

# LARGE STOCK MANAGEMENT



*Photograph by Marina Coetzee*

Compiled by  
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NAU - NLU



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 Labour Management  
 Farming Finances

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# Preface

It is with great pleasure, gratitude and pride that the JPC presents this production manual.

After years of deliberation, careful planning, and a lot of dedication the NAMIBIA AGRICULTURAL UNION and the NAMIBIA NATIONAL FARMERS' UNION jointly embarked on the EMERGING COMMERCIAL FARMERS' SUPPORT PROGRAMME. This programme resulted from the realisation that the new group of emerging commercial farmers who, having been previously disadvantaged and mostly coming from the background of communal farming, were in dire need of basic (sophisticated) skills training to manage modern farming techniques. The planning phase entailed, amongst others, a need assessment way back in 2004/5, which clearly identified the areas of assistance required. After having analysed all the relevant data, the two unions set about structuring a two-year programme which would address the challenges faced by new farmers so that ultimately they would be able to deal with the daunting task of becoming successful commercial farmers. Besides a dedicated programme of lectures, training courses, study tours and mentoring, it was decided to also produce and publish a set of eight PRODUCTION MANUALS which would serve as valuable training guides with technical details, but would also be a source of reference for future everyday practical farming in Namibia.

It is with gratitude that we acknowledge the unrelenting support of many individuals, too numerous to name, and certain institutions which supported and still support the whole Emerging Commercial Farmers' Support Programme.

We sincerely hope that this initiative will make a lasting contribution to sustainable agricultural land utilisation and to the goals of land reform in Namibia.

On behalf of the JPC,

Raimar Von Hase  
(President, Namibia Agricultural Union)      Pintile Davids  
(President, Namibia National Farmers' Union)

Windhoek, December 2007

# Foreword

Agriculture as the backbone of Namibia's economy has a major role to play in achieving Vision 2030. However, to be able to make a significant contribution towards the growth of the economy and thus wealth creation, agricultural production/output has to increase manifold. For the realisation of such an increase the following crucial issues have to be addressed. Subsistence farming should become commercialised, e.g. landownership in some form or other should be allocated to individuals, underutilised areas should be developed and put into production and the problem of bush encroachment should be addressed and solved at national level.

Food production at competitive and affordable prices for the consumer is the biggest challenge that farmers worldwide have to face. With input costs increasing at a higher rate than the increase in prices realised for produce from the farm, it is clear that productivity and the production capacity on farms have to improve continuously. This also applies to Namibia's agricultural sector.

Furthermore, if we want to participate in international trade with our export commodities, currently being beef, mutton, Karakul pelts and grapes, we have to be able to compete worldwide against all the countries exporting the same commodities. Apart from being price competitive we also have to be competitive in satisfying the needs of the sophisticated consumer in terms of quality, health issues, traceability, animal welfare and other ethical production norms, e.g. personnel management, conservation of biodiversity/ecology (fauna, flora and water resources), etc.

Agricultural production is no longer just a matter of producing whatever the farmer is able and willing to produce and then expecting to achieve good prices for the product.

Farmers have to become more involved in the value chain, and should become much more market orientated by being sensitive to the needs and preferences of the consumer whom they want to serve. In addition they have to adhere to international trading rules and regulations as prescribed by the World Trade Organisation (WTO), and also comply with the Sanitary and Phytosanitary (SPS) requirements of the various countries with which they want to trade. Norway, for instance, has zero tolerance for salmonella in beef/mutton, which is imported into that country, thus making it very difficult to serve this lucrative market.

*It is obvious that survival and growth in the agricultural sector can only be achieved if the farmer in future pays **greater attention** to the world around him, as has been the case in the past.*

Skills development and training of farmers and their employees are becoming imperative, and are of national interest.

Being a farmer and thus the owner of agricultural land in Namibia should be regarded as a privilege. Not every citizen in Namibia, as in countries all over the world, can own agricultural land. There is just not enough land available. Therefore every farmer has the responsibility to use his piece of land in a productive but also a sustainable way. Productive means exploiting the full production potential of the farm, furthermore contributing towards job creation in the primary and secondary sector, towards food production on national and international level and towards revenue for Government in terms of taxes paid. Sustainable means preserving and even improving the production potential, so that the generations to come can still make a living from that land. It should be the aim of every landowner to leave behind a farm that is in a

better condition than the one he started off with, including production capacity, infrastructure and natural resources, e.g. underground water, fauna (game) and flora (plants).

Commercial farmers in general are often perceived as being wealthy, which, however, is not the case. Becoming a successful farmer in Namibia may take years and even generations, and requires love for and dedication towards farming, hard work, good management skills, financial discipline, persistency and a positive attitude.

Climate (rainfall) and other external unforeseen events can have a major influence on the progress made on the farm, and can ruin achievements made over years within a matter of time.

To get an indication of the current gross/net income on a cattle farm, the following indicators could serve as a guideline.

The average stocking rate on cattle farms in Namibia is  $\pm 25$  kg biomass (live mass) per ha. In old terms this means  $\pm 14$  ha for every animal on the farm. In a cow/ox production system the production of beef (live mass) should be about 35 % of the stocking rate.

This means that if no herd building takes place, the farmer has  $25 \text{ kg} \times 35 \% = 8,75$  kg live mass/ha available for sale every year.

At an average selling price (cows, oxen, heifers combined) of N\$9.00/kg live mass he/she would be able to generate a gross income of  $\text{N\$}9.00 \times 8,75 \text{ kg} = \text{N\$}78.75/\text{ha}$  ( $\pm \text{N\$}80.00$ ).

The operational costs will be at least around 50 % of the gross income, which leaves a net income of  $\text{N\$}80.00 \times 50 \% = \text{N\$}40.00/\text{ha}$ .

On a 5 000 ha cattle farm the gross income will thus be  $\pm \text{N\$}400\,000.00$  and the net income, if operational expenditure is well managed,  $\pm \text{N\$}200\,000.00$ . This amount is available for interest and capital repayments (Agribank), new improvements/replacements on the farm and private expenditures.

These indicators clearly show that a 5 000 ha cattle farm will not enable a farmer to become wealthy overnight. To the contrary, for those farmers to survive, they often either create additional income with employment elsewhere, or they venture into diversification on the farm, e.g. guest farms, hunting, crop, hay, olive and charcoal production, etc.

*It is advisable not to diversify as long as the main production line is not well managed and exploited to its full potential.*

Although the commercial farmer functions in isolation on his property and to a great extent depends on himself concerning the day-to-day activities and progress on the farm, it is still important to establish and maintain good relationships with the neighbours. The control of stock theft and illegal hunting, predator control and the maintenance of border fences, etc. require good and open communication with, and trust in the neighbours.

In conclusion, farming should be a constant process of learning. Even farmers with formal agricultural qualifications still have to keep in touch with the latest developments concerning farming practices, market requirements, consumer preferences, etc. It is advisable to make use of every opportunity to improve own knowledge and skills, to be able to adjust and therefore survive and prosper in an ever-changing world. Farmers' days, study groups and established successful farmers can be a good source of knowledge and new ideas and are often a stimulation to creative thinking.

## INTRODUCTION

The predominant feature of the beef industry is that, in spite of the harsh nature of the production environment, it is still of tremendous importance to the economic and the socio-economic welfare of the inhabitants of Namibia. In spite of its significant importance in the agricultural sector the real production potential of the beef industry is still totally underutilised. With a cattle population of more than 2 million, the offtake (number of animals marketed) per year should be 500 000 to 600 000. The average official offtake in the formal market for the past five years has been  $\pm 300\,000$  animals. The reproduction rate and the age of marketing have a major influence on the number of cattle available for marketing every year.

Another disturbing feature of the industry is the obvious overutilisation of the production environment in both the title deed and the non-title deed production areas. It is estimated that the carrying capacity and thus the production per hectare of the beef-producing areas has decreased by at least 50 % over the past 40 to 50 years. It should be the aim of every current and future cattle farmer to reverse the situation and reclaim the original beef production potential of Namibia's rangeland. Combating bush encroachment would be of major importance in this regard.

The infrastructure (number of water points and camps), quantity and quality of grazing, the yearly rainfall and the farmers' management skills will determine the stocking rate per hectare (amount of live mass in kilograms which one hectare of rangeland can support) on the farm. The stocking rate, the production system (weaner, cow/slaughter cattle or ox production) and again the management skills of the farmer determine the yearly production in live mass (kilogram) per hectare, which can be produced. Guidelines, which could serve as indicators of what should be produced are as follows:

Assumption: stocking rate of 25 kg/ha

Production system	Kilogram live mass/ha
Weaner production	32 % of the stocking rate (25 kg) = 8 kg
Cow/slaughter cattle production	5 % of the stocking rate (25 kg) = 8,75 kg
Ox production	45–50 % of the stocking rate (25 kg) = 11,25–12,5 kg

The aim of every new farmer starting off with an Agribank loan, should be to enlarge his cattle herd as quickly as possible to exploit the full grazing capacity of his farm so that he will be in the position to service his loan agreement. In a herd-building phase it is advisable:

1. to retain as many heifers for replacement/breeding purposes as possible.
2. not to cull all cows which did not conceive within the first year. Only if the cattle herd has reached its full size and the reproduction rate is according to expectation, should strict culling of cows which do not conceive every year, be applied.
3. to stick to an all-year-round breeding season if the breeding herd (cow herd) has not been in a fixed breeding season before. As the cattle numbers increase, changes to one or two breeding seasons should be introduced gradually over a few years.

# CHAPTER 1

## Herd Management of Extensively Kept Beef Cattle

The aim of this chapter is to guide the reader to:

- determine when to mate cattle and why;
- determine how many bulls will be necessary;
- explain the advantages and disadvantages of various mating methods;
- determine how and when to assist during calving;
- explain various management techniques, namely  
identification,  
castration,  
dehorning,  
vaccination, dosing and dipping,  
weaning;
- handle cattle in such a way that minimum disturbance is created.

### 1. Management from mating to calving

#### 1.1 Breeding seasons

Cattle have a pregnancy period of 274 to 291 days and come on heat every 21 days when not pregnant. In nature, many animals have fixed breeding seasons and will only come on heat during certain times of the year. Sexual activity of cattle is not regulated by season, but secondary effects like times of optimal nutrition are important. Thus a limited breeding season (the bulls are run with the cows for a limited period of the year, e.g. three months), may have certain advantages:

- The period of maximum sexual activity can be exploited.
- The time of mating (and calving) can be chosen in such a manner that nutritional conditions in the veld should be at its best when needed by the cow or the calf.
- Management practices can be applied to the whole group of calves at the same time (dehorning, castration, vaccination, etc.).
- Calves are comparable, as no seasonal differences exist. This is important for selection purposes.
- Record-keeping is easier.
- Pregnancy diagnoses can be done at the same time.
- Performance testing is possible.
- Evaluation of herd fertility is easier.
- Special treatment of the herd at certain times of the physiological cycle is possible (extra camps, supplementary feeding).
- Husbandry practices can be applied at stages when it should not affect production or reproduction.

The only real disadvantage of a limited breeding season is that under suboptimal nutritional conditions some cows might not come on heat while the bull is run with them and a lower calving rate might be the result. This is a very big drawback. The solution lies in a good condition of cows when they calve. Cows in a good condition tend to have a shorter lactation anoestrus (period of no heat after calving). When all cows are in good condition when they calve and some do not reconceive within a limited breeding season, these animals can be culled because they are less fertile. This is the best selection criterion for fertility in a beef cattle herd.

*The beginner farmer could start off with a year-round breeding season. One (or two) limited breeding seasons should then be introduced over several years. At first, the bulls are removed from the herd for the two most unsuitable months. This non-breeding season is then slowly extended over years until definite breeding seasons and off-seasons have been established.*

As cattle under good nutritional conditions show heat throughout the year (not limited to a certain time of the year), it is up to the farmer to decide when he would like to have his breeding season. Remember that a cow must reconceive within 80 days after calving to deliver one calf every year.

It has also been mentioned that condition (and thus nutrition) is of utmost importance under extensive (veld) conditions. In practice it has been found that calving approximately two months before green grazing gave the best reconception results. Considering the rainfall pattern of Namibia, the breeding season for the northern parts should start around January, whilst in the south and west it should start in February or even later.

An additional breeding season for August/September is generally applied. If this is desired, it is very important to see to it that the cows that must conceive during this time are in a good condition. In addition to the best time for the cow to conceive, the best time for the calf to be born should be taken into consideration as well. It has been found that calves born late in summer perform less satisfactorily than calves born early in summer and in winter.

Bull performance must also be considered. Bulls, which are less adapted to warm conditions, show less libido under extreme heat (early summer). The duration of the breeding season must be kept in mind too. The point of departure should be that each cow should deliver a calf every year, and must thus reconceive within 80 days after calving. It is obvious that all the advantages of the limited breeding season become more advantageous as the breeding season gets shorter.

The following should be considered:

- Within 80 days (in practice three months, 90 days) a cow can come on heat four times (once every 21 days).
- With the first heat after calving, conception normally does not take place – this heat serves as a cleaning of the reproductive channel. Therefore, even a cow that calves immediately before the beginning of the breeding season, theoretically has three chances to conceive.
- A cow has a period of lactation anoestrus after calving. This will limit the number of heat cycles for cows calving immediately before the beginning of the breeding season. As mentioned before, calving in a good condition limits the duration of lactation anoestrus. Therefore, even late calvers should still conceive within a three-month breeding season.

- A short breeding season of 66 days (three cycles of 21 days + 3 days) is often recommended. Consequently all cows will have calved already one month before the beginning of the breeding season. It should be remembered that unexpected environmental changes (drought, cold, etc.) have an influence on heat of cows and such a short breeding season does not leave space for any prolonged heat cycles. It is, however, a very strict selection tool for herd fertility.
- Heifers should only have a very short (66- or even 45-days) breeding season. The abovementioned factors (lactation anoestrus, first, low fertile heat) do not apply to heifers and they should conceive with the first heat cycle. Heifers which do not conceive should be culled, as they have no reason not to.
- First-calf-cows tend to have more difficulties to reconceive than adult cows. For this reason it is sometimes recommended to mate heifers before the rest of the herd. This allows for a longer recovery period before they are expected to conceive with the rest of the herd.
- Good nutrition is of utmost importance for conception. A lower calving rate can therefore be expected during times of drought, especially if cows were in a poor condition when calving.

*Heifers, which do not conceive within the first two oestrus cycles, should be culled.*

*First-calf-cows tend to take longer to reconceive than adult cows. Therefore heifers should be mated earlier.*

## 1.2 Percentage bulls

Normally, 3 % to 4 % bulls are recommended with a limited breeding season (one bull per 25 to 33 cows). The size of camps and the terrain (mountainous or thick bush) might necessitate more bulls. With hand mating, fewer bulls might be needed, as the bull will only be allowed to serve a cow once during each heat cycle.

## 1.3 Mating methods

The normal method used by farmers who produce weaners or oxen is multiple-sire mating. During the breeding season, numerous bulls are run with the cows. In some cases, halfway through the breeding season bulls are replaced with fresh bulls. This is an easy system, but be aware of the following disadvantages:

- The father of each calf is not known. Selection can thus only take place from the mother's side.
- A bull which does not work or is infertile will not be observed.

Single-sire mating describes a system where cows are parted before the breeding season and each group of especially selected cows is run with one bull only (thus 25 to 33 cows/herd). This makes it possible to compare calves of different bulls with each other. The disadvantage is that a lazy or infertile bull will leave unmated cows, but he can be traced and culled or eliminated. This system is popular with stud breeders. With hand mating, the cows are observed every day and only those which show heat are allowed with the bull (mostly when observed and again twelve hours later). Very accurate record-keeping is possible, which can be advantageous for selection purposes.

*Single-sire mating should only be considered if enough camps are available to ensure that proper rotational grazing practices are still applied.*



Artificial insemination does not use bulls at all. Cows which show heat are mated by means of deep-frozen bull semen in a straw. This method allows the use of bulls which would be totally unavailable and unaffordable otherwise. The method requires some expensive equipment and know-how and results under extensive conditions are disappointing. Under intensive farming conditions, however, (e.g. dairy) this is virtually the only mating method that is used.

### 1.4 Pregnancy diagnosis

Two to three months after the end of the breeding season, it is possible to make a pregnancy diagnosis. This has the advantage that the farmer knows what to expect in terms of the number of calves that will be born. Non-pregnant cows are identified and management decisions can be made. The technique involves palpation by hand into the rectum of the cow and feeling through the wall of the digestive tract what changes have taken place in the reproductive tract. Basic knowledge and lots of practice are all that is needed.

### 1.5 Calving and assistance during calving

A calf should weigh more or less 7 % of the weight of the cow at birth. Higher birth masses may lead to calving problems.

Presentation is normally with forelegs first, head between the forelegs. Presentation with hind legs first does happen and does not normally cause problems. Problems do occur, however, in the following ways:

- The calf is too big (head or shoulders or hips get stuck).
- One or both forelegs are bent backwards.
- The head is bent backwards.
- The calf is upside-down (tummy up).
- Presentation with buttock first (tummy down or up).
- Presentation with all legs together.

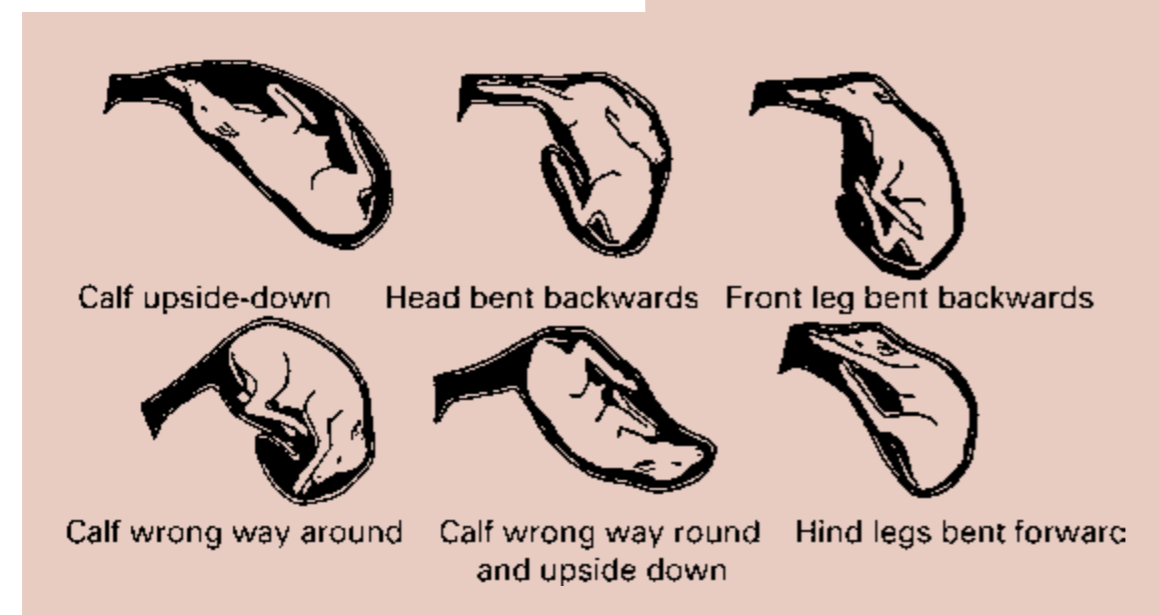
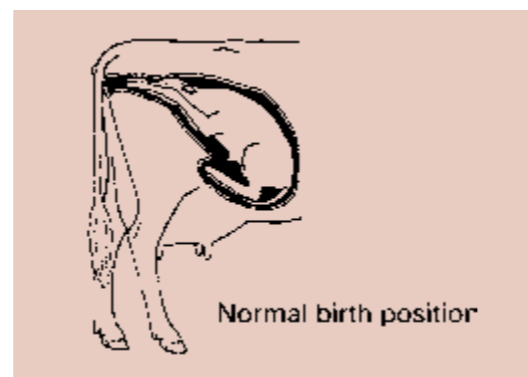


Figure 1: Normal and abnormal birth positions (© Battaglia, R.A. and Mayrose, V.B. 1981)

An important decision to make is when to step in and assist.

- If the feet show, but no further progress is made within one hour, assist.
- If a cow shows preliminary signs of calving for more than eight hours but does not lie down to give birth, assist (even if no feet show).
- Remember that hormones which release the muscles of the birth tract only work for a limited period. The longer you wait, the more difficult it will be to get the calf out alive.

The procedure to be followed basically involves the following:

- Try to turn the calf into the right position for calving if an abnormal birth position is the cause (**hygiene – work with gloves**).
- Attach a birth chain or sterilised rope to the forelegs.
- Pull backwards until the head and shoulders are exposed and then downwards in a constant manner to assist the pressure of the cow.
- Liquid paraffin can be applied as lubricant.
- In serious cases it might be necessary to cut the calf apart in the uterus. **This is the task of a professional veterinarian.**

Aftercare is important. Make sure the cow can get up after calving. Disinfect the uterus by placing afterbirth peccaries into the uterus.

## 2. Management after calving

### 2.1 Identification

The **stock brand act** requires all animals of six months to be branded with the owner's **registered** brand. This is normally done by means of a heated (gas or wood fire) branding iron. Application can be done while the calf is pulled down or while standing in the crush. Either way, the calf should be secured in such a way that it is unable to move. The heated iron is applied fast (1 to 5 seconds). A calf must be branded on the left hind leg just above the hock. Cattle hides that are branded too high will be down-graded at slaughter.

Various owners of a specific animal must all apply their various brands on a **prescribed** place on the animal.

- 1<sup>st</sup> owner: left hind leg
- 2<sup>nd</sup> owner: left shoulder
- 3<sup>rd</sup> owner: left neck
- 4<sup>th</sup> owner: right hind leg
- 5<sup>th</sup> owner: right shoulder
- 6<sup>th</sup> owner: right neck

Freeze-branding dark-haired cattle is possible. The branding iron is emerged in a freeze mixture and applied to the shaved skin. The hair that regrows will be white. This brand looks very neat, but is more time-consuming to apply and needs special equipment.

**Ear tags** are generally applied to identify individual animals for record-keeping and management purposes. Special ear tags are compulsory when moving animals from one farm to another.

The single big disadvantage of ear tags (plastic or metal) is that they tend to tear out and get lost and should thus be replaced in some way or other. Plastic ear tags can be written on with a special pen. It is up to the farmer what information he wants to put on the tag. The advantage of a plastic tag is that it can be read without the need to catch the animal. The advantage of a plastic tag is that it can be read without the need to catch the animal. Care should be taken that the correct applicator is used to apply the ear tags. Plastic ear tags are normally secured in the application pliers and affixed in the middle of the ear without any preparation. Some metal tags require a hole to be punched in advance. The applicator normally caters for this to be done.

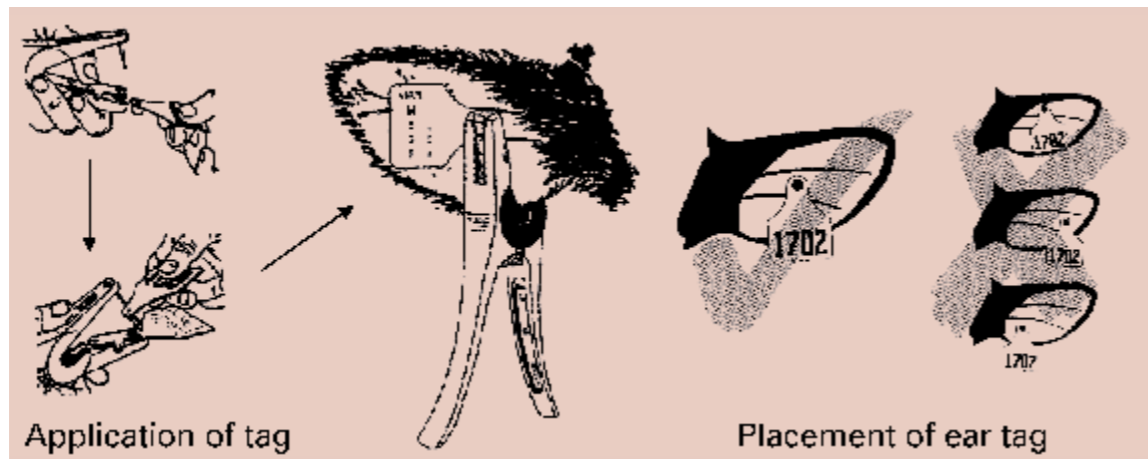


Figure 2: Application and proper placement of plastic ear tags (© Meatboard, Namibia)

**Tattoos** are normally used with stud animals and are a very safe method as there is no way that a tattoo can get lost. By means of special pliers, numbers and other characters consisting of small needles are punched into the ear. Ink is applied into the needle holes, and, if done properly, a readable number/code will be the result.

**Ear codes** involve clipping notches into the ears in such a way that a number code can be read by means of the notches and holes. It is difficult to read in the beginning, but is easy (and permanent) once you have got used to it. It is not suitable for cattle with hairy ears.

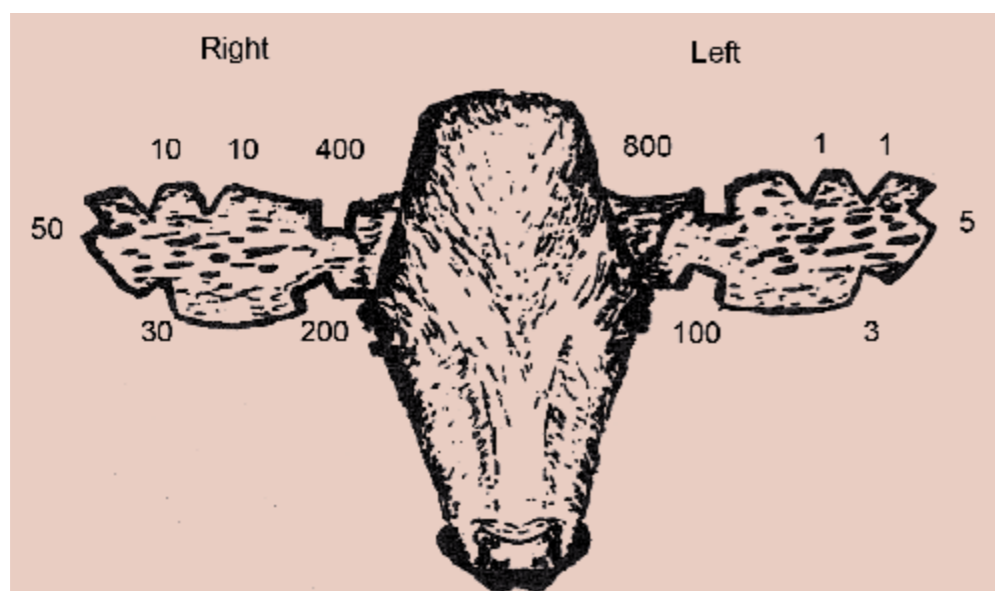


Figure 3: Ear codes for cattle (© Departement Lanbou Tegnieste Dienste, 1964)

## 2.2 Castration

Cattle for the weaner and slaughter market are normally castrated. This is done:

- to prevent unwanted calves (when run together with heifers or cows);
- for easier management (oxen are calmer than bulls);
- for fat deposition (oxen put on subcutaneous fat needed by the market more easily and more evenly).

It is often claimed that uncastrated males (bulls) grow faster than oxen. This is without doubt the case up to a certain point whereafter a bull stops growing whilst an ox continues to grow. Age of marketing must thus be considered if advantage is to be taken of this phenomenon. Also keep in mind that bulls do not fatten as easily as oxen, and the management problems that arise when keeping a herd of bulls.

The age of castration largely depends on (or determines) the method to be used. It is a fact that stress with any management practice is much less at a very early age and stress has a negative influence on growth. Small calves can easily be castrated with an elastrator. A rubber ring is applied above the testicles and cuts off the blood transfer to the testicles. This results in the testicles to dry up. Apply the rubber ring in such a way that the two testicles fit tightly into the lower part of the scrotum. The rubber rings should not be perished. A popped rubber ring can result in blood circulation returning with possible swellings, infection and tetanus. Because it is a bloodless method, there are no chances of infection if applied correctly.

Larger animals can be castrated bloodlessly by means of the burdizzo. These pliers cut the semen duct and blood vessels without an open wound. It is recommended to squeeze only one semen duct at a time and to squeeze the second duct a bit higher or lower as to leave some blood circulation to the lower part of the scrotum intact. The burdizzo pliers should be stored in a released position. To test, put a piece of string between two sheets of paper and squeeze. The string should break without damage to the paper.

Castration by means of a knife (with an open wound left) or by means of emasculator pliers (which are normally used to castrate horses and donkeys) is possible but not recommended as both techniques involve an open wound with the risk of infection and tetanus.

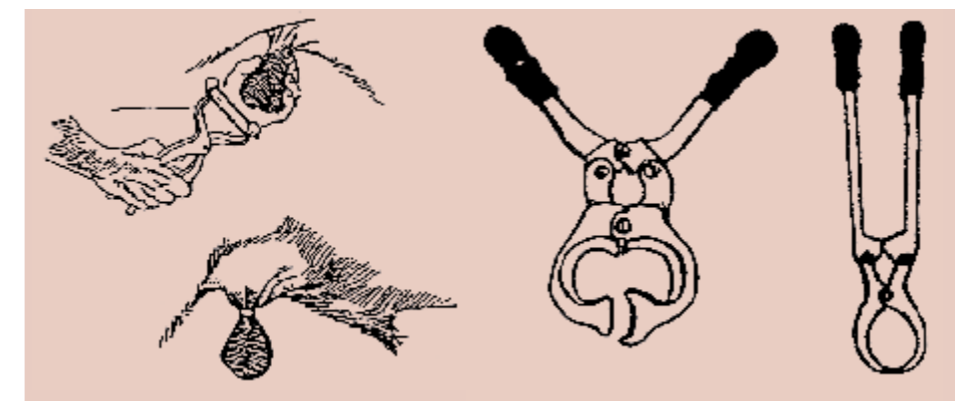


Figure 4: An Elastrator (left) and burdizzo (right) (© Meatboard, Namibia)

*Vaccination against tetanus should be considered with elastrator and open-wound castrations if animals are to be kraaled.*

## 2.3 Dehorning

Dehorning of cattle is normally done for the following reasons:

- Animals with horns injure each other.
- Handling (especially in crushes) is difficult.
- Fewer animals can be loaded on a truck.
- Bruises occur when animals are transported to the abattoir.
- In the feedlot, more space is needed at the feed trough.

The only reason in favour of not dehorning cattle is the ability of the horned cow to protect her calf better against predators. This might be an argument in a few isolated places in Namibia.

Calves are normally dehorned at an early age by means of a debudder (gas or wood fire heated). The hot debudder is placed over the emerging horn and turned around to form a brown ring around the horn bud. In cases where the horn is fairly large, it can be cut down with a knife or spoon-like dehorning pliers before burning. If more or less 6 mm of skin around the base of the horn is destroyed, no regrowth will take place.

Adult animals with horns should not be dehorned any more. In the case of large horns the horn tips can be sawn off to avoid injury. For younger animals, various horn cutters are available. All of them, however, have the same disadvantages that are always bigger as the horns get bigger:

- Blood is shed (with the danger of infection of an open wound).
- The skull can be fractured (with big horns).
- Sinus cavities are left open – this is a perfect breeding place for maggots unless treated.
- Regrowth will take place unless a bit of the skin around the horn base is also removed.

Large horns can also be sawn off. A normal saw works, but is difficult to handle unless the animal stands perfectly still. The embryo tome wire works very well. With some sort of handle attached to each side it is worked to and from around the horn like a saw. Sawing of horns might be necessary with poorly dehorned animals where bent horns are growing into the cheek of the animal but, as mentioned before, the dehorning of adult animals should be avoided.

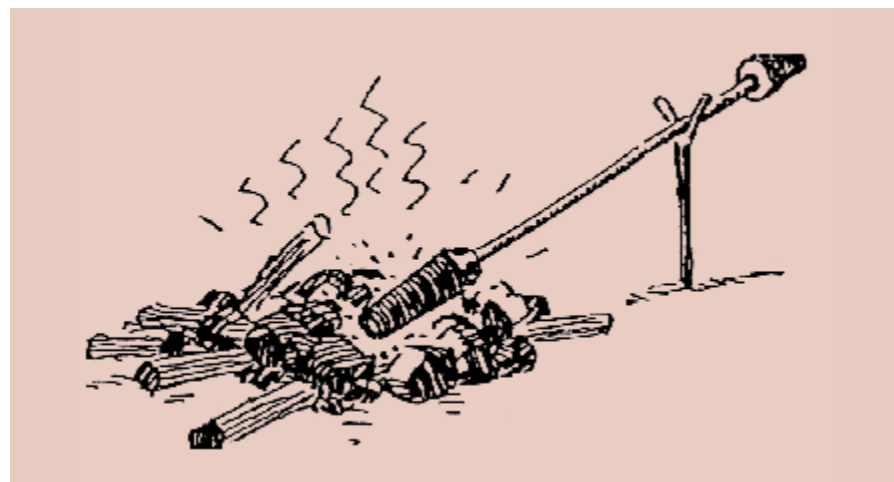


Figure 5: Fire-heated debudder (© Meatboard, Namibia)

## 2.4 Vaccination, dosing and dipping

It is compulsory to vaccinate cattle against anthrax every year, whilst heifers must be vaccinated against brucellosis between the age of three and eleven months. Many other vaccines are available and what would be necessary should be decided on in cooperation with the local veterinarian and stock inspector. With all vaccines, the following points are very important:

- Ensure that the vaccine is kept at the right temperature right from purchase to application. Vaccines get ineffective when they get warm or frozen.
- Read the instruction pamphlet. With some vaccines, a freeze-dried powder or pill has to be dissolved in a diluent and properly mixed before application. These vaccines have to be used immediately after mixing as they become ineffective within a short period of time.
- Make sure that the right dosage is applied (consult pamphlet).
- Apply the vaccine via the prescribed pathway (under the skin or into the muscle) (consult pamphlet).
- Ensure that the expiry date has not been reached.
- Use properly sterilised syringes and needles (boiled for 30 minutes).
- Change needles regularly (at least with every new crush of cattle).
- Use a separate syringe for each vaccine.
- Various vaccines can be applied to the same animal at the same time. Limitations are a maximum of five vaccines of which no more than two are live vaccines (pill or powder, which has to be dissolved).

In the drier parts of Namibia, dosing of cattle against internal parasites is necessary only in exceptionally good rainy seasons. If regular dosing seems to be necessary (confirm by having dung samples analysed), ensure a change in active component of the drench regularly. Parasites become immune against drenches with time.

Treatment of internal parasites is also possible by means of vaccination. These vaccines often also combat external parasites. They are fairly expensive, but very easy to apply.

External parasites pose a real problem in the higher rainfall areas of Namibia. Sometimes, elderly or sick cattle are attacked by ticks or horseflies and treatment of these individuals by means of pour-on dips is recommended. It is important for cattle to be infested with a few ticks as this makes it possible to build up immunity to some tick-transmitted diseases.



(Photograph by Danie de Lange)

Figure 6: Veterinary instruments top from left to right: drench gun; ear tag applicator; elastrator pliers Bottom from left to right: single-use injection syringe; multiple-use vaccination syringe

## 2.5 Age determination

At abattoirs, the age of cattle is determined by means of the presence and number of permanent teeth. It is thus of importance for the cattle farmer as this has a big influence on the price that can be realised. Some breed differences occur in terms of age of changing teeth. The diagram below gives a good general indication.

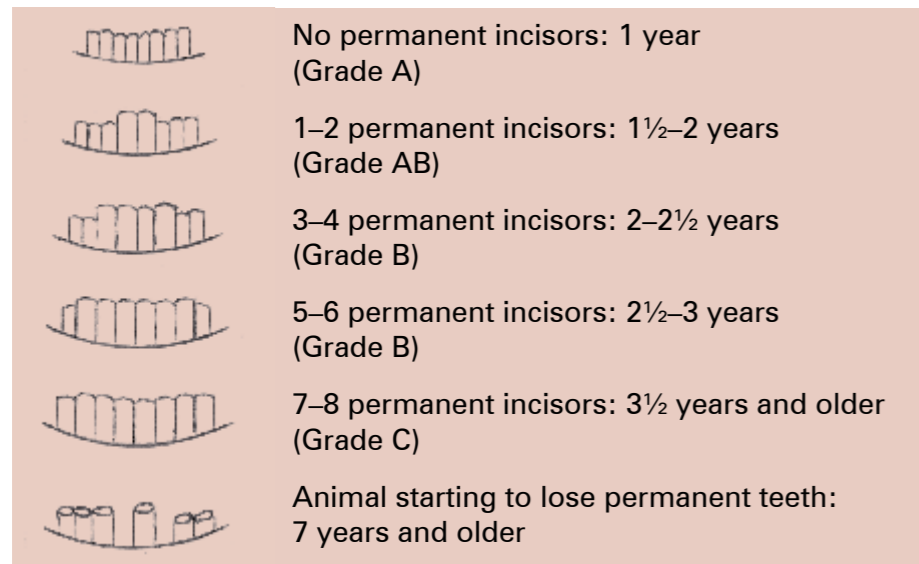


Figure 7: Determining the age of cattle by dentition (© Agriforum)

## 3. Weaning

The purpose of weaning is to give the cow a rest before the next calf is born. This is important, as the udder tissue needs time to regenerate. Without this regeneration, milk production in the next lactation period will be substantially lower. There are various methods of weaning:

- Cows can be removed from the camp where they were last run with their calves. This has the advantage that the calves know the camp. The cows should be moved so far that cows and calves cannot see, hear or smell each other for at least a few days. Calves will start to suckle again even months after weaning if the opportunity arises. It will help to calm calves down if a few dry cows (or even oxen) are kept with them.
- Calves can be kept in the kraal and fed for a few days. This works well if hay or fodder is available.
- Thorny nose rings are available which are fastened to the calf's nose. The moment the calf approaches the udder, the cow is irritated by the thorns and moves away or pushes the calf away. The method works well with some calves, but others find ways of sucking without irritating the cow with the nose ring.

Up to the age of weaning the condition of the cow should be the main consideration. Cows in a very good condition can have their calves with them up to nine months, but calves should be weaned at six months (even earlier) if the cows are in a poor condition. The aim is to have the cow build up reserves before the next calving. The early-weaned calf will be substantially lighter, but will outgrow this drawback before normal slaughter age (2½ to 3 years).



Figure 8: Thorny nose ring applied to weaner calf

Weaning is a traumatic experience for both the cow and the calf and is accompanied by loss of appetite, running around and thus loss of weight. The effects should be minimised by not applying any other husbandry practices like castration, dehorning and vaccination at the same time.

Some time around weaning (but not with weaning) calves need to be vaccinated. Some vaccinations like brucella (contagious abortion) for heifers and anthrax are compulsory, whilst others like rabies, lamsiekte, (botulism), black quarter, lumpy skin and others might be recommended for vaccination. Details are given in the manual on Animal Health.

## 4. Daily handling of beef cattle

Although a few differences exist between breeds, cattle have a relatively fixed daily routine and management practices should be arranged around this. Cattle tend to come in for drinking during the morning, linger around till noon and start grazing again some time in the afternoon. Any moving to other camps, sorting, marking of calves, etc., can easily be done during this time with minimum disturbance.

From this, it is also obvious that any kraaling that might be necessary should fit into this period. Early morning and late afternoon kraaling especially interferes with the most-needed grazing time of cattle, with an obvious negative impact on production. Some farmers prefer to run cows and calves separately and only allow suckling in the kraal for a few hours. This system has advantages for herd fertility and temperament of the herd, but should be applied in such a way that grazing time is not affected. The cows and calves will come down to the water fairly early in the morning, but should be let out early in the afternoon.

As cattle are bulk feeders, which graze large amounts of dry roughage every day, they need lots of water daily. Access to water should thus be unhindered all day long and the drinking water should be clean.

It is general practice with some farmers to milk a few beef cows for own use. This can be done with little (even no) negative effects on the calf (which is the main product the beef cow has to produce).

- Milk only two teats once per day, the other two teats and all the milk the rest of the day belong to the calf.
- Fit milking in with the normal grazing pattern of cattle, thus milk in the morning when cow and calf come down to the water, keep them together until the early afternoon and then keep them apart until the next morning.
- Assist the cow with a little extra feed.

The practice of breaking the teeth of new-born calves is sometimes observed. The idea is to prevent biting of teats. It must, however, be remembered that a calf starts to nibble on grass as early as at two weeks of age. The practice of breaking the teeth of calves can thus not be encouraged. The origin of this practice lies in pigs and there it should remain.

In some farming areas of Namibia, predators pose a threat to especially newborn calves. The following might serve as solutions:

- Do not dehorn the cows.
- Select breeds with very good mothering abilities.
- Run a few donkeys with the cowherd. Donkeys are very aggressive to predators, particularly mares with foals, and the calves will soon learn to seek their company. Stallions, and

especially stallions together with mares are not recommended, as they might injure calves with their fighting.

- Calves can be kraaled until they are fairly strong. This might have some negative effect on growth, depending on how long they are kraaled. Additional feed should be supplied in the kraal. Kraaling of animals always holds the risk of an outbreak of some disease or ailment, but if it can save a few calves, this might be an option.
- Calving can take place in small camps near the homestead where more intensive control can be practised. Regular movement of humans or humans with dogs will put predators off.

## CHAPTER 2

# Handling Facilities for Beef Cattle in Namibia

For effective cattle farming, basic facilities have to be created. This chapter explains what facilities are needed or are convenient for effective cattle farming:

- camps, corridors, water supply;
- design and layout of handling pens;
- the necessity and design of crushes, neck clamps and loading ramps;
- why a cattle scale should be installed;
- suggestions for lick and feed troughs.

To farm beef cattle successfully in Namibia, some basic facilities are needed. Much experimentation has gone into several designs. The aim here is only to give some advice for a few necessary structures that have been proved to work.

### 1. Camps

The purpose of camps is discussed in detail in the rangeland management manual. Fences, which separate camps for cattle, are normally constructed of wood or steel posts with steel wire and wood or steel droppers, but bush fences can serve just as well, especially on a temporary basis. To limit movement of cattle, a 1,2 m high fence with five steel wires serves the purpose. Away from water and corners, even four wires will do.

### 2. Corridors

Corridors are handy to move cattle around with little labour. They can also serve as utility camps (for sick animals, etc.) and can be grazed clean to form firebreaks. A corridor should be approximately 15 m wide, cleared of bush, but with a few trees to supply shade when used as a utility camp.

### 3. Water supply

Water supply should be done in such a way that every camp has free access to water. This can be a separate trough in every camp or a trough in a central water kraal if the adjacent camps are utilised by a single herd in rotation. Earth dams can be a source of parasite infestation and should be fenced off and the water supplied in a trough. If cattle have free access to water, a large trough is not necessary. The construction should be made in such a way that calves cannot fall over, get stuck and drown in the trough. The supply line should make the trough refill fast. Some sort of paving should be around the trough to avoid trampling. Troughs which stand a bit above the ground have the advantage that wind can move through underneath with less dust in the trough. Reservoirs should be big enough to supply water for a few days. Remember, adult cattle drink approximately 50 litres of water a day.

## 4. Handling pens

Much thought should go into the design and lay out of handling pens, e.g.:

- The present and the future number of cattle that will be handled.
- The facilities that will be needed, e.g. a loading ramp, a dip, facilities for artificial insemination, a cattle scale, a neck clamp, a separate calf crush.
- The number of groups of animals that will be handled at a time and division into groups.
- Whether the animals to be handled will have horns.
- The temperament of animals to be handled.

Remember a few basics when designing handling facilities:

- Gates must always be in a corner of a pen.
- Gates must be hinged in such a way that they stand against a fence when open.
- Gates of 2,4 m are sufficient (3 m where vehicles have to pass).
- Use chains as closing mechanisms. Cattle tend to bend gates easily with the result that fixed mechanisms will not fit any more.
- The funnel leading to the crush should have a straight side leading into the crush. Two sides approaching the crush at an angle will lead to milling in the mouth of the crush.
- Structures should be made of wood or steel. Initial costs are higher, but maintenance is lower, and animals that have conquered poor wire fences once, will always try to do so again.
- Poles should be 3,5 m apart, pressure point poles 2,5 m apart, height 1,5 to 1,8 m.
- There should be floor space of 3,2 m<sup>2</sup> per animal in handling pens.

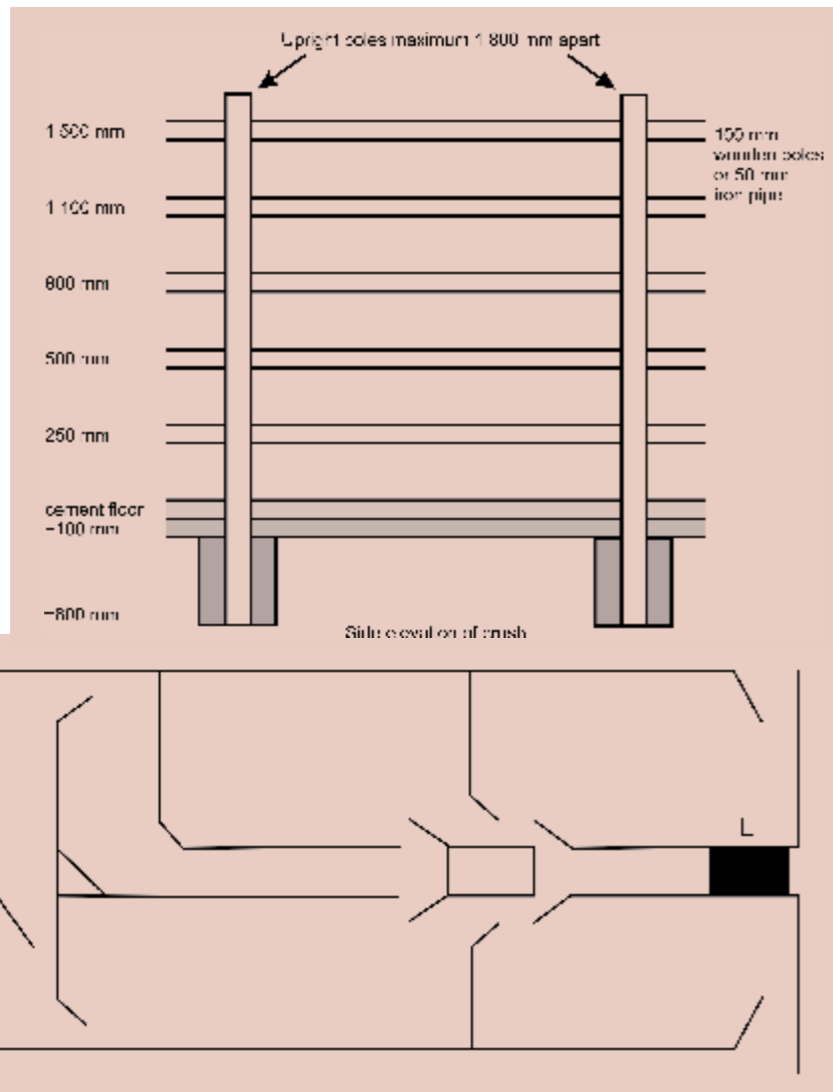


Figure 9: Side elevation of a crush pen lengthwise (top) and an example of a simple set of handling pens (bottom) (© Kreft, H.W. 1976)

Crushes form an integral part of handling pens. The purpose is to get cattle into single file. A crush should be 6 to 18 m long (not longer). If possible, a crush should face south. This enables working of cattle any time of the day without having to drive cattle directly into the sun. The distance between the front of the crush and the first upright should be one cattle length. Uprights should not be more than 1,8 m apart. Horizontals should preferably be of wood or steel. Internal measurement between the two sides should be 70 to 75 cm (beware of too wide). Sides can be straight or bent outward (the crush is narrower at the bottom than on top). The V-type crush (sides bent outward) has the advantage that smaller animals (calves) cannot turn around easily. On the other hand, cattle tend to climb upon each other and might get stuck when they lie down.

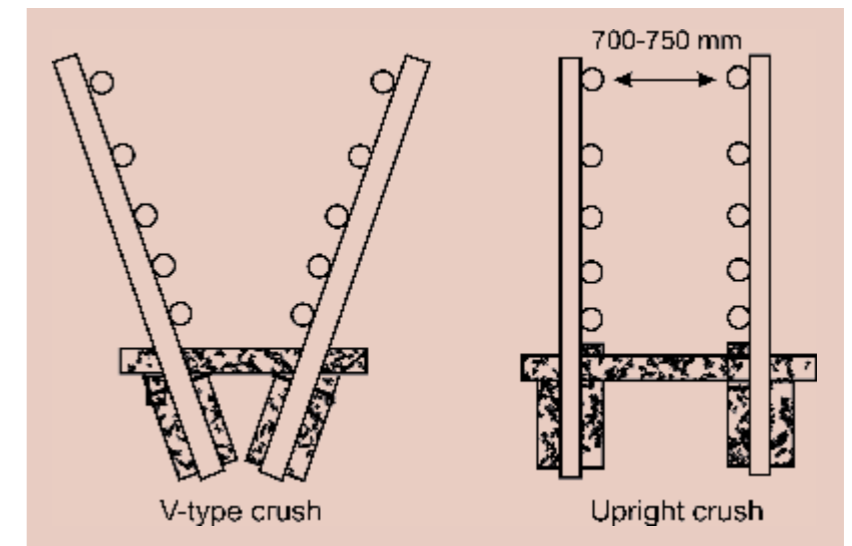


Figure 10: Examples of crushes (© Minnaar, P.P.J. undated)

Calf crushes are convenient and built in the same way as other crushes with an internal measurement of 40 cm.

## 5. Neck and body clamps

A neck clamp serves as gate at the front end of a crush and enables the farmer to hold an animal for various tasks. The following points are important:

- It must be strong enough.
- It must be wide enough to enable easy thoroughfare of cattle.
- It must be wide enough at the bottom to let animals run through without damage to their hooves.
- The head must be held still when it is closed.
- The holding mechanism must be strong and should catch automatically when the clamp is closed.

The purpose of a body clamp is to catch and pull down an animal (large animals and calves) to work with them (branding, surgery, etc.). If calves are worked when small, it is doubtful whether a calf body clamp is worth purchasing. Most farmers even get along well without a body clamp for adult animals. Combinations of scale and body clamps are available. An electronic cattle immobiliser is, in many instances, more effective than a body clamp. The animal must, however, first be caught (in the neck clamp) to enable the application of the electric clamps. This apparatus makes an animal stand stock-still and is an ideal solution for most situations where this is required (e.g. branding).

## 6. Cattle scales

Although expensive, a cattle scale is a must if performance in terms of growth and production is to be measured for selection purposes. A cattle scale replaces guessing with real figures in a

cattle enterprise. A scale is placed in or in front of the crush in order to get cattle to the scale one by one easily. Mechanical and electronic models are available. Both work effectively.

A cheap tape measure is available which can replace a cattle scale in a way. If only a few cattle are kept, this might be an alternative. The tape is placed around the chest of the animal and the weight is read off directly from the tape. The tape currently available is more suited for cattle with a round chest (European breeds), but a tape for oval-chested breeds (indigenous African breeds and Brahman) is in the process of being developed.

## 7. Loading ramps

Loading ramps also form an elongation of a crush and are necessary to load cattle onto a truck. An angle of not steeper than 1:4 is recommended. If the terrain permits, level loading is ideal. The internal measurements of the loading ramp should be the same as those of a crush and a fair end of level crush before the climb-up makes loading much easier.

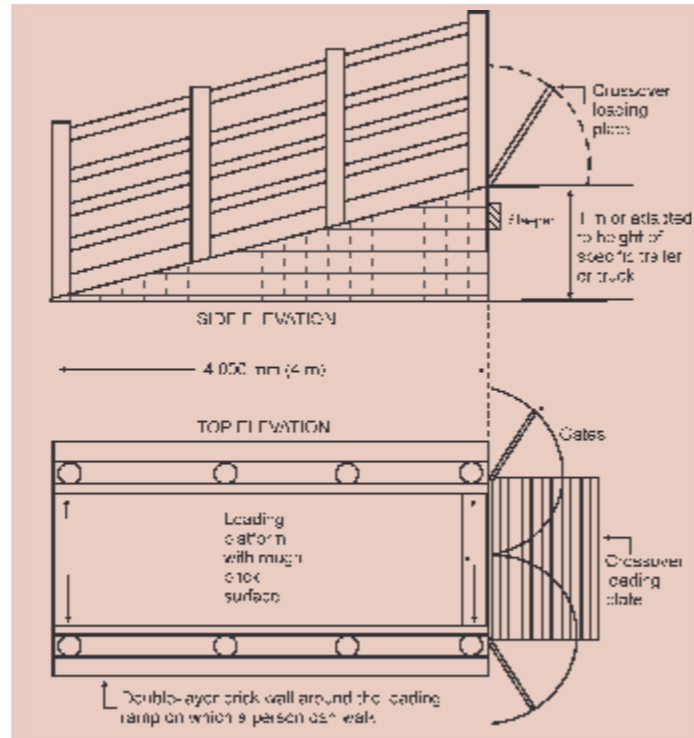


Figure 11: Loading ramp (© Minnaar, P.P.J. undated)

## 8. Lick and feed troughs

Lick troughs are normally made of half drums (cut lengthwise with some sort of footing to prevent roll-over) or cut transversely to form two round pots. Tyres turned inside out with a metal, cement or rubber plate in the middle have a virtually unlimited lifetime. Provision should be made to protect lick from rain, or at least holes in the bottom of the trough should prevent water from accumulating in the lick trough.

Feed troughs can be constructed of drums cut lengthwise. Feeding space is important (while space at a lick trough seems to be irrelevant) and  $\pm 40$  cm feeding space per animal should be catered for. If large numbers of cattle are to be fed or feeding will take place on a regular basis, many other aspects have to be taken into consideration. More advice should be acquired before getting involved in such an operation.

## 9. Cattle immobilisers

For the purpose of branding and dehorning, but also to treat sick animals, it is advantageous for an animal to stand stock-still. This cannot be achieved with a crush and neck clamp alone. Ropes and flat belts which pull the animal tightly to one side of the crush could help to some extent. However, an electronic immobiliser, which applies electric power to the animal by means of one or two electric connectors, makes the animal stand still. Apply the electric current only for short periods of time and only at the correct setting. Remember that this is not a tranquilliser and that the animal will still feel pain.

# CHAPTER 3 Reproduction and Fertility

This chapter concentrates on the importance of herd fertility:

- criteria used to express herd fertility;
- procedures to identify causes of low herd fertility.

## 1. Economic importance of herd fertility

The economic importance of herd fertility can best be illustrated by the following simple example:

A cow herd of 100 cows where each cow calves every year (= 100 % calving percentage) with a weaning weight of 200 kg each (no losses between calving and weaning) produces 20 000 kg of live weight weaners each year.

100 cows x 100 % calving % x 200 kg weaning weight = 20 000 kg
100 cows x 90 % calving % x 200 kg weaning weight = 18 000 kg
100 cows x 80 % calving % x 200 kg weaning weight = 16 000 kg
100 cows x 70 % calving % x 200 kg weaning weight = 14 000 kg

Multiply the total kilograms produced with the present price for weaners and it becomes clear what losses in financial terms are suffered with a lower calving rate (maintenance costs remain the same as the number of cows remains the same).

To put it in another form: if 20 000 kg weaning mass has to be produced with lower calving rates, either the weaning mass or the number of cows has to be raised. In figures, it looks like this.

	Weaning weight/calf to achieve 20 000 kg total	Number of cows needed to reach 20 000 kg with a 200 kg weaner
100 % calving %	200 kg	100 cows
90 %	222,2 kg	111 cows
80 %	250 kg	125 cows
70 %	285 kg	143 cows

In practice, the last scenario is often experienced. A certain budget line has to be met and to compensate for a lower calving rate, numbers are pushed up. Immediately the drought risk rises immensely.

The abovementioned example illustrates the importance of herd fertility. It must be remembered, however, that:

- reproduction heredity is low, thus selection for fertile animals will take time.
- reproduction is a sensitive trait. This means that environmental influences like nutrition, diseases, unadapted animals, climate handling, etc. have a big impact on reproduction and thus on herd fertility. Some of these factors (disease control, nutrition, etc.) can be manipulated by the farmer. This will obviously cost effort and money, but the example above shows how much can be put into trying to improve reproduction in the herd.

A highly productive cow (a regular calver) needs more fodder than one that does not calf regularly.

## 2. Puberty versus age at first calving

Puberty is the stage when a heifer ovulates (comes on heat) for the first time or a bull produces the first fertile sperm. Age of puberty differs according to:

- mass
- body frame size
- breed

Under conditions of good nutrition it happens in European breeds that puberty is reached before weaning. This causes immense problems for the breeder, as some heifers calve (or try to calve) at a much too early age.

Age of breeding is therefore determined by management. The farmer decides that a heifer is old enough or heavy enough to be able to deliver a calf without assistance in nine months' time. Normally this should be when a heifer has reached  $\pm 60\%$  of her adult weight. Under extensive ranching conditions, this should be around the age of 18 to 24 months. It must be mentioned that the frame size of the adult cow can be manipulated by means of age of breeding. A heifer that is allowed to be served at an early age when still fairly light, will remain a small cow for the rest of her life.

With a stable herd composition, only as many heifers are selected for mating as old cows have been eliminated from the herd (for reasons like low fertility, poor performance of offspring and age). It is a good practice, however, to mate more heifers than needed for substitution, or even all of them. (This is called **overmating**.)

Overmating can serve two purposes:

- In a stable herd composition, pressure is put on heifers by applying only a very short breeding season. Those that were able to conceive are selected as being the most fertile animals.
- While building a herd, the number of calves born is of utmost importance. Virtually any animal that can possibly produce a calf should be allowed to do so.

## 3. Criteria used to express herd fertility

Criteria of herd fertility should give an indication of the number of fertile cows. Thus a cow that delivers a calf, even if the calf dies at a later stage, must be included. The total number of calves born can be misleading as it may include twins. The following are generally used as criteria:

$$\bullet \text{ Calving percentage} = \frac{\text{cows calved}}{\text{cows mated}} \times \frac{100}{1}$$

This criterion should only be used when limited breeding seasons are applied.

- Intercalving period: This is the time elapsed (in days) between the birth dates of the last two calves of a cow. The average of all the cows will give an indication of herd fertility, even with an unlimited breeding season.

$$\bullet \text{ Weaning percentage} = \frac{\text{calves weaned}}{\text{cows mated}} \times \frac{100}{1}$$

This is actually not an indication of herd fertility only, but also production. From a production point of view, it might, however, be of more value than calving percentage as it shows the number of calves available for marketing.

- Criteria like number of matings (or inseminations) per conception or conception percentage (cows pregnant per cows mated) may be helpful in some instances, but are not commonly used.

In cases where different herds are compared, all criteria of herd fertility should always be seen in relation to the management practices applied. It is unrealistic to directly compare a calving percentage of a farmer with a 66-day breeding season to one with a 6-month breeding season.

## 4. Diagnosis to pinpoint a herd fertility problem

In cases where a herd fertility problem is experienced, it is important to try and find the cause.

- The bulls are the prime suspects. Have the bulls tested for semen quality and sexually transmitted diseases.
- In cases where heifers and dry cows get pregnant, but lactating cows fail to get mated, nutrition (too little grazing or very low intake) may be the cause. The condition of the lactating cows before and during the breeding season should be a good indication.
- If the scenario is that between all groups of animals (lactating, dry, heifers) low pregnancy is experienced, the cause could be a lack or an excess of some nutrients in the diet or some disease (sexually transmitted or otherwise).
- If the results of the pregnancy diagnosis and the calves born differ substantially, some cows must have aborted for some reason.

In view of the enormous influence of a low calving percentage, everything possible should be done to have the exact problem identified and solved.

## 5. Possible reasons for poor cow fertility

### 5.1 Genetic influences on cow fertility

Fertility is a trait with low heredity (10 to 15 %), indicating that the environment (availability of grazing, etc.) plays a much more prominent role (85 to 90 %) than genetics, but there are some traits that should be selected for:

- Adaptability. Select adapted animals.
- Long intercalving periods and heifers which take long to conceive for the first time. Cull these animals.



- Dystokia (calving problems). Cows with a drop of the rump from hipbone to pinbone and a good width between pinbones calve more easily. This can be selected for.
- General appearance. A female animal should look feminine. This shows normal hormonal processes in the body.

## 5.2 Non-genetic influences on cow fertility

### Nutrition

This is one of the few environmental influences that can in a way be manipulated by the farmer.

Overfeeding leads to fat depositions around the ovaries, in the birth channel and in the udder, each with obvious results. It furthermore lets the unborn calf grow excessively, especially if a cow or heifer is heavily fed during the last third of pregnancy. Calving problems might be the result. Drastic underfeeding leads to a suspension of the oestrus cycle. The cow will only start to come into cycle again after a much higher mass has been obtained than when it was suspended ( $\pm 70$  kg). This shows the importance of rather trying to keep cows in a fair condition than having them lose much weight and then trying to feed them right before the start of the breeding season.

Unbalanced rations, shortages or excess of various nutrients can have dramatic negative influences on cow fertility. Under extensive farming conditions, these are not observed easily. Some of the more common cases in Namibia include:

- lack of phosphorus (virtually everywhere in Namibia);
- phosphorus and calcium in the wrong ratio;
- lack of zinc, copper, selenium, vitamin A or excessive fluoride.

**Climate** has an influence on cow fertility, especially if sudden changes (excessive heat, cold or drought) are experienced. Cows moved from one climate to another (imports from Europe or America) will show long periods of anoestrus.

**Any disease or ailment** that causes fever has a negative influence on cow fertility. Furthermore, any infection of any part of the reproductive tract will have a negative effect on fertility, as will any ailment that causes loss in body weight (even internal or external parasites).

Of great concern are venereal diseases, which are transmitted by the sexual act and other diseases which affect reproduction directly, but are transmitted by other means. The most important are:

- Vibriosis;
- Trichomoniasis;
- Brucellosis;
- Bovine Viral Diarrhoea (BVD).

Every cow has a period of **lactation anoestrus** (no heat) after parturition. Breed differences exist and the period of lactation anoestrus is prolonged by:

- a difficult birth;
- poor nutrition;
- constant suckling of the calf.

Temporary weaning (each afternoon until the next morning) can solve the last problem if this proves to be the problem.

## 6. Possible reasons for poor bull fertility

### 6.1 Genetic influences on bull fertility

- Scrotum circumference. A bull with small testicles produces less and lower quality semen.
- Libido 60 to 70 % inheritable. There are breed differences.
- Conformational disorders. A bull works on his hind legs, therefore any disorders there may make it impossible to serve a cow.

When buying an inspected and tested bull all the abovementioned factors (except libido in a way) should have been looked into and sorted out.

### 6.2 Non-genetic influences on bull fertility

**Nutrition** has the same effect on bulls as on cows and heifers, but to a much lesser extent. Underfeeding is seldom a problem and is mostly observed as a lack of libido. Overfeeding is a problem with show animals and is manifested in lower semen quantity and quality and lower libido.

**Climate** has an effect. Bulls moved from moderate zones to warm areas are temporarily infertile. For all the abovementioned reasons it is advisable to purchase new bulls well in advance of the breeding season to allow for adaptation to the new circumstances.

Bulls are able to work before the **age** of two years, but should do so only under controlled circumstances. A bull that is expected to serve 25 to 33 cows should be at least  $2\frac{1}{2}$  (rather 3) years of age. High age does not have a negative effect on semen quality. Other aging problems tend to be the limiting factors (or management reasons like inbreeding). A bull can conclude many servings a year. With a limited breeding season, 25 to 33 cows per bull (which will each be served 2 to 3 times) are recommended. Multiple servings will lead to a decline in semen concentration, semen quality and libido.

**Diseases** have the same effect on bulls as on female animals. In many cases the bull seems healthy again after treatment, but the semen still shows abnormalities. It is recommended, therefore, to have the semen examined before a bull that was ill is used again.

Various injuries and **ailments** can cause the bull to be unable to serve or to shed infertile semen. The concerns are the same as with female animals.

**Psychological factors** must be taken into consideration with bulls. Each bull is an individual and any changes in handling, care, environment, etc. might result in a lack of libido.

# CHAPTER 4

## Breeding Beef Cattle

When breeding cattle for the market, the breeder should have a definite vision of what he/she wants to produce, as breeding is a very slow process in cattle. This chapter aims to give guidance on:

- how to set up a breeding aim;
- what traits should be looked into and why;
- why crossbreeding is popular amongst cattle farmers and the disadvantages of crossbreeding;
- how to engage in crossbreeding in the most effective way;
- what to take into consideration when animals are selected for breeding.

An animal is the result of its genes and the environment. For successful cattle breeding, knowledge of the interaction between genetics and environment is essential.

### 1. Aims of a beef cattle breeding programme

Determining where to go with a breeding programme requires good knowledge of the medium (your beef cattle) and wisdom to predict consumer needs.

With cattle breeding it is important to note that:

- progress is slower when selecting for multiple traits;
- genetic progress with cattle is slow because the rate of reproduction is slow (one calf/year), and the generation interval is long (a heifer produces her first offspring approximately three years after she was born);
- the investment per production unit (cow) is high.

### 2. Crossbreeding beef cattle for improved performance

#### 2.1 Aims of crossbreeding

Crossbreeding, along with inbreeding and selection, is one method to achieve genetic progress. It describes the mating of animals of different families, breeds and even species with each other. In cattle breeding, crossbreeding between breeds is of importance. It is done for the following reasons:

- Improvement of vigour (by improving weight, effectiveness of weight gain, fertility and general health).
- Fixation of wanted traits in a closed population. This might prove much faster than selection only to improve this specific trait. Stud breeders and breed developers do this.
- Crossbred animals can serve as a base for new breeds.

The principle of crossbreeding is based on the observation that a crossbred animal of purebred parents is superior to both the parents in terms of vigour. It has been observed furthermore that the best results were obtained where the parents' origins differed most. The superiority above the parents is not carried forward to the same extent if crossbreds are mated with each other. Good results with crossbreeding are dependent on the quality of the parents, especially the bull, and should never be seen as an alternative to good management.

#### 2.2 Advantages of crossbreeding

The single most important advantage of crossbreeding is that hybrid vigour is obtained. The crossbred animal outscored its parents in terms of vigour (reproductive ability and growth, fewer mortalities, better health, etc.)

It has also been discussed that missing (or poorly developed traits) can be bred into a closed population by crossbreeding, which can even result in the development of new breeds.

#### 2.3 Disadvantages of crossbreeding

**Violation of homozygous:** In cases where further breeding takes place with the crossbreds, the offspring will be variable.

The advantage of the first cross of purebred parents is not carried over to next generations in the same way.

**Management problems:** A proper crossbreeding system requires more than one cow herd during the mating season. This might cause bottlenecks regarding rangeland management.

#### 2.4 Systems of crossbreeding

##### Two-breed crosses (terminal crossbreeding system)

Purebred females of one breed are mated with a purebred bull of another breed and **all** offspring are marketed. This system makes maximum use of hybrid vigour, but requires careful planning.

The female breed should have:

- high fertility
- low to medium body mass
- low maintenance needs
- high milk production
- a long reproductive lifespan
- low mortality
- adaptability and hardiness

The bull breed should have:

- good growing abilities
- good efficiency of food conversion
- a relatively low birth mass
- good carcass traits

The system further requires that all replacement heifers will have to be purchased from elsewhere or be self-bred by a separate purebred herd.

Extensions to the system are possible by mating the crossbred heifer to a bull of a third breed. Fairly little additional gain is experienced, but the management problem increases.

### Backcross or “crisscross” system

This system logically follows the two-breed cross. Heifers of the crossbreds are mated with non-related bulls of one of the two original pure breeds. The heifers of this offspring are again mated to the other breed of the two original breeds. Thus, males of the two original breeds are used alternately on successive generations of crossbred females. Later generations of a crisscross system will thus carry about two thirds of the genes of one breed and one third of the other or vice versa. Hybrid vigour gets less with time, but is not totally lost. The system is popular in practice. Here, heifers which look like the one breed are mated with the bulls of the other breed and vice versa. Thus the system can easily be applied without any record-keeping.

As has been seen from the above, there are good reasons to engage in crossbreeding, but there are also good reasons to keep to a system. Unfortunately, in practice it is often experienced that farmers try to improve their herd by purchasing bulls of some popular breed at this stage. The end result is a genetic hotchpotch where no traits are fixed any more in any way. A herd with no specific character with any predictable traits is the end result. It will be much more difficult to develop a market strategy for such a herd, as any animal reacts differently to traits which are important to the market, but not easily observed on the live animal.

## 2.5 Choice of breeds for crossbreeding

A prerequisite for successful farming with any cattle breed is love for the specific breed. Furthermore, choice of a breed and marketing strategy always go hand in hand as some breeds tend to be ready for slaughter at an earlier age than others. For a crossbreeding system it should also be remembered that breeds whose origins differ most, give the most hybrid vigour. The desirable traits for a cow and a bull in a crossbreeding system have already been discussed.

Cattle breeds can be classified according to their origin and the purpose for which they were bred originally. The choice within these classes is one of personal preference.

- *Bos indicus* (Sanga, Afrikaner, Nguni, Brahman). Although breeds of different origin (Africa and Asia) are included here, they have much the same vital characteristics in that they are well adapted to hot climates and extensive farming conditions. All these breeds are popular as female breeds in a terminal system and as one of the breeds in a crisscross.
- Synthetic breeds (*bos indicus bos taurus* cross) (Santa Gertrudis, Simbra, Beefmaster, Bonsmara). These breeds have been developed from crosses between Zebu-type breeds and European breeds and were specially bred to deliver a well-adapted breed under hot climates, which still delivers a good carcass. These breeds are primarily suited for commercial pure breeding. They can replace the zebu in a crossbreeding system, but the sense of this is doubtful, as the wanted traits of the European breeds have been included already.
- British beef breeds (Hereford, Angus, Sussex). These breeds tend to mature fairly early (ready for slaughter at an early age). They are mainly used as father line in a

terminal crossbreeding system or as one of the breeds in a crisscross together with a zebu.

- Large-frame dual-purpose breeds (Simmentaler, Braunvieh). These breeds mature late and are thus only ready for slaughter when fairly heavy. Because of their origin as dual purpose (beef and milk) the cows have ample milk and are thus well suited for a breed in a crisscross.
- Large-frame beef breeds (Charolais, Limosin). These breeds mature late, but deliver heavy carcasses. They are popular as a father breed in a terminal cross or as one breed in a crisscross where late maturing oxen are preferred.

The choice of a breed or a combination of breeds will have a long-term impact on the beef enterprise of a farm and should thus be very well considered.

Every breed has traits that are wanted and traits that are less wanted and these should be considered thoroughly before making a decision. No breed is, however, perfectly suited for everybody, otherwise everybody would farm with that specific breed. The important thing is to make a decision and keep to it.

(Also see Table 1, Chapter 5 page 42.)

## 3. Selection

Selection is the process by which the farmer decides whether an animal will be used for further breeding or not. In nature only one selection rule applies, namely the survival of the fittest. Under farming conditions other rules apply and therefore the traits of economic importance have been explored.

### 3.1 Selection aids

When selecting animals, a combination of visual appearance and production records should be used.

#### Appearance

Basically three criteria apply:

- Is the animal a true representative of its breed?
- Is the animal a true representative of its sex (a bull should look like a bull and a female should look like a female).
- Is the animal structurally correct? (Judging for functional efficiency.) It is highly advisable for any cattle farmer to attend courses offered by the breeders' clubs/associations to learn how to look for the functionally efficient animal.

#### Production records

Production records should be available when animals are selected for own use or purchased for use as replacement animals in a herd. The farmer should look at:

- birth weight;
- various growth criteria (200, 400 and 600 days);
- intercalving period of mother (or, if cows are purchased, of the cows themselves);
- calving ease;
- scrotal size;

- days to calving (time elapsed from first day of breeding season to calving) – identify animals which are mated early in the season;
- carcass traits.

It is up to the farmer to decide which of these are important for his purpose and which can be ignored. This depends on the aims he has identified for his breeding programme.

### 3.2 Selection of female animals

When purchasing cows or heifers, remember that animals on offer will always be the culling of a herd (unless the whole herd is offered). It is therefore very important to choose the breeder from whom stock is to be purchased with great care.

It is advantageous if production records can be available. The farmer should look at:

- calving record (age at which first calf was born and number of calves born);
- average weaning weight;
- cow efficiency (weaning mass of calf as a percentage of cow mass);
- intercalving period.

These factors should be seen in relation to each other. A high average weaning weight can be the result of irregular calving.

*Take note that continuous selection for a high weaning weight will result in a higher adult cow mass, whilst continuous selection for cow efficiency will most probably lower adult cow mass.*

The following bench marks should serve as a guideline in modern beef cattle breeding.

Fertility: 90 % calving percentage or 365 days average intercalving period.

Weaning mass in relation to cow mass at weaning 46 %  
 18 month mass in relation to cow mass at weaning 70–75 %  
 28 month mass in relation to cow mass at weaning 100–105 % (28 months is slaughter age)

When selecting heifers from own stock, the same rules apply.

### 3.3 The choice of a breeding bull

The choice of the right breeding bull is of utmost importance because:

- bulls are expensive, and
- the impact of a bull in a herd is significant.

Genetic progress is mainly dependent on the bull because:

- the bull contributes 50 % of the genetics of the calf;
- the genetic composition of a calf is mainly the result of the bulls used for the last three generations;
- the heifer offspring of the bull will (in many breeding systems) be used as substitution heifers. The impact of the bull will thus remain in the herd for numerous years.

Beware of excessive use of a good bull. Inbreeding should be avoided at all times.

Factors affecting the choice of a breeding bull are:

- **The breeding system**  
A stud breeder is more interested in certain lines and family trees than a commercial breeder.
- **Deficiencies which are experienced in the herd**  
A specific bull might be selected to try and correct a specific herd deficiency.
- **Dictations by the market**  
If market tendencies move in a certain direction, this must affect the bull choice. A bull is needed to produce what the market wants.
- **The circumstances on the farm**  
Because the conditions under which the bull has to work differ (e.g. planted pastures versus dunes or mountains) the choice of the type of bull will differ.

Bulls should preferably be bought from a registered breeder and only after the breed examiner has inspected them. This gives a certain guarantee that the bull is purebred, complies with the breed standards and is free from functional deficiencies. It serves no purpose for the beginner farmer (and even many established farmers) to buy the most expensive bulls available. Remember, the impact of improved breeding is distinct compared to improved grazing management. Make sure that a bull is purebred, free from functional deficiencies, fertile and complies with almost all the aims that were set in the breeding programmes. (Even expensive bulls are not always perfect.)

# CHAPTER 5

## Beef Cattle Production Systems

In Namibia, beef cattle are bred to supply weaners or stores to the open market, slaughter cattle to the export abattoirs or breeding stock to fellow farmers. This chapter discusses various aspects to be considered before engaging in a specific production system.

Many different production systems exist, but traditionally (and for good reasons) the cattle farmer in Namibia is a stud breeder, an ox producer (from own stock or bought-in stock) or a weaner producer. All systems have advantages and disadvantages. Stud breeding requires much knowledge, dedication and high financial inputs into good breeding stock initially, but can give great satisfaction. It is fairly easy to change from an ox production system to a weaner system, but to change the other way round is, for financial reasons, very difficult. Therefore, once a farmer has managed to produce oxen, he should not easily consider changing to a weaner system.

### 1. Considerations when deciding on a production system

#### 1.1 Position of farm

Areas with more reliable rainfall are more suited for cow and calf production than areas with erratic rainfall. Furthermore, in some very sandy areas in Namibia (e.g. Omaheke), problems are experienced to get an ox ready for the market.

Other areas (e.g. Okavango) are excellent areas for fattening cattle. Some very mountainous areas might have severe calf losses due to predators. It might thus make sense to buy in weaners and raise them to oxen.

#### 1.2 Flexibility

In Namibia, rainfall is generally erratic and this should be taken into consideration when deciding on a production system. A system where calves are bought and raised to oxen is inevitably the most flexible, as purchases can be made according to the amount of grazing available. A system where the percentage cows is relatively low (ox production system) is also fairly flexible as stores and weaners can be sold to have cows survive (this, by implication, means that after the drought no income will be generated for 2½ to 3 years or that weaners have to be sold). A weaner system is the least flexible as many cows are kept which are very difficult to sell in times of drought.

#### 1.3 Management

Weaner production requires more management input than ox production. Most management practices (dehorning, castration, vaccination, branding, earmarks, etc.) need to be done up to weaning. Furthermore, a prerequisite for a weaning production system is a very high calving percentage. The effort that has to be put in to reach this

is high. Financial management needs to be considered as well. With a weaner system, sales normally take place only once a year. Strong financial discipline is thus necessary to survive for a year. Farm size should not have an influence on the production system. On a small farm with fewer cows oxen can be produced just as well.

Keep in mind: With weaner production, the weaner is the final product you deliver. Thus, only calving percentage and weaning mass determine the total mass sold. If an animal is sold at a later age, some compensation for a lower calving percentage can be achieved through growth to a higher mass.

#### 1.4 Profit

This subject is heavily debated and it must be accepted that production costs and profit will differ from farm to farm. Weaner prices change according to the beef price, the maize price and the relation between the two. This might result in very good prices at times, but in very low prices at other times. The weaner producer has no influence on this. It is important that, when making comparisons, all costs are considered (production costs, dressing percentage, agents' commission, transport).

#### 1.5 Breed and type

It must be accepted that feedlots (which eventually determine the weaner price) are profit orientated. Their interest is in a lean calf (lower purchasing price) that has the ability to grow fast with a good food conversion ratio. The weaner producer should take this into consideration when deciding on a breed.

The ox producer is also led by the market to make his breed choice and consumer preferences change. Years ago, very fat carcasses were in demand, which boosted early maturing breeds. Currently, the slaughter ox market in Namibia demands a carcass of 230 to 260 kg at an age of approximately 28 months (before the 3<sup>rd</sup> and 4<sup>th</sup> permanent incisors are visible) with little fat.

Table 1 (on the next page) gives an overview of the characteristics of various breeds (in classes as discussed before).

Table 1: Comparison of various classes of breeds

ADAPTABILITY OF BREEDS TO CLIMATE AND ENVIRONMENT					
	British beef breeds	Dual purpose breeds	Zebu type breeds	Synthetic breeds	Special beef breeds
tropics and subtropical conditions	poor	fair in sweetveld areas	good	good (big variations but not suited for extremes of temperature and humidity)	poor (but ability of crosses to grow well is in most cases good)
cooler areas	good	good	less good (maintenance needs increase; important on acid soils)	good (less suited for acid, poor soils)	good on fertile soils
poor and/or extensive management	poor	poor	good	fair (big variations between breeds)	poor
nutritional environment	intensive to semi-intensive	intensive	extensive	wide spectrum of adaptability	intensive

PHYSIOLOGICAL ABILITIES OF BREEDS					
	British beef breeds	Dual purpose breeds	Zebu type breeds	Synthetic breeds	Special beef breeds
puberty	early	early (exceptions do exist)	late	mostly early	not as early as other breeds (calving problems limit early conception)
fertility and presence of lactation anoestrus	good (satisfactory reconception, even after first calving)	good (satisfactory reconception, even after first calving)	average to poor (big variations, sensitive to handling and treatment)	good	average to good (depends on level of nutrition)
milk production and weaning mass	poor (variations between breeds and families)	generally good	varies between poor and fair	fair to good	fair (weaning masses are high due to ability to grow)
maternal abilities and deaths after birth	fair to good (depending on environment)	fair to good (depending on environment)	good (deaths after birth high in some breeds)	good	fair (extremely heavy or light calves pose a problem)
weight-loss during suckling and ability to keep bench mark masses	generally good (depends on milk produced)	good (depends on level of nutrition)	big variations (big weight-losses occur)	excellent	fair (depends on level of nutrition)

FUNCTIONAL AND ANATOMIC PROPERTIES					
	British beef breeds	Dual purpose breeds	Zebu type breeds	Synthetic breeds	Special beef breeds
ability of growth (average daily gain)	fair	fast	slow (Brahmans grow fast under veld conditions)	fair	fast
adult mass and type	small (380 kg digestive type)	large (550 kg respiratory type)	intermediate (450 kg respiratory type)	intermediate to large (480–500 kg mainly respiratory type)	very large (580 kg digestive type except Chianina)
muscling	good	good	poor (fairly big variations)	good	excellent
internal fat as % of total fat	little	fairly large	little (distribution good)	little	more than average
fat distribution	good	good	good (tends to be localised)	excellent	good
grading	very good (already at early age, even from veld)	good (depends on % adult mass reached when slaughtered, extended feeding period is biggest drawback)	good (even off the veld)	good (even off the veld)	good (depends on % adult mass reached when slaughtered)
occurrence of calving problems	normal	above average	normal (big variations in birth mass of calves of some bulls)	normal	above average
presence of genetic defects	fairly low	fairly low	above average	varies from fairly low to above average	fairly low

## 2. Stud breeding

The aim of stud breeding is to supply breeding stock to fellow farmers. Many beef producers breed their own female replacement stock (mainly for reasons of adaptability of animals to farm conditions and cost-saving), but are interested in purebred bulls from stud breeders to improve their herds and avoid inbreeding. The stud breeder serves this market.

With the beef breeder knowing the impact that a breeding bull has on his herd, it is obvious that only high-quality bulls are in demand. To supply these animals requires many additional inputs by the stud breeder:

- High-quality cattle can only be bred from high-quality parents. These animals are expensive.
- Even with high-quality parents, the majority of bull calves born are eventually culled and slaughtered rather than offered for sale as a bull.

- Buyers of bulls demand registered animals which have been inspected by a breed inspector, preferably performance tested and inspected by a veterinarian. This selection eliminates many of the initial bull calves born and involves costs for the stud breeder.
- Buyers want animals that look good at a stud sale. The stud breeder thus has to feed animals additionally before an auction.

It should be obvious that stud breeding is a specialised field, which, in many cases, is more a hobby than a business for a breeder from a financial point of view. Much thought and careful planning should thus be done before engaging in such an operation.

## CHAPTER 6

# Nutrition of Beef Cattle

To achieve productivity from the cattle that a farmer owns or manages, enough and reasonable quality grazing at all times is a prerequisite. It is, however, necessary to supplement natural grazing with certain nutrients that might be in short supply to achieve maximum cattle performance. This chapter:

- discusses the basic nutrients needed by cattle;
- explains the working of the digestive tract of the ruminant;
- discusses nutritional needs at various stages in the production cycle;
- gives guidance to supplementary feeding and finishing cattle for the market.

The importance of good nutrition has been mentioned several times in the manual. Under extensive farming conditions, it remains a problem, however, to supply exactly the correct nutrition. General nutritional shortages are easily observed, but the quality of grazing consumed and the shortages that may exist, still pose a problem.

### 1. Basic nutrients

To understand nutritional deficiencies in beef cattle some basic terms have to be understood. A feedstuff can be analysed according to various basic nutrients of which each fulfils a specific function in the animal body.

#### 1.1 Carbohydrates (energy)

Carbohydrates are used for the execution of body functions like breathing, digestion, movement, for maintaining body temperature and for production like growth and milk production. Carbohydrates are stored in the form of fat. Sources vary widely. Sugars like molasses are easily absorbed carbohydrates. Grains like maize, wheat, etc. need to be transformed to sugars before they can be absorbed. Grass (cellulose) also needs to be transformed, but this is only possible for ruminants.

#### 1.2 Protein

Protein is necessary for growth (tissue building) and replacement of body cells. Protein always contains nitrogen (N). Proteins consist of a great amount of amino acids and can be used as energy. This is observed when an animal is underfed. Body protein is mobilised and used as energy for body functions. The animal becomes lean. Sources of protein are legumes (especially oilseeds like sunflower, cotton seed, etc.) or animal products (fish meal, seal oil and carcass meal). **(NB: The use of carcass meal as animal feed is prohibited in Namibia.)** Non-protein nitrogen (NPN) can be used as a source of protein by ruminants only. Veld grass contains protein when green, but very little when dry.

### 1.3 Minerals

A great number of minerals exist in the animal body. Some are needed in fairly large amounts like calcium and phosphorus, which are the main components of bone and are called macrominerals. Others are only needed in very small amounts (but are still of vital importance). These are called trace minerals. The balance between minerals is very important for proper functioning.

### 1.4 Vitamins

Vitamins form part of enzymes or act as activators where enzymes function. The ruminant is able to produce most of its vitamins. Some vitamins are constructed in the animal body (specifically in the ruminant), but dietary intake of vitamin A is necessary.

Although a certain degree of transformation between nutrients is possible (especially by the ruminant) if all the necessary components are present, balance is important.

### 1.5 Water

Water is an important nutrient for all animals. Water functions in the body as a solvent in which nutrients are transported and broken down, and in which waste products are excreted. Lack of water will lead to lower feed intake and consequently to lower production.

## 2. The digestive tract of a ruminant

Digestion is the process by which food is broken down to such a degree that it can be absorbed by the blood stream and transported to the body cells. Carbohydrates are broken down to simple sugars, proteins are broken down to amino acids and fats are broken down to fatty acids.

Digestion in single-stomach animals is conducted by enzymes. Enzymes are highly specific in what they break down and to the environment in which they break down. The stomach and the small intestine are acid while the large intestine is neutral. Enzymes are not able to break down cellulose, thus a single-stomach animal cannot survive on grass. Equines (horses and donkeys) have extra abilities to do so. Enzymes can only break down nutrients. No rebuilding can take place. Single-stomach animals are normally kept under intensive conditions (pigs, poultry).

The digestive tract of the newborn ruminant (like cattle) resembles that of a single-stomach animal. The other stomachs only develop when roughage is ingested.

Rumination (“re-chewing”) serves as physical digestion to break down roughage. Mixing with large amounts of saliva is also accomplished. The saliva keeps the pH in the rumen neutral. In the rumen, digestion starts by means of fermentation. Bacteria are responsible for this. These bacteria are, just like enzymes, very specific in what they break down and only work in a specific environment (in this case a neutral pH and in the absence of oxygen). The big advantage of bacterial digestion is the fact that bacteria can break down cellulose. This is why ruminants can survive on grass/roughage. Bacteria themselves are live creatures, which reproduce and die very fast. The dead bacteria are digested in the lower digestive tract of the ruminant (they are proteins). Bacteria are also able to rebuild protein, are able to construct some vitamins and are able to use free nitrogen (free nitrogen gets bacterial protein). This is why it is possible to feed a ruminant fertiliser like urea or ammonium sulphate.

The lower digestive tract of a ruminant resembles that of a single-stomach animal. It is definitely so that rumination has some distinct advantages over the single-stomach system of digestion. There are, however, also disadvantages. The main drawback is that many gases that are formed are lost. These losses also include modified sugars and protein, which could have been digested by enzymes in the lower digestive tract. Thus a single-stomach animal will grow much better on the same amount of grains than a ruminant.

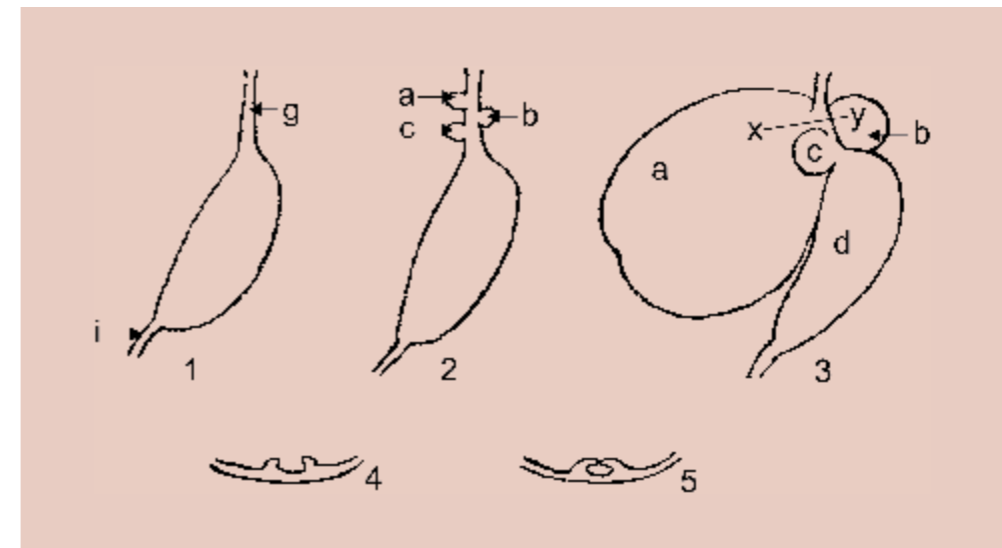


Figure 12: The digestive tract of single-stomach animals and ruminants

1. Single stomach: g = gullet, i = intestine
2. Fore-stomachs (a, b and c) arising as outgrowths from the gullet
3. Stomach of ruminant: a = rumen, b = reticulum, c = omasum, d = abomasum
4. Cross section x-y through 3 with oesophageal groove open
5. Cross section x-y through 3 with oesophageal groove closed

## 3. Nutritional needs of cattle

### 3.1 The infant calf

Because the calf is basically a single-stomach animal, its nutrition is more specialised than that of the adult ruminant.

- Colostrum (the first thick, yellow milk formed) is absolutely necessary within the first 6 to 18 hours after birth.
- A high percentage of digestible protein is necessary and essential amino acids are needed.
- Carbohydrates must be supplied in the form of simple sugars (lactose and glucose).
- All vitamins must be supplied.
- Water must be available at all times.

Full-cream milk preceded by colostrum meets all the abovementioned requirements.

Calves can be raised on milk substitutes, and early weaning on calf starter meals is possible.



### 3.2 The replacement heifer

In order to have a heifer achieve 60 % of her adult mass by 18 to 24 months of age (needed for mating), feeding for growth is necessary. Nutritional needs for growth are substantially higher than for maintenance only.

### 3.3 Pregnancy

Conception itself does not need extra attention in terms of nutrition if the heifer is large enough and the heifer or cow is in a good condition. Imbalances of manganese, calcium and phosphorus and shortages of phosphorus, zinc and selenium may, however, have negative effects on conception. These are difficult to detect and a veterinarian should be consulted if such imbalances are suspected.

Additional needs for the pregnant animal only arise during the last third of pregnancy. This is when the foetus grows fast and there are high needs for energy, protein, calcium and phosphorus.

It is often observed that cows pick up much more weight during pregnancy than just the weight of the calf and the additional membranes and embryonic fluids. While heifers are still growing during pregnancy, this increase of body weight is observed with adult cows as well. This extra weight serves as reserve for the lactation period and will disappear during lactation.

Underfeeding during pregnancy will result in the cow or heifer mobilising her own body reserves to save the unborn calf. Only very drastic underfeeding will result in abortions.

#### Bench marks:

Cows can lose up to 15 % body weight after birth and can still reconceive (large-frame animals more so than small frame animals).

Sexual activity will stop with a weight loss of 20 to 30 % and will only be re-activated if the original mass (100 %) has been reached again.

Condition scoring is a handy tool to determine these bench marks in a mixed herd.

Cows should have a condition score of 3 to 3,5 (full, but not fat) at the onset of the breeding season.

### 3.4 Lactation

During a single lactation period a high producing dairy cow produces three to four times her own body weight in the form of dry components in milk. This and the maintenance needs must be supplied by means of feed.

Lactation of the beef cow can be subdivided into four phases:

#### Phase 1: First 5 weeks after calving

If the cow was mated in the rainy season, she will calve when the nutritional value of the veld is at its worst. The nutritional needs are, however, low, as the needs for the small calf are low. The cow can even lose 15 % of her body weight during this time without any negative results on reconception.

#### Phase 2: 6 to 14 weeks after calving

Nutritional needs are very high. The calf is able to use all the milk the cow can supply and the cow needs to come on heat and conceive. It is thus logical that it is aimed to have this phase in the time of optimal nutritional conditions of the veld. In some cases, especially towards the end of the rainy season, energy might be a limiting factor. Also beware of shortages of zinc, selenium and phosphorus.

#### Phase 3: 15 weeks to weaning

Milk production declines systematically as do the nutritional needs. This is the time where cows tend to pick up weight in spite of having a suckling calf. The veld thus supplies more than is needed for maintenance and lactation.

#### Phase 4: Weaning to calving

Cows should pick up weight during this resting period. In practice, however, it is often experienced that cows pick up weight during the last third of lactation and keep a constant weight during this period.

### 3.5 Nutritional needs of the breeding bull

In practice, few problems are observed with the feeding of bulls because farmers realise the importance of the bull regarding the contribution to the calf production. It is also easy to feed a few bulls to have them in a good condition for the breeding season. This is a common practice amongst farmers. A bigger problem seems to be overfeeding. Bulls are fed excessively to appear good at auctions. This has negative effects on fertility. It is thus advisable to purchase bulls well in advance and allow for time to adapt to the new conditions before they are allowed to mate.

### 3.6 Nutritional needs of growing cattle

Nutritional needs of the suckling calf increase as its body mass increases (this applies to all nutrients). At a stage, the mother's milk production decreases, while the calf's needs still increase. This causes the calf to start grazing seriously.

Growth after weaning is directly dependent on the availability of all nutrients needed and can thus be manipulated by means of the quality of grazing and the amount of additives (lick and additional feeding) supplied. In practice, 80 % of growth is achieved during the rainy season with a bit of growth in autumn, no growth in winter and a bit of weight loss in spring/early summer. To achieve growth in winter and spring/early summer, supplementary feeding will be necessary. Considering the phenomena of compensatory growth (this term describes the observation that an animal which has suffered, will show so much growth in a following good season that, at the end of this good season, it will almost have the same weight as a contemporary that had not suffered at all) it is

doubtful to what extent additional feeding in winter and spring/early summer to achieve growth is justifiable. Dry season supplementary feeding (winter lick) is normally aimed at prohibiting weight loss only and thus only supplies enough to fulfil maintenance needs (which are much lower than production needs).

## 4. Feed intake

Feed intake is important for animal performance. No performance can be expected if, for some reason or other, too little feed is taken in. Feed intake is based on numerous factors.

### 4.1 Feed-based factors

- **Availability of feed**  
No food available, no intake.
- **Quality of feed**  
Intake is directly dependent on the time it takes for food to pass through the digestive tract. Low quality feeds take longer to digest.
- **Amount of processing applied to a feed**  
In a feedlot, roughages are milled (or even pilled) to achieve faster passage through the digestive track.
- **Taste and smell**  
Tasty and good-smelling feeds are taken in more readily. Sometimes roughage is sprayed with molasses (sugar) to achieve this.
- **Lack of specific nutrients**  
The importance of a balanced diet where all vital nutrients are supplied in adequate quantities has been discussed. Imbalances cause feeds to pass through the digestive tract more slowly.
- **Additives**  
The aim of additives in a feed is to increase the amount of bacteria in the rumen to achieve faster digestion and passage. Urea can be used for this on winter veld.
- **Adaptation to different feeds**  
Any change in feed will result in a temporary decrease in intake. The reason is that the microorganisms in the rumen (which are very specific in their workings) have to adapt. This is important in any intensive feeding programme (e.g. veld finishing). Calculations should be made beforehand and all the necessary food be purchased at once.

### 4.2 Environmental factors

- Heat causes lower intake of food
- Cold causes higher intake of food

### 4.3 Animal-based factors

- **Breed**  
European breeds have a higher intake of roughage than zebu breeds, but zebu breeds digest roughage more effectively.
- **Weight**  
Heavy animals have a larger digestive tract and the intake is higher.
- **Age**  
Old animals tend to be discouraged earlier in times of shortages of feed (drought).
- **Condition**  
Fat animals need less food for maintenance and excessive internal fat limits rumen capacity.

- **Production status**  
Lactating animals will have a higher intake to fulfil their needs.
- **Grazing**  
Maintenance needs of grazing animals are substantially higher compared with those of feedlot cattle. In a way, higher intake compensates for this, but primarily this is compensated for by lower production.

Intake of veld grass varies substantially according to the abovementioned factors, thus mainly according to the time of the year. Trials show variations between 2 % of body mass per day dry matter intake in late winter and 5 % in the rainy season. It is obvious that this has a tremendous influence on production.

## 5. The nutritive value of Namibian veld throughout the year

When balancing feeds for animals under controlled circumstances, the known needs of the animals are satisfied by mixing various feedstuffs of which the nutritional values are known until a balanced ration is reached.

Table 2: The nutritional value of Namibian veld during various seasons

AREA	RAINY SEASON				DRY SEASON				Ref.
	Protein %	TDN %	Ca %	P %	Protein %	TDN %	Ca %	P %	
West of Otjiwarongo	3,72	58	0,31	0,11	3,20	43	0,51	0,16	1
Okahandja/Omaruru/Karibib	3,80	56	0,29	0,08	2,90	46	0,56	0,20	1
Khomas Hochland	3,65	62	0,38	0,14	3,40	44	0,60	0,39	1
West of Rehoboth	4,20	61	0,39	0,22	3,38	49	0,60	0,38	1
Northwest of Maltahöhe	4,72	63	0,40	0,22	4,20	41	0,52	0,28	1
East of Otjiwarongo	3,90	67	0,34	0,15	3,05	42	0,35	0,17	1
East of Okahandja/Hochfeld	3,85	55	0,28	0,12	3,16	39	0,37	0,18	1
East of Windhoek	3,70	61	0,21	0,14	3,60	44	0,28	0,19	1
Windhoek	4,02			0,13	1,00			0,08	2
East of Rehoboth	4,15	61	0,41	0,22	3,75	44	0,49	0,27	1
Mariental sandy terrain	2,21			0,10	1,17			0,082	2
Grootfontein tasty veld	3,30			0,048	0,05			0,01	3
Grootfontein less tasty veld	1,50			0,027	0,05			0,01	3
Okakarara	3,52	58	0,21	0,10	2,86	38	0,29	0,12	1
Northwest of Gobabis	3,41	56	0,31	0,13	3,10	39	0,34	0,16	1
Leonardville	3,90	52	0,30	0,13	3,65	39	0,31	0,15	1
Stampriet calcrete	4,30			0,05	3,71			0,05	4

If it is considered that a balanced cattle ration normally contains 9 to 11 % protein, ± 65 % TDN (total digestible nutrients – an expression of energy content), 3 to 4 % phosphorus and 7 to 9 % calcium, it is obvious that unselected veld virtually never provides for the needs of the animal. Animals, however, are able to select a diet that is much higher in nutrients (specifically protein), if permitted to do so.

The problem with veld grazing is that:

- variations from one place to another are tremendous;
- variations appear between years (good season/poor season).

Computer balancing, as for feedlot conditions, is not possible. It should also be considered that animals graze selectively, which cannot be achieved with clippings that are analysed in the laboratory. Thus, the farmer is dependent on a few very broad rules, good observation of his cattle and possibly, information from veterinarians and fellow farmers regarding specific mineral shortages in certain areas.

Generally spoken, in the rainy season most nutrients are abundant in all parts of Namibia. In the dry season, protein is the limiting factor as is the fact that intakes tend to be low. These are both addressed by feeding urea licks. Phosphorus tends to be in short supply in all parts of Namibia for the biggest part of the year.

When weight gain or finishing of cattle in the dry season is to be achieved, mainly energy (with protein) needs to be supplied.

It is common practice amongst many farmers to include pods (especially camel-thorn or prosopis) in licks and feeds. This can be recommended, if these pods can be obtained at a fair price. Make price comparisons per unit protein or energy and not per kilogram or per bag.

Camel-thorn pods milled: 8 % digestible protein, 60 % TDN

Prosopis pods milled: 17 % digestible protein, 72 % TDN

Keep in mind that camel-thorn pods contain prussic acid, especially when green, which might lead to poisoning if fed in too large amounts. Consult an animal nutritionist on quantities that can be included with safety.

## 6. Supplementary feeding

### 6.1 To supplement shortages

The paragraph above has touched on this subject. In summer, some phosphate should be supplemented. As phosphates have a bad taste, some salt and energy, which are tasty, are supplied with the phosphates to ensure intake. Various products, which are all good, are on the market.

In winter (the dry season), protein is in short supply and a problem of low intake is experienced. Both these problems can be addressed by the supply of non-protein nitrogen like urea or mono-ammonium sulphate. To improve the working of these products in the rumen, some natural protein and some fast-available energy (sugars or grains) should be included as well. It is also not wrong to include some phosphorus for lactating and late-pregnant cows. Some sulphur (included in ammonium sulphate, but not in urea) should be supplied to facilitate the production of sulphur-containing amino acids. Sulphur also serves as buffer for plant poisonings, which tend to occur in spring and early summer.

Care should be taken when feeding urea or other non-protein nitrogen. These products are actually fertilisers. The microorganisms in the rumen need time to adapt. Thus, feeding a urea lick should start slowly (less urea in first batches). Because the microorganisms adapt to urea, this lick should be available every day. Feeding any lick on an irregular basis is a waste of money. Urea is highly soluble in water. Care should thus be taken

during early summer rains. Animals might drink the water accumulated in a lick trough and die as a result of an over-dosage of urea.

*Professional advice might be necessary, especially when engaging in an intensive feeding programme. Consult an animal nutritionist. The person at the till of the cooperative or feedstuff dealer is not always the appropriate person.*

### 6.2 To increase/decrease intake

The function of urea to increase intake of veld grass by ensuring a faster passage of grass through the digestive channel, has been discussed. A problem is to balance the intake of supplementary feeds. Intake can be increased by small amounts of salt or by the inclusion of tasty sources of energy (molasses).

Intake is decreased by the inclusion of large amounts of salt, but can also be achieved by means of mechanical measures (a grit in the lick trough, lick in block form, etc.).

It is interesting to note that throughout Namibia more or less the same nutrients are in short supply. This suggests that the same licks can be used throughout the country. Differences will occur when a change between summer and winter lick has to be made, as this is dependent on when the rains start and stop. Furthermore, lick intake will vary very much between different areas. The reasons are obvious when the nutritive values of veld in various parts of the country are studied.

Thus, when green veld is available, the use of a summer lick is suggested. Commercial summer licks are available as a P 6 (6 % phosphorus) ready-mix and a P 12 (12 % phosphorus) premix, which has to be mixed with salt.

Various winter licks are available for the dry period of the year. Some ready-to-use licks (eco-maintenance lick and maximaintenance lick) are available, but concentrates which have to be mixed with salt before use are on the market as well (dry-veld concentrate). The latest additions include concentrates which have to be mixed with salt and urea, with the possibility of including meal of camel-thorn pods (cattlemix).

For areas with edible bush, licks with special ingredients to assist with the digestion of bush are available (bosverteer). These ingredients are also available as an additive for the drinking water for animals (browse plus).

All the abovementioned products have been formulated for Namibian circumstances and include all the necessary nutrients. It is very important to follow the mixing instructions where applicable and to feed licks **every** day.

It has been mentioned that imbalances of minerals (especially trace minerals) can cause problems. Although all licks mentioned include a mineral premix, which should address this problem efficiently, the possibility exists to inject the most important trace minerals (various multimin products). Consultation with a veterinarian is recommended before use.

### 6.3 To finish cattle for the market

Veld finishing of slaughter oxen might be worthwhile to deliver the type of animal that is in demand at a time when market prices are high due to a lack of slaughter cattle in the market. This should, however, only be aimed at feeding up to the right grade (fat deposition) rather than feeding for a heavier carcass.

These rations are high-energy rations and intakes of 1 to 2 % of body weight daily over periods of 45 to 90 days are recommended. With such a programme, factors like trough space (discussed under handling facilities) become important. It is advisable to purchase all feed needed at one stage to avoid being forced to change to another ration during the feeding period (veld finisher meal or pellets, beefpro 50 or super-finishing lick).

### 6.4 To cope with drought

Cattle are bulk feeders. This means that large amounts of roughage are needed to provide for their needs. As droughts in Namibia are unpredictable in terms of when they will occur and for how long they will carry on, it is seldom wise to invest in feeding programmes. Good veld management and a conservative stocking rate is the best possible drought management practice. Products are available to feed cattle in a feedlot if it is necessary to do so (possibly until they are ready for slaughter).

#### Example of licks

##### Summer lick

P 6  
P 12 + salt

##### Winter lick

Ecomaintenance lick  
Maximaintenance lick  
Dry-veld concentrate + salt  
Cattlemix + urea + salt (+ pods)

##### Veld-finisher

Veld-finisher meal  
Veld-finisher pellets  
Super-finishing lick  
Beefpro 50 + maize  
Beefpro 17

## CHAPTER 7 Record-keeping

In this chapter, various records which might be helpful when selecting animals, are discussed.

### 1. Importance of record-keeping

Records of animals are kept to identify animals with superior genes and to eliminate less productive animals in time.

A record system should only include data which can be used. There is no sense in the purposeless collecting of data. As the needs of each farmer differ, the records below are to be regarded as a guideline only.

### 2. Records to be kept

#### 2.1 Mating register

Each year, prior to the breeding season, a list should be compiled of which cows are to be mated with which bull/bulls.

- Inbreeding can be prevented.
- Fertility of bulls can be controlled.
- The breeding value of a bull can be monitored.

#### 2.2 Kraal book

It is handy to have a pocket notebook at hand during the calving season to note all the necessary information on calves born in the stock pen. It might be a good idea to have a copy of the mating register available during that time. The following should be recorded:

- Calf number
- Date of birth
- Mother number
- Father
- Birth weight (optional)
- Sex

#### 2.3 Calving register

Information of the kraal book is carried over to the calving register. The purpose of this register is to determine what happens to each calf and includes the performance of the animal, whether it was used for further breeding and/or slaughter results.

## 2.4 Cow register

For each heifer selected as a replacement heifer, a cow card/cow register should be opened. This card should show performance of the breeding, production and reproduction of each female in the herd.

It must be mentioned that all these are basic data. Much more data can be collected, and analysing (of the basic data and extended data) can be done by systems like the performance testing scheme (out-dated) or breed plan. Farmers should be thoroughly informed before engaging in such sophisticated systems to be sure that the correct data are collected in the right way.

## 3. Evaluation of records

### 3.1 Evaluation of the cow herd

It must be noted that no comparisons of different herds are possible with normal records. The impact of the environment has to be taken into account. BLUP (best linear unbiased prediction) offers a possibility to do so, but only if the same sires have been used in different herds (bench mark bulls).

Much has been said about the evaluation of various cows in the cow herd under the subject of selection.

- Regular calving is the most important trait to be evaluated. If a problem is experienced, the various weights (after birth, at the beginning and end of the breeding season and weight at weaning) might help. Some cows give everything to their calves, but lose so much weight that they do not get pregnant again, whilst others wean very light calves, but get fat while lactating. Both are unwanted.
- Performance of offspring. Some cows tend to produce calves which perform well below average regularly. This is unwanted. On the other hand, some cows might produce good growers, but none of their offspring is ever selected for further breeding. For a stud breeder, this might be a reason to replace such a cow.

In general, a cow that calves every year and produces a good weaner (weaning weight average to above average) is the cow that should be kept in a commercial beef herd.

### 3.2 Postwean growth

After fertility, growth is the second most important trait in a beef herd. The breeding aim and production system must be taken into consideration when a decision is made about what growth data are to be considered. A heavy weaner is of importance to the weaner producer, whilst an ox producer might be happy with a lighter weaner, which shows good growing abilities from weaning onwards.

Please refer to the section on selection to add to this subject.

Any market-orientated cattle farmer (one who farms to make money) should eventually be able to calculate his total production (kilogram live mass produced per hectare per year) and the effectiveness of his production (production percentage – kilogram live

mass produced per kilogram stocked per hectare over the period of one year). The record suggested above should assist in identifying shortcomings in the production system.

**It serves no purpose to keep any records if they are not used.**

## 4. The FAN Meat scheme

The FAN Meat scheme is a traceability scheme implemented in Namibia to satisfy the demands of the end-user of every piece of meat. This is to ensure that cattle are raised, handled and slaughtered according to the demands of the end-user.

These demands place the following rules and regulations on the Namibian cattle producer:

- No carcass meal, blood meal or bone meal included in rations.
- No growth stimulants.
- No poultry manure in rations.
- Natural conditions for animals to grow up.
- Transport as short as possible with enough space on lorry.
- No foot-and-mouth disease vaccinations.
- Stock inspections once a year.
- Records of all treatments, vaccinations and feeds fed (animals treated with prescribed veterinary drugs need to be identified (Fan Meat tag).
- Strict adherence to withdrawal periods of any administered drug before sending any animal to an abattoir.
- Records of all births, deaths and movements.
- Stock brands as a means of group identification.
- Animal-friendly handling facilities.
- Ample drinking water and grazing.
- No leaking reservoirs and troughs.
- Traceability.

The objective of the traceability system is to enable individual tracing of any piece of beef on the plate of the consumer worldwide back to the animal's place of birth. To be able to do this, all animals that are moved must be tagged with a special ear tag. The procedure is as follows:

- Order tags well in advance. Each tag shows the registered stock brand and a serial number.
- Affix the tags to the left ear of any animal that moves from the farm. This tag remains the animal's ID for the rest of its life.
- Details of all animals to be moved have to be recorded in a departure register. A movement permit is invalid without the attached departure register.
- The receiver of cattle records all animals received in the arrival register and returns the permit with the attached departure and arrival register to the veterinary office.
- Any tagged animals that die need to be reported to the veterinary office by means of a termination (death) register.

The FAN Meat ear tag is not a substitute for the stock brand. These still have to be applied in the prescribed sequence by various owners.

# CHAPTER 8

## Marketing of Beef Cattle

Various means of marketing cattle exist in Namibia. This chapter discusses:

- the functions of the Meat Board;
- marketing to the abattoirs;
- marketing at auctions;
- the function of the livestock agent in the marketing process.

### 1. The Meat Board

The Meat Board is a statutory body and is financed by levies on animals slaughtered or exported. Some important functions are the following:

- Managing the FAN Meat traceability scheme.
- Industry development.
- Industry planning.
- Market development (advertising locally and in foreign countries).
- Market access (negotiating trade agreements for meat).
- Market information (to producer and user).
- Livestock marketing (ensuring that minimum standards are adhered to and that all producers have access to the market).
- Livestock production (promoting effective livestock production by supplying statistics)
- Import and export control (in accordance with legislation).
- Meat standards and hygiene (ensuring that meat is classified – graded – and that minimum hygiene and quality standards are met for import and export).



Photograph by Pieter Hugo

### 2. Marketing to formal abattoirs and local butchers

#### 2.1 Contracts and merit points

While marketing to local butchers is entirely dependent on agreements which can be reached between the butcher and the producer and is only regulated by national and municipal health regulations, marketing to formal export abattoirs is more regulated.

- **Contracts**

The function of quotas to be allowed to slaughter at local export abattoirs has been greatly substituted by a contract system at export abattoirs. Producers enter into an agreement with the abattoir in advance to deliver certain numbers of cattle at certain times. This makes planning for the abattoir possible and the producer is rewarded by a bonus if the contract is completed.

- **Merit points**

The merit point at export abattoirs ensures the producer of market access in times of oversupply. The merit point is calculated according to the following:

If a contract was signed;

If the contract was completed;

Distribution of deliveries to the abattoir for the last three years.

In good rainfall years the merit point is of little value to the farmer, but it becomes very important when a drought hits the country and everybody wants to have cattle slaughtered in April, May and June. With such a scenario, farmers with the highest merit point will get preference access to have their cattle slaughtered.

#### 2.2 Which cattle are most sought after?

The preference of private butchers varies according to the specific market and type of processing in which he is engaged. Fat old cows are often required for polony processing.

The export abattoirs seek a young animal (A, AB or early B grades – up to four permanent incisors) with little subcutaneous fat and a carcass mass of 260 kg.

#### 2.3 The function of the livestock agent

Livestock agents offer their services for marketing to formal abattoirs. They ensure that:

- all the necessary documentation is available (permit, slaughter advice);
- a slaughter date is fixed at the abattoir;
- transport is arranged;
- there is representation on the slaughter floor. The agent should sort out any queries which may arise in the interest of his client.

It is not necessary to make use of an agent. A farmer can make his own arrangements and represent himself.

#### 2.4 Marketing at auctions

Auctions are a popular marketing channel and are held countrywide on a regular basis.

## 2.5 What cattle are sought-after and why?

It is obvious that this depends very much on the buyers present at an auction. Some local butchers might look for fat, old cows whilst some local farmers might want stores, which can be ready for the market on the veld in a fairly short time. The big buyers, however, seek weaners for feedlot fattening. They want:

- breeds which are known for a high feed-conversion ratio (kilogram growth per kilogram food consumed in the feedlot);
- lean calves;
- mostly oxen (heifers tend to fatten too early in the feedlot and come on heat which hampers growth);
- uniform groups of calves;
- properly dehorned and branded calves.



Photograph by Kiep Lepen

## 2.6 The function of the livestock agent

- The agent supplies the auctioneer at an auction.
- He receives, weighs, sorts and marks the cattle prior to the auction.
- He is responsible for the completion of all paperwork involved (FAN Meat registers, permits, invoices).
- He despatches sold cattle according to the instructions of the buyer after the auction.
- He guarantees payment to the seller.

## 3. Stud cattle auctions

Stud cattle auctions offer bulls, heifers and sometimes old cows for further breeding.

## 3.1 Ordinary stud cattle auctions

At ordinary stud cattle auctions a breeder or various breeders of one or more breeds offer purebred cattle for sale. Most of these animals should be inspected by a breed inspector and found fit for further breeding. It is, however, up to the sellers to include cattle which are not registered as stud animals for some or other reason. This should be mentioned as such in the auction catalogues. The buyer of a registered animal should receive a registration certificate and a health certificate of that animal.

## 3.2 Auctions under the auspices of a breeders' society

With these auctions, the breeders' society involved takes a certain responsibility in respect of the quality of cattle which are on sale. Only registered animals are on offer and all animals have been inspected again prior to auction. The buyer can thus be sure that the cattle on offer are of outstanding quality.



Photograph by Kiep Lepen

## 4. Private sales

Private sales of stud and commercial cattle are another popular way of doing business. Many buyers of stud cattle prefer this way for the following reasons:

- The animals are not overfed and can be viewed in veld conditions.
- The circumstances under which the cattle grow up can be observed.
- Personal contact with the breeder, which makes it possible to find out more about his aims and tactics when breeding cattle.
- This is often the only way to obtain fairly good female cattle from a stud breeder.

Concerning commercial cattle, the reasons are more about price, transport involved and availability. Such sales can take place with or without the involvement of an agent. A livestock

agent charges commission for such a deal, but the buyer can make use of the agent's advice and have arrangements made by the agent whilst the seller is sure to receive his money.

When buying stud cattle privately, the buyer should make sure that the animals on offer have been inspected. (The registration certificate will show a date of inspection.) It must furthermore be understood that with such deals, animals will probably not (unless otherwise requested by the buyer) be tested for sexually transmitted and other diseases and no tests for fertility will have been conducted.



Photograph by Schalk Pienaar

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# Large Stock Management Programme

MONTH	WEEK	MANAGEMENT	
Jan.	1	a Collect dung monsters to have analysed for internal parasites b Decide on changeover to summer lick and fast rotational grazing c Wean winter calves	
	3	a Summer breeding season starts on 15 January b Last summer calves are born	
	4	a Breeding season for heifers stops on 31 January	
Feb.	1	a Dehorn 2 <sup>nd</sup> group of summer calves	
Mar.	1	a Vaccinate summer calves against anthrax, botulism and blackquarter	
Apr.	1	a Decide on changeover to winter lick and slower rotational grazing	
	2	a Summer breeding season stops on 15 April b Vaccinate summer calves (2 <sup>nd</sup> ) against botulism and blackquarter c Vaccinate summer heifer calves against brucellosis d Vaccinate all adult cattle against anthrax and botulism e Vaccinate all cattle younger than 4 years against anthrax, botulism and blackquarter f Have bulls tested for sexually transmitted diseases and fertility g Collect dung monsters to have analysed for internal diseases h Weigh all cattle to determine biomass stocking rate i Winter calving season starts j Pregnancy diagnosis of heifers	
	May	1	a Determine carrying capacity of farm and compile grazing budget b Plan for bull purchases
	Jun.	2	a Compile breeding herds for winter breeding season b Vaccinate winter breeding cows against bovine viral diarrhoea
		3	a Pregnancy diagnosis summer breeding herd b Brand all summer calves c Last winter calves are born
		Jul.	1
	3	a Wean summer calves b Winter breeding season starts on 15 July c Decide on vaccination of vitamin A	
Aug.	1	a Vaccinate winter calves against anthrax, botulism and blackquarter	
Sep.	2	a Winter breeding season stops 15 September b Vaccinate winter calves (2 <sup>nd</sup> ) against botulism and blackquarter c Vaccinate winter heifer calves against brucellosis d Have bulls tested for sexually transmitted diseases and fertility e Heifers start calving f Decide on vaccination of vitamin A g Vaccinate against anaplasmosis and lumpy skin disease	
	Oct.	2	a Summer calving starts
	Nov.	2	a Select breeding heifers for breeding season b Vaccinate breeding heifers against bovine viral diarrhoea c Pregnancy diagnosis winter breeding herd d Decide on vaccination of vitamin A
		Dec.	1
2		a Breeding season for heifers starts on 15 December b Compile breeding herds for summer breeding season c Vaccinate winter breeding cows against bovine viral diarrhoea d Vaccinate all bulls against bovine viral diarrhoea ( <b>only inactivated live virus</b> )	