Selecting traits for good milk is extremely important as a calf needs good milk to grow especially in the first 60 days of a calf's life where a calf may need up to 8lt of milk per day.

# 2.4.3. Breeding Program and Seasons

# **Breeding Program**

Implementing a comprehensive cattle breeding program that incorporates both natural breeding and artificial insemination can help improve genetic selection, reproductive efficiency, and overall productivity in your herd. Here is an outline of how to structure such a program:

#### **Natural Breeding Component**

- Fixed Breeding Period: Establish a specific timeframe when natural mating will occur within the herd. This helps synchronize calving seasons, facilitates management practices, and ensures uniformity in calf production.
- Bull Selection: Choose high-quality bulls with desirable genetic traits to breed with your cows during the fixed breeding period. Consider factors like genetic background, physical conformation, reproductive health, and breeding history.
- Herd Health: Ensure that both bulls and cows are in good health, free from diseases, parasites, and nutritional deficiencies. Implement a regular health monitoring program to maintain optimal reproductive performance in the herd.
- Observation and Monitoring: Monitor the cows for signs of oestrus and breeding readiness during the fixed breeding period. Proper heat detection and mating observation are crucial for successful natural breeding and conception rates. Take record of which cows are served by the bull.

#### **Artificial Insemination (AI) Program**

- Synchronization Protocols: Implement oestrus synchronization protocols to optimize the timing of AI in your herd. Synchronization programs help coordinate the reproductive cycles of cows, improve conception rates, and streamline breeding management.
- Semen Selection: Choose high-quality semen from proven sires with desirable genetic traits that align with your breeding objectives. Work with reputable AI companies or breeding specialists to access a diverse selection of semen straws from top-performing bulls.
- AI Technician: Partner with experienced AI technicians or veterinarians to perform the insemination procedures accurately and efficiently. Proper handling and insemination techniques are critical for successful conception and pregnancy rates.
- Record Keeping: Maintain detailed records of AI dates, semen used, cow identification, and breeding outcomes. Keep track of conception rates, calving intervals, and genetic progress to evaluate the success of your AI program and make informed breeding decisions.

#### **Integration and Evaluation**

- Integrate natural breeding and AI components strategically based on your breeding goals and operational requirements. Balance the use of both methods to maximize genetic improvement, reproductive efficiency, and overall herd performance.
- Evaluate the effectiveness of your breeding program by monitoring key performance indicators such as calving rates, calf quality, genetic diversity, and herd health. Analyse breeding data to assess the impact of natural mating and AI on the herd's genetic progress and productivity
- By incorporating both natural breeding with a fixed breeding period and an artificial insemination program into your cattle breeding strategy, you can enhance genetic selection opportunities, optimize reproductive outcomes, and drive continuous improvement in your cattle operation.
- Regularly review and adapt your breeding program to align with your long-term breeding objectives and herd management goals.

One of the biggest advantages of fixed time AI is that cattle can all be impregnated at the best time of year for available feed and grazing both during the pregnancy and for the calving process.

Planning your calving season keeps your calf ages relative and this will help with herd management over the years.



Figure 2.86: With Fixed Time AI we can plan our calving season

# **Chapter 3**

impuls

# Marketing and value adding

To be successful when farming with cattle, you must understand a few important factors related to marketing and value adding. You must understand the benefits of the different production systems. What would be the best composition of cattle for each area and farmer to have? Understanding your expenses, what type of income to expect and how profitable is cattle production depending on what the purpose of your cattle's production, beef or dairy, is. Different breeds of cattle can have different strengths. Friesland cattle are primarily dairy cattle, on the other hand brahman are a versatile beef breed.

# The value of beef as part of our diet

Cattle have always been a critical part of African culture. In our modern society, beef (meat from cattle) is a primary source of vitamins and minerals especially iron and zinc. Beef as part of a balanced diet can help with muscle growth and maintenance of the human body.

Meat – beef – is mainly composed of protein. Animal protein is usually of a high quality, containing all nine essential amino acids needed for growth and maintenance.

The following vitamins and minerals can also be found in beef:

- Vitamin B12 (blood formation, helps your brain and nervous system)
- Zinc (growth and maintenance)
- Selenium (support a variety of bodily functions)
- Iron (red blood cells, these transport oxygen around the body)
- Niacin (heart support)
- Vitamin B6 (blood formation and energy metabolism)
- Phosphorus (growth and maintenance)
- Other meat compounds
- Creatine (energy source for muscles)
- Taurine (antioxidant, heart, and muscle function)
- Glutathione (antioxidant)
- Conjugated linoleic acid (CLA) ruminant trans fat that may have various health benefits
- Cholesterol (serves a variety of functions)

# **3.1 Economics of keeping cattle**



**Figure 3.1: Pulling the processes together.** 

#### Understanding the business, profitability, costs, and income

What will the potential profitability of you farm be? The following are a few aspects to consider:

- How many calves can you expect?
- What are you selling? Feeders, cattle for slaughter, breeding cows, or all of them.
- The age/weight of the stock you are selling?
- What are the costs to keep a head of cattle for 1 year? Supplementation feed/licks, medication, dips, vet fees

By getting all this information together, you will be able to calculate the amount of money you can make and what your profit will be. The success of your business depends on how well you manage your cattle. If most of your animals die, your profit will also decrease. If the cost of looking after the animals is too high, the profit will also decrease. You should work to reach a solid middle-of-the-road approach.

#### 12 Marketing and Value adding

As per our process cycle:



**Figure 3.2: Process Cycle** 

We can plan our recordkeeping and finances and build a picture as to the realities of our environment and our cattle (herd). Below is a basic financial reporting system, you can use this during your planning phase, filling in anticipated incomes and anticipated expenses.

We can then complete in real time while *doing* and then compare the *planning* finances to the actual *doing* finances in the *reflection*.

# Year: \_\_\_\_\_

	1 <sup>st</sup> Quar	2 <sup>nd</sup> Quart	3 <sup>rd</sup> Quart	4 <sup>th</sup> Quart	Total
	Jan - March	April - June	Jul - Sept	Oct - Dec	
Income					
Sales (stock)					
Weaners					
Yearlings					
2,5+					
Other income (invoices					
received – creditors)					
Total:					
Expenditure:					
Feed					
Fuel					
Medicines, etc.					
Rent					
Transport					
Wages					
Electricity					
Telephone					
Stationary					
Labour					
Service providers (Vet)					
Assets purchased					
Chemicals/dips					

Other expenses (INDIRECT)			
Rent/bond repayments			
Loan repayments incl. interest on loans (debtors)			
Other:			
Total: Profit/loss			
Total income			
Minus			
Total expenditure			
Profit/loss			

Similarly, you can build records, checklists for:

- Weather
- Feed
- Body condition score
- Health and disease inspections
- Water availability
- Births, deaths of cattle

To build comprehensive records we must develop some basic skills regarding observing, counting, recording, and monitoring.

# Observing, counting, recording, and monitoring

#### Observing

Observation basically means watching something and taking note of anything it does. For instance, you might observe a bird flying by watching it closely. The sciences of biology and astronomy have their historical basis in observations by amateurs, therefore Agricultural data is often much enhanced by focused observation.

**How and what to observe?** Observation is one of the most important aspects of collecting Agricultural Data. It is a skill developed through dedicated action and meticulous methodology.

In Chapter 2 we meticulously discussed the observation techniques regarding the health and wellness of your cattle. Each aspect of the observation checklists must be noted and completed daily to take corrective action timeously to prevent the spread of disease.



Figure 3.3: Secondary observation points

#### Counting

Counting plays a very big role in collecting Agricultural data. A farmer may decide to count the number ticks on a specific cow, to determine whether chemical pest control is necessary.

We also count the number of kilograms of supplementation feed we purchase and distribute amongst our herds; this helps us determine:

- Daily intake per head of cattle
- Supply of feed required for a month or a season.
- Not over stocking on feed as the seasons change and nutritional requirements change.

# Recording

Recording may take place in various forms, namely: in written form, in oral form, electronically, digitally, photographically, or recorder (sound file). The most important point to remember about the recording of data, is that it should be VACCS:

- Valid
- Accurate, Authentic (connected to a specific head of cattle or herd and/or location)
- Current (up to date information)
- Consistent (use the same measuring tool)
- Sufficient (enough data, information)

When this is the case, the integrity of the data is sound. If not, the integrity of the data is compromised and not reliable and might lead to incorrect interpretation and findings, as well as incorrect decisions.

#### Monitoring

Monitoring would imply to count and observe a certain data package or the collection of data over a certain period of time.

# 3.2 Selling your animals

The last link to our production chain is the marketing of the product, calves, and non-productive cows.



**Figure 3.4: Process flow** 

The profit generated is calculated through a simple equation:

# **PROFIT = INCOME (Kg produced x Price) - EXPENSES**

A 10-cow unit is used as an **example** to explain the basic calculation of the possible profit that can be obtained:

- 1. Ten cows produce eight calves per year (80% calving success rate)
- 2. Four of the calves are bull calves and are sold at weaning when they weigh 175kg. The price obtained is ZMW 34 per kg hot dressed plus ZMW 300 for intestines
- 3. One of the heifer calves weighing 175kg is also sold at weaning at ZMW 34/kg.
- 4. The three heifer calves are kept as replacements for the cows.
- 5. One two-year-old heifer that didn't grow well or didn't fall pregnant is also culled and sold (250kg at ZMW 34/kg) plus ZMW 300 for intestines.
- 6. The two cows that didn't produce a calf during this year are also sold. They weigh 400kg and the price obtained is ZK34/kg, plus ZMW 300 for intestines.
- 7. The cost of supplementary feeding was ZK500 per cow for the year and the cost of medicine, dip and vaccines was ZMW 440 per cow.

The profitability calculation is simplified as an example for training purposes but contains all the principles for the cattle handler, whose primary role is to prevent production losses.

# 12 Marketing and Value adding

Example Cost Benefit Analysis						
Income	Quantity	Weight (Hot dressed)	ZMW per kg	ZMW per animal	ZMW for intestines	Income
Bull calves	4	87.5	34	2,975.00	300.00	13,100.00
Heifer 1	1	87.5	34	2,975.00	300.00	3,275.00
Heifer 2	1	125	34	4,250.00	300.00	4,550.00
Cows	2	200	34	6,800.00	300.00	14,200.00
Total income	8					35,125.00
LESS						
Expenses	Quantity	Unit	Unit Cost			Expense
Supplementary Feeds	17	Herd	500.00			8,500.00
Animal Health	17	Herd	440.00			7,480.00
Total Expenses						15,980.00
						Profit
						19,145.00
Average mont	thly income					1,595.42

# Example of a basic profitability calculation for a 10-cow production

# **PROFIT = INCOME (Kg produced x Price) - EXPENSES**

60% of income comes from the sale of calves after weaning	40% of income comes from the sale of cull animals (non-productive heifers and cows)
The loss of one calf not successfully weaned	The loss of one cow must be deducted from
and sold will decrease the profitability of this	the possible profit, resulting in a 25%
production unit by nearly 20%	reduction in profit



Figure 3.5: Improved calf next to mother



Figure 3.6: Improved calf next to mother

