LEARNER GUIDE

LIVESTOCK PRODUCTION PART 5

Manage a Feedlot

Course Name	National Diploma: Animal Production NQF 5 (249 Credits) SAQA ID: 49011
Module Name	Module 6: Livestock Production V Learner Guide
Module Code	12600
Unit Standards	116649
NQF Level	5

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Dear Learner

This Learner Guide contains all the information to acquire all the knowledge and skills leading to the unit standard:

Unit standard ID:	Unit standard title:
116649	Control feedlot production unit

You will be assessed during the course of your study. This is called formative assessment. You will also be assessed on completion of this unit standard. This is called summative assessment. Before your assessment, your assessor will discuss the unit standard with you.

It is your responsibility to complete all the exercises in the PoE Workbook. The facilitator will explain the requirements of each exercise with you. You will also be expected to sign a learner contract in your assessor guide. This contract explains responsibility and accountability by both parties.

On the document "Alignment to NQF", you will find information on which qualification this unit standard is linked to if you would like to build towards more credits against this qualification.

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KEY TO ICONS

	Individual **Formative** Assessment: These activities have to be completed individually in the PoE workbook.
	Group **Formative** Exercise: These activities have to be completed as a group in the PoE workbook.
	Summative Assessment: This icon indicates that the learner must complete the summative exercise in the PoE workbook.
	Important Information: These notes highlight key pointers

ALIGNMENT TO THE NQF

Element of Programme	
1. Name of programme	Livestock Production - Feedlots
2. Purpose of the programme	Form part of the qualification to equip learners with skills in Managing Livestock Production
3. Duration of the programme	6 days of formal facilitation; 320 notional hours
4. NQF level	5
5. NQF credits	32
6. Specific outcomes	See Unit Standard Guide
7. Assessment criteria	See Unit Standard Guide
8. Critical cross-field outcomes	See Unit Standard Guide
9. Learning assumed to be in place	See Unit Standard Guide
10. Essential embedded knowledge	See Unit Standard Guide
11. Range statement	See Unit Standard Guide
12. Recognition of Prior Learning (RPL)	RPL can be applied in two instances: • Assessment of persons who wish to be accredited with the learning achievements • Assessment of learners to establish their potential to enter onto the learning programme.
13. Learning Materials	Learner Guide, Assessor Guide, Facilitator guide, Learner PoE Workbook, US Guide

14. Links of the programme to registered unit standards, skills programmes, or qualifications	Registered qualification: Title: National Diploma: Animal Production ID: 49011 NQF: Level 5 Credits: 249

LEARNING UNIT 1

ESTABLISH A FATTENING UNIT

Learning Outcomes:
• Understand the definition of a feedlot or fattening unit • Understand the beef lifecycle • Understanding production cycle • Understand feedlot profitability • Understand how feedlot management impact on profit margins

Definition of a Feedlot or Fattening Unit

A fattening unit (feeding lot) is an enclosure (confinement, pen or kraal) in which underweighted animals are kept and provided with adequate amounts of feed and water until they reach the market ready weight for slaughtering.

The main purpose of a fattening unit is to achieve maximum growth (average daily gain) with minimum costs. This is achieved by getting the feed intake as high as possible through the constant provision of good quality feed.

BEEF LIFECYCLE

1. On cow-calf farms and ranches, cows are bred and give birth to a calf each year.

2. For the first few months of life, calves drink their mother's milk and spend time grazing on grass pastures.

3. Calves are weaned from their mother's milk when they are about 8 months old and weigh approximately 227 kg. Calves then move onto pastures where they eat grass and forages that are indigestible to people.

4. Many calves are purchased at livestock auction markets by farmers and ranchers. Some of the calves, including about one-in-three female calves, are kept on the cow-calf farm as breeding animals.

5. Farmers and ranchers and backgrounders graze cattle on many different kinds of pastures. These cattle gain weight and in effect, convert forage and grass into protein.

6. The cattle are then sold or moved to feedlots where they receive a carefully balanced, grain-based diet.

7. Beef cattle are harvested in modern processing facilities or packing plants where skilled workers break down beef carcasses into popular beef cuts.

8. Beef from the packing plant is sent to supermarkets and restaurants worldwide. South Africa's current annual average beef consumption of about 700000 tons, second after chicken consumption of about 1,7 million tons, is likely to increase by about 25% by 2020.

9. Beef provides high quality protein and 10 essential nutrients to diets in South Africa and around the globe.

Feedlot Production Cycle

Intake

Processing of incoming cattle is the collection of procedures and treatments given to cattle as they are worked in the chute and cattle squeeze. It is the first opportunity at the feedlot to impact on the health and performance of the cattle. Many successful processing strategies have been developed to reduce disease and promote the health and performance of incoming cattle. Unfortunately, processing often takes place at the busiest time of the year in the feedlot and since it is repetitious, it is sometimes delegated to the least experienced workers. Careful attention to details and the adoption of a good processing program can get incoming cattle off to a successful start in the feedlot.

Pre-Condition

Preconditioning is the preparation of feeder calves for marketing, shipment, and the feedlot environment; it may include vaccinations, castration, and training calves to eat and drink in pens. The concept of preconditioning is based in part on immunologic and nutritional principles. Preimmunization, or vaccination of calves 2 – 3 weeks before shipment from the ranch to the feedlot, was the basis of preconditioning. In addition to vaccination, more recent efforts have been directed toward increasing the number of days weaned before movement and improving management procedures on the ranch, such as genetic selection and nutrition that assist calves in making an easier transition to the feedlot.

Preconditioning has been defined by the following elements:

- Weaning at least 30 days before sale
- Training to eat from a feed bunk and to drink from a tank
- Parasite treatment
- Vaccination for blackleg, malignant edema, parainfluenza 3, infectious bovine rhinotracheitis, bovine viral diarrhea (some programs also call for vaccination against *Mannheimia haemolytica*, *Pasteurella multocida*, and/or *Histophilus somni*)
- Castration and dehorning with wounds healed
- Identification with an ear tag, and
- Sale through special auctions.

When preconditioned calves are placed in a feedlot, they usually begin to eat and drink on arrival; if they have not been subjected to unusual stressors, the incidence of disease is minimal. Because these cattle generally go onto feed more easily than calves that have not been preconditioned, care must be taken not to increase intake too quickly and cause digestive concerns.

Transportation

Transportation or shipping of cattle has long been associated with increased bovine respiratory disease (BRD) in the feedlot, hence the term “shipping fever.” With current improvements in transportation, however, there is no correlation between the distance cattle are shipped and the risk of fatal fibrinous pneumonia in the feedlot. Factors such as weaning, level of immunity, commingling, and other stressors appear more important in the risk of bovine respiratory disease (BRD) than distance shipped.

Cattle can lose considerable weight within the first 24–48 hr. after weaning, during shipment, and after deprivation of feed and water. This loss in body weight (known as shrink) varies from a minimum of 4% in cattle deprived of feed and water for 24 hr. to up to 9% in animals transported long distances over a period of 2–4 days or in unweaned, high-risk, lightweight calves. Most of the fluid and electrolyte loss can be restored within a few days if the animals begin to eat and drink normally, but some studies show as few as 35% of high-risk calves consume an appreciable amount of feed the first

24 hr in the lot. Shrink >7% has been associated with increased health problems. The total loss in body weight may not be restored for as long as 3 weeks in some highly stressed calves.

Transportation equipment and facilities should meet local standards and be able to transport cattle comfortably regardless of the season of the year. Some countries prohibit the transport of cattle over a certain length of time without unloading for rest, feed, and water. On arrival at their destination, cattle should be examined carefully for evidence of clinical disease or injury. Provision of fresh hay, a small amount of starter feed, and water can help detect those that are anorectic and require closer examination. This is particularly important if unexpected delays in transportation have occurred that increase the level of stress in the animals.

Assessment

Cattle arriving at the feedlot are usually tired and uncomfortable in their new surroundings. It is important they are fed and watered as soon as possible with good quality hay and fresh drinking water. Disease can occur soon after arrival in the feedlot and most of the Bovine Respiratory Disease (BRD) cases which die will get sick first during 2 weeks post arrival. Fall weaned calves purchased in auction markets often break with disease in the first few days after arrival and the peak number of treatments in a group can be as early as 7 days after arrival. It is obvious that some of these calves are already sick when they arrive at the feedlot. Finding these sick calves in the feedlot pens during the first few days is difficult, because the calves have not settled in yet and most of them are not eating properly.

These high-risk calves can be checked for early signs of disease during processing by checking their temperature with an electric thermometer. A cut-off temperature can be set (often 40.0°C), and any calf with a temperature greater than the cut-off temperature can be treated as shipping fever. Treatment records should be started for these animals at this time. In one feedlot, calves with temperatures greater than 40.0°C on arrival had approximately 9 times the chance of dying and 2 times the chance of being pulled for treatment when compared to calves that had temperatures less than 40.0 C. Early identification and treatment of these sick calves is the best procedure to reduce BRD losses. Other disease problems should be noted at this time and treatment initiated. Groups of incoming calves with many animals with high temperatures should be investigated with the cattle buyer, to help identify potential problem sources of cattle.

Identification

During processing most animals are given some form of identification. Ideally all animals entering a feedlot should be individually identified. Hot iron branding is the traditional method of identifying the ownership of groups of cattle. However, branding does reduce the value of the hide and should be avoided if possible. Each animal must be identified immediately, preferably with a color-coded and numbered plastic ear tag that is easily visible from a distance. In many feedlots, each animal is not identified individually but instead receives a tag with a lot number (group) or pen number. Systems are now in place that individually identify animals with tags that can be read electronically from a distance of 20- 50 cm. Information maintained on individual animals through this technology may include performance, vaccination, and treatment history. These tags remain on the animal until slaughter, at which time the identification from the ear tag can be transferred to the overhead trolley system.

Dose and Dip

Dipping is essential, but many people question the need to de-worm animals arriving at a feedlot. A positive response to dosing is often not seen, possibly because many farmers dose their animals before selling them.

Measurement

On arrival at a feedlot it is good practice to group animals according to size and sex. Large animals tend to bully smaller animals and keep them away from feed troughs. Key details such as breed, age and weight are recorded. This information is used to identify cattle which have similar attributes, so they can be yarded together.

Vaccination

Vaccination helps animals build their own immunity to a disease. Animals will not build a full immune response for several weeks following vaccination. This delay in immune response is one reason that vaccines do not always work as well as they should in feedlot cattle. If cattle are purchased directly from the farm, a vaccination program on the farm (preimmunization) should be arranged before the cattle arrive at the feedlot. This will ensure that the cattle have had a chance to develop their immunity prior to being exposed to disease at the feedlot. If cattle cannot be immunized prior to arrival at the feedlot, they should be vaccinated at processing, so that they have immunity as soon as possible.

The exact vaccination program will vary with the type of cattle and the feedlot. Different disease problems occur in different areas and require different vaccination programs. Almost all types of cattle entering a feedlot are at risk of developing infectious bovine rhinotracheitis (IBR). The modified-live-virus vaccines for IBR give some protection following a single vaccination. Cattle kept for more than 90 days may benefit from a second vaccination around 90 days post arrival to ensure that they are protected for the duration of the feeding period. Intranasal and killed IBR vaccines are also available, but they do not give the same level of immunity, and they should only be used in the feedlot under special circumstances (7). Other viral diseases include bovine virus diarrhoea (BVD), bovine respiratory syncytial virus (BRSV) and parainfluenza-3 virus (PI3). There are many different vaccines and new vaccine information available. Your local herd veterinarian should be contacted to recommend the best vaccination program for your feedlot.

Castration and Dehorning

Castration of bull calves during the initial processing adds additional health risks and stresses to incoming cattle. It is better to wait until a later date when there are fewer other health problems. The newer rubber band or elastrator methods of castration can be used successfully at the time of initial processing but follow up is important when the scrotum drops off to assess swelling. Research shows that feed efficiency and performance drops during that time. Possible treatment with a long acting antibiotic may be necessary to reduce the stresses of castration at the time when the rotted scrotum falls off. Abortion programs for heifers can also be quite stressful and include additional health risks. These abortion programs are best reserved for later in the feedlot period when it is easier to pregnancy check the heifers, induce abortions and monitor their health.

Dehorning of horned cattle is the process of removal of their horns or the process of preventing their growth. A polled animal is one that grew no horns or one that was dehorned. Horned animals are a problem. Dehorning sets an animal back a great deal. Leaving animals with horns can lead to severe losses resulting from damage to other animals and bruising. It is best to refrain from buying in animals that have not been properly dehorned. Disbudding by chemical or hot-iron destroys the horn-producing cells of the horn bud. Surgical disbudding removes the horn bud and the horn-producing cells of the horn bud. Dehorning removes the horn and horn-producing tissue after horns have formed from the bud.

Anthelmintic and Insecticides

Anthelmintics and insecticides are administered according to local conditions. Most incoming cattle will have been exposed to internal parasites, and appropriate deworming methods should be implemented. Young cattle raised on small farms in which the stocking rate on pasture is high may harbour helminths. Young cattle may also be affected by chronic verminous pneumonia caused by *Dictyocaulus viviparus*. Most young cattle will be infected with coccidian and having an appropriate anticoccidial agent in the feed is necessary.

Metaphylaxis

Metaphylaxis is the term used for the mass treatment with a long-acting antibiotic to a group of animals. Both long-acting oxytetracycline and tilmicosin have been tested and shown to be effective when used at processing in feedlots. An analysis and review of many different trials supports the use of long-acting oxytetracycline and tilmicosin at processing for high risk calves. It is not known if these antibiotics are working through the early treatment of cases or by preventing cases from occurring. Although the cost of a metaphylaxis program can seem expensive, reduction in mortality, treatments and increased feed efficiency (tilmicosin) can make these programs cost effective. The decision to use a metaphylaxis program will involve estimating the anticipated cost of disease and performance reduction versus the cost of the metaphylaxis program. Consultation with your herd veterinarian may help you establish when a metaphylaxis program is most profitable in your feedlot.

On Going Management

The major objective on arrival at the feedlot is to get the cattle onto a high-energy diet—which will result in rapid growth—as soon as possible, usually within 21 days, while minimizing the morbidity and mortality associated with acute respiratory disease, other common infections, and digestive diseases associated with adjustments to high-energy diets.

Animals should be observed daily for:

- Signs of disease onset.
- Feed problems (for example, shy feeders).
- Failure to adapt to the diet.
- Bad ‘doers’ – it often pays to remove these animals.

Growth Promotion

Growth-promoting agents increase growth rate of animals without being used themselves to provide nutrients for growth. They are generally administered in small amounts—often via implants or in feed—to alter metabolism so the animal increases body tissues and grows more rapidly. They include antibacterial, antimicrobials, steroids (e.g., estrogens, androgens), and ionophores. They promote changes in composition, conformation, mature weight, or efficiency of growth, along with changes in the rate of live weight gain

Feed Adaption Introducing Cattle to Grain: Open Troughs (or Bunks)

Ruminants must always be adapted to a new feeding regime. Adaptation allows the microflora in the rumen to adapt to the new substrate they must grow on. This usually takes up to three weeks. When adapting livestock to high concentrate diets, this process is best done by a gradual increase in energy content of a diet. This is called an adaptation ration. With modern additives, such as the ionophores, the adaptation period is not as critical as it used to be. However, although most feedlots no longer make use of an adaptation ration, a good practice is to place animals on hay for a day or two before supplying the high energy ration. Initially the intake of the concentrate is best limited to 1 to 2 kg per day before animals are allowed free access. This also assists animals to overcome the stress related to transportation to the feedlot.

Cattle must have grain introduced into their diet gradually. A gradual introduction allows the rumen microbes to adjust to a grain diet thereby minimising the incidence of grain poisoning and laminitis. The following feeding program is a satisfactory method of bringing cattle on to a high grain diet. Cattle should be continually observed during this period for sickness and other health problems.

Period	% IN DIET	
	Grain and Additives	Hay
Day 1 to 4	20	80
Day 5 to 8	40	60
Day 9 to 12	60	40
Day 13 to 15	80	20

Period	% IN DIET	
	Grain and Additives	Hay
Day 16 –	final diet	

Feeding

It is desirable that cattle are fed at the same time each day to reduce the incidence of metabolic upsets. In wet weather, it may be necessary to feed two to three times a day to avoid feed spoilage/wastage.

It is important that cattle have feed in the troughs at all times. Empty feed troughs are a prime cause of grain poisoning.

Do not feed excessive quantities each day, as the feed may become stale. Try and judge the amount fed so that a little is left over each day. This ensures the cattle are not without feed.If you have to change grains during the feeding period, it is important that it is done over about a 14-day period. This is particularly important going from sorghum to barley, but not as critical for the reverse.

Introducing Cattle to Grain: Self Feeders

Grain intake can be restricted with self-feeders by initially using a narrow opening (for example, 12 mm) and then gradually raising the shutters over two weeks. Initial mixes are usually 50:50 grain and hay by weight, to assist the mixture to `flow'.

The following method for self-feeders has been used successfully in commercial feedlots.

Day	Diet
Day 1 to 4	Provide the starter diet in self-feeders with a narrow shutter opening. Hay is fed separately in racks. If necessary, place hay on top of the grain in the self-feeder trough to attract cattle to the grain.
Day 5 to 7	Gradually increase the daily intake of grain by opening the shutters.

Day	Diet
Day 8 to 14	Free access to the starter diet. If mixing your own diet, it is preferable to gradually increase the grain percentage of the diet over the next week.
Day 15 on	Free access to the final diet. It is optional as to whether hay feeding in racks continues.

Feedlot Profitability

Four distinct factors affect feedlot profitability:

- buying price of store cattle
- selling price of finished cattle
- cost of the diet
- cattle performance, as influenced by management.

Each factor is important and requires consideration. Feedlot management influences cattle performance through its effect on feed intake, weight gain and herd health. Feedlot margins are often marginal. This reinforces the value of checking the economics, securing contracts and selecting cattle which perform well and consistently meeting market specifications.

Profit Margins in Feedlots

Factors affecting the profit margin of a feedlot operation include the price margin, feed margin, management, cost of feed, buying price of feeders and selling price, which is usually quoted as a carcass price.

Price Margin

The profit or loss which the feedlot makes as a result of an increase or decrease in price from the time the animal is bought (the cost price) to the time the animal is sold (sale price), is called the price margin and is calculated as follows:

Price margin = Initial live mass X (sale price/kg - cost price/kg)

Price margin includes the difference between purchase price and selling price resulting from beef price fluctuations as well as improvement in carcass quality due to feeding. The feedlot cannot control price fluctuations and must therefore rely on a prediction of what prices will be when stock are sold at a future date. Making use of a positive price margin is what is commonly called speculation. Although profits are potentially high, risk is high and people lacking experience often lose money with speculation.

When buying livestock, most feedlots make use of the price per kg live mass for their calculations. They must therefore know the dressing percentage of the animal. Dressing percentage varies, and feedlots base the value they use on experience and knowledge of the type of animal and its body condition. Lean animals have a dressing percentage of 49%, which increases to as much as 60% at a high level of finish. However, at a fat score of 2 to 3, the mean dressing percentage varies from 54 to 56%.

Feed Margin

The profit or loss a feedlot makes as a result of live mass gain in relation to cost of feed consumed, is called the feed margin and is calculated as follows:

Feed margin = Live mass gain X (sale price/kg - cost/kg gained)

A feedlot can influence feed margin by ensuring, through good management, that optimal growth rates are achieved and by taking steps to obtain the best feed at the best price.

Other Expenses

Other expenses incurred by feedlot include the following:

- agents commission
- slaughtering costs
- carcass condemnations
- transport
- interest on capital
- salaries of management and labour

- machinery costs
- mortalities and veterinary costs (disease control, medicines, vaccinations, veterinarian) and pre-treatment (growth stimulants, dipping, dosing, vaccination)

Feedlots can improve production profit by manipulating some expenses, but others, *e.g.* agent's commission, are fixed. Mortalities must be monitored carefully to ensure that a high loss rate does not severely limit profits. A mortality rate of 1% to 2% is accepted as normal.

Feedlot Profit

The feedlot profit margin is a function of price margin, feed margin and other expenses. Adding these three together, indicates profit or loss for the period of time over which the calculation is made. Feedlot managers need to keep a close watch on feedlot profit, which is a very sensitive measure of the efficiency of management.

FEEDLOT MANAGEMENT IMPACT ON PROFIT MARGINS

The price paid for feedlot cattle or their initial value (cost/kg), is a critical factor affecting the profitability of a feedlot enterprise, especially when a small or negative feed margin exists. A positive feed margin can only be realized with high mass gains and a relatively low cost of feed. The cost of the feedlot ration relative to the beef price and live mass gain thus exerts a major influence on the cost of gain.

Because of the high proportion of energy required to ensure good feedlot performance, the cost of carbohydrate, which is usually included in most feedlot rations in the form of maize, hominy chop or one of the other grains, in relation to the beef price, is a significant factor deciding profitability of a feedlot enterprise. This is usually expressed by the ratio beef:maize price, which experience has shown must be more than 13:1 for feedlots to be profitable. Feedlots can make substantial profits when the beef to feed cost price ratio is favourable. Some of this profit must be held over to tide the enterprise over in a subsequent period, which is sure to come, when profit margins are negative.

Because average daily gain declines toward the end of the feeding period, where animals are fed for too long a period of time (are over-finished), a negative feed margin resulting in reduced profit margins is likely.

It can therefore be stated that management will have a major influence on the profitability of a feedlot enterprise. Management aspects that are important include:

- Ensuring that the right type of animal is bought at the right price and at the right time. In some larger feedlots, feedlot managers rely on the services of experienced buyers.

- The feedlot ration must be balanced in respect of nutrient content, must be matched to the type of animal fed and should be the most cost-effective ration available at the time of feeding. In most feedlots the manager achieves these goals by keeping records of animal performance and monitoring results. A nutritionist is usually employed to do the ration balancing because this is a highly specialized task requiring a great deal of time monitoring feed quality and costs of ingredients.

- The daily running of a feedlot is the major task of the feedlot manager. This includes care that feed bins are full all the time, that fresh water is available to the livestock continuously, that animals are processed and adapted on arrival and that animals are marketed when ready.

- Diseases can be a problem in a feedlot. The services of a veterinarian to advise on disease prevention and the treatment of sick animals is a cost well justified. The adage "prevention is better than the cure" is very true in feedlots.

LEARNING UNIT 2

INFRASTRUCTURE AND FEEDLOT PLANNING

Learning Outcomes:
• Identify the elements of a successful fattening unit • Understand the different types of fattening units • Understand feedlot design • Identify feedlot infrastructure • Implement a maintenance and repair plan • Understanding feedlot budgets • Understand what feedlot maintenance entails • Understand pen maintenance • Understand feedlot cleaning • Understand environmental protection programmes

ELEMENTS OF A SUCCESSFUL FATTENING UNIT

A successful fattening unit consist of certain aspects that ensure the optimal growth of the animals that are being fed:

Healthy Animals	The animals that are placed in the fattening unit must enter the unit in an optimal health condition. Upon entry the animal must be vaccinated against diseases such as pulpy kidney (Bloednier). Because the animals are kept in small enclosures diseases can spread very quickly and the animal's health condition must be monitored constantly through the entire process.
Adequate High-Quality Feed	The animal must be provided with adequate feed of the right quality to ensure an optimal intake and digestion of the feed. The higher the quality of the feed the better the results will be.
Adequate High-Quality Water	Water quality is often neglected in a fattening unit, although it plays a very important role. The animals must be provided with a consistent source of fresh clean water.
Adequate Shade and Feeding Space	The animals must be provided with shade to improve feed intake. There must also be enough feeding space so that the animals do not have to contest for the feed.
Clean and Dry Environment	The fattening unit must be cleaned out after each batch of animals. This will help to reduce the spread of diseases and minimize pest like flies which irritate the animals and restrain growth. The fattening unit must also be kept as dry as possible and therefore must be preferable be built on a slope.

DIFFERENT TYPES OF FATTENING UNITS

A large variety of fattening units can be found over the country. It ranges from small farm fattening units where the farmer feeds 5 – 30 lambs or cattle weaners on a time to large commercial feedlots with standings of up to 50 000 cattle at a time.

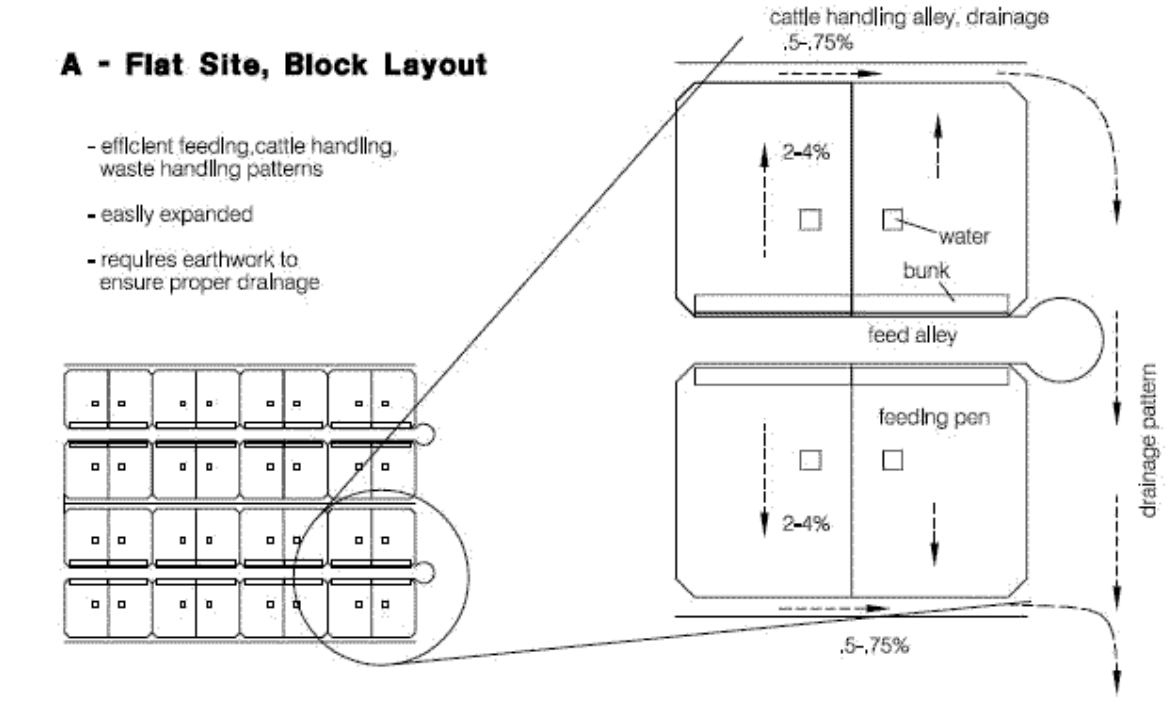
The small feedlots usually feed the animals about twice a day by hand, while the big commercial feedlots use automated machinery that automatically feed the animals every hour of the day and night.

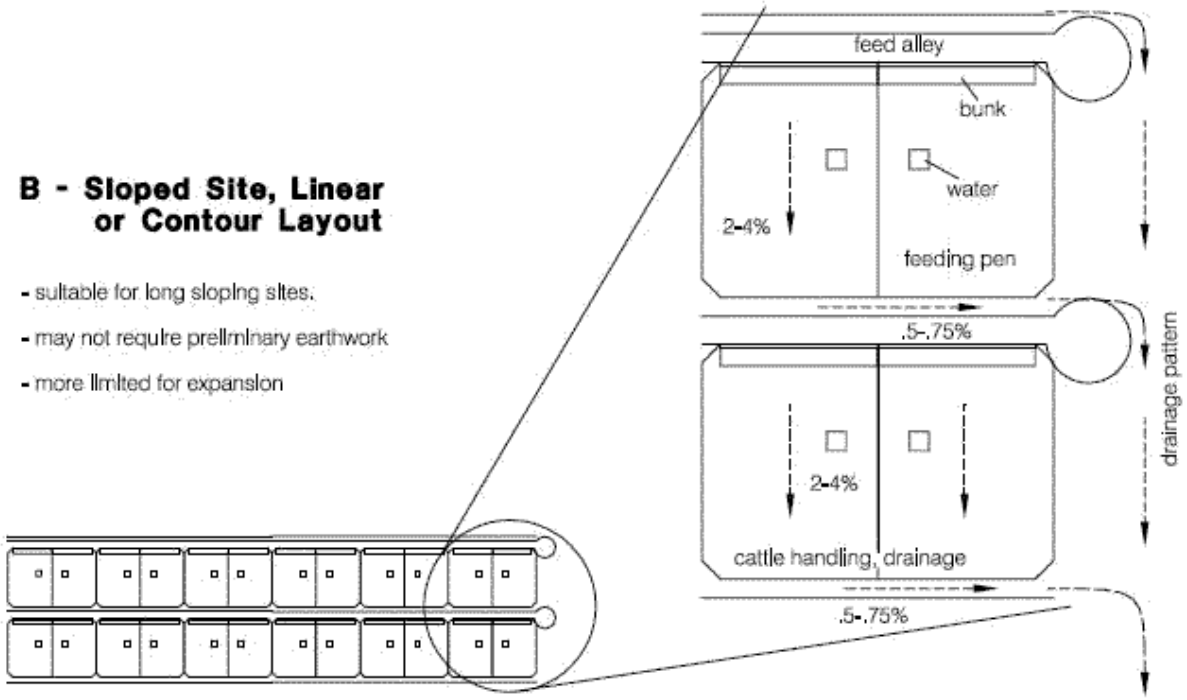
The commercial feedlots also use different type of growth promoters to achieve a better average daily gain, but because these products are very expensive their use in small fattening units are limited.

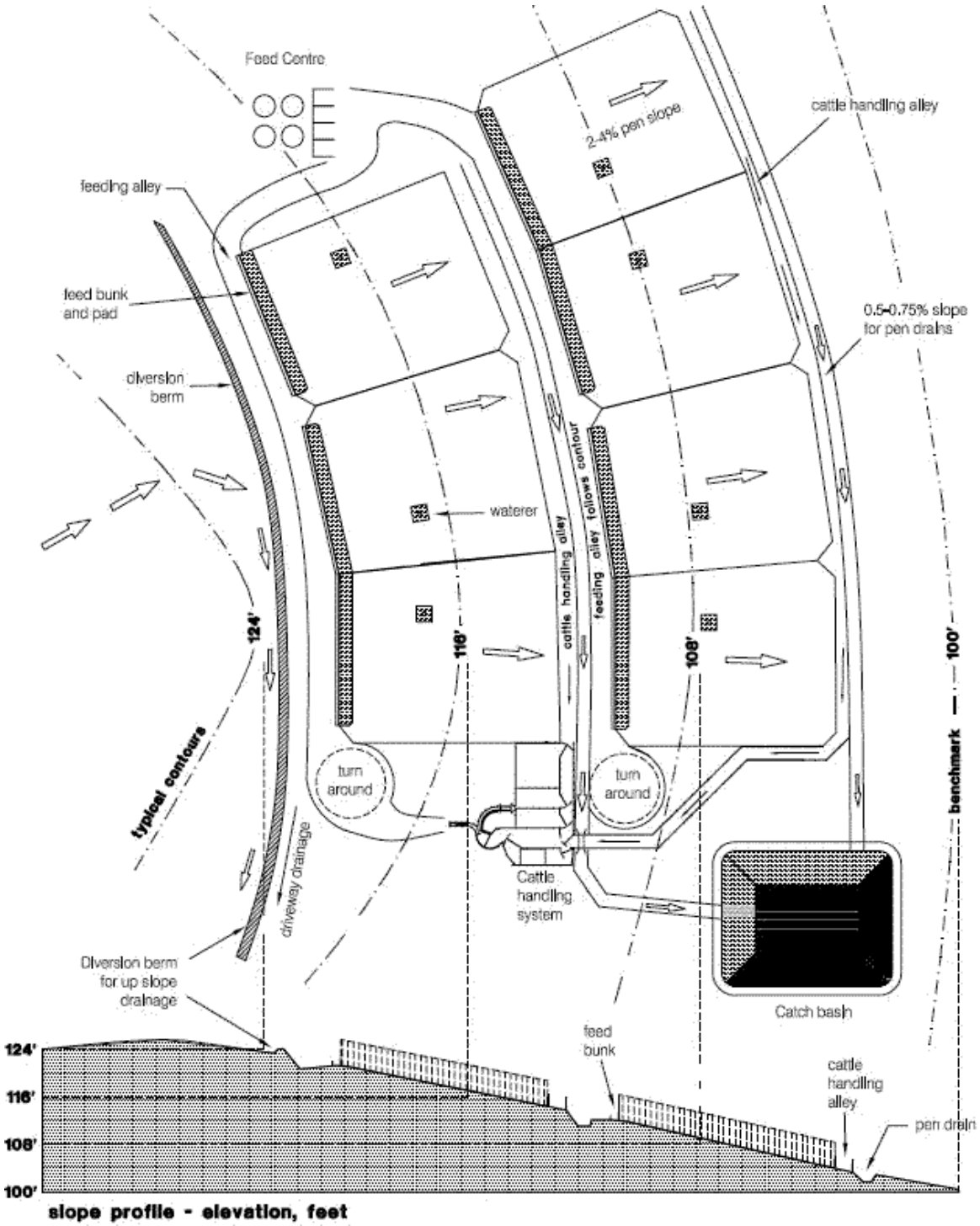
Feedlot Design Layout

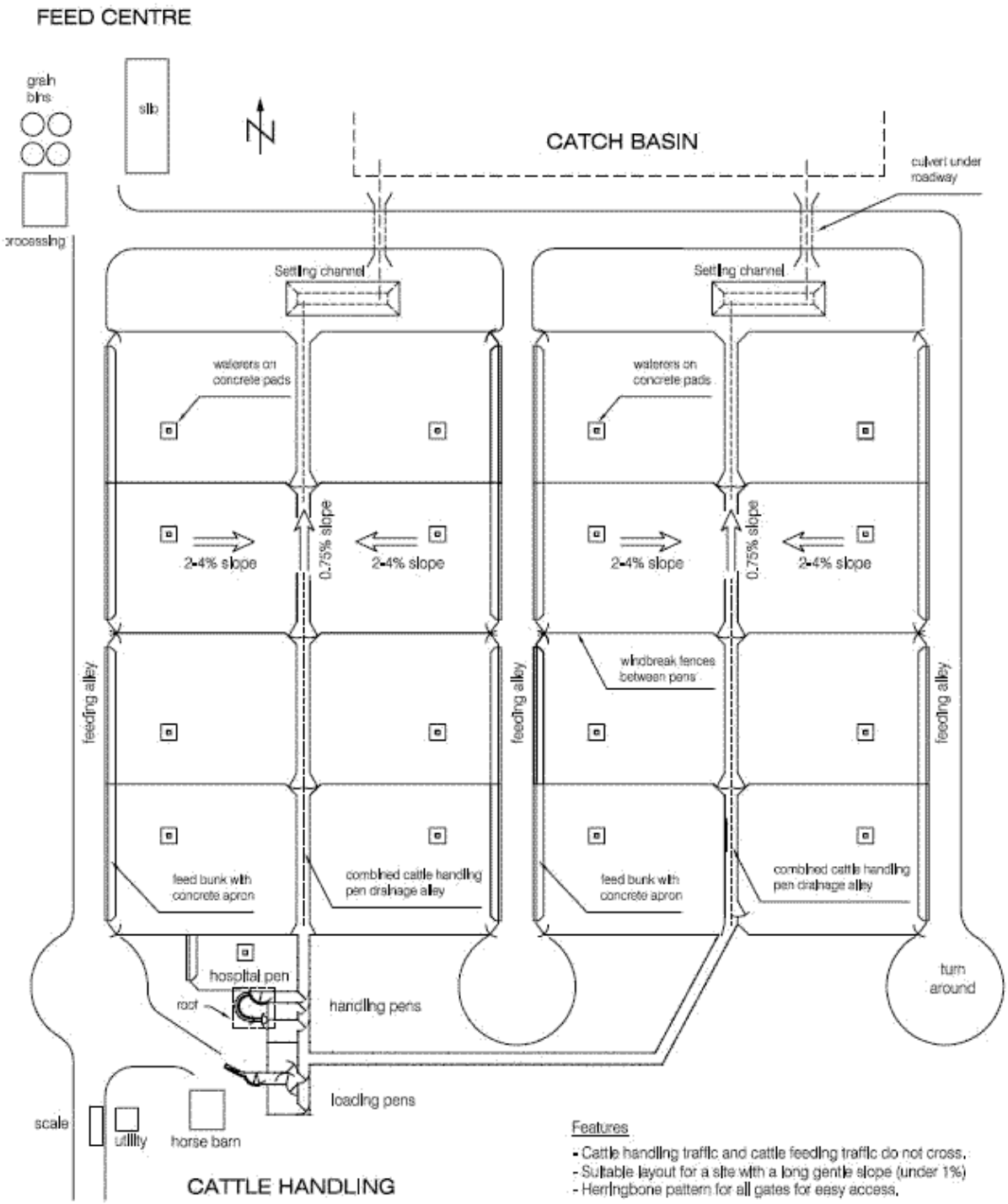
General design principles are:

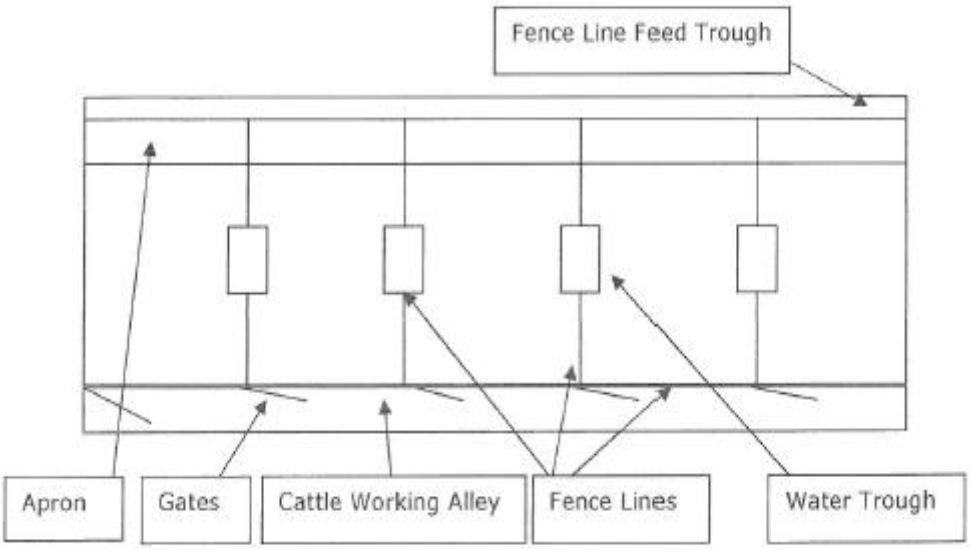
- To maintain clean, dry pens survey the site and do the earthwork to obtain a uniform 2 - 4% pen slope.
- Locate feeding pen runoff drains outside of the feeding pens. This makes the best use of pen area. Two options are to have combined cattle handling alley and drain or to have separate alleys and runoff drains.
- Design the runoff drainage system not to interfere with feeding roadways.
- Minimize interference between cattle handling alleys and feeding roadways. Feed trucks that have to wait for cattle to cross a roadway are not as efficient.
- Design all cattle alleys, feeding roadways, gates, and pen runoff drains so that flow is not restricted.
- Minimize travel distance for cattle, feed trucks and manure equipment, 25% less travel may reduce annual operating costs 6 - 10%.
- A single vehicle entry past an office and scale can improve security.
- Take care to engineer high quality road bases, good quality feed bunks and pads, and proper water system installation.





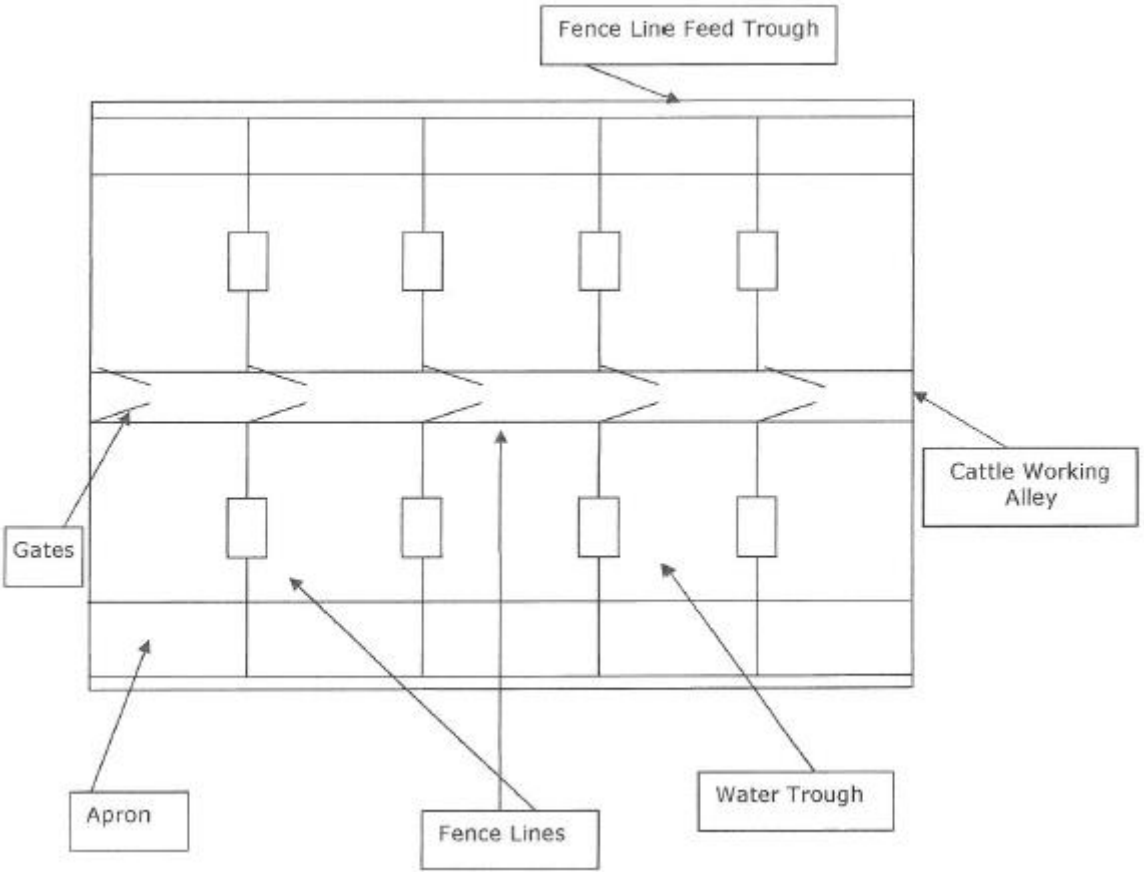

Feed Centre
feeding alley
feed bunk and pad
diversion berm
2-4% pen slope
cattle handling alley
0.5-0.75% slope for pen drains
waterer
cattle handling alley
feeding alley follows contour
124'
116'
108'
100'
benchmark
typical contours
turn around
turn around
Cattle handling system
Catch basin
driveway/walkway
Diversion berm for up slope drainage
feed bunk
cattle handling alley
pen drain
slope profile - elevation, feet



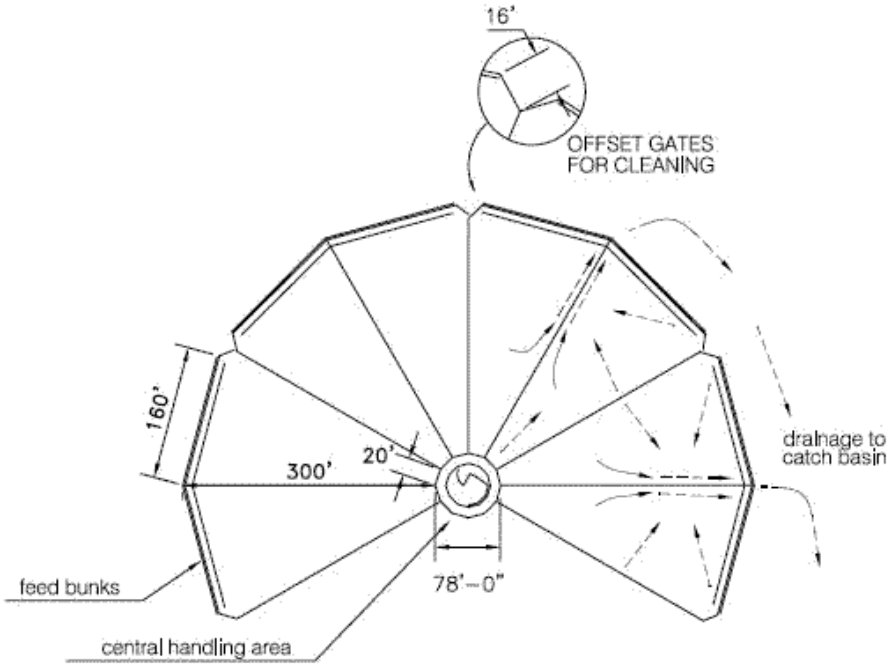


Pen Arrangement

Single Row


Fence Line Feed Trough
Cattle Working Alley
Gates
Apron
Fence Lines
Water Trough

Double Row



- easy animal movement to the centre for treatment.
- drainage is a challenge. Build on a knoll to keep the centre dry. For feed bunks on the outside perimeter, drainage will be along the fences.

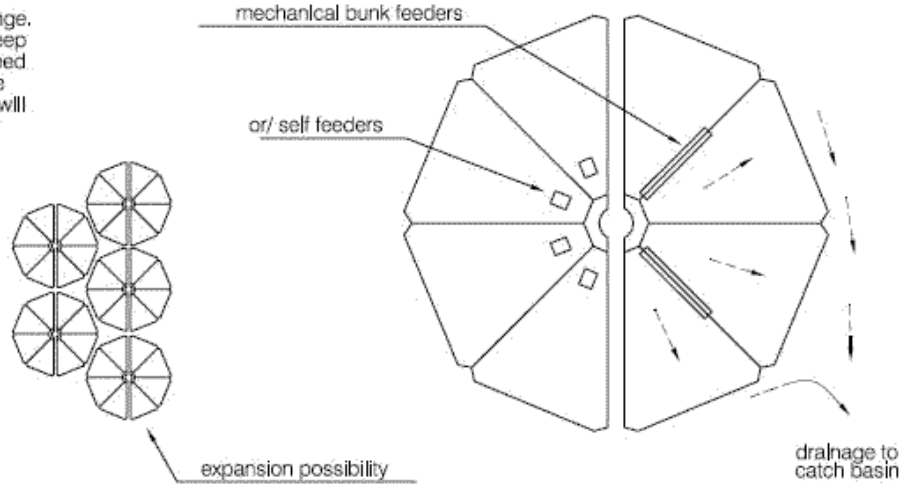
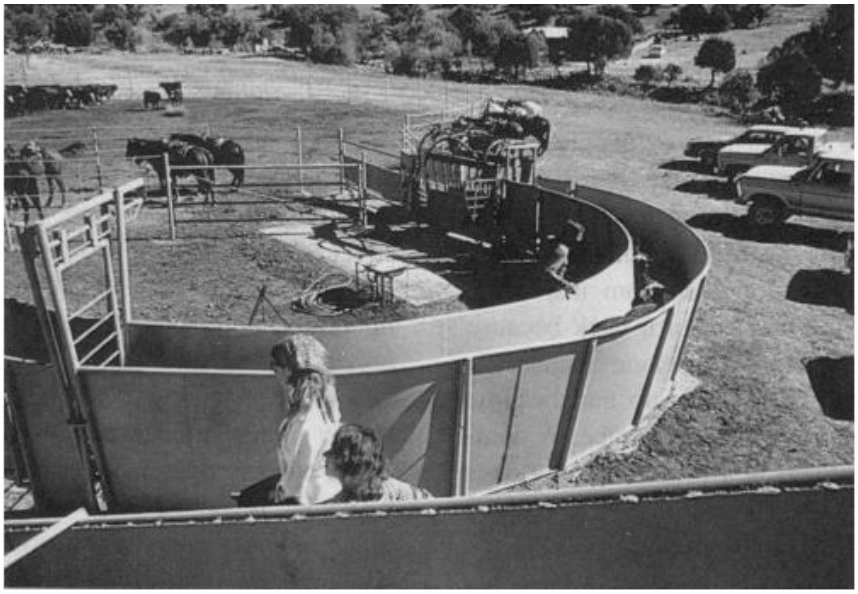
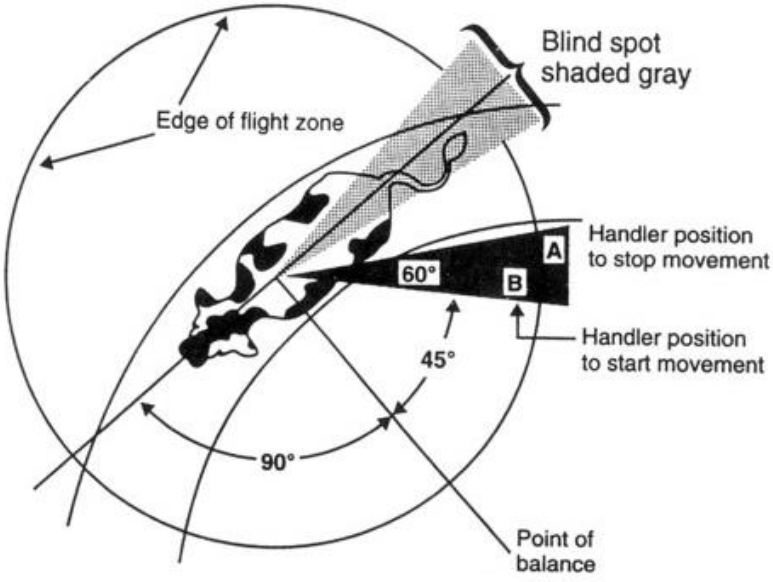


Figure 4. Alternate Pie Shaped Lots.



Well-designed curved single-file race with solid sides and a walkway along the inner radius for the handler.



Feedlot Infrastructure

A number of components are found in most feedlot. These are listed in the Table below. In some instances, certain activities, such as feed preparation and manure utilisation, may take place entirely off-site. In smaller feedlots, some activities may not be undertaken.

Common Components of a Feedlot

Component	Element
Livestock management	• production pens • livestock handling facilities • induction facility • cattle lanes • hospital pens • stables
Stock feeding	• feedstuff receivable facilities • grain storage • grain processing • silage bunkers • commodity storage • feed mixing • feed delivery • feed bunks
Stock watering	• pumps and pipelines water storage tanks and dams • reticulation system

Drainage system	• production pens • stock handling facilities • hospital pens • solid waste storage and processing facility • cattle lanes • feed lanes or alleys • runoff catch drains • run-on diversion banks • sedimentation system • holding pond
Manure management	• manure harvesting and transport equipment • stockpile and composting facility • any on-site manure utilisation area
Effluent management	• pumping, irrigation or application equipment • effluent irrigation area • evaporation ponds
Administration and staff	• office • weighbridge • staff amenities • any on-site staff accommodation

Feedlot Design

Good design makes regular tasks such as yard cleaning and cattle moving more efficient and effective and reduces dirty or boggy yard conditions that create odours, attract flies and can significantly reduce cattle performance. Many design features can greatly improve feedlot operation. The information below provides some general design and construction principles to assist prospective feedlot operators to maximize profitability and minimize any adverse effects.

Site Selection

Selecting the right site for a feedlot can make a large difference to the viability and sustainability of the development.

Important aspects which should be considered include:

- prevailing climatic conditions
- suitable site topography that affects building costs and site drainage
- distance to nearest receptors for odour, dust, noise or aesthetic impact
- distance to nearest potable water supplies (i.e. reservoirs, water catchmentareas)
- access to construction materials (e.g. clay and gravel)
- absence of archaeological and heritage sites or artefacts
- likely impact on threatened or endangered species or ecological communities
- flood or bushfire risk of the site
- legal and physical access to adequate water
- risk of salinity or groundwater impacts
- risk of impacts on surface water quality
- site access in respect to traffic and road safety
- available land and soil suitability for effluent reuse

- proximity to other feedlots or intensive livestock facilities
- proximity to abattoirs, sale yards and other services
- access to feedstuffs

Climate

Climate impacts on a diverse range of issues associated with feedlots. These include:

- heat and cold stress and animal welfare
- stock water requirements
- animal productivity and feed conversion
- odour
- dust
- noise
- feedlot drainage
- waste management and utilisation.

It is possible to avoid some of the above issues or make acceptable compromises. Climatic issues would preclude a development only in extreme circumstances; however, they are placed at the head of the listed considerations because:

- making provisions for difficult climatic conditions can be costly (financially and in terms of productivity)
- climatic considerations are interrelated with some of the other site selection criteria discussed below.

Topography

Sites with a natural slope of 2–4% will help minimise the cost of earthworks. The slope must be able to accommodate the fall required within the drainage system; sites with a low gradient can be more difficult (and expensive) to drain.

There should be sufficient depth of soil to accommodate the cut-and-fill and borrowing requirements needed to undertake earthworks during construction. This applies particularly to areas where sedimentation basins and holding ponds might be located.

Size

Feedlot size is determined by the number of animals to be penned. As a guide, provide each steer with a minimum of 24 square meters of open space, and 10 square meters of shaded area. Additional space will reduce social stress among the animals. A beef feedlot research project has suggested eight lots of 50 animals each totalling 400 meters. Each lot will need 50 sq. m of shade and 1,200 square meters of open space for 50 steers.

Water

A plentiful supply of cool, clean, good-quality water is essential. Water should be in a trough and off the ground, to aid in keeping it clean and free of manure and urine. This point cannot be overemphasized especially in the hot dry temperatures of our country. Poor-quality water – including contamination by feed, dust and feces – leads to a reduction in water intake and slower rates of grain.

The amount of trough space available when providing watering facilities or feeding livestock significantly influences the performance of livestock. Drinking troughs warrant special attention because an excessive amount of water is wasted when troughs are cleaned regularly, as is necessary for good management. Furthermore, poor design results in animals falling into troughs and drowning. It is not uncommon for cattle to fall onto their backs in a trough and dying if they cannot get up. Water trough design must take the following into consideration:

- Water troughs should be placed in a separate area away from the hay racks and feed troughs. Have a 3m cement base on the ground around the trough. That will allow ease of daily manure removal and avoid a mud problem near the water. The steers will spill water.

- The trough should be large enough to accommodate easy access for the number of steers to be housed.

- It is recommended that the water trough should be 2.5 to 3 m long and at least 60cm wide per 50 head.

The water trough should be cleaned at least once a day and more often if it becomes contaminated with manure or other dirt.

- Water troughs must be easy to clean:

    - a straight trough is easier to clean than a round or circular trough because a broom can be pushed through it with ease;

    - a drain plugs which is tamper-proof is needed to allow easy drainage;

    - the water inlet must include a tap so that the water supply can be turned off to drain the trough. Siting the tap well away from the trough prevents damage to the tap.

- An ideal width is about 20 cm. This allows animals to drink with ease and minimizes the danger of animals falling into the trough.

- Where the sides of the trough are broad, as with concrete troughs, the edge of the trough must slope towards the water. This discourages animals from placing their hooves into the trough.

- The height of the trough above the surrounding ground should be 20 to 40 cm, with the water level in the trough not more than 10 cm deep.

- The trough should be anchored to the ground to prevent animals knocking it over.

- Pipes to and from the water trough must be protected to prevent animals hurting themselves, as well as to prevent damage to the pipes.

- The water supply and delivery pipes to the drinking water should be large enough to ensure that animals do not drain the trough when they drink. Once a water trough is empty, animals start bumping it in their impatience to get water.

The average intake of water per steer per day is about 50 litres (2 500 litre per day for 50 steers and 20 000 litres per day for 400 steers). However, in our country's hot summers; the intake will be larger. A dependable water supply is essential.

Drainage System

Central to the design of feedlots is the controlled drainage. It is a self-contained catchment surrounding those parts of the feedlot complex from which uncontrolled storm water runoff would constitute an environmental hazard.

It is typically established using a series of:

- catch drains to capture runoff from the feedlot pens and all other surfaces
- within the feedlot complex, and convey that runoff to a collection and disposal system
- diversion banks or drains placed immediately upslope of the feedlot complex, designed to divert 'clean' or uncontaminated runoff around the feedlot complex

Depending on the topography and layout of the site, the feedlot may have more than one controlled drainage area.

Pen Configuration and Drainage

For ease of feeding, stock handling and service delivery, feedlot production pens are normally built in rows. To facilitate drainage, these rows are usually aligned across the slope, with a slight fall to one or both ends of each row to allow drainage.

Normally the configuration of the rows is in one of two basic designs.

These are:

- Back-to-back designs
- Front-to-back designs.

Back-to-back designs have two parallel rows of pens separated and serviced by a common feed road. This feed road should be located on the higher side or at the 'front' of the pens. Feed bunks or troughs are also normally located along the sides of the pens with frontage to the feed road. Both rows of pens

slope away from the feed bunk, towards the 'back' of the pens, where each row may share a common catch drain, with another row of pens. Rather than sharing a common cattle lane (and catch drain), back-to-back designs may have two separate cattle lanes, either side of the catch drain at the back of each row. Each cattle lane then only services a single row of pens on that particular side of the drain. The back-to-back design is probably best suited to sites with a relatively low natural gradient (i.e. <2%).

In general, front-to-back designs are better suited to sites where there is a substantial slope (i.e. >2%). These designs consist of single rows of pens, each serviced by a dedicated feed road (and normally a feed bunk) on the higher side, and a catch and cattle lane on the lower side. In either of the above designs, and except where there is only a single row of pens, the individual catch drains discharge into a larger main drain, located at one end of each row of pens. This main drain conveys the runoff to the sedimentation system, and ultimately the holding pond. In smaller feedlots, the catch drain may discharge directly into the sedimentation system or a full-length sedimentation terrace may be located directly below a single row of pens.

Sediment System

Feedlot sedimentation systems are designed to remove at least 50% of the settle able fraction of the solids entrained in the runoff collected by the feedlot drainage system. Different types of sedimentation systems are in use in feedlots, including ponds, basins and terraces. The sedimentation system will discharge its effluent to a holding pond or ponds. In more complex feedlot designs, where there is a second controlled drainage area (or more), there may be more than one sedimentation system. Sedimentation systems may also be duplicated (in parallel), so that one can be in service while the settled solids in the other are drying, priorto their removal before the system comes back into service.

The objective of the sedimentation (or settling) process is to remove a large proportion of the solids that would otherwise carry-through to the holding pond where they would substantially increase both the organic matter loading and the sludge build-up in the pond. Reducing the organic matter loading rate in the holding pond helps reduce odour emissions. Reducing the rate of sludge deposition increases the interval between the de-slugging operations required to maintain the design storage volume in the holding pond. The design capacity of the sedimentation system will be variable, dependent on climatic region, storm intensity, feedlot size and layout, and determined by the design process.

Holding Pond

A holding pond is located at the lower end of the controlled drainage area immediately below the sedimentation system. It is designed to capture and store the normal runoff from the controlled drainage area pending the captured effluent being either applied to cropland or evaporated.

Where evaporation is the sole or primary disposal mechanism for effluent (i.e. where captured effluent is not normally applied to crop land), these ponds are typically referred to as evaporation ponds.

Manure Stockpile and Composting Pad

There is normally a requirement to store feedlot manure after it has been removed (scraped or harvested) from the feedlot production pens, and before it is used, normally by application to cropping land. Sometimes the stockpiled manure is actively composted to enhance its value. Deceased animals may also be composted in the stockpile. The storage and processing of manure must take place on a specially designed pad located within a feedlot controlled-drainage area or in a controlled drainage area of its own.

Stock Handling and Induction Facility

Stock handling and induction facilities that are used to unload, load, draft, weigh, treat and, in other ways, attend to the needs of the stock must be sited within a controlled drainage area.

Feed Storage and Preparation Areas

Feed storage and preparation areas may also be included in the feedlot-controlled drainage area. Where they are outside of the controlled-drainage area, the facilities may need to be within a separate controlled-drainage area. Storage and handling of materials in the facility must not constitute a hazard to surface or groundwater (e.g. The associated storage and milling and mixing operations should take place entirely within covered areas or sheds not exposed to rainfall runoff).

Water Trough Is in Middle of the Pen, But Can Be Between Two Pens

Loading and Unloading Facilities

Cattle arriving or leaving a feedlot typically do so using a dedicated area on the operation with sorting or holding pens called slants and loading ramps or chutes. These can be as sophisticated as concrete and metal structures under cover to simple metal ramps and earthen pens with fences. After unloading, cattle are generally placed in receiving pens in this area and allowed to rest before moving to a feeding pen or processing. Cattle should have access to fresh water and, depending upon how long they have been in transit or will remain in the receiving pen, offered fresh feed (typically a palatable hay).

Processing and Treatment Facilities

Most feedlots have some type of facility available to restrain cattle for routine processing (vaccination, deworming, applying identification, implanting, etc.) and for treatment of sick animals. After resting, new cattle arrivals may be weighed, vaccinated, identified with one or more ear tags, treated for parasites, and sometimes implanted with hormones to aid in growth.

Processing facilities vary widely based on the size of the operation. Very small feedlots may have no facilities. In contrast, very large feedlots may have facilities for routine processing and others for treatment. Generally, a working facility will contain a chute and a system of alleys that bring the cattle to and from their pens to the holding pen and chute. Chutes are designed to restrain one animal at a time. Some larger operations may have multiple chutes for processing several animals at a time;

others will only be able to process one at a time through a single chute. The chute area may be located in a building or with a shade structure; others may be out in the open.

Pens

Large feedlots are usually divided up into dry lot feeding pens that share a fence line and may also share a watering source with a neighbouring pen. Within the pens, mounds of dirt are formed that are steep enough to provide water drainage, while sloped enough to allow the cattle to lie down along its sides and top. Mounds aid in minimizing soil erosion in the pens and increase the available dry surface area for cattle to lie down. Large continuous feed bunks for holding the ration are usually present along one side of the pens. Pens will have a gate that opens into large alleyways. This system of alleyways, often referred to as a drover's alley or lane, is used to move animals between pens, to and from processing facilities, and to and from truck loading/unloading facilities. In drier climates, the drover's alley is often at the bottom of the pen because water drainage is less of an issue. In wetter climates, cattle may be moved along the feed alley or lane which is often located at the higher end of the pen. Small feedlots may consist of one or more pens with or without shelter. Feeding can mirror larger operations or can be much simpler. Some small feedlots may use self-feeding systems in which enough feed for many days is loaded into some delivery device and cattle are allowed to eat as much or as little as they desire. The alleys to move cattle vary in their interconnectivity depending on the size of the feedlot and available labour to move cattle to processing and load/unloading.

Hospital Pens

Some feedlots have dedicated hospital pens for sick or lame cattle. In some cases, these pens are physically separated from pens housing healthy animals, but not always. These hospital pens are usually smaller in size than home pens so that sick cattle are closer to feed and water sources. They may have shelter and usually a forage-based diet is offered. Some feedlots have no or very limited hospital facilities. Regardless of the availability of hospital pens, some feedlots routinely send sick animals back to their home pens after treatment. This may pose the risk of disease exposure to pen

mates but that may be outweighed by decreasing the stress on treated animals by allowing them to stay in a known social structure. Depending on how cattle are marketed, it may also be necessary to keep one customer's animals all together as opposed to moving them to another pen.

Feeding Equipment

Alfalfa-grass hay must be available at all times. This will facilitate higher rates of grain per day which improves overall feedlot efficiency. It also helps to reduce the risk of digestive problems. The hay and grain should be fed separately, with feed troughs for grain and hay racks for hay. Feed grain troughs will require twice-a-day filling. The hay rack should never run out of hay. A shade roof should be constructed over the hay rack and grain trough to protect the steers from the sun during the hot time of the year. Animals will stand and eat more during the hot days if shade is provided. Weight gain is in direct proportion to feed eaten.

Troughs or Feed Bunks

Feed and lick troughs can be made from almost any material. Inverted rubber tyres have become very popular because they do not rust and cannot cause injury to animals, are cheap and readily available.

Prior to the start of feeding, animals must be grouped according to size of animal and age group. By dividing livestock into production groups, feeding is simplified because each group can be fed a ration suited to its requirements. Separating animals into groups overcomes the problem of larger animals dominating at feed troughs and preventing smaller animals from obtaining their allocation of feed. Especially where feed is rationed, adequate trough space is essential to prevent smaller animals from losing mass and condition, while larger animals get over fat.

Where trough space is limited, cattle can cause damage to troughs or turn them over when they butt each other in an effort to reach the food. Damage to troughs and the loss of food is reduced if troughs are firmly anchored to the ground.

Allow a minimum of 25-30 cm of trough space per steer and place it at the opposite end of the feedlot from the shade shed. It is recommended that the feed bunk extent the entire width of the lot or 20 m long for 50 steers. If more than 50 head are housed together, add 25cm per head. It needs to be long enough, so all animals housed in the lot can eat grain at the same time.

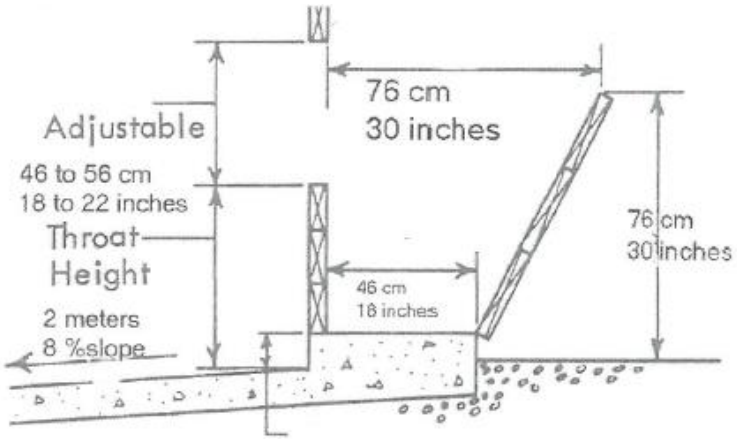
The feed bunk or feed pad should be 10 to 15 cm higher than the alley where the cattle are standing. Cattle consuming feed at ground level waste less feed.

Feed bunks must have smooth surfaces. Surfaces without grooves or holes that can trap feed are easier to clean and help reduce build-up of waste feed, mould growth and odour.

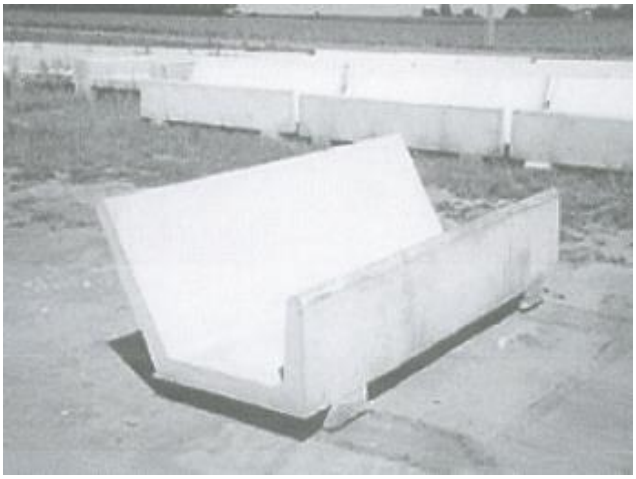
The grain mix will be fed twice a day. Several configurations are possible to keep the feeders from standing in the feed trough or exiting the feedlot. Steel pipes can be vertical or slanted but should be adjustable so the space between changed for bigger or smaller animals

Another important factor is to avoid muddy conditions and manure build-up on feed bunk aprons. These conditions can decrease palatability of the ration as well as increase the transmission of disease.

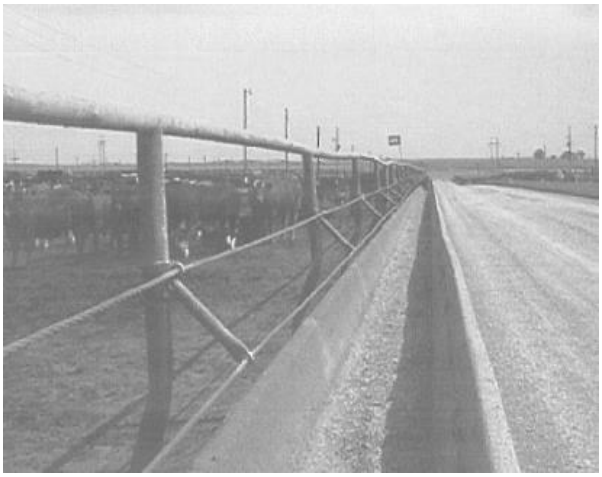
The pipes through which the animals eat at the bunk need to be about 25cm apart and adjustable (cannot be welded!). Or parallel pipes can be used that are close enough, so the animal can get their head through but not escape. The manger should be made of cement.



Cross Section OF Feed Trough



Feed Trough



Feed Trough in a Double Row Arrangement

Hayracks

Hay can be successfully fed in hayracks within feedlot pens. Simple racks can be made from wood or pipe. The hayrack should be off the ground at least 60 cm with a tray at the bottom to reduce trampling and waste. A shade roof should also be above the rack to encourage daytime eating. The hay rack can be in the pen where steers can consume hay from both sides or along the fence where they can eat from only one side. It needs to be twice as long if feeding from one side. For 50 steers, the hay rack should be 10 m long if along the fence line and if in the pen where steers can feed from both sides, 5 m long. The distance between vertical pipes should be about 12 cm. Allow extra length to lessen animal social stress.

Hay and grain should not be fed in the same trough unless the hay is ground and mixed with the grain, or what is called Total Mixed Rations (TMR). As beef feedlots expand in size a total mixed ration system mixer might be considered. A 400-steer feedlot is not big enough to justify the cost of a TMR system.

Feed- and Water Trough Space Requirements for Different Classes of Livestock

Class of livestock	Trough space required per animal (mm/animal)	
	Feed	Water
Cattle		
Horned mature cattle	.600	. Rule of thumb:

Dehorned mature animals Ad lib feeding Lick troughs	250 200 15 polled animals per lorry tyre	Provide space for 10% of a herd @ 400 mm per polled cow or 200 R drum with 25 mm pipe per 50 animals
Sheep		
Intensive feeding	100	.10 (this = 100 / 10% of ewes)
Pigs		
Mature Baconer Piglets	.600 300 225	

HAVING A MAINTENANCE AND REPAIR PLAN

A modern farm must function as a business unit with an integrated plan for maintenance and servicing of all tools, equipment, machinery and implements necessary for the operation. This plan needs to be established as part of the total management plan and integrated from top level management down to the operator level. Planning and control is vital if an effective maintenance plan is to be implemented. The management must, in conjunction with the person who will be responsible for the maintenance procedure, establish from the outset a plan that is practical and functional (It is important that this person be in a senior management position).

This plan must allow for unforeseen deviations, but only under extreme conditions. At this point it is important to establish a plan for the storage of tools, equipment, machinery and implements. This storage will determine the value that management places on the maintenance level of the tools, equipment, machinery and implements. It must include a demarcated area that is specific to the cleaning of tools, equipment, machinery and implements. This area must conform to the farm's conservation and environmental policy and plan that would take into account the use of harmful chemicals that will be detrimental to the environment.

Once the five-year production plan for the farm is established, then planning for maintenance of tools, equipment, machinery and implements and machinery within the production plan can begin.

Budget

Maintenance Budgets

A farm maintenance budget needs to be practical and consists of two sections:

- Frequent routine maintenance costs- these costs are budgeted for in general but not planned for. For example, a tractor might get a puncture, and this would come out of this cost center.
- Major maintenance work- in the plan it would be budgeted that after one year the tractor would require a major service and after five years the engine would require a total overhaul.

Maintenance Plan and Processes

Major maintenance work involves complete rework of equipment, machinery and implements or an engine that has had considerable service time. This sort of maintenance is planned and budgeted for and would be scheduled to occur during a non- productive period on the farm.

In the planning stage the managers would have to decide if they are going to have the infrastructure available to do major maintenance work on equipment, machinery and implements, or are they going to outsource this work. If they decide to keep the work in-house, they must plan to have all the tools and equipment available to carry out major repair work.

The costs involved in the maintenance are substantial and if machinery and equipment are not checked and repaired regularly, it will result in a major breakdown which will cost considerably more to repair.

Often all major maintenance is carried out by specialists as some machinery and equipment are too specialized to be serviced by untrained persons. The farm store would normally have a list of the suppliers of all tools, equipment, machinery and implements operating on the farm and if a new part is required to carry out work identified during a frequent inspection then the stores can order the part if they do not carry it as a stock item.

Part of the planning process would be to identify how much capital would be invested in stock items for maintenance and what would be acceptable down time if the maintenance team has to wait for the supplier to deliver. A balance needs to be planned for, as it is very costly to keep stock in the store and it can be costly to production not to have it immediately available.

Maintenance Involves

Routine Planning

The routine maintenance and scheduling plan need to be broken into two major sections.

Detailing the pre-planned times that coincide with non-production peaks for major maintenance and;

There are frequent inspections, daily / weekly / monthly checks, that are carried out on the tools, equipment, machinery and implements.

Inspections

Frequent inspections would identify the need to replace or repair faulty items.

Maintenance of Equipment and Machines

A maintenance schedule would involve the operator cleaning the air filter and spark plug and the outside of the machine for physical dirt on a daily basis. If the operator notices that there is an oil leak on the engine, then the operator must report it to their supervisor who will authorize the operator to book the machine in at the workshop. The operator conducts a daily routine service at the end of the day and on a monthly basis takes the machine in to the workshop for service.

During down time, the machine will be booked in for a major overhaul.

The workshop must be flexible and cater for tools, equipment, machinery and implements being brought in for minor essential repairs out of the set schedule, a sprayer that has an oil leak needs immediate attention as the lack of oil would cause major damage to the machine with further use.

Part of the plan for maintenance needs to be the availability of a replacement machine that can allow the operator to continue with operating while the broken machine is being fixed. There needs to be an agreed upon time for faulty tools, equipment, machinery and implements to be taken to the workshop, machines must be booked in and a job card issued for the work that needs to be conducted. For every type of equipment, machinery and implement operating on the farm there must be the necessary specific or generic tools available to carry out maintenance. Most machinery and implements come with a set of spanners that is specific to it. It is best for the workshop to have a set and for the operator to have a set to take into the field.

Pen Maintenance

Beef feedlot operations are faced with daily tasks of managing feed and cattle inventory, animal health, labour, operational activities and marketing of the resident cattle in the yards. No less important are details to manage the feedlot environment and facilities. All of this is made more tedious and challenging by the forces of Mother Nature. In the northern and central plains, the long winter and the recent spring storms have crippled one area of management that may have created some cattle issues. That area is feedlot pen maintenance and cattle comfort. Many open-lot cattle feeding sites have been burdened by mud and water accumulations – making regular pen cleaning difficult. Closed, confined feeding facilities may be hampered in removing stockpiled manure and or disposal of pit-stored waste. In the face of muddy, soggy feedlot pens, cattle discomfort and lameness are potential problems that producers may be facing. The end result of these problems may be loss of performance and negative closeouts.

Cattle Pens

Scrape pens frequently so that solid manure does not accumulate.

Solid Settling Structures

Clean out solids settling structure after every rainfall and before the structure is full. Make sure slotted gates aren't plugged or frozen.

Retain liquids long enough for solids to settle out, but as short a time as possible so that ammonia levels don't become elevated. Check berms frequently for erosion. Maintain vegetation on berms to stabilize the side slopes.

Areas below Solids Settling Structures

Keep grass mowed so that you can inspect waterways and filter strips. Make sure that liquid run-off spreads out, so that it is more likely to be absorbed by soils.

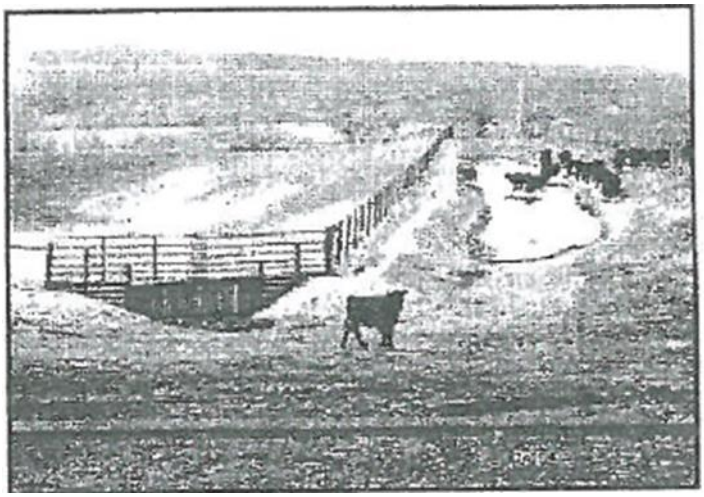
Check grass waterways frequently for signs of channelizing. Check grass filter strips frequently for signs of channelizing or trenching. Repair reseed and mulch areas that are channelized as soon as possible to re-establish vegetation and prevent more damage.

Check for tile inlets and subsurface tile lines. Plug the tile or divert the manure away from the tile if there is a potential for contamination.

After Rainstorm or Freeze/Thaw Cycle

Look for odours and signs of brown water in waterways after a rainstorm or freeze/thaw cycle. If brown water or odours are present, there may be a problem. Make sure the run-off is not reaching a stream.

Check below the solids settling structure to make sure that liquid run-off does not go directly to a stream. The longer the distance the run-off has to travel, the more likely that it will be absorbed or diluted. The minimum required r open feedlots are to protect water quality, so that downstream waters are free from unpleasant odours or colour, sludge deposits and floating debris. Down-stream waters must also be free from substances like manure solids or excess nutrients that can cause algae blooms or fish kills.



Solids settling structure with slotted gate

Maintain Most Conditions

As long as the layer of loose manure is at 25 to 35 per cent moisture content, dust and odour problems are minimized. Recent research has shown that 0.3 in (8mm) of moisture, in the form of rain or irrigation, minimizes ammonia losses to the atmosphere.

Increasing or decreasing animal numbers in a pen can help to maintain this moisture level. In warm, dry periods, animal numbers per pen can be increased to increase the amount of urine, thereby helping to keep the pen surface damp. The limits to animal numbers per pen are feed bunk space, watered space and pen area per animal.

If sufficient water is available, sprinkler systems can also be used for dust control. However, remember that additional water on the pen surface can increase odours from the feedlot.

Fill in Low Spots

As part of on-going pen management, low spots that develop need to be filled in. The ideal fill is a clay or silt soil. Filling in these spots provides a smooth, even pen surface and prevents ponding of water.

Ensure Proper Drainage

Feedlot runoff has high organic matter content, therefore a high pollution potential.

Direct the feedlot runoff to storage ponds or catch basins where it is stored until it can be applied to crop land. Protect ground and surface water from high organic matter content feedlot runoff with proper drainage design.

Diversion drains – Diversion banks prevent runoff from areas outside the feedlot from entering controlled drainage area of pens, cattle alleys, and feeding alleys. This decreases the amount of liquid to be handled. Diversions can be as simple as a furrow. Up slope runoff can also be excluded from the waste land spreading areas.

Pens – Allow free drainage of runoff and water spillage from waters to exit the pen and enter the feedlot drains.

Pen requirements are:

Feed troughs are located at the top of the en slope and running parallel to the contour to minimize pen to pen drainage.

Water trough aprons are located and shaped to shed rainfall and divert runoff around the watering area.

Fence lines built so that manure accumulating under the fence can be easily removed.

Construct a stable pen base with a smooth uniform surface.

Pen slope 2% to 4%.

Feedlot mounds – Build the mound, if used, parallel to the drainage direction, avoid blocking the drainage path.

Feedlot drains – Construct drains below feeding pens to carry runoff to sediment and catch basins. The preferred design has the drain outside the pen. If the drain is inside the pen, it increases pen areas. An option is to build a second alley for handling cattle, so cattle don't walk along the drain. Don't build drains across roadways used for hauling feed.

Catch and sediment basins – Feedlot runoff is held until it can be utilized on crop land. Depending on the design and runoff patterns, solids may be a problem. Sedimentation basins upstream from the catch basin will minimize solids build up in the catch basin.

Manure stockpiles – Where short term manure stockpiling occurs outside the pen area, ensure that drainage is directed into the containment system. Also, the stockpile should be placed on a compacted clay base to protect ground water.

WHY PEN MAINTENANCE ARE IMPORTANT

Feedlot animals do best – with optimal performance – when environmental conditions are good and cattle are minimally stressed. Stress is increased with wet, muddy conditions or when pens are too dry and dusty. Strategic pen management can help minimize these problems.

Clean pens and clean cattle are important because:

- Muddy pens increase feeding costs
- Animals at the plant are docked for 'tag'
- Ground and surface water quality can be affected by high organic matter runoff.
- Water and waste movement in feeding pens is controlled by the water holding ability of the manure pack, the impermeable soil/manure layer sealing the feeding pen, and the slope and drainage patterns of the pen, drains, and catch basins.

Mud

Chris Reinhardt, extension feedlot specialist at Kansas State University, says the most obvious time animal comfort and performance is affected is when pens are muddy. Mud can also predispose animals to foot rot.

If water (or mud) is excessive, cattle tend to move less; they try to find the most comfortable place and remain there. If they eat and drink less because they aren't moving around, they perform at a lower level.

It has been estimated that 10-20 cm of mud in a pen can decrease feed intake by 8 to 15 percent, reduce daily gain by 14 percent and increase feed conversion by 13 percent.

Severely muddy conditions (30 cm to 60 cm deep mud) may reduce intake by as much as 30 percent and reduce daily gain and increase feed conversion by 25 percent. Steers that might normally gain 1,5 kg per day may gain only 1kg on days when pens are muddy. That means for every four days of mud, cattle will require one additional day to reach finish weight.

100 Steers in a muddy pen can cost up to R 7000 per month extra. Every 4 muddy days adds 1 day to the total time spent in the feedlot.

Dry, Dusty Conditions

During a hot summer, cattle limit their activity during the heat of the day and then dramatically increase their activity at sundown when it's cooler. This generates a great deal of dust within the pens and across the entire feed yard.

Dusty conditions can cause respiratory irritation that may lead to or exacerbate respiratory disease in new cattle as well as in heavy cattle near finish.

By periodically scraping the pen surface – once a week or at least monthly – and removing the dry, dusty manure material, the amount of dust generated can be greatly reduced.

During dry periods, pen surface moisture may diminish to less than 10 percent. Sprinkling can be used to increase the water content of the pen surface to help bind the dust and ammonia.

Why the Cleaning of water Troughs and Feed Bunkers Take Place

Feedlots are places where cattle are forced to live in close proximity to each other in an unnatural environment for them. This close proximity of cattle from, often, a range of sources creates ideal circumstances for the spread of sickness and diseases. To lessen the risk of the diseases and sicknesses spreading a thorough and well-designed cleaning programme must be implemented within each feedlot.

Research has also shown that the weight gain of cattle fed spoilt feed declines rapidly. This gives us another reason to make sure that cleaning is done regularly and in a set manner. Clumps of feed left over in the bunkers are likely to spoil and create conditions that can negatively affect the weight gaining process. Similarly, dirty water can create ideal condition where diseases can spread and multiply with astonishing speed throughout the entire feedlot.

The cleaning schedule will depend on the size of the feedlot. As it is best practice to feed cattle as early as possible in the morning cleaning are usually the first duty performed every day in the feedlot. The amount of cleaning teams employed for this duty varies between feedlots. It normally takes a well-trained cleaning team about 15 minutes to empty out, clean and sanitise a feed bunker and a water trough within a feeding pen.

The length of time necessary to refill feed bunkers and water troughs within the feedlot are then also used to decide the number of cleaning teams to be employed. If four cleaning teams are employed in a feeding lot that consists of sixteen feeding pens the cleaning process can then be completed in an hour with 4 teams cleaning one pen each at a time.

It is also important that feed bunkers and water trough are refilled as soon as possible after cleaning, therefore the cleaning and refilling processes must be scheduled in such a manner that they run concurrently to each other. In most instances it is good practice to clean one section of feeding pens and as the cleaning teams move to the next section the refilling process can start in the previous section.

FEEDLOT CLEANING

The main waste product of a beef cattle feedlot is manure. To maintain good conditions for workers and cattle and to ensure sound environmental performance, manure must be removed from feedlot pens regularly. Some feedlots use bedding and this, along with small amounts of spoilt feed thrown into the pen during bunk cleaning, is removed with manure during pen cleaning. Thus, manure handling becomes a major on-going part of feedlot management. Spoilt silage and mill run, mortalities, and sometimes boiler ash, are other solid wastes that may also need to be managed.

Pen Cleaning

Pens must be cleaned regularly to:

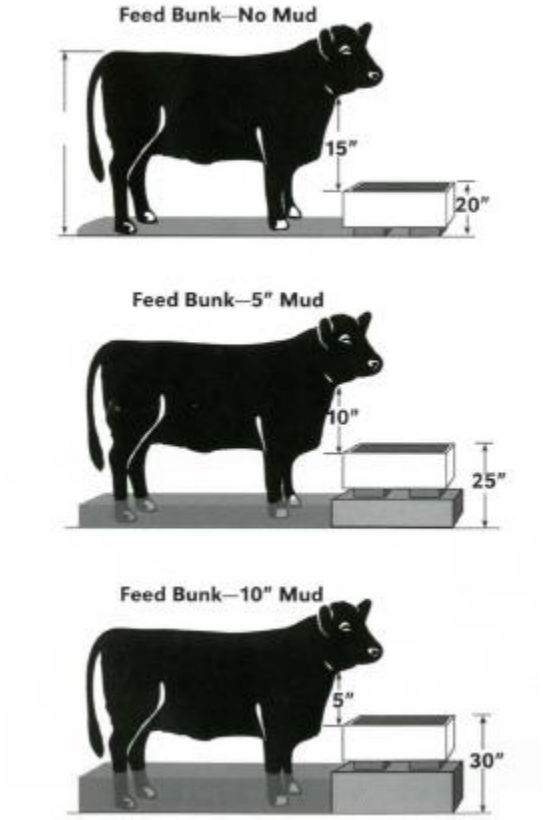
- Optimise cattle performance and welfare

- Present animals for pre-slaughter inspection in a clean condition
- Provide a safe work environment for staff (particularly pen riders)
- Minimise odour levels
- Minimise dust during hot, dry conditions
- Promote good pen drainage
- Promote good integrity of the pen surface
- Minimise costs of pen maintenance.

Frequent, regular pen cleaning reduces the average depth of manure over the pens, promoting more rapid pen drying. Odour emissions from wet feedlot manure can be 50–100 times higher than from dry manure, and the odour is more offensive. Even a small area of wet manure, such as a pothole, can be a significant source of odour. Regular pen inspection allows low spots to be identified early and repaired.

Muddy, odorous conditions do not provide a pleasant, safe working environment for pen riders and others working within the feedlot. Weight gains can be reduced by 30–40% and feed conversion rates increased by 20–35% when cattle are kept on deep manure. Wet, muddy conditions also adversely affect animal health, with increased incidence of foot problems such as foot abscesses.

Effect of Mud on Efficiency and Access to Bunk



Manure Pad

As manure deposited on the floor of feedlot pens dries and is compacted by the action of cattle hooves, it typically forms layers. The lowest layer may be an 'interface layer' – a compacted, moist plastic mixture of manure and soil – which has low permeability and can reduce nutrient leaching through the feedlot pen. If there is no interface layer, the manure layer overlies the feedlot base directly as a moist and plastic layer, sometimes with a crust on the surface.

The thickness of the manure layer depends upon the manure deposition rate, the pen cleaning frequency, weather conditions and other factors. Under dry conditions, about 20 mm of manure accumulates across the pens after 25 days, gradually increasing to about 30 mm after 75 days and to around 35 mm after 100 days. When the dry compact manure pack is moistened by rainfall, it may double in depth.

Principles of Pen Cleaning

Feedlot pens should be cleaned at least every 13 weeks. Ideally, pen cleaning should occur when the manure is moist (but not wet). Moist manure is more easily removed in a good even cut for a smooth pen surface. However, pens should be cleaned regularly even when conditions are not ideal.

If a manure–soil interface layer will be retained, it is necessary to determine the depth of manure covering it. In moist manure, a screwdriver pushed into the pad will encounter increased resistance at the interface layer. The difference is less distinct if the manure is hard and dry and it may be necessary to dig into the pad to confirm the depth to interface.

The depth of manure, and its moisture content, will vary over the pen; for example, manure will accumulate and may be wetter under shade. During cleaning, care needs to be taken to prevent machinery from cutting too deep in different parts of the pen. If the manure is too hard, pen cleaning can be deferred until the manure moisture content increases.

Because of climatic conditions, some feedlots do clean all manure from the feedlot floor. But this may include large amounts of soil or rock resulting in more material for processing, including manure screening. It may also increase pen maintenance needs and result in more wear and tear on manure handling equipment.

Attention to detail during pen cleaning is important to control odour since even small areas of wet manure can emit significant odour. Every time pens are cleaned, manure that has accumulated under fence lines, along the sides of feed bunks and water troughs, and along aprons should also be removed. Cleaning under the bottom fence line more frequently will also promote good pen drainage and fly control.

Manure can be temporarily mounded in the pens before stockpiling and composting, but never in drains or cattle alleys. Temporary mounding of manure in the pen may increase management flexibility because:

- Decomposition reduces the mass of manure to be removed from the pen
- Pens can be cleaned as required and more regularly
- The manure mound can be removed from the pen at a convenient time

Mounds should be removed when conditions allow but also when:

- they become too high for machinery to practically and safely drive over them
- they become a hazard to the welfare of cattle
- they begin to disintegrate under dry conditions
- manure haulage equipment becomes available

To form stable mounds, the manure needs to be moist enough to be well compacted so that it can support the weight of cattle and also to exclude air. Mounds should be shaped so they shed runoff and located so as not to interfere with pen drainage. In un-shaded pens, they should be situated in the centre of the pen with their long axis running down the slope. In pens with shade over the centre or top third of the pen, they should be located downslope of the shade structure.

Drains below the feedlot pens (which often also act as cattle lanes) are used to catch rainfall runoff and direct it to a holding pond generally via a sedimentation basin, tank or terrace. Drains need to be kept free of sediment build-up to maintain maximum flow capacity. Where drains are vegetated, the grass should be kept short by regular mowing.

Sedimentation facilities are designed to remove at least 50% of the settle able solids in the runoff and should be cleaned out when they are dry to maintain removal capacity. This will reduce the amount of organic matter entering the holding pond and hence the potential odour emission rate. Weirs also need to be cleaned when deposited sediment is sufficiently dry. In wetter climates, having two sedimentation facilities in parallel allows one to be dried and cleaned while the other is in operation.

Manure entering the holding pond is broken down by microbial action, but some ungradable material is deposited as sludge on the floor of the pond. Holding ponds need to be cleaned when the required water-storage capacity is compromised (e.g. less than 80% available), typically every 5 to 20 years depending on the initial size of the pond and the efficiency of the sedimentation system.

Pen Cleaning Equipment

Equipment that can be used for pen cleaning includes:

- Tractor-drawn box scrapers – box scrapers are widely used in medium to large feedlots in conjunction with wheel loaders. These scrapers provide good depth control, a smooth pen finish, a single manure removal and mounding operation and a fast rate of manure removal. However, they are less effective in wet conditions when an excavator may need to be used instead.

- Wheel loaders – wheel loaders are widely used in medium and large feedlots for removing mounded manure from the pen. While they can also be used to quickly clean the pens, they often produce a rough surface finish and may damage the interface layer. Buckets should be fitted with small teeth to minimise damage to the pen surface.

- Excavators – excavators can efficiently remove manure, particularly under wet conditions, but need to be used carefully as it can be difficult to achieve good depth control and a smooth finish. They are efficient at transferring mounded manure into trucks.

- Skid-steer bobcats – bobcats can be used to tidy up small areas.

- Under-fence pushers – mounted on tractors, front-end loaders or bobcats, under-fence pushers are commonly used for removing manure from under fence lines, around shade posts and water troughs; and manure and spilt feed from feed bunk aprons.

- Slider blade – mounted on a skid steer bobcat, the slider blade can be used in place of an under-fence pusher but can also clean drains and lanes.

- Graders – graders are suitable only for cleaning large pens; they provide good depth control and a smooth finish.

Manure collection and handling is a significant component of the feedlot budget. Different manure removal technologies offer different efficiencies in time and energy, but the most efficient systems may conflict with retaining an interface layer and maintaining an even pen surface.

For example, tractor-drawn box scrapers, which provide good depth control and a smooth finish, could have a capacity of 45–50 t/hr. compared to 80 t/hr, for the wheel loaders, which may produce a rough surface finish and damage the interface layer. The manure harvested with a wheel loader is likely to contain extra soil and rock, and this will increase the mass of material for transportation and processing.

Local climate conditions can also interfere with the retention of an interface layer and equipment used.

Once the pens are clean, routine maintenance, such as patching pot holes, can be carried out.

Manure removed from pens is usually transported by truck to a stockpiling or composting area, allowing manure spreading to occur at the most suitable time and independently of the pen cleaning and manure collection process. Efficiency of manure removal is improved by:

- minimising idling time during truck loading
- using larger capacity trucks
- loading the trucks in the pen rather than having to transport the manure to the truck. If this is not possible, locate the truck in the stock lane or drain below the pen so that feeding is not disrupted.

Under Fence Cleaning

Under-fence cleaning is done at every pen cleaning, but also between pen cleanings as needed to remove accumulated manure that will obstruct pen drainage. This is particularly important for manure that has accumulated under the fence line at the bottom of the pen.

Manure is moved from under the fence lines into the pen and is collected during pen scraping / cleaning operations. Alternatively, it is taken immediately to the manure stockpiling /composting area; it should never be left in the drains.

ENVIRONMENTAL PROTECTION

Water Management

Flooding

Pens, manure stockpiles, effluent irrigation areas, sedimentation basins and holding ponds should not be located in flood-prone areas unless adequate safeguards are incorporated. In some cases, levee banks may provide the necessary protection; however, permission to construct levee banks may be required from DERM and/or local authorities. Also consider vehicle access to the site during periods of prolonged flooding.

Protection of Surface Water Quality

The feedlot should be sited, designed and managed so that the quality of surface waters in the vicinity of the feedlot is not degraded by runoff, leaching or seepage form the feedlot yards, ponds or water utilisation areas. To achieve this, a reasonable buffer should be provided between the feedlot complex (including waste utilisation areas) and streams, rivers and other watercourses. The separation distance chosen should be a function of the intervening topography, vegetation, natural gradient, management practices employed by the feedlot operation and other site-specific factors. Effluent utilisation areas should be sited so that irrigation spray drift or direct runoff of applied effluent does not enter a watercourse.

Protection of Groundwater Quality

A feedlot should be sited, designed and managed so that the quality of groundwater is not degraded by the movement of pollutants or pathogens into the water resource. To achieve this, a feedlot should not be sited above groundwater recharge areas or above groundwater resources that are deemed to be vulnerable, unless those resources can be demonstrably protected. Such protection may be provided by one or more impervious geological strata and/or because the water is at considerable depth. Clay or synthetic lining may also provide protection.

Sites to be avoided include those where there are:

- Existing shallow or rising water tables

- Shallow perched water tables
- Useable underground water resources which are already partially degraded
- Major faults that might provide pollutants easy entry to the groundwater resource.

Waste utilisation areas should be sited away from bores and wells. Effluent r manure should not be applied within 25m of a bore or well which is used for domestic consumption.

Odour Management

Feedlots must be designed and operated so as not to produce any odour which gives rise to material detriment to any person (i.e. so as not to interfere with the normal use and enjoyment of life and property to an extent which is more than of a trivial or minor nature). Potential nuisance from odour is a function of several factors including:

- distance of receptor from odour source
- sensitivity of receptor to odour
- cattle numbers
- climatic conditions
- feedlot operation; and
- frequency, intensity, duration and offensiveness of odour. Odour is produced from biological activity which occurs in the decomposition of manure, spilt feed and other organic matter.

Overall, a combination of design, management and regular cleaning and maintenance will reduce or virtually eliminate the risk of offensive odours.

Design will assist the reduction in odour potential by eliminating opportunities for odour generation. For example, having fully enclosed feed and water trough bases prevents a build-up in spilt feed and manure in a difficult to clean location.

Where intensive animal industries are not sufficiently separated from sensitive land uses, amenity and quality of life in the adjacent area may be reduced due to odour, dust or noise, creation of a potential hazard, or aesthetically unpleasant due to physical aspects. Because it is not always possible to

eliminate impacts on adjacent areas, it is unwise to permit land uses which would be sensitive to such reduced amenity to be located within the affected area.

While management and design reduce odour generation, buffer distances are a necessary means of reducing the effects of emissions. People who use land in particular ways have expectations of amenity that relate to that use. Residents, for example, expect higher standards of amenity than people at work in an industrial area.

If buffer distances are to be implemented effectively, the points between which the distance is to be measured must be clearly defined. At the "emitting" end, it will be the closest boundary of all facilities living rise to air emissions. At the "receptor" end, it will be the boundary of any sensitive land use nearest the emission source.

Manure Management

Besides the production of premium beef and lamb for the public, feedlots produce a valuable by-produce, manure. Feedlots produce large quantities of liquid and solid by-products through runoff from the feedlot area and manure from the cattle. These by-products must be disposed of and used in a manner that will not cause contamination of land and surface or underground water supplies nor cause offence to people. They can most beneficially be used in a manner that obtains the maximum benefit from the nutrients they contain.

The waste system should be designed to be simple and require minimal maintenance input. It shall be an integral part of the feedlot complex.

Factors to be considered in the design and operation of the waste management system include:

- Land slopes
- Pen and lane way layout
- Vehicle and stock movements
- Drainage systems
- Location of settling and storage ponds
- Availability of areas with suitable soils for waste usage.

If not properly designed and maintained the waste system can be a major source of complaint and lead to enforcement proceedings.

The manure management plan for the feedlots includes:

1) daily collection of manure
2) composting of the manure and
3) distribution of the compost to local grain and alfalfa-grass hay growers.

Cattle manure is low cost organic fertilizer that will provide plant nutrients, improve soil microbes and improve organic soil structure, but can cause environmental problems if not properly stored or applied to the crop fields.

Because of the low average rain fall in our country and the dandy soils, feedlot runoff will not be a problem when manure is manually removed on a daily basis. However, the manure storage area (two compartment composting centre) will have a concrete floor and wood or concrete slides to retain any runoff.

The processed compost could be delivered and sold to local grain growers at planting time and to alfalfa-grass hay growers for topdressing the hay fields after harvest. This service could be provided by the feedlot owner or a private contractor with a manure spreader and tractor. The manure management plan would work well with alfalfa-grass hay and feed grain projects located near the

feedlots. This will be an excellent opportunity to demonstrate an environmentally friendly nutrition management cycle between plants and animals.

Keep the following in mind:

- Manure should be removed each day manually with shovels and carts to the composting bens.
- The largest amount of manure droppings will occur near the grain bunk, hay rack and water supply therefore a concrete pad is needed in those areas.
- The two part storage bins are needed to properly mix and age the compost.
- The aged manure compost could be loaded by hand onto a manure spreader and delivered to the fields at planting time or top dressed on hay fields after harvest.
- Soil testing will be done in advance of delivery to determine the amount of compost needed.
- Soil testing is also required to make sure that over application of compost do not occur.

The following statistics should be kept:

The steer and lamb manure production vary based on size of the animals, water supply and feed quality and amount. Properly fed animals produce high nutrient value manure. These statistics are projections based on animals receiving proper nutrition and care:

- Average daily production of manure per steer – 10 kg.
- Production per day for 400 steers – 4 tons.
- Average daily production of manure per lamb – 3 kg.
- Production per day for 400 lambs – 1.2 tons.
- Projected manure production from steer feedlot per year – 1320 tons.
- Projected manure production from lamb feedlot per year – 396 tons
- Each ton of manure on average will provide 10 kg nitrogen, 11 kg phosphorous and 15 kg potassium.

- Compost storage area needed for steer feedlot – 2 storage areas for 480 tons each.
- Compost storage area needed for lamb feedlot – 2 storage areas for 144 tons each.

Community Amenity

Even with the best design and operational practices presently available, it's not possible to prevent the generation of odour, dust and noise entirely. Therefore, to protect community amenity, feedlots should be established at an appropriate separation distance from sensitive community receptors. Following the development of the feedlot, local authority planning provisions and decisions should seek to discourage the establishment of new receptors within the previously determined separation zone, wherever possible.

The desirable separation distance between the point of generation of the odour and each sensitive receptor is a function of the:

- Source and intensity of the odour
- Prevailing meteorological conditions at the site
- Nature of the intervening terrain and vegetation.

Odour intensity is a function of the:

- Climatic conditions
- Feedlot capacity
- Stocking density
- Design, construction and management practices

The separation distance should be sufficient to protect sensitive receptors from odour impacts. If it does this, it will usually protect them from dust and noise as well.

Wherever possible, use existing topography and vegetation to screen and provide a buffer against odour, dust and noise (and as wildlife habitats) from roads, towns and nearby residences.

LEARNING UNIT 3

FATTENING UNIT ANIMALS

Learning Outcomes:
• Understand types of sheep and their habitat • Understand types of cattle and their habitat • Selecting animals suitable for feedlot • Understand the morphology of fattening unit animals • Understand the anatomy of fattening unit animals

INTRODUCTION

Cattle and sheep are the animals that are used the most commonly in feedlots in South Africa and around the world. Although other edible animals are also fed commonly, it is done to promote growth (chickens and pigs) and not to fatten the animal. In some cases, goats may also form part of a fattening unit.

The reason cattle and sheep are used most commonly in feedlots is the fact that these animals have a very good feed transfer ratio (FTR), and it is thus relatively cheap to feed them. The good FTR is due to the fact that these animals are part of the ruminant family which will be explained later. Secondly it is not always possible to bring these animals up to a market ready weight on extensive conditions, because the resources in the field may be limited.

BREEDS OF SHEEP AND THEIR HABITAT

There are a very large number of different sheep breeds. The number of breeds is still increasing due to crossbreeding practices the farmers use to develop a new breed with certain desired qualities.

Sheep are found all over the world, and the races in South Africa originate from indigenous races such as the Damara, European races such as the Suffolk and Australian and New Zealand races such as the Merino. Some of the most popular races in South Africa, such as the Dorper and SA Meat Merino, were bred locally from breeding systems.

Sheep breeders concentrate on four different types of breeding practices. Firstly, breeding is done to improve the meat and carcass quality of the sheep as in the case of the Dorper and the Meat master. Secondly selection and breeding are used to improve the amount and quality of the wool of the sheep as in the case of the Merino. A third type of breeder focus on producing an animal with good meat as well as good wool properties and breeds such as the SA Meat Merino developed. Lastly a tendency develops to breed sheep that produce more milk that is used in the making of certain cheese types.

Sheep can be found from areas where it is very hot and dry up to areas which are cold and wet. Especially the breeds with wool as cover is very good isolated against the extremes of the environment, they found themselves in.

In South Africa the most popular breeds for use in a fattening unit is the Dorper and different types of Merino. These animals have larger bodies than the other races, such as the Damara, and thus have a better build carcass for meat purposes. The Merino is preferred above the Dorper because it put on more muscle than fat in the fattening unit, while the Dorper have the tendency to become too fat.

BREEDS OF CATTLE AND THEIR HABITAT

Cattle in South Africa can be divided into two main groups namely the Dairy cattle breeds and the Beef cattle breeds. A large number of different breeds exist in each group with the Jersey, Holstein and Ayrshire as some of the popular Dairy breeds and the Afrikaner, Simmentaler, Brahaman and Nguni as some of the popular Beef breeds. As with sheep, a lot of the breeds originate from cross breeding programs to improve the milk, meat or milk and meat properties.

Cattle are found around the globe and the races in South Africa are bred from different breeds locally and internationally. Cattle can be divided into two families, the *bos taurus* family that originate in the European countries and include races such as the Charolais and the Limousin, and the *bos indicus* family that include the American and African races such as the Angus, the Brahaman and the Boran. The local or Africa races are commonly referred to as Zebu cattle.

The *bos indicus* cattle types usual have a smaller body frame, lower metabolic rate, a shinier coat to reflect heat, better fertility and maternal instinct, better adaptability and is more resistance to external parasites and tick-borne diseases than the *bos taurus* types of cattle. The *bos indicus* cattle also have better quality meat.

In South Africa almost all the types of beef cattle are rounded off in fattening units before being sent to the market for slaughter. Especially the *bos Taurus*types are extremely difficult to get market ready

from the field. Bull calves from Dairy cattle that cannot be used in the dairy sector also make out a relatively large proportion of the fattening unit stock in the country.

Selecting Animals Suitable for Feedlot

Weight and Condition

Economic success is more likely in feedlots with healthy calves that have just been weaned and disease and parasite free. Be especially vigilant for pinkeye and lameness. Live weight information at regular intervals is important and a fundamental requirement for efficient management so the feedlot must have scales. Use them when selecting lambs and to monitor performance over time. Scales need to be easily accessed so weighing can be done frequently. If selecting bull calves that will be housed together, select those calves that are similar in size and weight. That will provide a low-stress feedlot environment resulting in fewer problems.

Veterinarian Check and Animal Identification

All animals must ear tagged, branded or painted with an individual identification number. This is essential for proper herd management. All animals need to be weighted on the feedlot scales regularly to track weight gain of each animal and feed conversion rate. A herd record keeping book is available. The feedlot design needs to have walkway along the side of the lot where animals must walk through in single file. Scales with gates on both sides must be built into the animal walkway. This will allow individual animal weighing to record weights and for veterinarian treatment needs.

Calves should be clearly identified with an ear tag

An isolation pen away from the rest of the feedlot and not sharing the same fence is needed to put all new animals into for the first 3 weeks. That is to avoid introducing any new diseases to the rest of the feedlot animals. While in the isolation pen the veterinarian must check all calves for pinkeye, lameness and any other diseases and treat all animals with a broad-spectrum de-wormer.

Calves should be vaccinated for any known cattle diseases that are common in the region where the calves were bought and given a shot intramuscularly with vitamins A, D, E and B12. The neck or ear area is the best site for vaccinations, so damage is not done to the carcass. The calves should also be castrated at this time.

This procedure is needed for meat quality in the finished steer and for safety of workers. A pen full of healthy bulls can be very dangerous for workers. A castrated bull becomes a steer. Banning the bulls at purchase time is preferred to surgical castration.

Selecting Cattle

Cattle can be classified according their maturity type. Early maturing types start depositing fat at an earlier age and can be market ready at a live mass of 380 to 400 kg. Late maturing types can reach market readiness at a live mass of 500 kg or more.

As a general rule, dual purpose breeds are late maturing types with high growth rates and require a longer feeding period. The beef breeds, excluding the Sussex which is medium to late maturing, are generally early maturing and although their growth rates are relatively lower, they need a shorter feeding period to reach a good carcass finish. Indicus cattle can do well in feedlots, but temperament and problems with laminitis can occur.

Maturity Types of Different Breeds of Cattle

Frame Score	Maturity Type	Breed	Range in Frame Scores
1	Early 1 - 2	Dexter	1 to 2
		Nguni	1 to 2
		Angus	1 to 3
		Potfontein Rooies	1 to 3
		Afrikaner	1 to 3
2		Herefords	2 to 4
		Rietvlei Reds	2 to 4

		Shorthorn	2 to 4
		Sussex	3 to 5
3		Symons	3 to 5
		Smythe	3 to 5
		Bonsmara	3 to 5
		Bongihlati	3 to 5
		Brangus	3 to 5
	Medium 3 - 5	Brahman	3 to 5
4		Braford	3 to 5
		Tauricus	3 to 5
		Beefmaster	3 to 5
5		Limousin	4 to 6
		Drakensberger	4 to 6
		Santa Gertrudis	4 to 6
		Simbra	4 to 6
		South Devon	4 to 6
6		Simmentaler	4 to 6
	Late 6 - 7	Gelbvieh	4 to 6
		Pinzgauer	5 to 7
7		Charolais	5 to 7

A problem encountered in practice is that, especially in Natal, most cattle entering feedlots are crossbreeds and maturity type does not always follow as a mean of the breeds crossed. In addition, there has been a trend to breed larger cattle, resulting in late maturing types within breeds traditionally known as early maturing. Fortunately, experienced stockmen can judge maturity type with reasonable accuracy.

Females are earlier maturing than steers and steers in turn are earlier maturing than bulls. Bulls can do well in feedlots, but often cause problems by fighting. Females can do well in feedlots, but often have poor growth rates partly because they reach carcass finish at an earlier age and there is a tendency to be tardy in sending them for slaughter. Disruptions caused by females coming on heat could be a contributory factor.

Animals can be placed in the feedlot at any age, usually after weaning. In practice animals tend to arrive at feedlots shortly after weaning (7 to 9 months of age), as yearlings (12 to 18 months of age) or at two and a half years of age. In most feedlots there is no differentiation in feeding regime between animals of different ages and it has been found that irrespective of the age, animals tend to gain about 150 kg and are then ready for slaughter. Cattle placed on high energy rations at an early age tend to deposit fat more rapidly than if they are kept on low energy diets for a time before being placed on a high energy ration.

In cases of emergency caused by food shortages e.g. drought, a question often asked is whether cows and calves should be separated before entry to the feedlot. The best practice is to place the cow in the feedlot with her calf. As the cow reaches carcass finish, the calf will have started eating concentrate. The dam can be removed from the feedlot and the calf remains until it in turn is ready for slaughter.

Irrespective of breed, sex or age, a proportion of animals (usually about 10%) do not adapt to feedlots. It is best to cull these animals as soon as possible. They can be identified by their poor performance in the initial stages of feeding.

Selecting Lambs

Economic success in feedlots is more likely with crossbred lambs because of the higher price paid per kilogram for their carcases, their faster growth rate and earlier maturity. There is a market premium for crossbred lambs over Merino lambs.

Live weight is important when choosing lambs. A fundamental requirement for efficient management is access to scales. Use these when first selecting lambs, and to monitor performance over time.

Drafting lambs according to live weight and size, providing a low-stress feedlot environment and ensuring that adequate trough length is available will minimise shy feeder numbers.

Success, in terms of physical performance in the feedlot, is increased if lambs have reached a minimum live weight of 25 kg and at least fat score 2 before entry. However, fiscal success is more likely if the heavy trade and export market segments are targeted. In these circumstances, the minimum entry weight should be 35 kg or higher.

To finish lightweight lambs (25–35 kg) to export-grade weights requires additional time in the feedlot – which increases production costs and ads to financial risk. If such lambs are to be finished in a feedlot, it is recommended that the target is a trade weight carcase of 18–22 kg.

MORPHOLOGY OF FATTENING UNIT ANIMALS

Morphology refers to all the physical external components and attributes of an animal that can be used to identify the specific animal. The morphology of the most common fattening unit animals will be described with specific reference to sheep and cattle.

Morphology and the Life Cycle of Sheep

The sheep is one of the smaller mammal type farm animals with an average weight of 80-120kg for rams and 50-80kg for ewes. The colour and coverage of the animals differ significantly between species. It is easier to describe the morphology attributes of sheep separately for wool and meat sheep.

- The wool sheep types have a thick and fine wool fleece for coverage that can be shorn to use as clothing for man. They usually consist of one colour that differs between white and a creamy colour. Wool sheep types usually have a smaller frame (body size) than meat sheep types. In most of the breeds especially the ram develops horns, but in modern farming practices the horns are cut and burn at a young age. This practice prevents the horns from growing back.

- The meat sheep types usually have short hair for coverage, but some races may consist of wool. The wool quality however is not very good, but the carcass composition is excellent. Due to a better carcass composition these animals usually have a bigger body frame than the wool sheep types. The colour of these animals differs from one colour white or cream to white animals with

black heads and even painted animals that consist of white, black and brown colours. As in the case with the wool sheep types these animals are also dehorned in modern farming practices.

- The udder of the female animals has only two teats, so they are referred to as ewes.

The breeding season of sheep is usually determined by the seasons but may be manipulated by the farmer. The best conception results however are obtained when the ewes are mated in their natural breeding season during spring and early summer (September-January). Approximately 150 days after mating a single lamb or up to four lambs are born. The lambs suckle on their mother for up to 5 months and are then weaned. The animals that are not kept replacing older animals are then sent to the fattening unit until they reached the market weight to be slaughtered. Replacement ewes reach puberty (sexual readiness) at 12 to 16 months of age and are then ready to conceive and reproduce.

Morphology and the Life Cycle of Cattle

Cattle are the largest type of modern farm animal with an average weaning mass of 200-220kg at 205 days of age and an average weight of approximately 340-360kg at 540 days of age.

Cattle vary significantly in colour and it differs from white, white and black, black, brown and red accordingly to the different species. The *bos indicus* types usually have shorter hair and a more shining than the *bos Taurus* types. *Bos indicus* types also have a smaller body frame and are usually recognized by a big bulk of muscle on top their shoulders. The most cattle species have well defined horns, but it is removed in modern farming practices to make the handling of the animals safer.

Female cattle have and udders that consist of four teats and is thus refer to as cows.

There is no specific mating season for cattle and conception can take part during any part of the year. Farmers usually decide when to bring their bulls to cows. After conception the cow is pregnant for 283 days before the calf is born. Usually only a single calf is born, although twins do exist. At 205 days of age the calves are weaned and sent to the fattening unit until they reach a market ready weight after approximately 90 days. Replacement heifers reach puberty at an age of 24 months of age and is then ready for conception and reproduction.

ANATOMY OF FATTENING UNIT ANIMALS

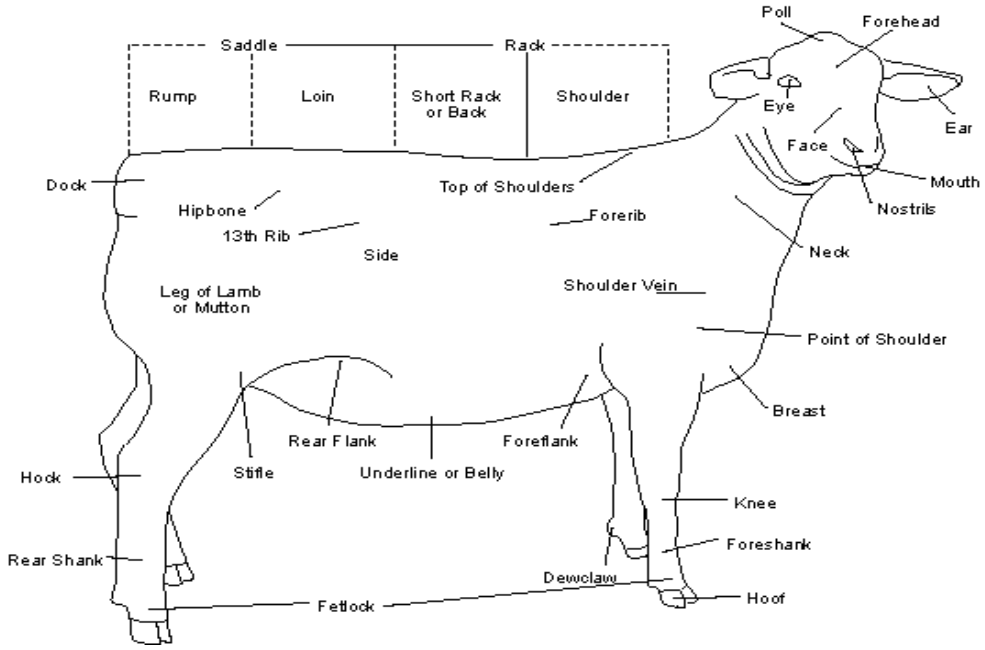
The anatomy of an animal describes basically the whole body. In this section we will first look at the external body sections of an animal that is visible to us. Secondly a description will be given of the most important anatomical systems in the body together with an explanation of their functions.

The anatomical description will specifically focus on sheep and cattle since they are the most common feedlot animals. Due to the fact that there is almost no difference between the anatomical sections and processes of these two species, the description will be for both and no specific reference to a certain specie will be made unless it describes and unique attribute of the specific specie.

Anatomical Sections of Fattening Unit Animals

Cattle and sheep can be divided in 8 big important sections that are visible on the animal, namely:

Head	The head of the animal host the eyes, ears, nose and mouth of the animal. The head also house and protects the brain.
Neck	The neck is a small piece of the body that connect the head to the back and thus the rest of the body.
Back	The back is an extension of the neck and run the whole length of the animal up to where the tail begins. The back and neck play an important role in the protection of the nervous canal that extends the brain to the rest of the body.
Thorax	The back is an extension of the neck and run the whole length of the animal up to where the tail begins. The back and neck play an important role in the protection of the nervous canal that extends the brain to the rest of the body.
Front Legs	The front legs are attached to the thorax. It basically starts at the back on top of the animal, and end in the hooves at the bottom.
Abdomen	This is the area behind the thorax and below the back of the animal. It is the place where the biggest part of the digestive system is situated, along with organs such as the liver, pancreas and kidneys.
Hind Legs	The hind legs are situated the furthest from the head, just before the tail. It starts at the rump on top and end in the hooves at the bottom.
Tail	The tail is the last section of the body and is an extension of the back. Its only function is to get rid of parasites.


Saddle
Rack
Rump
Loin
Short Rack or Back
Shoulder
Poll
Forehead
Eye
Ear
Face
Mouth
Nostrils
Dock
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Hipbone
Forerib
13th Rib
Side
Neck
Leg of Lamb or Mutton
Shoulder Vein
Point of Shoulder
Breast
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Foreflank
Stifle
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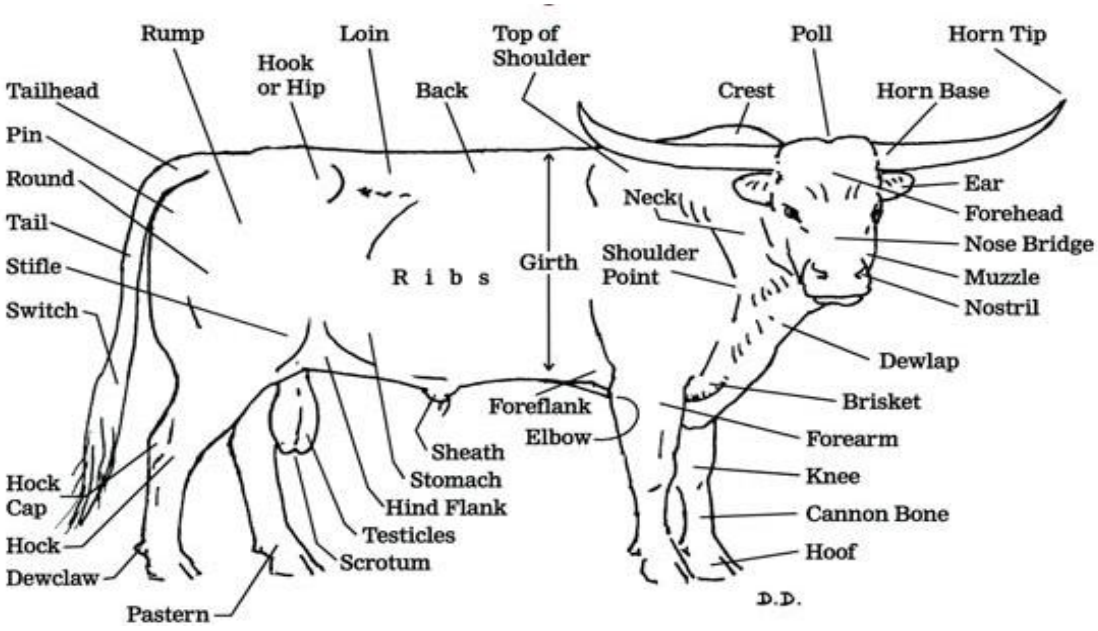
Hock
Knee
Foreshank
Rear Shank
Dewclaw
Fetlock
Hoof


Rump
Loin
Top of Shoulder
Poll
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Tailhead
Back
Crest
Horn Base
Pin
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Tail
Stifle
Switch
Neck
Ear
Forehead
Nose Bridge
Muzzle
Nostril
Ribs
Girth
Shoulder Point
Dewlap
Brisket
Foreflank
Elbow
Forearm
Sheath
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Testicles
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Scrotum
Hoof
Dewclaw
Pastern
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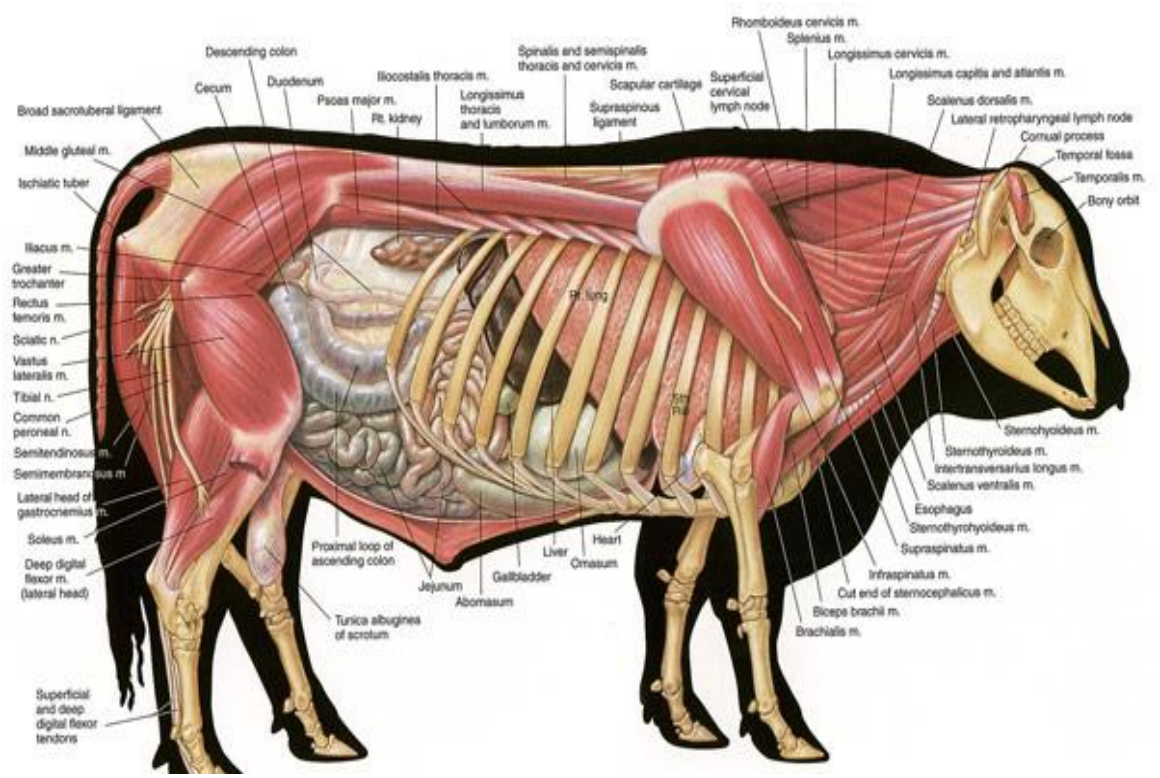

Rhomboideus cervicis m.
Splenius m.
Longissimus cervicis m.
Longissimus capitis and atlantis m.
Scalenus dorsalis m.
Lateral retropharyngeal lymph node
Cornual process
Temporal fossa
Temporalis m.
Bony orbit
Descending colon
Cecum
Duodenum
Iliocostalis thoracis m.
Psoas major m.
Rt. kidney
Longissimus thoracis and lumborum m.
Spinalis and semispinalis thoracis and cervicis m.
Scapular cartilage
Supraspinous ligament
Superficial cervical lymph node
Broad sacrotuberal ligament
Middle gluteal m.
Ischiatic tuber
Iliacus m.
Greater trochanter
Rectus femoris m.
Sciatic n.
Vastus lateralis m.
Tibial n.
Common peroneal n.
Semitendinosus m.
Semimembranosus m.
Lateral head of gastrocnemius m.
Soleus m.
Deep digital flexor m. (lateral head)
Rt. lung
Proximal loop of ascending colon
Jejunum
Gallbladder
Abomasum
Liver
Heart
Omasum
Tunica albuginea of scrotum
Superficial and deep digital flexor tendons
Sternohyoideus m.
Sternothyroideus m.
Intertransversarius longus m.
Scalenus ventralis m.
Esophagus
Sternothyrohyoideus m.
Supraspinatus m.
Infraspinatus m.
Cut end of sternocephalicus m.
Biceps brachii m.
Brachialis m.

Internal Anatomical Systems of Fattening Unit Animals

The internal anatomical systems are those that cannot be seen with the eye, but which plays a vital role in the animal. It is impossible for the animal to live or function normally if any of these systems is absent. In feedlot animals the following 6 internal anatomical systems is the most important: Nervous System	This is the most important anatomical system in the body and controls all the other anatomical systems. The brain lays the most important role here and together with the neurons and hormones it fulfils its role.
Respiration System	The respiration system is responsible for the inhaling of oxygen and the exhaling of carbon dioxide. The lungs are responsible for this function together with the nose, mouth and respiratory tracks.

Cardiovascular System	This system consists of the heart, arteries, veins and the blood that flows inside. It is responsible for the transport of all the soluble supplements, fats, hormones and gasses (O_2 and CO_2)
Digestive System	The digestive system starts at the mouth of the animal and end at the anus. There are two types of digestive systems namely the ruminants and the single stomach animals. Ruminants, of which cattle and sheep form part, are animals with a series of four different stomachs in its digestive system. The rumen, reticulum, omasum and abomasum form an impressive digestive system that allows the animal to ruminate and thus chew and digest the food more than once. Rumination allows the animal to receive the utter most amounts of supplements from the food ingested.
Urinal System	The blood of the animal runs through the kidneys which extract all the waste and poisonous substances from the blood and excrete it with the urine.
Reproduction System	In feedlot animals this is the most unimportant systems because no breeding took place in the feedlot. The reproduction system is responsible for all the reproductive functions of the animal. In the female animal it basically consists of the Ovaries, Uterus and Vagina while in the male animal the Testis, Sexual glands and Penis are the most important parts.

LEARNING UNIT 4

FEEDING OF ANIMALS

Learning Outcomes:

- Understand feeding definitions
- Understand water requirements of livestock in fattening units
- Determine water consumption levels
- Determine feed requirements for feedlot animals
- Understand the classification of feeds
- Understand the forms of feed and the characteristics of an attractive feed
- Understand the nutritive value of feeds
- Understand feedlot blends
- Select the appropriate feed for fattening unit animals
- Determine the daily feed consumption
- Determine the feed consumption ratio
- Understand different blends according to growth stage
- Adapting feed rations to production stages of the animals
- Reporting eating and drinking deviations
- Implement a feed management plan checklist

DEFINITIONS

Feeding Stuffs

In general, this term is synonymous with feed, food or fodder, but it is a broader term in that it includes all materials included in the diet for their nutritional properties. It includes plant or animal products and by-products as well as chemically synthesised pure nutrients or mixtures of nutrients added to animal feeds. Thus, maize meal is a stock or human food, but the vitamin thiamine-HCl is a pure nutrient that can be chemically synthesised. The vitamin is not food but is a foodstuff.

Ration: Diet

A ration is a 24-hour allowance of a feed or of a mixture of feedstuffs. The term implies nothing with respect to the suitability or adequacy of the allowance but merely refers to the amount of the provisions permitted. We commonly refer to the daily allowances for animals as rations but speak of human diets. For all practical purposes these terms are synonymous.

Balanced Ration

This refers to a feed mixture just sufficient to provide for all the requirements of a specified animal for one day. The term "balanced" originally referred to the proportions of fat, carbohydrate and protein in the ration. In the feed trade a balanced ration refers to a mixture of feedstuffs nutritionally adequate for the feeding of specified animals when used as recommended by the manufacturer.

Nutrient

A nutrient is any food constituent or chemical substance that aids in the support of animal life. Thus, carbohydrates, fats, proteins, individual amino acids and the various vitamins and minerals are all nutrients.

Toxicity

This term should be distinguished from "poisonous". A nutrient may be essential to an animal in small amounts, but when taken in excess it may result in toxicity, mild or acute. Fluorine is desirable in small amounts (about 1 mg/kg in the DM of the ration), but it is harmful in large amounts (about 30mg/kg) and it may actually poison the animal.

Feeding Standard

A general term for tabulations of the amounts of the various nutrients required by specified animals.

Feed Allowance

The amount of feed actually given to an animal daily is usually greater than the "requirements" by a safety margin to allow for variations in requirements between individuals.

Nutrient Requirement

A statement of what an animal on average requires for a particular function.

Digestibility

This term is usually taken to mean that nutrients which are consumed are broken down in the digestive tract and absorbed. In common language both processes, digestive attack as well as uptake of the resulting nutrients, are understood by the term "digestion".

Composition and Concentration

Composition may be expressed as a percentage (%) or as mass/unit mass *e.g.* g/kg.

Concentration may be percentage or mass/unit volume *e.g.* ml/litre.

Very low concentrations are usually expressed as mg/kg (ppm - parts per million)

Vitamin units are usually expressed in terms of mass of active compound and called i.u.

Antioxidants

Natural fats possess a certain degree of resistance to oxidation, owing to the presence of compounds termed antioxidants. These prevent the oxidation of unsaturated fats until they themselves have been transformed into inert products.

Metabolic Body Size

This is the mass of an animal (kg) raised to the power 0.75 ($Wkg^{0.75}$)

Energy

The international unit of work and energy is the joule. One joule is the work done by a force of 1 Newton exerted through a distance of 1m. One Newton is the force that will give a mass of 1kg an acceleration of 1m/sec^2.

1kcal = 4.184 kJ or 1 kJ = 0.239 kcal

Previously energy content of feeds was expressed as TDN (total digestible nutrients), whereas ME (metabolisable energy) is the modern unit used.

To convert TDN to MJ of ME, multiply the TDN value with 0.15%.

Water requirements of livestock in Fattening Units

The first essential nutrient for living organisms is water. Whereas an animal can survive for days without food, a lack of water can cause death within a matter of hours. In the case of cattle and sheep, an animal can stay alive for up to 3 weeks without food but can live for two or at most three days if not provided with drinking water. High temperatures, as are often experienced during dry periods, increase stress related to a water shortage.

The water requirements of livestock are based on a number of assumptions:

- environmental temperatures are not excessively high
- the water provided is relatively clean
- the water is palatable
- animal activity is average
- dry matter intakes (and consequently growth rates) are average.

In the case of cattle, the European breeds have a slightly higher daily water need than indigenous breeds. European cattle will consume 3 kg of water per kg of dry matter consumed at an environmental temperature of 5°C, and will drink about 8 kg of water per kg dry matter intake at an ambient temperature of 32°C. With sheep, the voluntary consumption of water is two to three times the intake of dry matter. The daily water intake of sheep can be 12 times greater in summer than in

winter. The data in the table should therefore be used as a guide only. Local conditions, including temperatures, wind speed and water quality, could change these figures substantially.

To ensure that a water shortage does not adversely affect animal performance, livestock must have constant access to water. Drinking troughs must be checked daily and, as a precaution, a back-up system is important. With a large water reticulation system, the primary reserve should contain at least 8 days' supply and the secondary reserve (between the main water reserve and the drinking points) at least a 2-day supply of water. It is useful to keep water carts on standby for emergencies.

DETERMINING WATER CONSUMPTION LEVELS

To determine the collective water consumption of the cattle in a feeding pen or a feed bunker one needs to be firstly aware of how much water was given to the cattle in each pen. Normally water troughs are refilled once a day after cleaning and a feedlot manager should be well aware then of how much water was left in each trough before cleaning and how much water each trough contains.

Many producers overlook the importance of water availability as it relates to bunk management, including the amount of water, space provided, and the location of water sources. Problems that limit water intake also can limit feed intake, and this, in turn limit overall animal performance. Poor water quality or lack of water can cause cattle to go off feed quickly.

Feed callers need to recognise this problem before making any drastic changes in the amount of feed offered. In free-stall barns, 3 inches of linear space per cow and one watering space (or 2 feet of tank perimeter) for each 15 to 20 cows are recommended. A water depth of 6 to 8 inches is suggested to help keep the water fresh and easier to clean, because less debris accumulates. As temperature and humidity goes up, more water is required. During months of hot weather, water supply becomes an important issue. Adding water tanks for the summer can help in the feedlot.

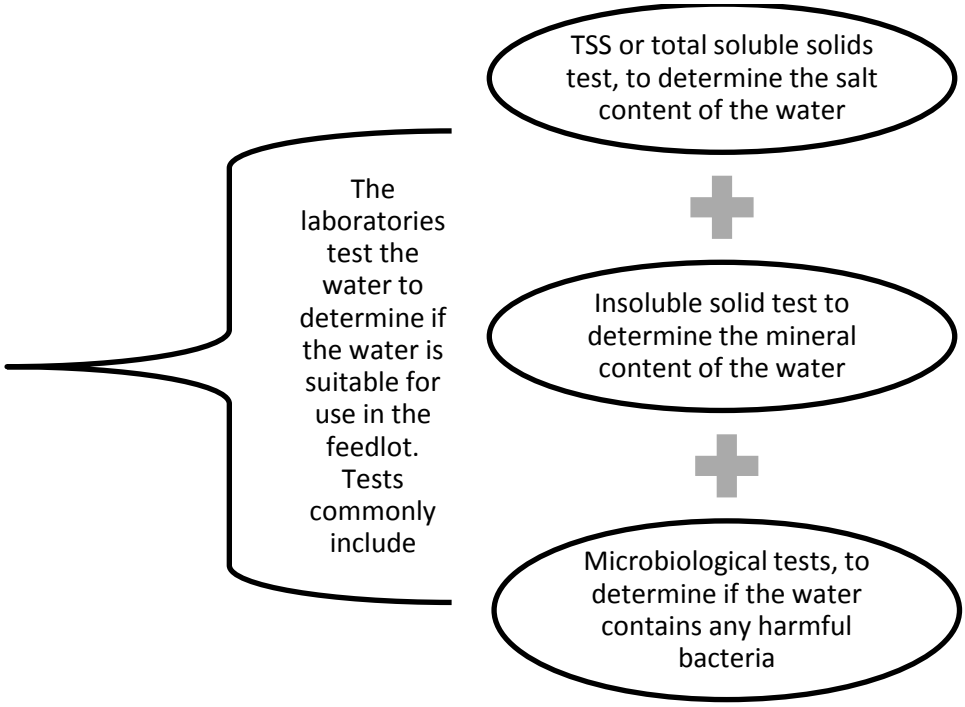
The following table gives an indication of the amount of water needed per head of cattle per day at different temperature.

Water requirements of livestock, excluding waste, and assuming that the water is clean and palatable

Class of Livestock	Requirement(R/animal/day)
Cattle	
Cow	40 to 50
Bull	45 to 55
Dairy cow	5 per R of milk
Yearling	25 to 40
Calf	15 to 25
Sheep	
Dry ewe	8
Ewe with lamb	11
Ram	11
Lamb	2 to 4
Pigs	
Dry sow	5 to 9
Lactating sow	18 to 23
Boar	9
Baconer	5 to 9
Piglet (4 to 5 weeks)	4 to 5

Determining Water Quality for Water Troughs

In the same manner that feed blends and ingredients are assessed the quality of the water to be used in the feedlot should also be assessed. Water quality is assessed by regularly taking samples of the water at the source and sending these samples for analysis to independent laboratories.



Decision on whether water cleaning system and the type of system needed can only be made using recommendation from laboratories after the testing of water samples. Water quality should be assessed at least once every six months and more often if any problems are noted.

When taking water samples always use a clean sterilised plastic container and take the samples in such a manner to avoid contamination of the sample. Always fill the sample container right to the top and seal the container tightly with a lid. Note the time and date on the container as well as where the sample was taken. It is good practice to always take two samples. One for testing and one kept as reference in case retesting are required.

- Why Water Quality is Important to Animals:

Water is the life giver. No feedlot can be successful if the quality and quantity of water given to cattle are insufficient. Dirty water is a source for disease organisms, and disease can spread rapidly if animals drink from the same trough.

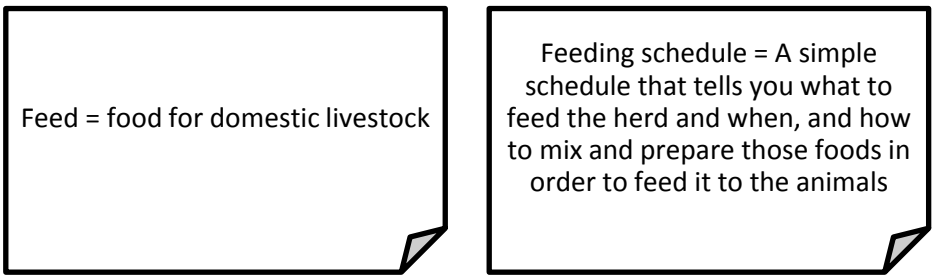
Sick animals must always be isolated, and the trough disinfected and cleaned. Poor quality water leads to a reduction of water intake, and thereby a reduction of feed intake causing slower rates of gain.

- Why Freshness of Feed Is Important to Animals:

No feedlot can be successful if the cattle in the feedlot don't maintain sufficiently high levels of daily dry matter (DM) intake to ensure a constant weight gain. As we discussed earlier a range of different feed blends are used within the feedlots each with its own unique characteristics to perform certain function. If for any reason any of these blends or the ingredients used on the blends is of an inferior quality the rate of weight gain necessary for the cattle to achieve in order to ensure the profitability of the enterprise will not be obtained.

Rations should be fresh, palatable, and uniformly nutritious. Spoiled or mouldy feed ingredients should be discarded; this helps minimise ration contamination and potential for reduced DM intake. Unfortunately, discarding of spoiled feedstuffs is not always a common practice. In a recent study, growing steers were fed high silage rations, which contained 90.0% well-preserved corn silage or 67.5% well preserved corn silage and 22.5% spoiled corn silage for example, silage from the original top 3 feet in an unsealed bunker silo. Steers receiving the ration with the spoiled silage had significantly lower DM intake and lower organic matter, protein, and fibre digestibility. This led to reduced weight gain and can therefore negatively affect the profitability of the feedlot enterprise.

FEED REQUIREMENTS FOR FEEDLOT ANIMALS



Feed bunk management refers to all aspects of the feed selection, delivery, consumption, and control of the feeding program. Researchers refer to feed bunk management as the quantity of feed offered to the quantity of feed consumed. The goal is to assure fresh, palatable, and balanced rations which are available to reach optimum (not maximum) dry matter intake. As herd production increase, you need to monitor dry food intake carefully. It is the most important factor in ensuring sufficient animal bulk and in maintaining milk production in dairy herds.

Feed bunk management does not involve feed delivery decisions alone. It also involves ration ingredient characteristics and quality control, nutrient balancing, feed processing and mixing, water quality control and other factors related to feed presentation.

Superior livestock performance begins with quality feedstuffs and a sound nutritional program. All livestock producers should establish quality standards and acceptance/rejection criteria for all feed ingredients to account for and control variation in feed composition and quality. Systematic sampling, accurate analysis, and timely ration adjustments, based on nutrient density and moisture content of individual feedstuffs, are all fundamental to ration quality control.

Rations should be fresh, palatable, and uniformly nutritious. Spoiled or mouldy feed ingredients should be discarded; this helps minimise ration contamination and potential for reduced intake. Unfortunately, discarding of spoiled feedstuffs is not always a common practice. In a recent study, growing steers were fed high-silage rations, which contained 90.0% well-preserved corn silage or 67.5% well preserved corn silage and 22.5% spoiled corn silage (e.g., silage from the original top 3 feet in an unsealed bunker silo). Steers receiving the ration with the spoiled silage had significantly lower feed intake and lower organic matter, protein, and fibre digestibility.

Delivering the wrong ration can lead to disaster. But mistakes can and do happen. In a feedlot, an alert feed truck driver knows that, when he loads the tractor with grain, it's not supposed to go to a pen of bawling calves or yearlings with sale barn tags still on them.

Proper feed processing and mixing are essential for optimum feed utilisation. Adequate and consistent feed mixing will ensure that every bite of the ration is the same. Fine particles that separate in the bunk must be avoided, because they can contain high concentrations of minerals, feed additives, or rapidly fermentable grain particles. Ration conditioners (e.g., molasses, fat, or water); high moisture feedstuffs; and uniformity of forage particle size can help reduce fines, sorting of ingredients, and rejection of feed.

CLASSIFICATION OF FEEDS

There exist a very large variety of feeds that can be used to feed animals. Anything that is digestible and not poisonous to the animal can be used as a feedstuff.

Animals in fattening units usually receive a complete feed (ready mixed) as this is the best way to ensure an intake of all the necessary elements. The feeds that will be mentioned in this section can be used as ingredients to compile a complete feed mixture that satisfy the requirements of the animal.

Different types of feeds are fed to get a balanced diet that will promote the maximum growth in the shortest possible time at the lowest cost.

The most basic classification of feed according to their chemical compositions can be given as:

- Roughage and fibre – including hay, silage, pastures and other forages
- Energy feeds – including starch rich, low-protein feeds and protein supplements
- Supplements – including minerals, vitamins and non-protein nitrogen (NPN) supplements

Roughage

Roughages	Roughages should make out at least 40-50% of the total feed in the first two weeks the animal is in the fattening unit. After two weeks it can be reduced to 10-20% but not less than 10%. Types of roughages include but are not limited to: • Lusern hay (*Medicago sativa*) • Soybean hay and straw (*Glycinemax*) • Barley hay and straw (*Hordeumvulgare*) • Oats hay and straw (*Avenasativa*) • Grass-types hay (*Eragrostis*) • Different types of Silage (Have relative high energy values)
Dry Roughage	Includes all dry or dried feeds with more than 18% crude fibre on a dry mass (DM) basis.
Pastures and Veld	All feeds that are not dried or processed before feeding.
Silage	Feeds that are processed through controlled fermentation.

FIBRE

Fibre	Beef cattle are ruminants; therefore, they also need some fibre. Straw is a common feed fed in our country. It is high in fibre, but very low in energy and protein and is not a feed. Straw should be used for bedding or left in the field and ploughed down to build soil structure. Alfalfa-grass hay also has fibre but at much lower levels. So, a well-balanced ration of barley and alfalfa-grass hay not only provided most of the protein and all energy needed but also all the fibre needed. Too much fibre limits Dry matter intake and stunts growth.

Following Roughages are Available	
Hay from legume plants	Lucerne is the best-known legume hay. It is very palatable and is usually beneficial in nearly all rations. It contains high protein levels in general but is relatively poor in energy. It combines well with feed like maize silage, maize and molasses. There is no restriction on the levels of inclusion. As a result of its high calcium content it should however be avoided during the dry period in cows that are prone to milk fever. Pea hay is mostly of a poorer quality than lucerne hay especially because most of the seeds had been removed. The same principles apply regarding the feeding of it. If hay from peas is stringy, it should preferably be ground to increase intakes.
Grain and grass hays	These hays have lower protein and calcium levels than legume hays. The growing stage, during which crops are cut for hay, has a large influence on the spontaneous intake and nutritional value of it. In lactating cows, the levels of inclusion are usually limited because of its lower quality.
Pasturages	Grazing is normally the cheapest source of roughage for cattle. Factors that limit weight gain from grazings are mainly the energy content and the high moisture content of crops. The protein content of rye grass clover grazing is usually high. Kikuyu has low levels of calcium. Other pasturages on the other hand have high levels of potassium and should be avoided.
Straw	This comprises the stalks and leaves of crops that remain once the seed had been threshed out. Grain straws are the best-known low-grade roughages. It is low in protein, energy and minerals. Of the most common small grains, oat straw is probably the most valuable, followed by barley and corn straw. Maize straw and grain sorghum straw are just as good as oat hay or even better. Straws should be ground in order to get good intakes. The low nutritional value of straws limits its inclusion

	levels. Small grain straws should preferably not be used in rations. With the necessary supplementation straws can be used to a limited extent in the feeding of replacement heifers. In the Western and the Southern Cape small grain straws are often upgraded by treating it in an oven or in a stack with ammonia. That way the energy and protein content, as well as the palatability are improved considerably. It is not normally necessary to grind ammoniated straw. In the case of feedlot cattle, it should not make out more than 40% of the ration. When ammoniated straw is used, it is important for the levels of phosphorus, magnesium, zinc, cobalt, selenium and copper, as well as vitamin A and E to be supplemented.
Silage crops	This is the cheapest method of storing roughages. Maize is mainly used for this. Good quality silage can also be made from most grass types and legume plants. Silage has high moisture levels and as a result it is bulky. The crude protein level in silage is often higher than that of hays. It is excellent feeding for young animals older than 9 months. There is no limit on its inclusion in rations. Mouldy silage often contains fungi with dangerous toxins, and it should therefore not be fed to animals.

ENERGY

Energy	This is the most expensive part of the diet. Energy feeds are included on a basis of 40% when the animal enter the fattening unit and are then increased to levels of about 60-70%. The most important energy feeds are: • Maize (*Zea mays*) • Grain sorghum (*Sorghum vulgare*) • Molasses Energy is provided through the breakdown of carbohydrates, protein and oils/fats within the rumen and small intestine. Starch is the most common form of carbohydrates and found in cereal grains. Feeding excess protein can be used to provide additional energy for feedlot steers; however, it is less efficient than starch digestion. Oils/fats are energy-rich forms which provide as much as 2.25 times the energy of starch. Unfortunately, levels exceeding 7% in the ruminant diets can lead to a decrease in rumen efficiency.
Energy feeds	Feeds with less than 20% protein and less than 18% crude fibre such as cereals (grains), fruit and nuts. It is important that you have an understanding of potency of the various ingredients that can be used to formulate feedlot feeds. Commonly when we refer to potency, we refer to the protein content of the different ingredients. There are however a range of factors that can have an influence on the protein content of the concentrates or roughages used in your feedlot blend, so it is important to have the various components tested on a regular basis in order to accurately measure the potency.

The following table contains various concentrates with their relative energy values compared to corn and suggested levels of use in feedlot diets:

Value of various energy sources compared to corn in feeder rations with ration restrictions

Concentrate	Value Compared Ration to Corn (%)	Restriction (Maximum %)
Corn	100	100
Animal fat	160-180	5
Barley	88-90	100
Beet pulp, dried	88-95	50
Millet	90-100	50
Milo	85-95	100
Molasses	70	5
Oats	88-94	25
Rye	80-85	20
Wheat	100-105	40
Wheat bran	65-80	10
Wheat middlings	70-85	20

SUPPLEMENTS

Where cattle are on veldt grazing, it is common practice to provide them with supplements. The objective is to add to deficiencies that may exist in the feed available to them and thus prevent losses. It can happen that severe deficiencies exist on a specific farm and farmers should always monitor their livestock to determine the presence of specific problems on their farms. On the other hand, supplements can be used to enhance animal performance. Enhanced animal performance is only advisable when gains provide greater financial returns than the associated input costs.

Summer Supplementation

In many parts of KwaZulu-Natal, shortages of iodine, zinc and magnesium limit the growth of livestock. In addition, on almost all farms in the region, phosphorus and salt should be provided, although in many areas close to the sea, salt inhibits lick intake when added to the licks in even small amounts.

A mature cow requires about 30 g of salt and 10 g of phosphorus per day.

Many commercial summer licks are available, but the most commonly used is to mix dicalcium phosphate or P12 with salt. The salt usually comprises 50% of the lick but must be reduced where lick intakes are too low. Intakes of 170 g per cow per day can be expected.

Winter supplementation

With winter feeding of beef animals, the objective is to maintain adequate body condition for cows so that they can calve down during the subsequent summer and re-conceive as well. The main deficiency in winter veldt, more specifically in the sourveld, is a protein deficiency. The general recommendation is to provide 200 g of crude protein per adult dry cow per day. This could be achieved by the provision of winter licks or the feeding of oil cakes. Many licks are available, and advisors should be consulted. Whichever lick is used, it must be remembered that enough roughage must be fed with the lick because licks are additives and the bulk of an animal's diet must be provided by relatively cheaper feed. Some examples follow:

Winter Lick 1:

Feed 2 kg poultry litter per cow per day.

Caution: Livestock being fed poultry litter must be vaccinated for botulism and the litter must be free of maduramycin.

Winter Lick 2, for Sourveld:

Maize meal 20.2%

Salt 46.2%

Feed lime 16.8%

Urea 16.8%

Intake should be 0.4 kg per cow per day.

Caution: This lick contains non-protein nitrogen (urea) and the necessary precautions must be taken, including that livestock must be adapted to the lick and the lick must be kept dry. This lick does not contain phosphorus and is suitable for mature animals, whereas growing animals should still be fed phosphorus.

Winter Lick 3, for Sweetveld:

Maize meal 35.8%

Salt 30.0%

Feed lime 17.1%

Urea 17.1%

Intake should be 0.385 kg per cow per day.

Caution: This lick contains non-protein nitrogen (urea) and the necessary precautions must be taken, including that livestock must be adapted to the lick and the lick must be kept dry. This lick does not contain phosphorus and is suitable for mature animals, whereas growing animals should still be fed phosphorus.

Protein Supplements

Protein feeds are also very expensive and make out 20% of the total feeding cost. Protein are included on a basis of 11-13% in the diet of which not more than 40% must be of NPN and the rest must be natural proteins. Protein sources include, but are not limited to:

- Urea (NPN)
- Oilseed meal
- Fish meal

Protein is necessary for muscle development and appetite. Inadequate protein can lead to a reduction in rumen bug numbers and activity, a reduction in take and slower weight gains. Crude Protein (CP) requirements vary according to the rations energy content and the steer's age and live weight. Young lightweight calves require higher levels of protein at any given energy intake due to their higher requirement for muscle development.

Urea is a cheap form of non-protein nitrogen that the rumen microbes are able to turn into protein for the steer's use. Urea can be included in the ration but not to exceed 1%-2% of the ration and must be mixed into the grain evenly. Calves under 100kg of weight should not be fed urea because their rumens are still developing. If urea is used in the ration, it should be introduced slowly over 10 to 14 days and must be evenly mixed into the ration. Urea is converted to crude protein by first being converted to ammonia by the rumen microbes. A sudden increase in ammonia can cause death.

Key ingredients	% CP	NEm	NEg	%ADF	%NDF
Barley	13.5	2.07	1.41	7	19
Wheat	11.3	2.20	1.52	4	14
Corn	10.0	1.94	1.30	3	9
SBOM	49.0	2.07	1.41	10	15
Alfa-G Hay	18.0	1.32	0.75	31	42
Straw	3.6	0.75	0.22	54	85

Energy, Protein and Fibrein Common Feeds

- SBOM = Soybean Oil Meal

- %CP = Percent Crude Protein
- NEm = Net Energy for maintenance
- NEg = Net Energy for growth
- %ADF = Percent Acid Detergent Fiber
- %NDF = Percent Neutral Detergent Fiber

Energy information on the feeds is listed as Magi calories per kilogram. (Note that straw is very low in all important nutrients and too high in fibre)

Mineral Supplements and Vitamins

Steers need a range of minerals to maintain good health. Three are important are calcium, phosphorous and salt. Most cereal based rations provide enough of the trace mineral needed with the exception of calcium phosphorous and salt. However, alfalfa hay is high in calcium but low in phosphorus and when that is part of the ration, calcium does not need to be feed however phosphorous might need to be added to the ration. So, in the beef feedlot project salt must be provided and phosphorous might need to be added. In the sponsored feedlot project, the hay and grain feed will be tested for mineral content. Calcium, phosphorous, salt and trace minerals will be added to the grain mix to balance the needs not provided by the hay and grain. Lose ground salt available free choice must also be provided in the feedlot. Salt blocks will not provide the salt needed. A steer would have to stand there all day and do nothing but lick salt to get enough sodium.

Vitamins will be added to the grain mix in small amounts if needed, however, it is recommended that the calves be given shots of vitamins A, D, E and B12 when they first come into the feedlot in the neck or ear area. High quality alfalfa-grass hay will help to correct many mineral and vitamin deficiencies.

ADDITIVES

Antibiotics, hormones, vitamins, minerals and growth promoters are usually purchased in a premix which already contain the right proportions and are just mixed into the complete diet.

FORMS OF FEED AND THE CHARACTERISTICS OF ADDITIVE FEED

Different feedstuffs are used to make up a complete diet for a fattening unit animal. The different feedstuffs (ingredients) that can be use is classify as:

Loose Ingredients	This is the types used to make up a complete diet from scratch. Loose ingredients include, but are not limited to: Maize, Luzern, molasses, Urea, Salt, Water, Calcium, Vitamins, Minerals, and Medicine etc. A combination of some of these ingredients mixed together give form to a complete diet or feed.
Concentrate	Concentrates can be purchased from animal feed manufacturers. A concentrate usually contains a mix of all the necessary feedstuffs like protein, vitamins, growth promoters, salt, minerals and medicine, while it usually does not contain enough energy feed and roughage. The concentrate is then mixed with maize and roughage to form a complete feed.

The complete feed can take on different type of attributes, determined by the type of processing it went through. The complete feed can be in the form of:

Loose Mix Feed	This is the form when all the ingredients are well mixed together and then being feed in that form. This is the way it is done on farm level and in the big commercial feeding units.
Pellets	A complete feed may be bought from an animal feed manufacture in the form of pellets. The complete mixed feed is pressed into pellets to make it more compact and to reduce the amount of dust. This form of feed is especially useful for the feeding of sheep. The processing the feed has to go through make it more expensive than a loose mixed feed.

To ensure the maximum intake of feed by the animal, the animal must find the feed attractive. Feed is of no use if it is not willingly consumed by the animal in large quantities. The more feed the animal consume the better will the average daily gain (ADG) in weight of the animal be and the faster its weight will increase.

Animals consume feed that is easy digestible better. In the case of cattle and sheep it helps to add 15-20% water in the feed to reduce the amount of dust that occurs from the milling of the feed. Molasses also help to bind the dust.

Sheep do not eat as willingly as cattle and will pick out certain ingredients in the feed and leave the rest untouched. To reduce this problem, you have to ensure that the feed is uniform and that picking is impossible. If the feed is compressed into pellets the sheep cannot pick out certain parts and amount of dust in the feed is minimal.

Fattening unit animals, especially sheep, is very picky with what they eat. Even the smallest strange smell or taste in the feed will cause the animal to refuse the feed. It is thus very important to ensure that the ingredients in the feed is fresh and of good quality. Feed that is rancid or starting to rot have a strange smell to it and will not be eaten by the animals. Certain types of fungi that develop on wet feed are poisonous and can cause the death of an animal. Other feeds with a strong smell are some of the protein sources. Although there is nothing wrong with the fishmeal that is being use, the smell may be to strong and the animal will refuse to eat it.

Animals take time to adapt to a new kind of feed and will not eat it willingly from the start. This is often seen with feeds that have a strong taste, such as silage. When an animal is not use to silage, a small amount should be added at first so that the animal can get used to it. The amount of silage can then be slowly increased with time.

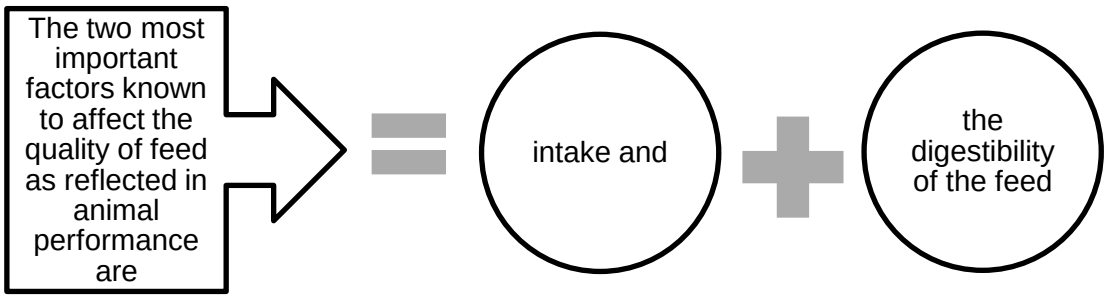
NUTRITIVE VALUE OF FEEDS

Most feedlots will employ a nutritionist to help them to formulate their main feed blends. The availability of ingredients will always be a factor when a new feed blend is formulated and therefore there are usually significant differences in the exact feed blend formulas form one feedlot to the next.

Cattle in feedlots also have different nutritional needs and, depending on their state and age, will be fed different feed blends. Most commonly a good feed blend will consist of roughage and protein as we discussed in the previous section. Quite often though; the nutritionist within the feedlot might identify the need to add supplements such as vitamins and minerals to the feed blend in order to facilitate the weight gaining process.

Methods do exist for balancing rations or creating feedlot diets with just a pencil and paper. However, given the complexity of feedlot diets, computer ration balancing software can reduce the time in looking at various ration options. Various universities and agriculture software companies have created such software for sale. The cost of such software can range from R1000 to R100,000 depending upon what you require. Universities and feed companies also offer such services. The only caution is that all this software can be "inherently stupid" and create a nutritionally balanced diet but which may be actually difficult, if not dangerous, to feed.

Various terms are used to describe the nutritive value of feeds, including feeding value and quality feed. Often these terms are used without a clear definition of what is meant. Ultimately, the best criterion of feed quality is the performance of the animal consuming the feed.



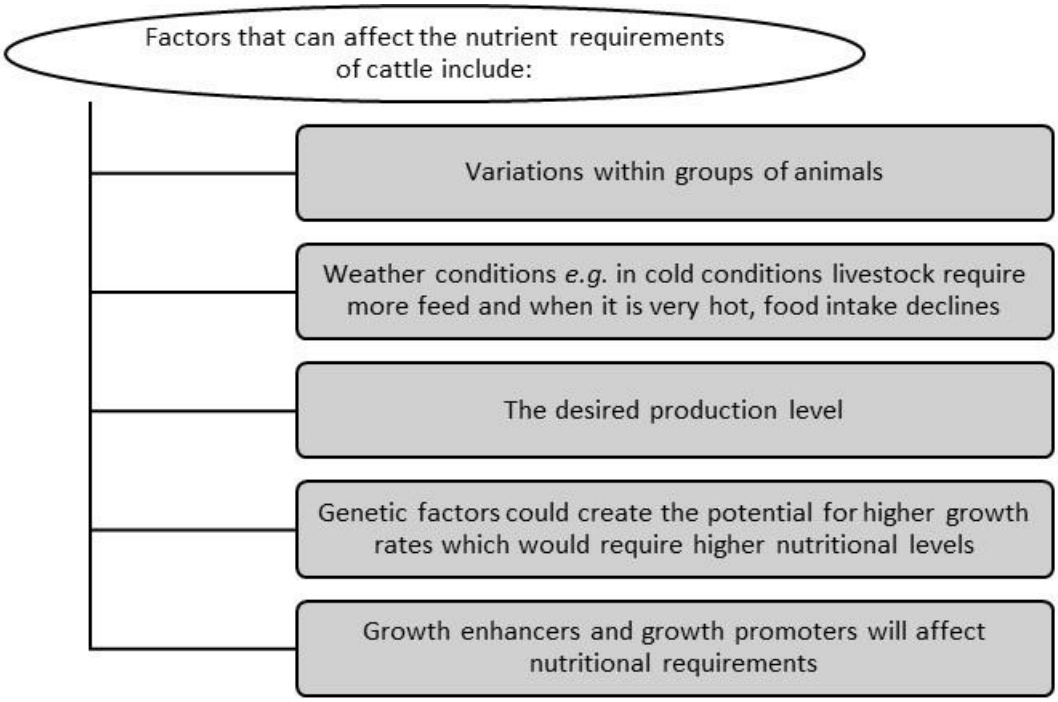
In feedlots, concentrates formulated to achieve the most economic animal performance, are used. With concentrate feeding *i.e.* where feeds with a digestibility above 70% are fed, intake is limited by rumen capacity and the digestibility of the feed is the major determinant of animal performance. For feeds where the digestibility is below 70%, it has been shown that voluntary intake by the animal is the major factor limiting animal performance. A trial at Glen showed that approximately 80% of the

difference in quality between roughages could be ascribed to voluntary intake and 20% to digestibility. With very poor-quality roughages, cattle cannot ingest enough feed for maintenance requirements. In the case of beef cattle, the main source of nutrients is the grass they graze. Farmers are therefore well-advised to evaluate quality of grazing with care and ensure that cattle not only have enough feed, but that they grow well, indicating that the quality of their feed is good. Experience has shown that when grass is grazed at a relatively early stage of growth *i.e.* has not matured to the extent that its lignin content is still relatively low, animals perform well.

Different animals require different types of food and amounts of nutrients to satisfy their nutritional needs. The National Research Council (NRC) of the United States of America and the Agricultural Research Council (ARC) of Britain compiled tables listing the requirements for different classes of livestock.

Experienced nutritionists know which feeds can be included in diets and what limits must be placed on the presence of certain feeds in a diet. Farmers are well advised to seek advice from nutritionists about feeds they do not know.

The values reflected in the nutrition tables are average values containing a safety margin and must therefore be applied with caution when estimating the nutritional needs of an animal.



With the nutrition tables, tables reflecting the chemical composition of feeds are available and, where the analysis of a feed is not available, these tables provide usable data.

FEEDLOT BLENDS

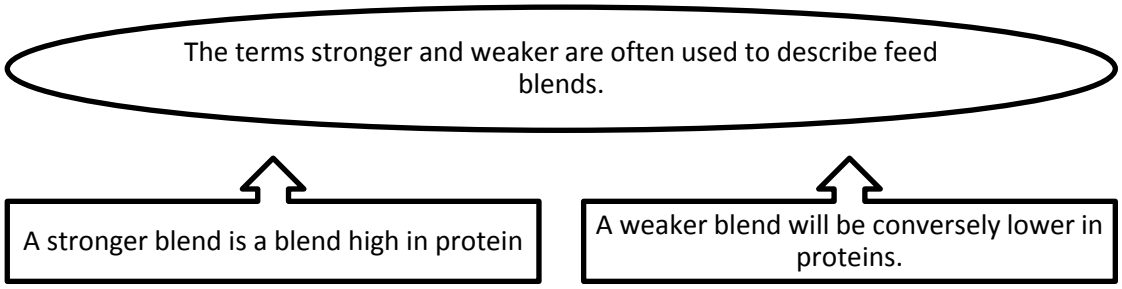
Identifying Concentration of Ingredients in Blends

As we discussed earlier in this guide any feed blend consists of a range different ingredient. These ratios and type of ingredients differs also from blend to blend and are specifically designed for cattle at a certain stage of growth. As do the vitamin and mineral supplements differ between feed blends.

It is therefore important that a feedlot operator or manager is able to distinguish between the different ingredients and the concentrations of those ingredients in the feed blends to ensure that cattle receive the correct feed. No feedlot manager or operator should ever use a feed blend bought from a supplier and not mixed on the feedlot without obtaining sufficient information concerning the content of the and the concentration of the different ingredient of the blend.

Only ever use reputable suppliers for blended feed and if you are unsure about the supplier it is good practice to rather mix your own feed in the feedlot in order to obtain the correct blend of ingredients and the correct concentrations of those ingredients to ensure maximum growth of cattle. If a feedlot manager is uncertain about the contents of feed blends some universities and a few independent laboratories offer the necessary testing services that can be used to test and determine the content of blends.

Understanding when a Feed Blend is "Stronger" or "Weaker"



Calves are normally started off on weaker feed blends until their capacity to digest proteins increase. The blend is then strengthened by adding more protein to the blend to assist and accelerate weight gain. As the cattle move towards finishing the protein content of the blend might be adjusted again to slow weight gain as we discussed earlier.

SELECTION OF APPROPRIATE FEED FOR FATTENING UNIT ANIMALS

It is very important to make sure that the correct feed is given to the animals in the fattening unit. Usually there are different groups of animals in a fattening unit, with each group on another stage of feeding. Each group receive its own planned diet according to the stage of production they're in, the average weight of the group and the amount of feed the group receive.

Animals that are newly introduced get a totally different kind of feed than animals that are in the program for some time already. When a feed that were made for rounding of animals in the final stage is given to animals that are new in the fattening unit, the consequences may be fatal because the ration is to "hot".

A fattening unit that consist of sheep and cattle must take care that each type of animal gets the feed that was formulated for it. If the wrong type of feed is given to an animal the fatal consequences will cost the fattening unit quite a lot of money.

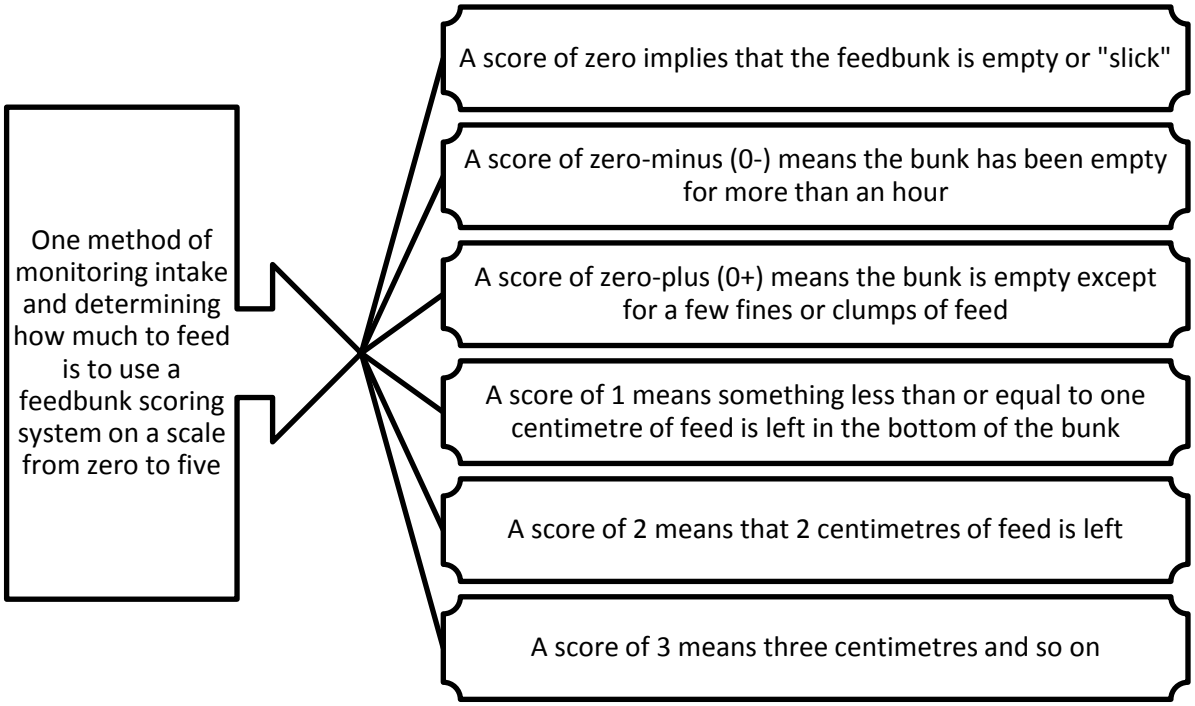
Through the correct following of workplace procedures and good control over the feed this type of problems will normally not arise.

DETERMINING THE DAILY FEED CONSUMPTION

As we discussed earlier one of the most critical aspects in the management and operation of the feedlot is the correct application of the correct amount of feed and correct blend of feed to the different groups of cattle in the different feed bunkers. All feedlots should therefore design and implement a process whereby they can easily and effectively differentiate between the different feed bunkers in the feedlot and the different requirement of each bunker.

By minimising digestive disorders, we can keep cattle on feed and maximise performance. Poor bunk management and not the ration being fed can be "the first domino to fall" resulting in digestive disturbances such as bloat, acidosis, and liver abscesses. Cattle feeders should strive to have uniform day to day consumption of fresh, high-quality feed. The bunk management tools described below can aid in preventing large fluctuations in intake caused by acidosis and recovery from a bout of acidosis.

Determining how much feed to offer requires a certain amount of skill and good judgement. Cattle are big fermentation vats and fermentation vats work best under constant conditions. Careful bunk management during the winter months when is especially important since weather conditions alter consumption patterns.



Normally, if the score is zero for two consecutive days, you must increase the feed delivered to cattle by 5-10 percent. If the score is two or more, you must reduce the feed offered by 5-10 percent.

To accurately manage the different feed bunks a feed bunk sheet system should be in place for each feed bunk. A bunk sheet should have a place for date, pen of cattle, amount of feed delivered and a bunk score. A feeder should have at least 4 days of records whenever determining how much feed to put in the bunk.

Scoring bunks should be done the same time each day. Looking back, the bunk score, combined with the amount of feed provided can tell you if intakes are going up, coming down or holding steady. Scores constantly in the 2 to 3 range may lead to feed wastage and reduced feed efficiency due to the possibility of large fluctuations in feed intake.

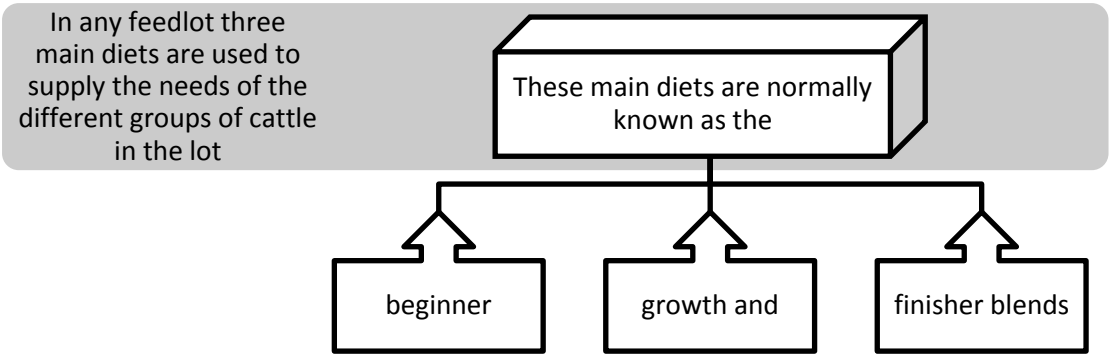
DETERMINING THE FEED CONSUMPTION RATIOS

In order to put together a feeding schedule for cattle, it is necessary to be informed about the requirements of animals and the properties of feeds that are available. In practice ignorance about feeds often leads to animals being fed either too much or too little with economic losses as a result. The most effective manner in which to determine the amount of feed needed accurately is by using a bunker scoring system as we discussed during previous sessions.

Recording daily consumption is important as this determines the amount of feed needed. Daily feed consumption is determined according to recent consumption. Monitoring and recording of consumption is therefore essential, enabling the producer to distribute correct amounts of feed. Feed calls should be made prior to the morning feeding, with two additional observations made during consumption of the first feeding and one in the afternoon feeding. Although the amount of feed offered never should be increased by more than 10%, decreasing feed offered by 10% might be warranted to ensure that cattle clean up feed remaining in the bunk before it spoils.

Feeding practices and time of feeding can also differs from feedlot to feedlot; commonly cattle will be fed in the morning and in the late afternoons with less feed being distributed in the afternoons if the morning's ration was not finished. But some feedlot has found that daily DM (dry matter) intake can be increased during the winter months or colder periods by feeding cattle only once a day late in the afternoon. The reasons for this are not always clear and each feedlot manager should adjust his feeding practices and times to best suit his cattle.

DIFFERENT BLENDS ACCORDING TO GROWTH STAGE



Starter Blends

Newly arrived calves do not readily eat upon arrival in the feedlot. On day one in the feedlot, only 22% of the calves may eat. By day three, approximately 40% may still not be eating. And on day 10, an average of 15% of the cattle may not be eating. Starter rations should be fed for 3-4 weeks after arrival. The actual starter ration should contain from 60% to 80% concentrates. If cattle are destined for a high roughage program, the starter ration should be about 40-50% concentrates.

The starter ration should contain about 16% crude protein on a dry matter basis, depending on intake. Dry matter (DM) intake is often less than 1% of body weight during the first week of arrival. Diet

concentrations of protein and other nutrients need to be increased based on feed intake level in order to meet requirements. Recent research has suggested that up to 23% crude protein (dry matter basis) during the first week, comprised partially of a by-pass protein, can improve gains during the first week.

Animal sources of by-pass protein may be less palatable which means that a flavour enhancer such as molasses may need to be added. One thing to keep in mind when feeding receiving diets containing 70-80% concentrates, and high levels of crude protein is that these diets are highly digestible. Therefore, stools will be much looser than if the calves were being fed a diet with a high roughage content that was less digestible. The loose stools clear up in approximately two weeks and should not be confused with a diarrhoea condition resulting in dehydration.

Calves are not initially capable of utilizing urea or other non-protein nitrogen sources very effectively. In addition, as urea decomposes in the bunk, as sometimes occurs in hot weather, it gives off an ammonia odour. Possibly, urea can be added up to 0.5% of diet dry matter in receiving diets, but higher levels may depress feed intake.

Provide about 3000-4000 International Units (IU) of vitamin A per kilogramme of dry matter. Receiving diets containing between 50 and 100 IU of vitamin E per pound may be adequate for most circumstances. Supplementing vitamin E through the diet appears to be more beneficial than by injection intramuscularly during processing of cattle.

The B complex vitamins are generally produced in sufficient quantities in the rumen and use of B vitamins has not consistently improved performance. However, if cattle have been off feed for some time, supplemental B vitamins, particularly niacin and thiamin may be beneficial. It has also been observed that calves fed supplemental B vitamins (600 mg niacin, 200 mg thiamin and 750 mg choline per head) plus vitamin E gained more weight than calves fed vitamin E alone.

The following table contains the nutrient recommendations for starter blends

Nutrient Recommendations for Starter Blends			
Dry Matter, %	80-85	Sodium, %	0.2-0.3
NEm, mcal/lb	0.70-0.75	Sulphur, %	0.08-0.15
NEg, mcal/lb	0.45-0.55	Copper, ppm	10-20

Calcium, %	0.6-0.8	Iron, ppm	50-100
Phosphorus, %	0.3-0.5	Manganese, ppm	100-200
Potassium, %	1.0-1.4	Zinc, ppm	20-40
Magnesium, %	0.2-0.3	Cobalt, ppm	75-100
Crude Protein, %	16	Selenium, ppm	0.1-0.2
Vitamin A, IU/lb	2000-3000	Vitamin E, IU/day	0.3

Some benefits may be realized by phase feeding diets which provide 20-23% crude protein during week 1, 17% crude proteins during week 2 and 14% crude protein in week 3. Protein concentration decreases as intake increases to provide the same amount of protein daily.

There are also a range of artificial supplements and medications that can form part of the starter blends to help calves increase their DM intake. A nutritionist should be approached to determine the supplements needed to obtain maximum weight gain in new calves.

Rations used for feedlots increase in volume or weight as the steers gain weight starting with calves that weigh 50 to 100kg and finishing with steers weighting 400 or more kilograms.

- The starter ration allows the weaned calves to become accustomed to the grain mix and the alfalfa-grass hay.
- The alfalfa-grass hay should be tested by a forage lab to determine the protein, energy, vitamins and minerals contents. The project has access to a forage laboratory. From those tests, a grain mixture is developed to provide the additional nutrients needed to gain 1kg of body weight or more per day.
- Alfalfa-grass hay must be available 24 hours a day in a hay rack in each pen.
- The grain mixture will be fed twice a day, early morning and later evening.
- The amount will be set periodically as the animals gain weight. (see table)

Each steer should be weighed twice a month and the weight recorded. To do that each calf must be identified with an ear tag or other method of identification the first day at the feedlot and that information recorded in the herd recordkeeping book. From that information of bi-monthly body

weights the manager can track each animal and the whole pen to see if the expected rate of gain is being achieved. If not, the problem must be found. If the expected rate of gain is not being achieved or if one or two animals are not keeping up with the rest, it could be for the following reasons:

- The balanced ration of grain mix is not correct.
- The feed mill is not putting the proper amounts of protein or energy in the grain that was ordered.
- The employees are not feeding the amounts of grain that they should.
- The hay rack is not full all the time.
- The animals are not genetically capable of gaining weight at the expected rate. If that is the case, the amount of grain needs to be reduced. If it is just one individual, that animal needs to be removed from the lot.
- There could be a disease or parasite problem and the animals need to be checked by the veterinarian and treated.
- It is critical that good quality alfalfa-grass hay is available in the hay rack 24 hours a day, so the steers can eat whenever they want. As the animals gain weight, they will eat more feed each day.

Animal weight in kg	Grain Fed/head/day
50 to 100	**Gradually increase grain until eating 1.75kg/day**
150	2 kg
200	3 kg
250	3.5 kg
300	4 kg
350	4.5 kg
400	4.7 kg

One ton grain mix when alfalfa-grass hay is available 24 hours a day

Grain Schedule	
Cracked, rolled or course ground Barley, corn or wheat	995.02 kg
Ground white salt	1.66 kg
Vitamins A, D and E	1.66 kg
Mineral Mix	1.66 kg
Total Tone batch	**1000.00 kg**

Suggested grain schedule for animals as they increase in weight and having high quality alfalfa-grass hay freely available 24 hours a day.

The mix is only suggested if high quality alfalfa-grass hay is available 24 hours a day. The hay will provide the protein and most of the minerals needed for growing steer, so they can gain 1kg of body weight per day. If straw or poor-quality hay or pasture is fed, then expensive protein supplement must be added to the grain mix greatly increasing your feed cost. If the protein requirements are not met, animals will gain at a much slower rate, at a much greater cost per kilo of body weight gain.

Growth Blends

In most feedlots there is very little if any distinction between growth and starter blends. The only real distinctions are adjustments in medication and supplements with cattle being allowed to eat as much as possible.

Some producers might also adjust the level of protein in the diets to slow down the rate of weight gain in cattle. Growth feeding normally means the cattle consume feed ad libitum (all they want). Some attempt to moderate daily intake fluctuations can be done with bunk management. Cattle can be put on forage, hay-based, silage-based or moderate gain level diets to grow at moderate rates of gain. These systems are well suited to many producers who are limited by facilities or by having abundant supplies of forages to use.

Finisher Blends

After the cattle have grown to about 340 kg, they are placed on high grain, finishing diets. These programs are best suited to medium frame cattle. This will allow them to finish at a heavier weight. Large frame cattle are better suited to high grain finishing diets following weaning. Although large frame cattle can perform very well on forage-based diets, caution should be considered since they will also finish at greater than desirable weights. Type of cattle, price margins, market conditions and feed supplies will dictate the optimum system for each producer.

Limit feeding strategies can also be applied during the finishing period and have two potential applications for cattle feeders. Backgrounders can limit intake of a high grain diet to achieve any rate of gain desired. This strategy should be considered when corn is a less expensive source of energy than hay. Limit feeding can also be used for finishing cattle to improve feed efficiency and increase carcass leanness.

Recent research suggests that feed efficiency may be improved if cattle are fed at intakes which are slightly less than ad libitum. In these trials cattle were fed 10-20 percent less feed than counterpart steers allowed to eat free choice.

Cattle were all fed to the same final weight (520 kilograms). Each 10% decrease in intake decreased rate of gain by about 1kg per day. As a result, it took the limit fed cattle 15-25 day longer to get to market weight. However, the limit fed cattle used 50-120 kilograms less feed to achieve market weight even though they were on feed longer.

There were also advantages to limit feeding in terms of carcass composition. Limit fed cattle had carcasses with 15-25% less fat than the full fed cattle. This was achieved without decreasing marbling score or quality grade.

The system described above would provide little economic benefit for cattle feeders in today's marketplace. The improvement in feed savings would probably be offset by the need to feed cattle longer. This should change if a value-based marketing system were in place which rewarded carcass lean. The bottom line is that it may not always be best to allow cattle to set their own intake. By manipulating intake, producers may be able to improve feed efficiency, cut costs and produce a more desirable carcass.

Producers wanting to implement a limit-feeding program should make sure all the cattle can eat at the feed bunk at one time. Otherwise, dominant cattle will consume more feed than needed and probably incur acidosis conditions.

Finishing rations should have roughage levels of 10 to 15% on a dry matter basis so as to prevent potential problems if there is any processing. Ideally, it is desirable for the corn and the roughage to be mixed together to avoid sorting and digestive upsets. A course chop (greater than 6mm) is suggested for hay or silage. Bunk management is critical to reduce fluctuating intake and acidosis problems. Roughage is included in finishing rations to firstly contribute to the physical nature of the rations and, secondly, to provide nutrients.

The following table gives an indication of the supplements that should commonly form part of the finishing diet.

Mineral Requirements for Finishing Cattle

Calcium	% 0.4-0.6
Phosphorus	% 0.3-0.4
Potassium	% 0.6-0.8
Magnesium	% 0.2-0.3
Sodium	% 0.08-0.1

Sulphur	% 0.05-0.2
Copper	ppm 6-10
Iron	ppm 50-100
Manganese	ppm 20-50
Zinc	ppm 50-75
Cobalt	ppm 0.1-0.15
Selenium	ppm 0.1-0.2
Iodine	ppm 0.2-1.0

REPORTING OF ANY EATING AND DRINKING DEVIATIONS

By monitoring the animals during each feeding time, you will get to know their eating and drinking habits. Animals in a fattening unit quickly adopt a routine and will usually storm to the troughs at feeding time.

By monitoring the animals, you will quickly see which animals do not follow their usual pattern. An animal that stands away from the other and who do not apply to the feed immediately is usually sick. These animals usually tend to have stiff limbs and cough occasionally. A running stomach (Diarree) may also cause the animal to react different than usual.

The early detection of sick animals in very important and these animals should be taken away from the rest and be hospitalize in a separate pen on green feed if possible. If no pasture is available, the animals should be fed a diet which is rich in crude fibre and lower in concentrates. The animals must also be treated immediately with the correct medicine according to the illness.

LEARNING UNIT 5

STORAGE AND PREPARATION OF ANIMAL FEED

Learning Outcomes:

- Identify the quality of feeds
- Understand the physical evaluation
- Understand heat discharge
- Understand chemical evaluation
- Understand biological evaluation
- Understand the improvement of the quality of feed
- Preparation of animal feed for storage
- Mixing feed
- Loading feed
- Driving the tractor correctly
- Preparation and filling of feeding and drinking troughs

IDENTIFYING THE QUALITY OF FEEDS

Assessing the Quality of Feeds

The objective of quality control of feedstuffs is to ensure that a consumer should obtain feeds or that cattle are fed feeds that are unadulterated, true to their nature and produce desired results. Quality control is therefore, defined as the maintenance of quality at levels and tolerances acceptable to the buyer while minimising the cost of processing.

Superior livestock begins with quality feedstuffs and a sound nutritional system. All producers should establish quality standards and acceptance/rejection criteria for all feed ingredients to account for and control variation in feed composition and quality. Rations should be fresh, palatable and uniformly nutritious. Spoiled and/or mouldy feed should be discarded, this helps minimise ration contamination and potential for reduced Dry Matter (DM) intake.

The efficiency of feed utilisation in livestock development is dependent upon quality of feeds. The quality of feeds is based on the quality of its constituents for example the raw materials such as

cereals, cereals by products, oilseed meals, marine feeds, agro industrial by products, used to formulate the ratio.

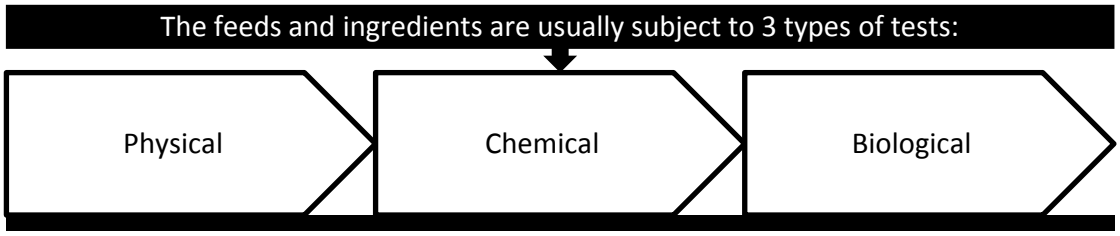
Quality has been defined as “any of the features that make something what it is” and “the degree of excellence which a thing possesses.” A quality feed would supply all nutrients in adequate quantity and high digestibility.

Quality Commitment and Points to Evaluate

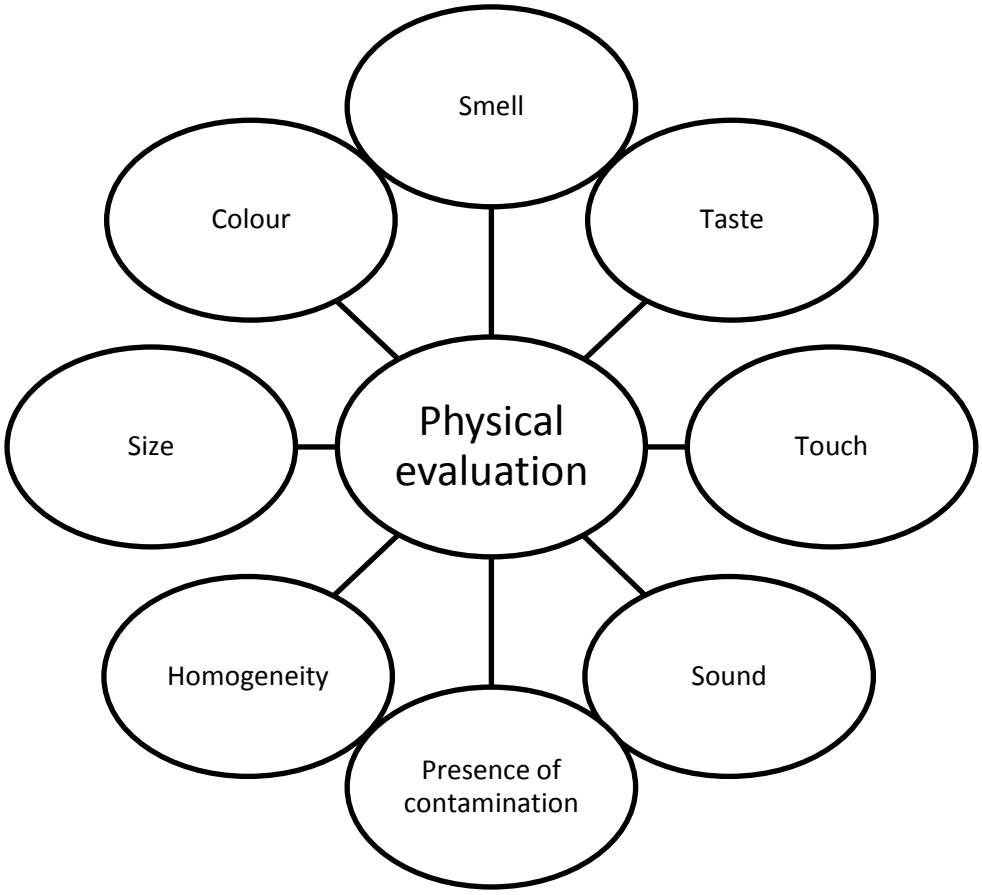
To organise an in-plant quality control program, an overview of the local operation is the primary consideration, and the development of a quality control manual is a logical first step as a useful guide to action, as an employee training tool and as a reference for all company personnel. A typical quality control manual will usually have the following:

- An index or outline of content.
- A statement of the company’s quality control philosophy.
- In-plant quality control supervisory and operator duties and responsibilities.
- Sampling practices and procedures for ingredients.
- A suggested ingredient assay schedule.
- Laboratory report including interpretation as to their use.
- Regulation and compliance (Good Manufacturing Practices).
- Production record keeping and procedures.
- Compliant procedures.
- Product recall procedures.
- Rework material guidelines.
- Housekeeping (sanitation) requirements.
- Ingredient purchasing specification.

- Warehousing and pest control practices.
- Shelf-life and finished product turnover standards.
- Guidelines for medicated feed manufacturing and handling.
- Plant formula guidelines/standard operating practices for the handling of new and old formulas.
- Employee training in quality.
- In-process sampling, testing method and test equipment for particle size reduction, batching and mixing, pellet quality, etcetera.
- Maintenance practices and responsibilities.
- Assignment of one person for total co-ordination of the program. The person should be given clear authority to articulate conditions and problems to management and should not be restricted in that by purchasing, production, sales or any other person or function.
- All plant personnel, including delivery personnel, should be involved in the program and trained to perform their individual quality control duties.
- All quality control stations receiving the various processing locations such as grinding, mixing, pelting, and others, and bulk load out, should be provided with the necessary test equipment, forms of recording test results, sample bags and other supplies.
- Periodic routine compliance inspections should be conducted by appropriate management personnel using checklist to ascertain that the company's quality commitment standard levels are being met, and the results of those inspections should be shared with all levels of management as well with plant sand truck fleet employees.



PHYSICAL EVALUATION



Ingredient Quality **(Qualitative)**	Physical characteristics (analyst's skills) Colour, Texture, Odour and Taste, Particle size (screen analysis), shape, Adulteration, damage and deterioration, bulk density, storage pests, hairs etc, spot chemical tests,

Physical evaluation is easy but rough in nature. One must be highly trained to identify the changes in the nature of the raw materials/feeds. Usually the following criteria are investigated:

Colour	The appearance of the ingredient will reveal its quality. Any change in the colour of the feed ingredients gives an indication of the maturity of the grain, storage conditions, presence of toxins, and contamination due to sand, possible use of insecticides/fungicides which gives dull and dusty appearance. Orange to red colour of

	sorghum indicates high tannin content. Browning or blackening due to heat on improper storage reduces nutritive value. Black coloured fish meal indicates the rancidity of fish oils.
Size	Size of the grains governs its energy value due to the proportion decrease/increase in seed and its coat. Smaller the grain lower will be the protein value in proportion to the hulls. To evaluate the cereals weight of a fixed number of grains usually 100 grains or fixed volume is taken. Higher weight indicates a higher protein value. This technique is called Test Weight.
Homogeneity	The presence of contaminants like other grains, husks broken grains, weed seeds, infested seeds is looked for. In the oil seed cakes closer observation will reveal the presence of fibrous material, especially in de-oiled groundnut cake, the cake with hulls which contains nearly 20 to 25 % crude fibre can be visually identified. Clumps in mineral ingredients make them unsuitable for premixing.
Smell	Smell is the next best indicator just standing near the stock itself will immediately indicate any difference in the normal smell. The feedlot manager should familiarise himself with the normal smell of the ingredients, any change in the normal smell of the ingredients should be viewed with suspicion. A musty odour indicates the beginning of fungal contamination or boring insects. To detect rancidity in oil rich feed ingredients this is the best method. An odour of petroleum products is suggestive of excessive pesticide or fungicides. A leathery smell of meat indicates adulteration with leather meal.
Taste	Each ingredient has a different taste, any change in the taste like bitterness in the grains, soya, sunflower oil meal and groundnut cake might indicate the presence of mycotoxins. The level of salt can be detected by tasting the ingredient and the feed. Bitter taste of rice polish indicates the rancidity of the fatty acids.

Touch	Feeling the raw material will indicate the dryness. Chilliness indicates high moisture content. Clumps can be found out by inserting the hand inside the bag. The clumps may be due to high moisture content, improper storage, packing of fresh warm solvent extracted from meal, which crumble on application of light pressure. Clumps formed due to excess of moisture will be very hard. To evaluate rice polish, place about 25g of rice polish on the palm and close the fingers tightly and then open the fingers, the rice polish will become like a solid mass if the crude fibre level is below 12% if the fibre level is high the mass will disintegrate once the fingers are opened. Further pressure will be felt when the hand is closed in high fibre rice polish.
Sound	Dry grains on pouring down or biting will produce sound of spilling coins.
Detection of Adulteration or Contamination	The common contamination or adulteration in most ingredients is husk or sand. Winnowing is the best method to detect husk in feedstuff. Sieving can be done to differentiate contaminants based on particle size. To detect for the presence of sand a weighed quantity of the grain is soaked in water then by sieving with hand the grains that be separated. The remaining water if decanted the settled sand can be weighed and the level of contamination can be assessed.

When determining the quality of feeds or ingredients, the first step it to check the feeds for adulterants that can affect the digestibility of the feed.

Feed Ingredient	Adulterant
Groundnut cake	Groundnut husk, urea. Non-edible oil cakes
Mustard cake	*Argimona maxicana* seeds, fibrous feed ingredients, urea

Soybean meal	Urea, raw soybean
De oiled rice bran, wheat bran	Ground rice husk saw husk
Fish meal	Common salt, urea, sand
Mineral mixture	Common salt, marble powder, sand, limestone
Molasses	Water
Maize	Cobs
Rice grains	Marble, grit

HEAT DISCHARGE

Another important factor that is used when assessing feed is the heat discharge factor. Heat discharge is commonplace and takes place when the moisture content of ingredients is too high. A high moisture level in ingredients usually leads to fermentation of those ingredients and a by-product of the fermentation process is the release of heat.

Whilst feed and ingredients are assessed the presence of heat should be immediately reported to the feedlot manager or operator as this might be an indication that the feed is not suitable for use. It is always good practice to ensure that all staff involved in the mixing and distribution process of the feed should be trained to look for heat discharge in the feed and report it when found.

CHEMICAL EVALUATION

The presence of any adulterants can indicate an ingredient of poor quality that should not be used as it might affect the overall suitability and quality of the feed blend.

Ingredient Quality (Quantitative)	Chemical analysis: Moisture, CP, CF, EE, NFE, ash, acid insoluble ash (silica or sand), salts, free fatty acids, biogenic amins urea, and NPN, amino acids.

	Anti-nutritional factor: Extrinsic (contaminants); mycotoxins, weeds, insecticide, herbicides, fungicides Intrinsic: allergins, lectins, phytoestrogens, glucosinolates (rape seed), saponins, tannins, ricin, sinapine, gosspol (cotton seed cake), lipoxgenase, trypsin inhibitor, urea. Decomposition and rancidity test: acid value, peroxide value, etc. Protein quality: protein solubility or dispersibilty, nitrogen solubility, mailard reaction product, dye binding, pepsin digestibility, amino acid digestibility.

An analytical laboratory for the precise estimation of nutrient contents and contaminants is of utmost importance. Analyse the feeds for proximate principles. This indicates possible constraints on usage due to the presence of excessive content of crude fibre, fat or total ash. Low crude protein and high crude fibre (CF) levels of oil seed meals is indicative of adulteration with fibrous material. The high CF alone is indicative of adulteration with urea and or some inferior quality oil seed meals.

The amount of acid insoluble ash is a good guide to the amount of sand or other dirt which may be present. Fish meals are usually adulterated with sand during drying process.

It is also desirable to determine the free fatty acid content of oily materials as this will affect palatability due to rancidity of oils. The chemical composition or specifications of various animal feeds are laid down, which acts as guidelines for the suppliers, buyers and the users at farm level. Protein meals should also be analysed for their amino acid contents.

Ingredient Specification

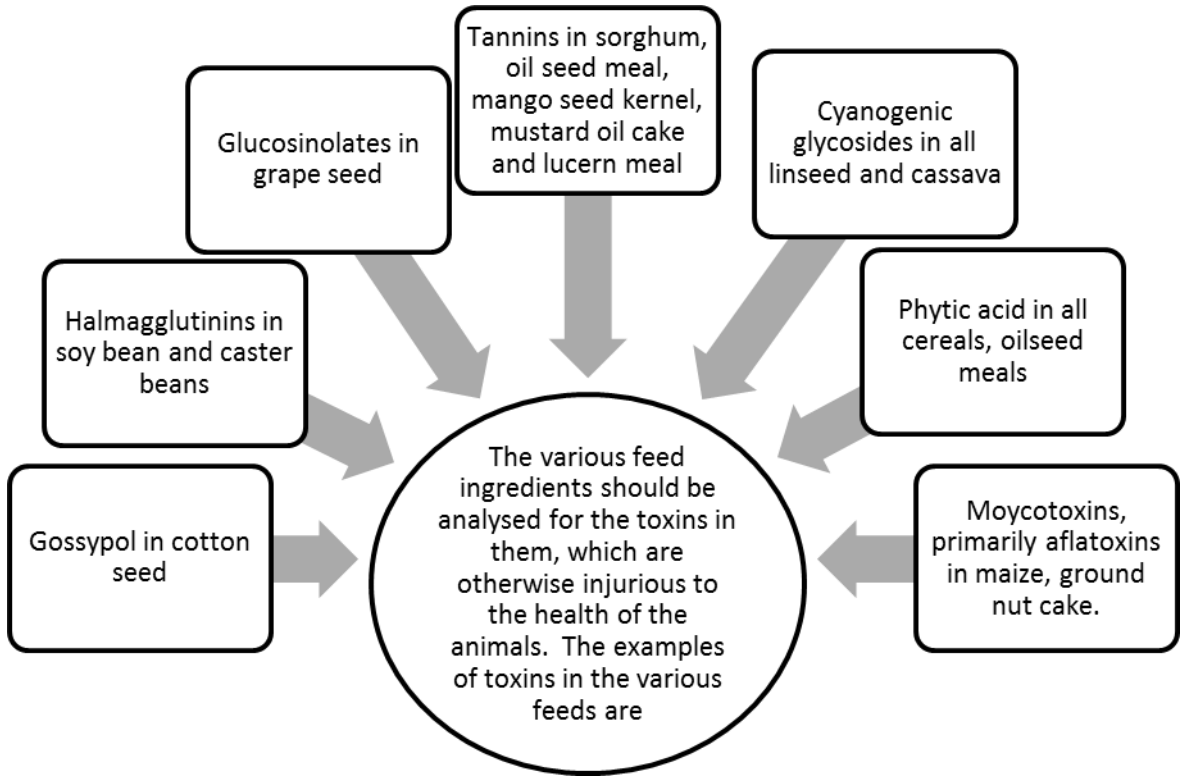
Ingredient specifications are essential in a feed quality assurance program. Specifications serve as the basis from which purchasing agreements are written, feed blends are formulated, and ingredient inspections are performed.

Ingredient description and general nutritional specifications may be found in specifications for feeds and feed ingredients. Specifications of feeds must be as comprehensive as possible, realistic, must be

transmitted to the seller. These are the measuring sticks to which the delivered material must conform.

Specifications are the foundation of a quality assurance program because the serve as an understanding between nutritionist, purchasing and production departments. A list of feed ingredients and their target nutrient level are presented as an example. Some analytical procedures are given to detect the various types of adulteration.

Toxins in Animal Feed



Ultraviolet screening is used whereby a greenish yellow fluorescence is observed when the sample is exposed to ultra violet light to detect mycotoxins. One should get the best source of supply and one should have some idea of normal levels of toxicity which may be expected.

BIOLOGICAL EVALUATION

Biological evaluations of feeds involve the use of animals and specialised persons to conduct the digestion and metabolism trails on the various species of livestock. These methods are time consuming.

IMPROVEMENT IN THE QUALITY OF FEED

Any feedlot manager or operator assesses the quality of feed blends and ingredients with the aim of improving the feeds used in the feedlot. Improving the quality of feed can be done by

- Choosing the best quality raw materials availability
- Fortifying the nutrient content of the diet with commercially available nutrients i.e. amino acids, mineral supplements, vitamins, etc.
- Using additives to enhance the availability of the nutrients e.g. enzymes

Wide variations in the chemical composition of ingredients are common and this is the main constraint with which the farmer and the nutritionists have to formulate the ration to maintain the quality of the feed at affordable costs.

Hence choosing the best quality raw material continuously throughout the year is nearly impossible. Further, we are not in a position to reject the materials if there is variation in the specification since the availability is constant or lower and the demand is increasing. Routine assessment of the raw materials is essential. Purchase of raw materials should be based on quality and nutrient content. Formulation should be done to obtain optimal production at the lowest cost.

PREPARATION OF ANIMAL FEED FOR STORAGE

The preparation of feed for storing will depend on the type and quantity of the feed that is working with, as well as the specific procedures that is usually follow in the specific workplace. In this section we will discuss a few preparation practices for feed before it can be stored.

Roughage can be prepared on one of three methods in order the store the product:

Hay	To make hay plants must be cut and the moisture content of the plant material must be reduced from 70-80% to 15-20%. A small amount of fermentation and respiration during the drying process give the distinguish smell to hay. When the material is dry enough it is pressed into bales and can be stored in a dry place for long periods of time.
Silage	Silage is made by cutting the whole plant together with the seeds into small pieces. The plant material is then compiled into a big heap and compressed by heavy vehicles driving over it. After the heap is formed the material is covered by a layer of salt to protect it from bacteria. Finally, the heap is covered with canvas to keep oxygen out. Fermentation takes place due the availability of sugars from the seeds of the plant. The fermented product can be stored in this heap for several months. This is the only way to store green feed for animals.
Pellets	Roughage can also be compressed into pellets to store it. This is one of the best forms to store it in, because the roughage is more compressed and thus took up less space. This process makes roughage more expensive because it needs some extra processing. Pellets are usually made out of good quality hay and is used for supplementary feeding for grazing animals.

Energy feeds such as grains is best stored in its natural state. Not only give the shell of the grain some protection to the feed, but grains are the most compact in its natural state and thus took up less space than when it is crushed or milled.

Protein feeds often need some type of treatment to protect the proteins from degrading before it can be stored for long times. These processes, like heat treatment, require big machinery and operations and are very expensive to perform. Fattening unit owners rather buy pre-treated protein feeds than to treat it themselves.

Storage and Control of Animal Feeds

It is very important to take good care when storing animal feeds. Feed is the single most expensive item in the running of a fattening. Feeds that are not properly stored and controlled may get damage and it can result in a big financial lost for the fattening unit.

The storage of the feed depends on the type of feed that needs to be stored, as well as the physical resources at the fattening unit that can be used to store the feed.

Roughage are usually stored in the form of big bales. This should be preferable be packed in a barn with a cement floor. The barn must be clean out before the time and the floor and walls must be treated in order to kill all possible insects and pests that may be harmful to the feed. Great care must be taken to keep the bales of roughages dry, because dampness may cause the feed to catch on fire. Mice and rats are a big problem with the storage of roughage. The urine of these animals gives a bad smell to the roughage and the animals may refuse to eat it.

The best way to store grains is in its natural form. A silo is the best place to store grains in because it can then easily be treated against insects by blowing in poisonous smoke at the bottom which circulate through to the top. If no silo is available, the grain should be sacked into bags and stacked in a barn with a cement floor. As in case of roughage the barn should be cleaned and treated. When grains get wet it started to ferment and fungi will grow on it, if this happen the feed is no longer suitable to be used for animal feed.

Protein feeds, salt, minerals and other additives are usually bought in bags and should also be stored in a clean and dry facility. Medicine, antibiotics, growth promoters and vitamins are purchased in very small amounts and are expensive. These products should be locked away and handled by a responsible person.

The control of the feeds must be done by a responsible person because it is a very serious part of successful feed storage. Only enough feed for about three weeks should be purchase at a time, especially if it is products that do not stay fresh for long. The first in first out principle must be used to control the entrance and exit of the feeds from the storage unit. This will ensure that the oldest feed is used first. Care must be taken to prevent a mixing of different feeds because it is impossible to separate them again in the most cases. Each type of feed should be pack on its own heap with a defined space between the one heap and the other.

The quantity of feed that leave and enter the storage unit must be noted each day to ensure that it will be noted early if there is a shortage of feed. Shortages must be prevented so that the animals can receive feed on the usual feeding times.

MIXING FEED

Vertical Grinder Mixer

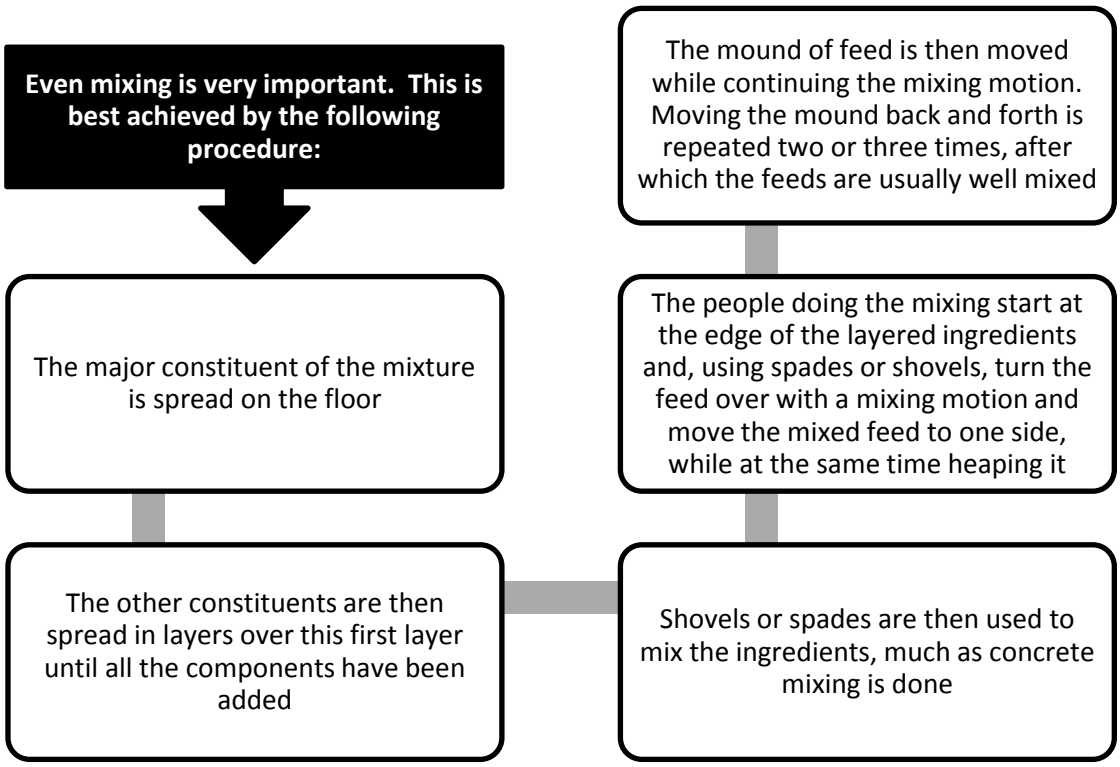
The following is a recommended method of adding supplements to vertical grinder mixer:

1. Add half the grain or other concentrate used.
2. Add the supplement premixed with grain.
3. Add the rest of the grain.
4. Add the roughage.
5. Mix for five minutes at the feeding site to eliminate separation occurring during travel to the feeding location.

Floor Mixing

Very expensive modern machinery is available to mill and mix feeds. Unless very large quantities of feed must be mixed, hand mixing is quite effective if certain principles are adhered to.

The equipment required must include a scale, shovels or spades and a floor large enough to do the mixing on. Although a well-packed earth floor can serve, a cement or concrete mixing floor is better.



Feed ingredients should be mixed at regular intervals preferably daily to avoid spoilage. In some instance where cattle are fed twice a day it may be necessary to mix feed more than once per day.

Always remember that the best practice is only to mix enough feed for one feeding. If too much feed is mixed sorting out or separation can occur necessitating the need to remix feed thereby causing a breakdown on particle size.

Feed that are left over are also more likely to spoil and spoiled feed can cause sickness and loss of appetite in cattle thereby severely affecting the profitability of the feedlot enterprise.

LOADING FEED

Collecting Feed from the Loading Points

Any feedlot consists of a range of different feeding bunkers and loading points for those bunkers. Most commonly feedlots will have a range of cattle at different stages of development and health therefore requiring different amounts and type of feed. These different groups of cattle are normally grouped together, like by like, to ensure that each group's specific dietary needs are met.

For instance, in most feedlots young cattle arriving at the lot will be fed on a diet consisting of roughage only for a week or two to kick start the weight gaining process. As the cattle settle into their routine of feeding their dietary needs will change and so will the amount of feed needed in order for them to maintain a steady weight gain.

The purpose of the feedlot is too quickly and cost effectively fattens cattle to a point where their body mass and fat content reaches the levels required by the market. It is therefore very important for the feedlot operator to be able to effectively adjust feed blends and amounts, when needed, to the different groups of cattle within the different loading bunkers.

To determine the needs and dietary requirement of each feed bunker and load point most feedlots will employ a scoring system whereby the amount of feed needed as well as the blends required in each feedlot can be effectively measured and regulated. It is therefore critical that we must be able to differentiate between the different feed bunkers and feed loading points in order to ensure that the correct amount and type of feed is delivered to the correct feed bunker at the correct time.

This knowledge of the different feed bunkers and loading points within the feedlot is therefore a critical part of the successful operation of the feedlot and workers loading feed into the feed bunkers must therefore be fully conversant on the different locations of the different loading points.

Feedlots most commonly will have different loading points for feed destined for different bunkers. The person responsible for the collection and distribution of the feed to the bunkers must therefore be fully aware of where the food required for the specific bunkers that needs to be refilled must be loaded. Where only the three main blends namely a starter blend, a growth blend and a finisher blend are used the implementation of a colour coded system seems the best way to ensure that the correct feed goes to the correct bunkers.

When designing and developing a colour scheme the loading points containing the different feed blends should be colour coded. The same colour code should then be used on the feed bunker cards to ensure that the driver of the tractor delivering the feed to the feed bunkers can easily check and ascertain that the correct feed is going to the correct bunkers.

PREPARATION AND FILLING OF FEEDING AND DRINKING TROUGHS

Although the preparation and filling of feeding and drinking troughs depend on the type of feeding system that is used and the workplace procedures that are normally followed, there are some basic principles that apply.

When animals are put in the fattening unit you must make sure that enough feeding space is available for the animals so that competition for food does not take place. For cattle there must be approximately 20-30cm of feeding through space available for each animal, and for sheep approximately 10-15cm. Water space is not that important, and it is usually better to use a smaller water through to ensure a fresh inflow of water during the day.

Clean Feed Troughs	The troughs must be swept clean with a broom and all excess feed from the previous mealtime must be removed.
Clean Water Troughs	The water troughs must be washed each time the animals are fed. Animals that receive poor quality water have a lower feed intake and thus a reduced growth tempo.
Fill	Fill feed troughs with the right amount of feed following workplace procedures.
Water	Make sure the water inlet is working properly allowing fresh water to flow into the through.
Visual check of fattening unit	This is a very important part of the feeding procedure. During this stage you must check for any abnormalities in the structure of the fattening

	unit, such as water leaks, broken fencing or troughs and an excess amount of left-over feed.

Animals should be fed at least twice daily, and the following routine tasks must be fulfilled each time:

In some of the large commercial fattening units the animals are not fed by hand. These fattening units make use of modern technology and machinery to provide the animals with feed almost every hour of the day. Although this process is almost much less labour intensive, someone must still do the routine check every day. The feed and water troughs should also be cleaned at least twice daily to prevent any type of build-up of excess feed. Animals easily refuse to eat if there are some old feed in the troughs that start to become rancid or sour, especially sheep are very particular about their feed.

LEARNING UNIT 6

DISEASES OF FATTENING UNIT ANIMALS

Learning Outcomes:
• Understand the diseases of fattening unit animals • Understand sheep disease in feedlots • Cattle diseases in feedlots

DISEASES OF FATTENING UNIT ANIMALS

There are numerous health and disease issues commonly found within a feedlot system. Many are preventable, through vaccinations for common diseases (follow veterinarian's recommendations); vitamin shots when entering the feedlot, proper balanced feed rations and good daily management.

To follow are some of the more common health and/or disease issues found within feedlot systems. The local veterinarian should assist with the diagnosis and management of all health and/or disease related issues. This pamphlet will focus on preventive management that will control or eliminate these problems.

Although animals in the fattening unit may get a wide range of diseases the ones that will be described is the most common in fattening units.

Koksidioses	It is state that start when young animals are fed on green pastures or in fattening units. It is caused by koksidia protosoa which are situated in the intestine and is spread by the dung of the animal. Sick animals have diarree and should be treated with a sulfa antibiotic or with diklasuril. Koksidioses can be prevented by adding medicine like monensin to the feed.
Bloat	It is caused by a build-up of gasses in the rumen of the animal. These gasses that usually exit through the mouth and nose of the animal are trap by foam that builds up in the rumen due to diets that is high in protein. Bloated animals are easily spotted from the abnormal size of the abdomen. Bloated animals are treated by injecting an anti-foam agent directly into the rumen through the paralumbal fossa.
Asidoses	It is caused by a very big amount of carbohydrates that is ingested quickly by the animal. Animals that are not given enough time to adapt to the fattening unit diet get asidoses. The situation can be prevented by making sure that the animals are not fed with too many carbohydrates at a time.
Pasteurella	The disease is caused by the bacteria *Pasteurella haemolytica* that start to multiply in the respiration tracks of the animal. Animals that are under high stress due the intensive situation in a fattening unit tend to get this disease more quickly. Animals must be injected with against pasteurella before they enter the fattening unit.
Lameness	Sore feet will cause animals to go off feed. If it hurts to walk, they will not get up and walk to the hayrack or feed bunk and will not compete with healthy animals for grain. Daily observation of the animals is important. If an animal shows the slightest limp, the vet must check their feed for burses or foot rot. The earlier a foot problem is seen, the quicker the animal gets back to gaining weight. If you wait until an animal is walking on three lags before treatment, you will have lost all your profit on that animal.

Pinkeye	Pinkeye is common in feedlot cattle and must be detected and treated early before the animal goes blind. Blind cattle cannot see to find feed or water. Daily observation is essential. The problem is easily detected early with watery eyes. In the advanced stage, the eyes turn white in the pupil. At that stage, the disease can be stopped, but eye damage has already occurred.

Most of the diseases and deficiencies can be prevented through good feeding and management procedures. Animals getting a ration that provides all the protein, energy, minerals and vitamins needed have much more resistance to diseases than poorly fed animals.

It is a good principle to call in a veterinarian when diseases are discovered among fattening unit animals. Because the animals are living in close contact with one another, the disease can spread very quickly. Consultation with a veterinarian will ensure that the correct medicine can be given and that the animals can recover in the shortest possible time.

Sheep Diseases in Feedlots

There are numerous health and disease issues commonly found within feedlot systems. Many are easily preventable, through vaccination (clostridial diseases, arthritis, scabby mouth) or grazing management (mineral and vitamin deficiencies) prior to entering the feedlot. Management within the feedlot is also an important means of preventing the outbreak and spread of ailments such as pinkeye, pneumonia/pleurisy, prolapse, salmonellosis and coccidiosis. Urea poisoning and the negative effects of toxins (mould and fungal) are specific feed-related issues that can be prevented through careful ration preparation and testing.

Following are three of the more common health and/or disease issues found within feedlot systems. Veterinary staff and/or extension officers can assist with the diagnosis and management of all health- and/or disease-related issues.

Acidosis (Grain Poisoning)

Lambs that are not accustomed to grain are prone to acidosis. Lambs eating relatively small amounts of grain, or pelleted ration with a high starch content, can develop acidosis due to the production of high concentrations of lactic acid within the rumen. Lactic acid accumulation can cause distress, diarrhoea and/or death.

Grain poisoning is most likely to occur when:

- Lambs are being introduced to grain
- There is a sudden increase in grain intake (e.g. following wet weather)
- There is a change of grain source in the ration.

Gradual introduction of the grain content in the ration is essential if grain poisoning is to be avoided. Loose droppings are an early indication of digestive disorders. If this occurs, maintain the ration at the existing grain level until droppings firm. Sometimes it will be necessary to drop back to the previous level of grain feeding. If the droppings develop a watery consistency, return to hay-only feeding and recommence grain introduction when droppings have returned to normal.

Symptoms of acidosis in lambs may include scouring, abdominal pain, a sluggish and dehydrated or bloated appearance, and a characteristic arching of the back.

Treating lambs suffering from acidosis is difficult and rarely successful, unless lambs are identified and treated within the early stages of developing the disorder. Lambs should be removed from feedlot pens and drenched with 60 g of Causmag (magnesium oxide) or 15 g of sodium bicarbonate in 1 L of water, in an effort to neutralise acids produced within the rumen. Alternatively, drenching with 10–20 mL of paraffin or light vegetable oil and/or dishwashing liquid will enable lambs to belch the gas and foam that has formed within the rumen during early stages of acidosis. Gas and foam can cause distension of the rumen, which restricts lung movement and frequently leads to death by asphyxiation. Affected sheep should be given hay until they recover.

Numerous additives may be used in rations to reduce the likelihood of acidosis. Most do not prevent lactic acid production but may help to reduce its effects on the lamb. The following are the most commonly used additives.

- **Sodium bentonite** is a clay that swells when in contact with rumen fluids, slowing down the passage of food in the gut. It binds acid ions to its surface and reduces the risk of excessive starch fermentation. It may reduce ration intake and lower feed digestibility. Add at a rate of 1%–2% (w/w).
- **Sodium bicarbonate** is an alkali and acts as a ‘buffer’ against moderate increases in acidity following the intake of starch-rich grains. It is safe to feed throughout the feedlot process. Once lambs are accustomed to a ration it may be removed; however, you should be wary of periods when lambs may ‘go off’ feed. Reintroduce sodium bicarbonate within the grain ration or in

loose lick troughs within the feedlot if this occurs. Add at a rate of 1%–2% (w/w). May be removed within two weeks of lambs starting the finishing ration.

- **Ground limestone** will help correct calcium deficiencies and buffer against acid production within the rumen and small intestine. Add at a rate of 1%–1.5% (w/w).
- **Acid Buf** is a seaweed extract high in calcium and magnesium carbonate. It is a buffer with a high surface area structure capable of binding acid ions. It is slow-acting and provides prolonged buffering within the rumen. Add at a rate of 1%–2% (w/w).
- **Bovatec** is an ionophore that modifies rumen fermentation and changes volatile fatty acid patterns within the rumen. Registered to prevent coccidiosis, Bovatec may also reduce acidosis risk and improve feed conversion efficiencies but may also reduce intake. Add 30–75 g per tonne of feed.
- **Virginiamycin** is an S4 antibiotic that prevents the growth of lactic acid producing bacteria within the rumen. It requires veterinary approval for use. Discuss the use of antibiotics, such as Virginiamycin, with your processor, as several export markets do not allow antibiotic use.

Laminitis

Laminitis is similar to ‘founder’, an ailment commonly found in horses. Affected animals appear lame and are hesitant to stand or move unless provoked. A form of acidosis, laminitis is caused by the release of toxins within the bloodstream following consumption of excess dietary energy or protein. Affected animals may recover within several days. Provision of reasonable-quality roughage and/or removal of affected animals from the feedlot will facilitate recovery.

Bladder Stones

Also known as water belly and urinary calculi, bladder stones commonly develop when rations are low in calcium relative to phosphorus. High magnesium intakes, low roughage, poor water quality and low water intake may also lead to the formation of ‘stones’ within the bladder and/or kidney tracts. If blockage of urine flow occurs, the lamb’s bladder will eventually burst, leading to the swollen ‘water belly’ appearance, and death of the affected animal.

Prevent formation of stones by adding limestone to increase calcium intake on high-grain diets. You need to ensure that the calcium to phosphorus ratio within the ration is greater than 1.5:1. Ensure that rations contain adequate fibre and that good-quality water is available, to stimulate intake.

Adding salt to rations will help increase water intake. Alternatively, the addition of anionic (acid) salts at 0.5% (w/w) may improve calcium mobilisation within the small intestine and acidify urine to help dissolve forming stones.

CATTLE DISEASE IN FEEDLOTS

Close observation of cattle each day is essential. Become aware of what is normal. Only then can you recognise the abnormal. Count how many times resting cattle breathe per minute during cold or hot weather. Count how much faster they breathe when they are put up the race. Note how obvious or slight the respiratory movements are.

Look at how much mucus the average animal has in its nostrils. Some clear mucus can be quite normal. Does a particular beast have more than the others? A runny nose and rapid respiration could be the start of respiratory disease; a cough may not show up until later. If in doubt, take the animal's rectal temperature. Normal adult temperature is 38°C.

Observe the behavior of the animals. Look for depressed animals, droopy ears, excess salivation, shivering, panting, animals standing alone or reluctant to move or get up when others do. Watch for bloat (animals with fuller flanks than others). Look for animals that approach the feed bunk but then don't eat.

Look for animals that seem restless or irritable, swishing the tail or kicking at the belly.

Look for swelling of the legs, lame animals or those standing oddly, for example leaning back, or shifting weight from one foot to another.

Look at the consistency of the dung, particularly during the build-up phase. Pale pasty dung or diarrhea may indicate feed problems or, in some cases, gut infections.

Feed-Related Illnesses

Grain Poisoning / Acidosis

Signs:

- Kicking at the belly.
- Obvious pain and discomfort.
- Grinding of teeth.
- Animal stands dejected and is disinclined to move.

- Bloating is sometimes apparent.
- Scouring (light-coloured smelly faeces) is usual.

Animals are usually affected to varying degrees, from mild indigestion to severe poisoning.

Acute cases show staggering, appear blind and ‘drunk’ and go down after 10 to 48 hours. Death can occur 12 to 72 hours after the onset of signs.

Cause:

Too much grain eaten too quickly results in an excessive build-up of lactic acid in the rumen. Changing from one grain to another too quickly can cause similar problems, so a slow introduction to any grain diet is necessary. Grain or roughage too finely milled is a common factor in grain poisoning. The condition is accentuated when the animal is suffering from cold stress.

Treatment:

Mild cases often respond if treated early to a drench of sodium bicarbonate (110g followed by 60g every 8–10 hours for the next day). One hour after the first treatment, give 0.5L liquid paraffin or other vegetable oil. If the beast is not already scouring, a purgative drench such as 230g Epsom salts may be warranted.

Electrolyte treatment to restore the balance in the rumen is useful in the recovery phase.

The disadvantage of using alkaline solutions, such as sodium bicarbonate, is that it is difficult to know how much to use, and if too much is given, you may send the rumen on a ‘pH roller-coaster’.

The incorporation of an ionophore in the ration modifies rumen fermentation and helps prevent acidosis and also bloat. Liver abscesses and damage to the rumen wall can result from chronic or less severe acidosis. Affected animals often show no obvious signs, but their growth rates will be reduced, and therefore cost of production is increased.

Records are essential for revealing whether individuals are performing to their potential. If you are feeding animals that are growing too slowly, you will very soon go broke!

Ergot poisoning

Signs:

- Nervous signs including convulsions.

- Gangrene of extremities including lower limbs, tail and ears.
- Reduced feed intake.
- Scouring.
- High temperature.

Cause:

Grain contaminated with the fungus ergot of rye, usually on ryegrass infesting the cereal crop.

Diagnosis:

The dark, curved ergot-affected seeds can be identified in contaminated grain.

Treatment:

Remove affected grain from the ration. No specific treatment is available.

Feedlot Bloat

Signs:

- Abnormal distension of the abdomen, particularly on the left-hand side.
- Laboured breathing.
- Distress.

Cause:

Gas accumulates in the rumen and is unable to escape. Legume roughages predispose cattle to gas formation, as do the very fine particles of shattered grain.

Treatment:

Drench with at least half a cup of oil (peanut, paraffin or linseed) or use proprietary formulations of bloat oil as per instructions provided. Severe cases may need a stomach tube passed, or 'tapping' the left flank with a trocar and cannula.

Chronic, persistent cases may require addition of an anti-bloat agent mixed in the feed.

The use of fibrous, stalky roughage, such as stubble, as part of the roughage component will help reduce bloat, particularly where legume roughages are used. Wetting the grain before processing can also help.

Founder

Signs:

- Lameness caused by heat and pain around the coronet of the hoof.
- Reluctance to move.
- The animal may lean back to take the weight off the front feet so that feet are forward of vertical.
- Gait is shuffling and stumbling.

Cause:

The inability of the animal to digest high-grain rations. Founder is an occasional end result of lactic acidosis. Protein level of the ration may be deficient.

Treatment:

Mild cases often recover without treatment, provided the ration is corrected. More severe cases require urgent veterinary attention.

When an animal recovers from grain poisoning, feedlot bloat or founder, it rarely performs satisfactorily and should be culled.

Polioencephalomalacia (PEM)

Signs:

Affected cattle may die suddenly with no prior symptoms, or may die within 1–5 days of the onset of the following symptoms:

- Dull/dopey appearance — may be ridden by other animals and identified as ‘bullers’ sudden blindness
- Muscle tremors
- Champing of jaw and frothing of mouth
- Convulsions

- Collapse

Cause:

PEM is caused by a thiamine (Vitamin B_1) deficiency, which may develop as a sequel to acidosis. Acidosis is thought to encourage the growth of rumen micro-organisms that produce an anti-thiamine factor, resulting in thiamine no longer being available to the animal. Young feedlot cattle (6–9 months of age) are most at risk. Sulfur toxicity can also cause PEM, but there is no response to thiamine.

Treatment:

Seek urgent veterinary assistance. Intravenous thiamine will usually allow an animal to recover entirely if it is treated early.

Ionophore Poisoning

Signs:

- Feed refusal
- Diarrhea
- Tremor
- Incoordination
- Rapid heart rate
- Damage to heart muscle leading to heart failure
- Death

Cause:

The high levels of ionophore — accidental overdosing or poor mixing.

Treatment:

Remove source. No effective treatment.

Urea poisoning

Signs:

Urea poisoning usually occurs 20–30 minutes after feeding:

- severe abdominal pain

- shivering
- bloat
- salivation
- death.

Cause:

Too much urea often caused by inadequate mixing allowing pockets to accumulate, or by rain falling into troughs causing pools of liquid high in nitrogen content. (Inexperienced operators should not attempt to use more than 1% urea in the ration.)

Treatment:

Call your veterinarian. In the interim, drench with 0.5L vinegar, 0.5L water and 1kg sugar. Repeat 2 hours later. Treatment is often not successful because the animal is too far gone when found.

Urinary Calculi (Urolithiasis) — Bladder Stones

Signs:

Usually it is not obvious until the urethra becomes blocked. Watch cattle for:

- straining
- dribbling of bloodstained urine
- kicking at the belly
- twitching of the penis.

If the bladder ruptures, there is temporary relief, then:

- depression
- loss of appetite
- peritonitis
- death.

Alternatively, the urethra may rupture at the bend near the scrotum (sigmoid flexure), in which case the underline will fill up with fluid (‘water belly’).

Cause:

The high phosphorus levels in grain increase the likelihood of the formation of urinary calculi or bladder stones, which may block the urethra and prevent urination. An alkaline water supply, or too much sodium bicarbonate in the diet (sometimes used to help prevent acidosis), will also contribute to stone formation.

Vitamin A deficiency has also been implicated in cattle on longer feeding regimens.

Treatment:

Usually, emergency slaughter is the only option. If the bladder has ruptured, the animal will be condemned. If the urethra is blocked rather than the bladder, a vet may be able to remove the blockage surgically or operate to create an opening in the urethra before the blockage, to allow urination. Call the vet urgently if this option is being considered.

Prevention:

The chemical composition of the stones needs to be determined by laboratory analysis in order to decide on the best method of prevention.

For cattle on feedlot rations, magnesium ammonium phosphate (struvite) stones are the most common, and a urinary acidifier, such as ammonium chloride or ammonium sulfate at 1–2%, can be added to the diet. Calcium stones are insoluble, and prevention relies on encouraging animals to drink by having good-quality, easily accessible water and to ensure calcium supplementation is not excessive. Additional dietary salt will increase water consumption and dilute the urine.

Vitamin A Deficiency

Signs

- Lameness.
- Swelling of the hind legs, progressing to generalised subcutaneous oedema (swelling due to build-up of extra fluid under the skin).
- Increased respiratory rate.
- Panting.
- Drooling.
- Elevated rectal temperatures.

- Recumbency.
- Death.
- Vision may be impaired, especially in low light ('night blindness').

Causes:

The depletion of vitamin A reserves due to insufficient green feed in the diet or insufficient vitamin A supplements, for 3 months or more, either before entering the feedlot, or during the feeding phase.

There seems to be an interaction with season/temperature, since the problem has mainly been observed in February and March. Affected animals are more susceptible to heat stress.

It is most likely seen after more than 100 days on feed, on a ration without vitamin A supplement, but it can be earlier if animals have originated from drought conditions.

Treatment:

Repeat vitamin A, D, E injections, or a vitamin A or green chop supplement in the feed should be used to prevent this disease in animals on longer feeding regimens.

Vitamin E Deficiency

Signs:

- Swelling of lower legs, especially hind legs and hocks.
- Predisposition to heat stress.

Treatment and prevention:

- Oral vitamin E supplementation.

Diarrhoea

Most cases of diarrhea in feedlots are probably due to incorrect ration formulation, but there may be causes unrelated to feed. These include infections with salmonella and coccidia. In these cases, the animals usually appear sicker, and have other symptoms besides the diarrhea.

Signs:

- Salmonellosis causes a high-fever depression. There is usually, but not always, bloody diarrhea.

- Coccidiosis can also cause bloody diarrhea, and animals can become quite weak and ataxic.
- If you suspect either of these diseases, call your vet to help reduce the risk of spread.

Treatment:

Salmonella is treated with antibiotics. Coccidiosis is usually treated with sulfonamides. The ionophore group of growth promotants (Rumensin®, Bovatec®, and Posistac®) have an added benefit in that they help control coccidiosis. Coccidiosis has become much less common since the use of these growth promotants has become widespread.

Diseases Unrelated to Feed

Bovine respiratory disease

Signs:

- Symptoms of respiratory disease may vary from a mild, barely detectable illness to animals simply found dead. Depending on severity, there may be:
- animals off their feed
- nasal discharge
- fever
- depression
- coughing
- 147 abored breathing.

Causes:

Stress is a significant predisposing factor. The vast majority of disease in feedlots occurs in the first 4 weeks on feed. One Australian study involving six feedlots showed that fever at the time of feedlot entry, or respiratory disease, accounted for 66% of all sickness recorded over an 18-month period.

Several viruses, the most important probably being infectious bovine rhinotracheitis virus (IBR) and pestivirus, as well as bacteria such as pasteurella and haemophilus, can contribute to or cause respiratory disease in cattle. Viruses will not respond to antibiotics, but viral infections are frequently followed by secondary bacterial infections, so it is usual to use broad-spectrum antibiotics such as tetracyclines in the first instance.

Treatment:

Your vet should be consulted promptly if any signs of respiratory disease appear in the feedlot. If one of the more serious pneumonia-causing bacteria such as haemophilus or pasteurella is involved, there may be rapid spread, and in-feed antibiotics may be required for the entire pen, or even the entire feedlot, to prevent major losses. Individual animals too sick to eat must still be treated by injection, and in severe outbreaks injections for the entire pen may be warranted.

Identify the treated animals, record the treatment and make sure the withholding period has been observed before those animals are slaughtered.

Prevention:

Vaccines are now available for the prevention of IBR and pestivirus.

Foot Abscess or Footrot

Signs:

- Lameness and local swelling, usually only in one foot (which distinguishes it from founder).
- Abscess formation or discharge, most often from between the claws of the affected foot.

Causes:

Wet and boggy conditions are predisposing factors, so problems should be minimal if yards have good drainage, and bog holes are not allowed to develop around troughs. Problems are most likely in new feedlots before a protective pad of old dung is formed in the pen.

Treatment:

Injection of broad-spectrum antibiotics is the usual treatment. The infected area should be washed out, and the foot kept as clean and dry as possible.

Bullers

Signs:

'Buller' is the term given to an animal which is repeatedly ridden or mounted by others in the group.

Cause:

The cause is obscure but may be related to the establishment of a 'peck order' when strange animals are mixed. The problem appears to be increased by the use of growth promotants. If implants are crushed, this may release the hormones more rapidly than intended. Some batches of feed, suspected to be those containing natural oestrogens, may also exacerbate the problem.

Treatment:

Bullers should be removed from the pen immediately, and any physical injuries treated. After recovery, they can often be restarted on feed with a new group of cattle, without the problem recurring.

Pinkeye (infectious keratoconjunctivitis)

Signs:

The first sign is tears running down the face, followed by obvious eye inflammation, giving a pink or red appearance to the cornea, which becomes opaque.

In severe cases an abscess forms in the centre of the cornea, which may burst, leading to the loss of eyeball contents.

Cause:

The bacterium responsible, *Moraxella bovis*, is spread by dust and flies, so can be a major problem in feedlots. Any eye damage will predispose to infection.

Treatment:

The most effective treatment is generally accepted to be Orbenin® eye ointment. A single application lasts 48hours.

Affected animals should be isolated to reduce spread of the disease. Severe cases may need injections of antibiotics and anti-inflammatory drugs around the eye and may need the eyelids stitched together. Patches glued over the eye speed recovery and also prevent flies spreading the disease more widely.

Heat Stress

Signs:

The following signs may be observed, in order of increasing severity of the heat load:

1. alignment of the body with the sun
2. seeking shade
3. refusal to lie down
4. reduced food intake
5. crowding over the water trough
6. splashing the body
7. agitation and restlessness

8. reduced rumination (cud chewing) or none at all
9. grouping to seek shade from other animals
10. open mouth breathing or panting
11. excessive salivation
12. ataxia (inability to move)
13. collapse, convulsions, coma

Cause:

High temperatures, with high humidity and no wind, especially when temperatures remain high overnight for several nights in a row, may predispose animals to heat stress.

Predisposing factors may include:

- vitamin A deficiency
- vitamin E deficiency
- ergot poisoning.

Treatment:

On smaller farm feedlots, it is usually possible to release animals into areas where they can obtain shade or stand in a dam, or you can take other measures such as hosing them down if only a few animals are involved. A hose enema may help those individual animals which are most severely affected.

Probably at about point 5 or 6 in the list above, you should be taking steps to prevent the situation getting any worse.

If you build any shade or shelter for your cattle, remember that good airflow is at least as important as shade in preventing heat stress, so solid walls should not be incorporated in areas where heat stress is a possibility.

First aid Measures

A hospital pen with shade and windbreak, and a treatment area with running water and a hose, are essential for adequate treatment of sick animals.

It would also be of benefit to keep the following compounds to treat disorders which may occur in the feedlot:

- liquid paraffin, 2 L
- bloat oil (cooking oil or margarine in hot water can be used)
- antibiotics (available only on prescription), stored in a refrigerator as directed on the label
- antibiotic, fly-repellent, wound spray
- Orbenin® eye ointment
- bicarbonate of soda, 1 kg
- vinegar, 5 L
- Epsom salts, 2 kg.

LEARNING UNIT 7

HERD PERFORMANCE AND ANIMAL HANDLING

Learning Outcomes:
• Understand the performance of livestock in feedlots • Understand beef cattle appearance and behaviour

PERFORMANCE OF LIVESTOCK IN FEEDLOTS

Prime cattle are important for cash flow and performance should be carefully managed in order to ensure optimal profitability. Careful observation of the performance of each animal in the feedlot is required.

Animal Behaviour

When an observer is familiar with the normal behaviour of animals, he will be able to identify individuals that behave differently from the group or differently from the norm of the species.

If an animal behaves abnormally, care must be taken to further access the cause thereof. Take care when approaching such an animal because it might be defensive or aggressive. Other indication of abnormal animal behaviour:	When animals are kept in a restricted area they will compete for food and space. This may cause an injury that in return will lead to the abnormal loss of weight.

Territory	Most male farm animals are territorial and will fight for grazing- and breeding rights within their individual areas. It is not the behaviour of the animal that is abnormal when competing, but the secondary effects like injury, malnutrition and abnormally high levels of aggression and defensive behaviour.
Refusal to Eat	You also need to be looking at the cattle when you make a decision. If the bunk is empty (slick), do the cattle look like they are hungry, or do they look content? If they look content, wait for a second or third day of slick bunks before increasing the amount of feed. One cool night or a small front can cause steers to slick a bunk that normally would not be slick. Increasing the feed delivery may only cause them to back off feed in the next 2 to 3 days. If they truly appear hungry, increase the feed delivered 5 percent today and hold it there tomorrow to find out if they can actually handle the extra feed. If they do handle the feed, try increasing it again on the third day.

Stool Observations

Tall firm stools are a sign the cattle are consuming significant levels of roughage. Flat brown stools indicate that the cattle are consuming a higher amount of grain but are not incurring digestive upsets. Flat grey stools are a sign of acidosis. Acidosis is the most common nutritional disorder in the feedlot. A large amount of highly fermentable feeds, such as cereal grains, consumed in a short amount of time can result in the production of morelactic acid than can buffered by the rumen. This results in water from the circulatory system being drawn into the rumen (body becomes dehydrated) and pronounced changes in the blood Ph. Signs will usually be acute or sub-acute. Survivors of acute acidosis may have chronic problems such as fungal rumenitis, liver abscesses, bloat, and founder or laminitis.

Flat grey stools may be observed before an actual drop in intake occurs. Pens that have a majority of flat brown stools and a few grey stools are a sign that cattle are optimizing intake.

Health Observations

Regularly observe the health of feedlot stock and treat preventative and re-active as and when required. Refer learning unit 6 for diseases. Animals may have to be moved to the health / hospital pen or totally removed from the feedlot if required.

Animals can exhibit discomfort in different ways when exposed or kept under stressful and unfavourable conditions. Some of these symptoms can be:

Pacing and Route Tracing	This happens when animals are kept in a confinement, such as a cage. For example, hens kept in a cage pace because they do not have access to a social environment.
Rocking, Swaying and Weaving	This kind of behaviour shows boredom in animals.
Rubbing	Animals such as pigs can start rubbing their heads, or even bang their heads, leading to injuries when restricted in a narrow single sty.
Pawing or Stall Kicking	When horses are frustrated because of not getting food they will start pawing which can lead to leg injuries.
Head-Shaking and Nodding	Caged domestic fowls or caged birds can start showing this kind of behaviour when their movement are retained. They are unable to escape and obviously they get frustrated.
Eye-Rolling	Is shown by calves in pens**.**
Shan-Chewing	This behaviour, typical to pigs when no litter or leavings are available for scrounging. (Pigs chew even if there is no feed in the mouth.)
Licking or Crib Wetting	An animal repeatedly licking its own body, can lead to the abrasion of the tongue. This condition is caused by inadequate food.
Drinker Pressing	Caused by boredom. The animal tries to reduce boredom by pressing the drinker repeatedly without drinking the water.

Animal Identification

Animal identification is the basis for keeping accurate production records of the herd/flock. Individual animal identification allows producers to keep records on an animal's parentage, birth date, production records, health history, and a host of other important management information. Accurate records provide the producer with enough information to make individual or whole herd/flock management decisions. In many instances, the producer needs to be able to quickly identify an animal. A successful identification system makes this task more efficient. Identification is also important to indicate ownership of a particular animal, or to indicate the herd/flock of origin.

BEEF CATTLE APPEARANCE AND BEHAVIOUR

Cattle Appearance

There are many different breeds and types of cattle. Some breeds of *Bos indicus* descent have humps on their necks and naturally droopy ears. These breeds also have less hair than many of the *Bos taurus* breeds of cattle. *Bos indicus* cattle usually handle high temperatures much better than the *Bos taurus* breeds. However, *Bos taurus* is more comfortable in the colder weather climates. Within the two species, there can also be large variations in body frame, size, and shape.

Cattle Behaviour

Cattle behaviour is best understood and explained in the context of cattle as a prey species. Their senses are developed to rapidly detect changes in their environment. Cattle seem to have poor detailed vision but are very good at detecting changes in light and movement. They also have excellent hearing. In most situations, prey animals will flee situations they find alarming. Cattle will tend to escape if an alarming presence is detected within their flight zone – an area in which a threat is determined to be too close for comfort. Flight zone size depends on each animal's temperament and previous experiences. Some flight zones are small enough to allow close contact with the animal and some are extremely large. It is also important to realize that as prey animals, cattle may hide signs of disease or pain until it becomes over- whelming. In the wild, diseased or injured animals are targeted by predators and prey species have adapted to hide these signs. This behaviour can complicate early disease detection in animals, especially if they are easily excited. Cattle will usually cluster together in groups even on very warm days if they are being bothered by flies and other insects. Good pest management can help to alleviate this and also help to prevent cattle from becoming too warm while clustered together on hot days.

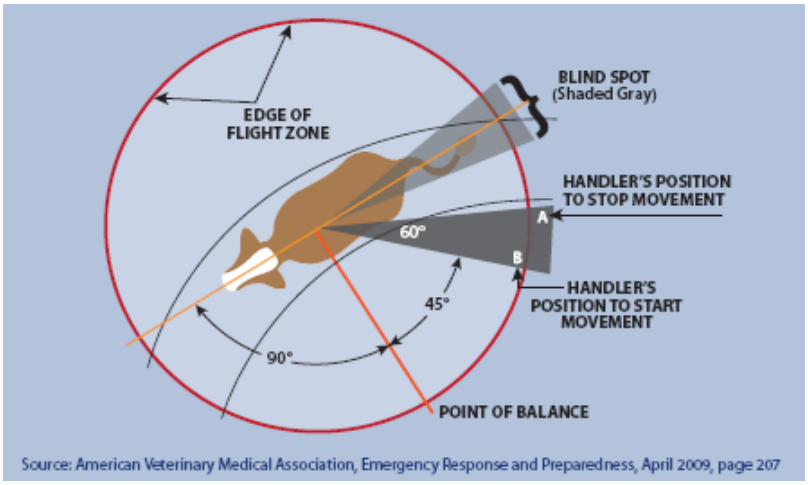
Methods for Safe Restraint of Beef Cattle

Squeeze chutes are the most common method of cattle restraint. A properly operated chute will capture an animal by narrowing an opening around an animal's neck. The head is too large for the animal to back out of the head catch, and the body is too wide for the animal to move forward. In addition to the head catch, most chutes have mechanisms to gently squeeze the animal. This promotes a sense of well-being in the restrained animal and prevents dangerous movement in the chute. Some chutes have additional features that allow the animal to be tipped onto their side to allow access to the animal's feet, if needed, or that will further restrain the head and neck for procedures like tagging or blood collection. Chutes should be adjusted to accommodate the size of animals being processed. If the head catch is set too wide, animals will slip their heads out of it and pose a safety hazard for both the animals and the workers. If the head catch is set too small, it can squeeze the animal's neck tight enough to asphyxiate the animal. In operations without chutes, cattle can be captured and restrained using ropes in a variety of ways. Some specific tools include rope halters and nose tongs. These tools can be used to restrain an animal's head for a short period of time. These methods require substantial skill and much practice to be utilized effectively. Chemical restraint is an excellent tool to keep cattle quiet for many procedures. There are many protocols available depending on the depth and length of sedation that is required for a given procedure. Chemical restraint can be used effectively in combination with physical restraint in many cases. Records must be kept for any chemical restraint administered and meat withdrawal times followed. Handling and restraint of cattle requires substantial training and experience to be carried out effectively. Many dangerous situations commonly arise, especially if cattle are excitable. These situations require experienced personnel and good facilities for a satisfactory outcome.

Methods for Safe Movement of Beef Cattle

Cattle behaviours can be utilized to handle them safely and effectively. When moving cattle, it is best to utilize their flight zone, or their personal space. By entering the flight zone behind the shoulder, cattle can be encouraged to move forward, whereas entering the flight zone in front of the shoulder will initiate backward movement. The shoulder is referred to as the point of balance. It is best to work at a 45 to 60-degree angle behind the animal's shoulder. When moving the cattle, avoid coming at the animal straight on. Instead work near their point of balance and work back and forth parallel to the direction that you would like to move them in.

Cow Flight Zone, Point of Balance and Blind Spot Video



Cattle handling is most successful if all personnel involved remain calm. Cattle tend to react to loud noises and sudden movements by balking, fleeing, or fighting the pressure that is being applied. By remaining calm, cattle tend to respond well to the cattle movement technique described in the preceding paragraph. Electric cattle prods should only be used as a last resort and should never be applied to areas in front of the point of balance or the rectal area. Improper handling is very stressful for cattle and has production and health consequences. When cattle are being handled in a confined area such as a crowding pen or sorting alley, handle small groups. Bring eight or ten cattle into a crowding pen (also referred to as a tub) instead of twenty. Overloading the crowding pen is a common handling mistake; cattle need room to move along the alley. A stick or whip with plastic streamers, a flag, or a garbage bag tied on the end is useful for turning cattle in the crowd pen. Shake the streamers on the right side of the head to turn left and vice versa. Use the animal's natural following behaviour to assist with filling chutes. Wait until the single file alley leading to the squeeze is almost empty before refilling. Avoid the overuse of crowd gates; if cattle are moving; do not use the crowd gate. An animal left alone in the crowding pen after the other animals have entered the single-file chute may attempt to jump the fence to re-join its herd mates. A lone animal may become agitated and charge the handler. A large portion of the serious handler injuries occur when an animal, separated from its herd mates, refuses to enter the single-file chute. When a lone animal refuses to move, the handler should release it from the crowding pen and bring it back with another group of cattle. Cattle work done in extreme weather conditions warrants extra precautions. If the cattle get alarmed and excited, their body temperature will rise. Cattle can easily become hyperthermic; they are more sensitive to heat than humans. During hot conditions, cattle will retain heat for six to eight hours following peak temperatures. Therefore, cattle handling should occur during the coolest parts of the day. Working

cattle in extremely cold weather can also induce stress on the animals. Cattle are in very close contact during the shipping process to decrease the amount of movement of the group for their own safety. It is better to have closer contact in the winter to increase body heat for the cattle and less contact in the summer when it is warmer. Recommendations for the number of cattle that can be loaded onto a semi-trailer will vary depending on the cattle's weight, the size of the trailer compartment, the maximum legal load limit for the roads travelled, and the outside temperature, humidity, and wind.

Size and Capacity of Livestock Trailers Based on Market Weight

Cattle Weight	Decks	Trailer Length	Number of Head
500 kg	Single	14 m	25 without horns
500 kg	Double	14 m	40 without horns
500 kg	Single	16 m	30 without horns
650 kg	Single	14 m	18 without horns
650 kg	Double	14 m	28 without horns
650 kg	Single	16 m	22 without horns

Removing Non-Performing Animals from Your Feedlot

Culling is the process of removing animals from a group based on specific criteria. This is done either to reinforce certain desirable characteristics or to remove certain undesirable characteristics from the group. In feedlots the purpose would be to remove animals with undesirable characteristics from the group

The word comes from the Latin *colligere*, which means "to collect". The term can be applied broadly to mean sorting a collection into two groups: one that will be kept and one that will be rejected. The cull is the set of items rejected during the selection process.

Since livestock in feedlots are reared for the production of meat, the herd must be culled to ensure that only performing animals are kept on the expensive feeding and treatment system. Animals not selected to remain for are sent to the slaughterhouse, sold, or killed.

Criteria for culling livestock and production animals are based production norms. In a feedlot situation the culling process involves selection and the selling of stock that does not meet the growth norms.

5B. Group Formative Exercise:

LEARNING UNIT 8

MARKETING OF PRODUCT

Learning Outcomes:
• Determine product readiness for the market • Predicting carcass mass • Understanding classification system for red meat in South Africa • Determine the selling price • Understand market indicators • Marketing livestock • Understand the different methods of marketing

PRODUCT READINESS FOR MARKET

Meat is animal flesh that is eaten as food. Meat consists largely of muscles, but fat and other animal tissue are also considered meat. The most commonly eaten meats come from animals that are raised for food. These animals - and the meat that comes from them - include cattle (beef and veal), pigs (pork), chicken and sheep (lamb and mutton). The meat from cattle, pigs and sheep are all classified as red meat. Chicken and fish are classified as white meat. There are several different types of meat. The names for meat from cattle and sheep also indicate the age of the animal from which the meat was taken.

- Veal is the flesh of calves less than 14 weeks old. It is light pink and contains very little fat. Veal is tenderer than beef and has a milder flavour. Beef is the flesh of full-grown cattle. Most beef sold in shops comes from animals one to two years old. Beef is bright red and has white or yellow fat, depending on the food the animal was raised on.
- Lamb is the flesh of sheep slaughtered at a young age (younger than 6 months). It is red and has white fat. Lamb has a milder taste than mutton.
- Mutton is the flesh of sheep older than 6 months. It has a deep red to purple colour. Mutton has a stronger flavour and a coarser texture than lamb.

The value of the product depends on the following factors:

- Availability
- Demand
- Readiness
- Quality
- Genetic parameters – age, fertility, reproductive performance

Due to the factors that influence the value of a product, animal production had intensified during the years and will certainly not stop there. The technique and methods used for harvesting have also undergone some changes to enhance the harvesting process.

When you have an objective what to produce, you need to review with what type of animal you should produce that. Animals are being used in many different production units and therefore differ in age, breed and species.

For example: Animals that are being breed for mutton production must be early matured so that they can be slaughtered at a very early stage e.g. 3 – 4 months (±35kg weight). At this stage only the male animals are slaughtered. At a young age, better quality mutton is produced.

Product Readiness to be Harvested

The consumer faces an on-the-go lifestyle that demands consistent, high-quality foodstuffs that are convenient to prepare. These and other attributes are important in driving consumer purchasing of meats. Producers recognize that management practices could affect product quality and are important to consumers. You want consistently high quality, safe, and nutritious foods that are easy and convenient to prepare.

Therefore, you as producer should take the following into consideration:

Consumers want meat products that are tender, safe, nutritious, and conveniently available.

You should measure the consumers' acceptance and willingness to pay for new products and different product attributes.

When you harvest products (meat), you should do it as early as possible, meaning, when the animal is produced economical. *For example*: animals that are used for lamb production must be early matured so that they can be slaughtered at very early stage e.g. 4 – 6 months (± 40kg live mass). At this stage the animal's daily requirements are still low and its feed conversion ratio (FCR) is still high. **FCR:** The amount of feed needed to produce 1 kg meat.

The illustration that follows shows that at ± 5 months muscle are at an optimum and after ± 6 months fat deposited increases, whereas muscle decrease relative to fat deposition. Mutton and lamb differ from each other in that lambs are slaughtered very young and before much connective tissue has developed, hence their meat is very tender. Mutton, having more connective tissue, is less tender but also very tasty on account of its higher proportion of connective tissue. During cooking, the white connective tissue (collagen) is converted into gelatine, which makes mutton as tender and tasty as lamb.

Both beef and mutton can be harvested at different stages. Breeding stock is slaughtered only at the end of their productive lives, but their offspring are slaughtered when they will produce the best quality meat. For most mutton sheep breeds this is when a body mass of between 35 and 45 kg is reached depending on the breed.

Breeds that tend to put on fat at an early age such as the Dorper, Persian and fat-tailed breeds will be slaughtered at between 35 – 42 kg. At this stage the lambs will have very little fat and tender meat.

The mass of the carcass is approximately 45% of the live body mass of approximately between 17 – 20 kg. This will give a high-quality carcass.

Other breeds such as the S A Mutton Merino, the Dormer and other breeds that put-on fat later will produce carcasses with weights between 20 – 25 kg with the same characteristics as the lighter carcasses.

Young cattle vary more and are mostly fed in a feedlot (a place where animals are fattened for slaughtering) until they reach the correct slaughter stage. They are then slaughtered depending on their fatness and depending on the breed. The carcass mass can vary a lot.

The carcass is also classified in the same manner as that of sheep and pigs on age, fat distribution and body conformation or condition score.

To asses if a sheep is ready for slaughter one must measure its weight, deposition and distribution of fat on the potential carcass. There is method that can be used to determine these qualities in the crush before the sheep is slaughtered.

While the sheep is standing in the crush one can easily feel the amount of fat deposited on the back of the animal. By placing the thumb and middle finger on either side of the spinal column at the juncture to the ribcage, when moving the hand back and forth whilst having a firm grip, the handler will feel the amount of fat distribution as a soft rubbery mass under the skin.

If the feeling under hand below the skin is still bony and sinewy it is a good indication that the animal is still too lean to be slaughtered. By weighing the animal, the handler will also have a good idea of its readiness for slaughter and by observing the measure of muscle development on the shoulders and thighs.

Remember the modern consumer market prefers a fairly lean product which is tender and that must be the focus of the inspection.

PREDICTING CARCASS MASS (YIELD)

A grading system provides a common language for describing various types of cattle. Transactions can be made without a buyer seeing the cattle. In the case of feeder cattle, a grading system allows one to predict the feedlot performance and carcass characteristics of the finished cattle.

Your facilitator will lead a discussion on the prediction of carcass yield in sheep and beef- refer Handout 6 and 7

CLASSIFICATION SYSTEM FOR RED MEAT IN SOUTH AFRICA

SAMIC

Classification of Red Meat*

A key to more effective marketing

PROUDLY SOUTH AFRICAN

Classification provides a sound basis for:

- Meat traders to describe their specific requirements in simple terms when purchasing carcasses.
- Utilisation of variety in the market with a view to optimum consumer satisfaction.
- Utilisation of price differences.
- Determining selling prices.

CLASSIFICATION CHARACTERISTICS OF:
Beef, Lamb, Sheep and Goat Meat

AGE	CLASS
0 Teeth	A
1-2 Teeth	AB
3-6 Teeth	B
More than 6 Teeth	C
FATNESS	**CLASS**
No fat	0
Very lean	1
Lean	2
Medium	3
Fat	4
Slightly overfat	5
Excessively overfat	6

CONFORMATION	CLASS
Very flat	1
Flat	2
Medium	3
Round	4
Very round	5
DAMAGE	**CLASS**
Slight	1
Moderate	2
Severe	3
SEX	
The carcase of a ram or a bull as well as of a hamel, a kapater or an ox showing signs of late castration of the AB, B or C age classes, are identified.	

CLASSIFICATION CHARACTERISTICS OF:
Pork

% MEAT*	mm**	CLASS
≥70	≤12	P
68-69	13-17	O
66-67	18-22	R
64-65	23-27	C
62-63	28-32	U
≤61	>32	S
No specifications in respect of % meat apply in the case of Rough, Sucking pig (≤20kg) and Sausage pig (≥100.1kg). **In case of Intrascope.		
FAT THICKNESS**		
% MEAT* Only in case of the Hennessy classification apparatus.		

*Measured between 2nd and 3rd last rib, 45mm from carcase midline.

CONFORMATION	CLASS
Very flat	1
Flat	2
Medium	3
Round	4
Very round	5
DAMAGE	**CLASS**
Slight	1
Moderate	2
Severe	3
SEX	
The carcase of a boar as well as of a barrow showing signs of late castration, are identified.	

MARKS FOR CLASSIFICATION CHARACTERISTICS ON:
Beef, Lamb, Sheep and Goat Carcases

TRAIT	MARK	WHERE ON THE CARCASE
Age (A, AB, B, C)	A AB B C	One mark on each quarter of beef carcase.
Fatness* (0 to 6)	Eg. Class 3: 3	Only one mark on the carcase for lamb, sheep and goat carcasses.
Conformation (1 to 5)	Eg. Class 3: 3	One mark on each side of beef carcasses. No mark for lamb, sheep and goat carcasses.
Damage** (1 to 3)	<1> <2> <3>	Taking into account the area of damage, one mark on each side for beef carcasses. Only one mark on the carcase for lamb, sheep and goat carcasses.
Sex	MD	One mark on each side of beef carcasses. Only one mark on the carcase for lamb, sheep and goat carcasses.

* In case of a sheep carcase with a fat tail, a double impression of the mark.
** Damage, if it occurs, is indicated on a scale of one to three for the areas concerned, viz B (buttock), L (loin) and F (forequarter).

EXAMPLES OF THE ROLLER-MARK COMPOSITIONS FOR:
Beef, Lamb, Sheep and Goat Carcases*

AAA ABAB BBB CCC - Age class of the animal as an indication of tenderness. The A age class is roller-marked in purple (most tender), AB carcasses are in green (tender), B in brown (less tender) and C in red (least tender)
000 000 000 000
ZWZ ZWZ ZWZ ZWZ
AAA ABAB BBB CCC
000 000 000 000
ZWZ ZWZ ZWZ ZWZ
AAA ABAB BBB CCC
000 000 000 000 - Fatness class** of the carcase. This symbol can be replaced in the roller-mark by 111, 222, 333, 444, 555 or 666.
ZWZ ZWZ ZWZ ZWZ
AAA ABAB BBB CCC
000 000 000 000
ZWZ ZWZ ZWZ ZWZ - Abattoir-identification code.

* All goat carcasses are roller-marked in orange, taking into account the age of the animal (AAA, ABAB, BBB or CCC).

MARKS FOR CLASSIFICATION CHARACTERISTICS ON:
Pork Carcases

TRAIT	MARK	WHERE ON THE CARCASE
Conformation (1 to 5)	Eg. Class 3: 3	One mark on each side.
Damage* (1 to 3)	<1> <2> <3>	Taking into account the area of damage, only one mark on the carcase.
Sex	MD	One mark on each side.

* Damage, if it occurs, is indicated on a scale of 1 to 3 for the areas concerned, viz B (buttock), L (loin) and F (forequarter).

MARKS FOR CLASSES OF PORK:*

CLASS	MARK	WHERE ON THE CARCASE
Sucking pig	S	One mark on forehead.
P, O, R, C, U & S	P, O, R, C, U & S	One mark on each side.
Sausage pig	W	One mark on each buttock.
Rough	RU	One mark on each side.

* The class of a pig carcase is not roller-marked on it. Some pig carcasses may be roller-marked in purple ink with a specific abattoir-identification code/trademark.

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*Meat Classification Regulations No. R. 863 in Government Gazette

DETERMINE SELLING PRICE

A simple way to evaluate cattle feeding and marketing alternatives is to use "break-even" analysis. This is a way of comparing total cost and total return at various output levels.

When returns equal cost, the operation is breaking even. To calculate a break-even point, use the following formula:

$$\frac{(IW \times IP) + (G \times C)}{FW} = FP$$

IW is the initial weight purchased

IP is the initial price of the animal going into the program

G is the expected pounds of gain during the feeding program

C is the cost per pound of gain

FW is the final weight sold

FP is the final price needed to break-even on the investment

The equation for developing a breakeven price is relatively simple. Determining accurate numbers is another matter. Economic projection articles and local auction barn prices are a good place to start for cattle prices. Gain projections may need to be obtained from personal experience or you might check with other producers that have similar feeding programs. The real "pencil sharpening" is on cost of gain.

Standard components in cost of gain are feed, vet, electric, labour, interest, marketing, and other yardage charges.

Calculating a Break-Even: *Purchase Price*

Another way to use the break-even analysis formula is to work it backwards to determine the break-even purchase price, break-even cost of gain, weight of steer or heifer to purchase, or amount of gain to try to put on in the feeding program.

What price can I pay for calves?

(FP x FW) - (G x C) = IP

IW

What sort of gain must I get?

(FP X FW) - (IW x IP) = G

C

What is the maximum cost of gain I can handle for this rate of gain and at these animal prices?

(FP X FW) - (IW X IP) = C

G

At what weight should I sell my cattle?

(IW x IP) + (G X C) = FW

FP

Break-even analysis will allow the feedlot operator some idea of how much they can pay for their calves. Breakeven prices can be calculated for the entire feeding period or only a certain part of the feeding program. By looking at different parts of the feeding program (e.g. growing versus finishing) a producer can determine where the most returns to labour and management can be obtained.

The farmer can determine his breakeven point, but he market dictates the price. **Refer to Skills Programme 5: Marketing where we discussed the market, the consumer impact and how this regulates produce prices.** The critical question that must be asked with regard to price is: At what price can I sell my product to the customer to ensure the optimum sales but also the best possible profit margin?

The price at which the product is sold is critical. This is because a high proportion of the costs involved in producing and packing fresh fruit for a particular market are fixed. Distribution costs vary depending on who does it and where the market is located. Profit is highly dependent on the price earned in the market.

It has been said that the market price is the market price – take it or leave it. This is indeed the case in well-supplied markets where large volumes of product are moved at discount prices. In this case

the retailer is able to exercise pressure on the supplier. In other cases, where the supplier or grower, has a product that is generally in short supply or is particularly desired by the market, he has more bargaining power and is in a position to more easily influence the selling price in his favour.

When produce of a particular variety or specification is in abundance, it is more difficult for the farmer to negotiate any form of advanced payment or minimum guaranteed price with the buyer or his export agent. Under such circumstances, the farmer may be forced to send his produce to the market and hope for the best. This is called selling on consignment.

Before deciding what price to ask, the farmer should have in mind some kind of pricing strategy. For example, he might decide to work on a cost-plus basis, whereby he simply calculates his costs and adds a desired profit margin. The farmer might otherwise decide to try to penetrate a particular market by going in at a specifically low price. On the other hand, he may go in at a high price and skim the market for a short period while competitive product is absent.

Whatever pricing strategy is followed, price is a critical aspect of the marketing mix.

MARKETING LIVESTOCK

Successful marketing of any product requires producers to have a strong understanding of their customers' needs and preferences. Potential customers of beef feedlots, both domestic and export, may include processors, retailers, supermarkets, food service industries and re-stockers.

Before investing in a feedlot, it is very important to investigate and establish relationships with potential contractors, buyers and processors. The components needed for producing beef should be derived according to the requirements of the target market.

This includes feeding regimes, animal genetics, product price, animal welfare and investment in infrastructure. In order to minimize associated risks and increase market security it is important to maintain a close relationship with the target customer.

An advantage of lot feeding is the ability to produce animals that are uniform in both weight and fat score. This enhances the capacity for forward selling or contracting as a suitable marketing option.

The following considerations need to be taken into account when marketing beef products:

- Identification of target markets
- Size of the market, market growth and competition
- Types of products to be marketed
- Capacity and continuity of supply to market annually

The wide range of markets available to the feedlot industry means that there is a broad spectrum of market specifications. Each market may require different specifications for delivery of each of its products. Factors determining market specifications include a wide range of carcass and eating quality criteria including live weight, fat score, marbling and age. Payment from all markets can be based on live weight, carcass weight, forward contracts, and spot prices to name a few.

METHODS OF MARKETING

There are many methods used to sell cattle to meat packers.

Spot or Cash Marketing	Spot or cash marketing is the traditional and most commonly used method. Prices are influenced by current demand and are determined by live weight or per head.
Forward Contracting	Similar to this is forward contracting, in which prices are determined the same way but are not directly influenced by market demand fluctuations. Forward contracts determine the selling price between the two parties negotiating for a set amount of time. However, this method is the least used because it requires some knowledge of production costs and the willingness of both sides to take a risk in the futures market.
Formula Pricing	Another method, formula pricing, is becoming the most popular process, as it more accurately represents the value of meat received by the packer. This requires trust between the packers and feedlots though and is under criticism from the feedlots because the amount paid to the feedlots is determined by the packers' assessment of the meat received.
Live- or Carcass-Weight Based Formula Pricing	Finally, **live- or carcass-weight based formula pricing** is most common. Other types include grid pricing and boxed beef pricing. The most controversial marketing method stems from the vertical integration of packer-owned feedlots, which still represents less than 10% of all methods, but has been growing over the years.
Selling Direct	The feeder needs to have knowledge of carcass beef price, the strength of the dressed beef market, and the potential quality and yield grades of the cattle owned. A 500kg steer at about the fatness of low choice can be expected to have a carcass weight of about 300kg or a dressing percent of 60%. If the price quoted is R7 per k of live weight, then the carcass value is 700/60 = R11.67.

It may be advisable to sell based on live price and weight if you are concerned about the ability of the cattle to grade or when the market is strong, and competition is good.

Weighing conditions (shrink) that are fair to all concerned should be agreed upon. If you are not satisfied with the weighing conditions (shrink), you might consider a guaranteed dressing percent. If

cattle are muddy or dressing percent is in doubt, then you might sell based on a flat over-all carcass beef price. If you feel that the cattle are better quality than the price offered, sell them based on carcass weight and a price schedule for different quality/yield grades.

It should be agreed upon prior to sale who stands the condemnation and bruises and if standard slaughtering and trimming procedures are followed for all cattle processed. It should be known how soon the cattle will be processed (tissue shrink probably starts after 12-14 hours off feed), what slaughter information can be obtained, and how soon payment is made.

Selling at Auction	A preferred method of selling cattle may be at a local auction barn. It is a good idea to let your local auction know when you have cattle ready and they can advise you when there will be buyers present for your type of cattle.

LEARNING UNIT 9

REPORTING AND RECORDING FEEDLOT DATA

Learning Outcomes:
• Understand feedlot record keeping • Understand the record keeping system • Understand closeout data interpretation • Understand the types of records to be kept • Understand feed records

FEEDLOT RECORD KEEPING

There is common belief amongst businesspeople that "One can only improve what is measured." Therefore, good (i.e., complete and accurate) record keeping is crucial to the success of any business. During times of high-cost inputs, this is particularly important for feedlot managers. Good records are essential to monitor measures of production and allow for informed management decisions and planning.

Cattle feeders use feedlot close-out information for economic evaluation of pens. However, frequently monitoring feedlot performance and costs as cattle are still being fed not only tells you where the feedlot is currently, but also allowing managers to make fast mid-course corrections as feed costs or cattle prices change. Knowing the current cost of production is essential for making timely marketing decisions and decreasing corn use.

Good records help feedlot managers to answer important questions about the operation's financial health, and effective management will depend on accurate measurement of production and financial variables. This data, compared to appropriate industry averages, helps managers to pinpoint both the strong and weak characteristics of the operations. The use of these comparisons is called "benchmarking." Benchmarking records is important to evaluate the competitiveness of a particular operation, and to allow for the comparison of a feedlot to others in the industry. This allows for management decisions and plans based on good historical data.

Information in today's world is generated quickly. Therefore, it can be challenging to manage the volume of information available in ways that make the information understandable and manageable. However, once collected, information is of little value unless it is used to monitor progress, make decisions, and evaluate alternatives. Feedlot managers should continue to invest in methods of managing information. The manager should also communicate the critical importance of accurate information from various input points in the feedlot.

RECORD KEEPING SYSTEM

They can be simply kept on a handwritten card system. However, computerized record keeping systems are better than handwritten record systems, because they allow for easy entry and quick use of information on a daily basis. Records are essential for efficient operations and in the future, they will also help protect feedlots from liability issues that may arise from quality assurance and food safety concerns.

There is a wide selection of commercial computer closeout programs available on the market. Unfortunately, many of these closeout programs are cumbersome when sorting specific data that may be useful for management decisions and direction. It is important to thoroughly research the ability of a commercially available closeout program to perform the functions that your particular feedlot needs before purchasing the program.

Each feedlot should identify important performance criterion recognized by the management team, feedlot crew, consulting nutritionist and consulting veterinarian, before a closeout program is purchased. Many closeout programs will include a feedlot tracking system and a series of yard-sheet reports that will be utilized on a daily basis. However, I have seldom seen a commercially available record system that includes all the important aspects that I feel should be documented. Therefore, many nutritionists decide to build their own database to use when combining feedlot data for quarterly closeout analysis.

Standard measurements used for feedlot closeout data are generated from the following basis data points:

1. Pen/Lot Information

2. Cattle in weight and date, number of head and cost

3. Feed/Ration fed to cattle in the period

4. Veterinary medicine costs

5. Yardage and Interest costs

6. Cattle out weight and date, number of head and price of finished cattle

These measurements will generate a standard closeout that will generally record average daily gains, feed efficiency, days on feed, death loss and cost, cost of gain and economics of the pen. The aforementioned measurements will provide closeout information that can then be scrutinized for each pen of cattle. However, there are many more measurements that should be considered when selecting a closeout program.

One should realize that required electronic tracking systems will greatly change the data cattle producers will need to record in the near future. Thus, feedlots should take extreme scrutiny when purchasing a new closeout or records system to conform to the national electronic identification system that will soon be mandated. Many feedlot programs also are capable of receiving inputs coming from radio frequency transmission, which will expand the data gathering capabilities of each system.

Measurements that should also be considered when purchasing/selecting a feedlot tracking system or closeout program are:

1. Lot movement/EID and premises identification
2. Sex and mixed sex of cattle, breed and type of cattle
3. Buyer of cattle, origin of cattle, previous plane of nutrition of the cattle
4. In and out shrink of cattle, physical description and background identification, realizer data, necropsy information, etc.
5. Classification of feedstuffs and processing of feedstuffs used in diet, Net energy efficiency and intake chart of each pen of cattle, by-product used, and feeding program utilized (limit feeding, program feeding, etc.)
6. Ionophore or additive used, metaphylactic treatment used, vaccination program used, implant or implant combination used, treatment type/duration/cost/etc.
7. Housing type that cattle are fed in, pen condition records, cattle movement
8. Check weight data from re-implant (chute scale download)
9. Packer/alliance, carcass characteristics, weigh conditions, risk management, etc.

The above items are just suggestions for data that should be considered for closeout data. Many more items should be collected for yard-sheet data. I would highly recommend that one select a program that is compatible with your feedlots' chute scale, truck scale, batching scales and EID program.

Closeout Data Interpretation

Only include closeouts in the data set that are complete and include all desired measurements. I would recommend that closeouts be calculated on a pay-weight to pay weight basis, which represents a true reflection of the real economic and cattle performance of the pen. Also include dead weights and realizer weights in the closeouts.

Several closeout programs offer the ability to calculate net energy efficiencies and intake efficiencies for each group of cattle which is calculated from comparing that particular pen of cattle with the NRC equations for comparable breed, sex and weights of cattle. These efficiency numbers often prove to be valuable parameters to use when evaluating the closeout data. Many feedlots manipulate their closeout data to include full weights or adjust the performance data to "standardized" dressing percentages. This data may look impressive from a performance perspective, but the validity of the data should be questioned from an analytical value. A high-quality closeout/data control program will allow the feedlot to apply quality control and quantitative control of feedstuffs, morbidity, mortality, veterinary supply costs, etc.

Many select suppliers such as implant manufacturers, pharmaceutical companies, veterinarians, feed companies or consulting nutritionist will sort and analyse data for feedlots. This service is a very valuable tool and should be utilized if possible by the feedlot. However, it is important to remember that each particular feedlot's closeout data is highly confidential. While one can compare implant programs, health programs, etc., it is important to consider with all sorts that the associative effects of any biological system (cattle) may make data interpretation difficult. However, it is easier to sort within each feedlot and compare pens, lots and groups of cattle.

To gain the most information available from records and to make correct management decisions, unique, individual, animal identification is essential. Currently, it is recommended that uniquely numbered ear tags, either plastic or electronic, be given to each animal on feedlot entry to identify each animal individually and to follow its progress through the feeding period and packing plant. Electronic identification is now available and shows great promise to help trace an animal from birth to slaughter and to allow the two-way transfer of important management information. The feedlot

manager, consulting veterinarian and nutritionist can use this information to improve production efficiency and lower costs of production.

When facing difficult economic times all aspects of the operation should be evaluated. Sound economic decisions are made based on what we can measure and identify as not profitable. Accurate evaluation of all processes and revaluation of current practices is the way progress can be achieved for an individual feedlot, and because of this, good records are essential to maximizing productivity.

TYPES OF RECORDS TO BE KEPT

Production Records

Production records, including those for animal health, are used in feedlots: to keep track of current practices, monitor processes, decide where and when problems occur, and verify that corrective procedures are beneficial to the operation.

What types of information should feedlot managers keep? When should they be reviewed? How can they compare their data with other feedlots data? Some suggestions include:

- Cost of gain and breakeven should be continually monitored. Feedlots should work with projected breakeven and marketing date/weight.
- Employees should be trained and should make decisions based on management input provided weekly.
- Inventory analysis should be conducted daily or weekly.
- Feed mixing and weighing of ingredients should be monitored.
- Cattle intake should be evaluated daily, and ration bunk samples should be analysed frequently.
- Feed waste should be measured, and adjustments should be made.
- Cattle gain and performance should be estimated with the use of software. Previous closeouts and records on cattle from a specific source could be used to estimate future performance.
- Feed purchases and waste should be monitored monthly for billing or cost of feed adjustments.
- Health management program effectiveness should be evaluated annually.
- Non-feed costs should be monitored and adjusted annually using feedlot figures.
- The charge of feed costs should be based on updated fixed and variable costs.

- Databases should be maintained and reviewed regularly.
- It is important to evaluate the database of grid premiums by the type of cattle and feeding programs.
- It is helpful to feedlots to belong to a benchmarking program.

Animal Health Records

Animal health records are used to monitor health, disease occurrence, and the effectiveness of treatment, preventive and control procedures, inventory management and accounting/billing. Processing, treatment, necropsy, transaction and closeout records are fundamental to a record keeping system.

Animal health records monitor the occurrence and severity of disease, the effectiveness and cost of processing, treatment and vaccination programs, and production performance. Records can be kept manually on cards or in binders. However, to increase the likelihood that the information is used to its fullest, the records should be computerized. There are many computer programs available that include animal health records. Information recorded should include:

- lot descriptions with purchase and sale information
- processing records with predefined processing and implant schedules
- drug inventories with cost analysis
- treatment records with predefined treatments and withdrawal dates
- dead analysis
- pulls reports
- cattle's transfers and movements and
- closeout summaries

Processing Records

Processing records are usually kept on a pen or lot basis and should show the date that animals were uniquely identified (tag), branded, vaccinated, implanted, and injected with prophylactic antimicrobials, de--wormers and vitamins. Any other procedures such as dehorning, castrating, aborting, re-implanting and revaccinating should also be recorded. Additionally, the crew responsible for processing the cattle should be identified and an injection site map should be kept. An injection site map simply shows where on the animal's body products and procedures were given. This

information is important to ensure that the best practices are followed, and it also provides an information database for subsequent buyers.

Processing records should be standardized for certain types/groups of cattle to avoid waste, errors in procedures and guess work, and to allow the evaluation of the effectiveness of processing regimes. Most computer programs allow the entry of predefined processing schedules for specific types of cattle that also record associated costs of procedures.

(NAME) FEEDLOT - PROCESSING RECORDS

LOT _____ PEN(S)#_____ HEAD _____
ANIMAL ID (TAG # -> #) _____
BRAND _____ BRAND LOCATION _____
ARRIVAL DATES _____
PROCESSING DATES _____
SEX _____ ARRIVAL WEIGHT _____ SHRINK _____
ORIGINS _____
TRUCKERS _____

Number of injection site	Product	Lot #	Dose	Route (IV, IM, SQ, oral, topical)	Initials of Processor

OTHER INSTRUCTIONS:
_____
_____
_____
_____

Treatment Records

Treatment records should be kept for each animal so that the treatment history of an animal and group of animals can be summarized to evaluate disease occurrence and treatment response. The records should include:

- the lot and pen number
- animals' unique identification number

- date(s) pulled and treated
- disease suspected
- rectal temperature
- body weight
- drugs used and dose, route of administration and site of injection
- movement of the animal (home pen, sick pen, recovery pen, chronic pen, buller pen)
- outcome of treatment (recovery or death)
- crew who pulled and treated the animal, and
- withdrawal dates

Most computerized programs have withdrawal dates built-in by animal and/or lot following any treatments to avoid shipping animals to slaughter before the recommended withdrawal period. This helps prevent drug residue problems in beef.

Standard treatment protocols should be established by your consulting veterinarian to reduce guess work and the use of inappropriate and useless pharmaceuticals and to ease the evaluation of the success or failure of treatment regimes. Most computerized treatment records allow for the entry of predefined treatment protocols, costs of each treatment, and entry of an individual animal treatment. From this information one can decide the occurrence of disease by lot, pen, specific disease, cattle weight, arrival month, and days on feed. Additionally, one can figure out treatment response by disease, drug, individual, lot, pen, and feedlot. Most computer programs will also summarize the costs of treatment. This information can be used by the feedlot crew, management, and consulting veterinarian to monitor events, decide actions to take when problems occur, and verify the health program is cost efficient. Additionally, this information is used for accounting and billing purposes in custom feedlots.

(NAME) FEEDLOT - TREATMENT RECORDS

LOT _____ PEN _____ SEX _____
ANIMAL IDENTIFICATION _____ WEIGHT _____

Date	Disease	Temp	Drug	Dose	Route	Injection	Comments	Crew

OTHER COMMENTS:

_____
_____
_____
_____

Death Records

The veterinarian who does necropsies should fill out feedlot records on the results of the necropsy and include the date the animal died, its identification, lot number, pen number, cause of death, explanatory comments, and outcome of any further laboratory analyses. From this information, one can summarize the number of deaths by disease, treatment regimes, lot, owner, age and type of cattle, days on feed, and feedlot. Death records can be used to monitor events, decide actions to take when excess losses occur, and verify the health management program is working.

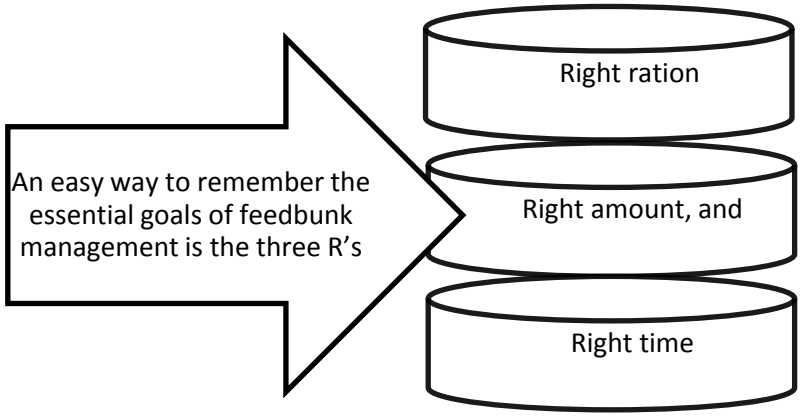
Another important record is a **case summary record** on an animal in the feedlot. The case summary includes the processing, treatment and death records of that animal. This information, along with production data, such as arrival weight, final weight, days on feed, average daily gain, feed conversion, and costs of production are summarized by lot, cattle weight, or arrival dates in closeouts to provide the feedlot with a record of its performance. This information is required by most custom feedlots for their clients.

Feed Records

Recording the Ingredients Mixed into the Feeds:

No feedlot manager or operator will be able to make decisions about the adjustment of feeding practices without the necessary information being available to him or her. The only way in which the necessary information can be gathered is through the implementation of a thorough and well managed recordkeeping system.

Effective feed bunk management is a key component in accomplishing the goals of any cattle feeding program.



It is therefore important that the correct bunker location and the practices applicable to the feed bunk are accurately recorded to carry out the three R's.

Only through analysing the records and scoring system of each bunker can a feedlot manager then decide where to adjust feeding practices to optimise results.

The success of feedlot practices is dependent on various factors from the quality of ingredients used to feed the cattle with to the amount of feed supplied and the times at which the feed are supplied. Other external factors can also have an effect on the feeding patterns of cattle, such as climatic conditions and so forth. Only through the collection of complete and intensive records and the capturing of these records will a feedlot manager or operator be able to make informed and well thought out decisions concerning the operation of his feedlot.

It is important that a feedlot manager have the ability to predict the effect that certain changes in practices will have on the performance of the feedlot. The effects that changes in feed ingredients,

such as the seasonal availability of certain concentrates, must be judged before-hand in order to determine the effect that these changes will have on the profitability of the enterprise. The only manner in which the feedlot operator or manager are able to make these predictions is through the analysis of records and the compilation of historical data obtained from these records.

Discharged volumes/mass of mixed feed is determined according to procedure

Making the feed calls or determining the amount of feed to offer involves estimating the amount of feed a pen of cattle will consume in a 24-hour period. Therefore, the effect of a given feed intake at subsequent feedings must be considered. As we discussed earlier a well thought out and implemented scoring system can help determine the amount of feed needed per bunker, but results must be measured over a period of time.

For example, cattle might consume all of the ration offered just after an increase in the amount fed but lose appetite and crash a day or two later. When this type of situation occurs, cattle will have periods of overeating, which may result in acidosis or a sub-acute rumen acidosis condition, followed by a period of reduced feed intake while the rumen returns to a normal pH. However, this will be a continual process resulting in increased feed intake, followed by reduced feed intake. If given enough time the cattle will then return to normal feeding patterns with the increased food intake.

A feedlot operator should therefore always monitor the feed intake of the cattle and only adjust practices of a trend becomes visible over a period of time.

Recording the Amount of Feed To Animals

It is important that a record of loads discharged be accurately reported and recorded to maintain a correct feeding schedule. If the loads discharged into feeding bunkers are not recorded correctly it can lead to the wrong information being used to adjust the feeding practices.

Earlier in the guide we looked at the importance of loading the correct amount of feed onto the feeding wagon when refilling the feed bunkers. If this practice is closely monitored and recorded the accuracy of the entire feeding process can be increased. Records of the amount of feed distributed to each bunker is another critical step in assuring that the success of feeding practices can be measured, and practices adjusted where necessary.

Failure to correctly record the amount of feed discharged into the feeding bunkers can lead to a feedlot manager or operator taking drastic steps. For example, a sudden loss of appetite can mean

that cattle are sick or that the feed blend being used is of a poor quality forcing the feedlot manager to implement costly changes in the feed blend or scheduling treatment or vaccinations. If the seeming loss of appetite is only indicated due to the wrong information being recorded the feedlot can easily occur unnecessary expenses that can influence the ultimate profitability.

If the necessary information concerning the amount of feed discharged at each bunker is not recorded a feedlot operator or manager will not be able to make the adjustments to the feeding practices as needed. The livestock feedlot industry has become a highly skilled and competitive industry in which only the best feedlots are able to survive and flourish.

To ensure the survival and profitability of the feedlot a manager must be able to make well thought-out and informed decisions and the only manner in which to accomplish this is by the design and implementation of well-structured recordkeeping system. Going hand in hand with the recordkeeping system is the capturing and analysis of the data obtained from the records. The analysis and capturing of recorded data gives the feedlot manager a tool that can be used to track trends and thereby measure the success of feed volumes and feed blend quality.

Stock Control of Feed Ingredients and Ordering Feed Ingredients

Any feedlot's ultimate goal is to be profitable and sustainable. As with any other business, times will come when the market price places pressure on the profitability of the enterprise. This is a naturally occurring cycle and similar to nature this process eliminates the weak and identifies the strong.

A strong feedlot is a feedlot that keeps control of all the various elements that can have an effect on the quality of the cattle and the ultimate profitability of the enterprise. One of these factors that are a necessary but large expense for the feedlot is obtaining the ingredients used on the feed blends. As we discussed earlier these ingredients consist of a variety of elements from roughages to concentrates to additives such as vitamins and minerals.

In order to ensure that the feedlot does not undergo any unnecessary expenses and thereby negatively influencing profitability strict control should be kept of these ingredients. The only effective manner in which to control the levels of the ingredients is to employ a well detailed and structured recordkeeping system where all the ingredients obtained and where the ingredients was used can be captured.

A stock control system can help to ensure that the profitability of the feedlot improves and that the right ingredients are available when needed. To effectively develop a stock control system a feedlot manager should determine minimum and maximum stock control levels for each separate ingredient.

The setting of minimum and maximum stock levels helps in maintaining the quality of the stock as well as ensuring that the necessary ingredients are available for use when needed. Over ordering of stock can lead to ingredients deteriorating before use thereby leading to stock having to be destroyed or discarded. On the other hand, under ordering of stock can lead to ingredients not being available for blending when needed. Stock should be ordered once the stock level reaches the minimum level. The amount of stock ordered will be depended on the maximum stock level. So once stock reaches the minimum level enough stock should be ordered to bring the stock levels up to the set maximum level.

Ensuring that the right ingredients are available at the right time in the right amounts goes a long way to ensuring that the feedlot can maintain its profitability.