

5.1

Dairy feed types

A. Basics of cow nutrition

Correct feed management is necessary to ensure good health and welfare of the animals on a dairy farm. By nature, cows are creatures of habit that need to perform the same activity at the same time (e.g. feed, rest, ruminate). Feed management programmes that consider such behavioural needs, are likely to reduce stress and aggressive behaviour within a herd and have a positive impact on herd health and productivity.

Dairy cows are ruminants, or animals with four-compartment stomachs. When cows ruminate, they regurgitate (bring up) their food and chew it again. They are adapted to a diet primarily composed of roughage feeds, which has a high fibre content. They need good quality feed with sufficient levels of protein, energy, vitamins and minerals, which are essential for their growth, reproduction, milk production, etc. The nutritional demands will vary according to each animal's age, size, weight, level of milk yield, and stage of its reproduction cycle.

Good dairy farming practice is to always provide sufficient and high-quality feed and water for the animals. The dairy farmer can greatly increase his annual milk production and income by feeding his cows the right feed at the right time. It is much more profitable to keep fewer cows that are well fed, than to keep a big herd and not being able to feed them properly.

A cow with the genetic ability to produce a high yield of milk will not perform as expected if not fed sufficiently. On the other hand, an average cow that has access to sufficient high-quality feed is likely to produce more milk. If a cow is undernourished, it will have low milk production, regardless of its breeding.

Protein is essential for growth, to build muscle, to produce milk and to boost immunity. Good sources of protein are legumes, such as lucerne, oil cake meals, fish meal, cotton seed, soya beans, etc.

Energy is mainly obtained from fibre digestion, and carbohydrates, such as starches and sugars. Good sources of energy are grain (maize, wheat), grain by-products (hominy chop) and by-products from the sugar cane industry, such as molasses.

Forage is the main source of fibre, which helps to keep the rumen functioning properly. Forage is also a source of energy, protein and minerals. Sources of forage include natural veld,

pastures, legumes, grass hay and silage. Various kinds of forage can be mixed with protein and energy sources to provide a total mixed ration (TMR). The term “total mixed ration” (TMR) means the practice of weighing and blending all feedstuffs into a complete ration that provides adequate nourishment to meet the needs of dairy cows. Each bite contains the required level of nutrients (energy, protein, minerals and vitamins) needed by the cow.

We have to keep in mind that ration balancing is only one part of dairy herd management. If the other parts are neglected, this exercise will not be worth much. Supplemental feed could be given in addition to normal feed, and never as the main source of feed. Get professional advice.



B. Hay crops

Hay-making is the process of turning green, perishable forage into a dry product that can be safely stored and easily transported without danger of spoilage, while keeping nutrient loss to a minimum. This involves reducing its moisture content to below 15% by drying the forage in the sun after cutting. Making hay is a process that is very weather-sensitive.

Feeding hay to livestock is essential for health and it helps reduce the amount of concentrate feeding, and thereby, the cost of feeding. Two critical aspects in making high-quality hay are when the green forage on the land is harvested and how the hay is stored. You can have great hay to start with, but if stored improperly, the hay will be damaged. Stop oxidation by compressing and covering it with plastic sheeting, thus preventing fresh air from getting into the cut crop.

Teff

Teff can easily be made into hay. It is easy to establish, grows fast, cuts easily and dries quickly, so that it can often be baled on the same day. Animals like the taste of teff. It is also economic. It does well as a rotation crop. It is mainly produced on the Highveld, in areas with a rainfall of 600 mm per year and more.

Lucerne

Lucerne can be produced on dry land or as an irrigation crop. Lucerne has different dormancy classes, which give an indication of the cultivar's sensitivity to cold temperatures. A dormancy class of 10, for example, is very resistant to cold, and can be cut up to ten times a year. The best time to plant it is autumn. Once a lucerne field has reached its production limit, it must be replaced with a follow-up crop. Teff is the ideal follow-up crop.

Weeping love grass (Oulandsgras)

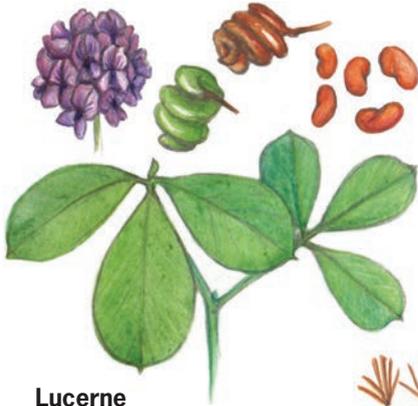
Weeping love grass is the most common hay crop. It is easy to cut, dry and bale. Its only drawback is that it has little value as standing hay during winter. Therefore, the farmer keeps the first two cuts for himself, and fertilises and sells the third. The first cut he keeps aside for his highest-producing cows and the second cut for the cows in later lactation.

Smutsfinger grass

Smutsfinger grass grows best in warmer regions. It can take up to 18 months before there is any really good production. Smutsfinger must be allowed to go to seed once a year. Make hay towards the end of November or beginning of December, and then leave the second growth to go to seed. These fields can then be left to be utilised as standing hay for the winter.

Foxtail buffalo grass (Bloubuffel)

Foxtail buffalo grass grows at its best in the warm parts of the world where rainfall is low. The lower parts of the plant easily become rough and thick, which could injure animals' gums. Therefore it must be grazed short. It makes a good hay if it is cut down short.



Lucerne



Teff



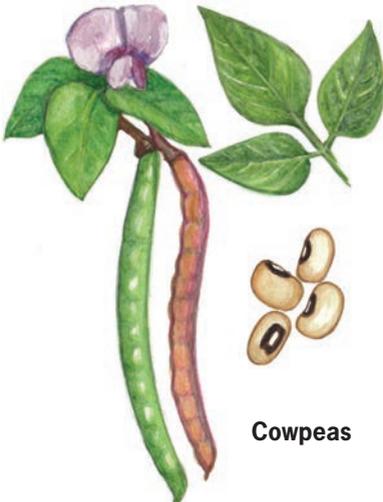
Weeping love grass



Smutsfinger grass



Rhodes grass



Cowpeas



Foxtail buffalo grass

Cowpeas

Its hay is similar to lucerne because it is also a legume. However, the haymaking process is labour-intensive, which makes it a difficult hay crop.

Rhodes grass

Rhodes grass is a good hay crop that is easy to establish and grows quickly. It is a particularly good grass to establish together with Smutsfinger grass, as it does not have a long lifespan – by the time the Smutsfinger grass is well-established, the Rhodes grass has reached the end of its lifespan. Although the fields cannot be grazed at that stage, hay can be cut.



Best quality, but less bulk.

C. Making hay

On commercial farms there is sophisticated machinery, such as a hay baler, to bale the hay. On a smaller scale, the following simple and practical method can be used to bale hay. Once you have cut your hay, it should be dried as quickly as possible. Spread the hay with a rake. Once it has dried on the top (after about four hours on a warm day), turn it with a rake or fork, and dry it for at least another four to five hours.

Hay should not lie in the sun for too long and should not get wet. If it does rain, your hay may need to lie in the sun a little bit longer and should be turned once more to dry. Do not work roughly, especially when you are moving the dried legumes, as they may lose their leaves.

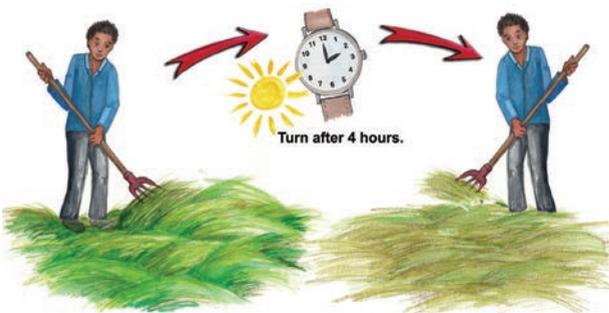
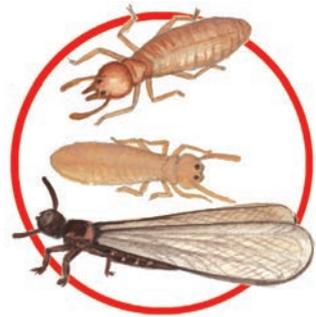
Baling hay

Hay can be gathered loose or baled for easier storage and transport. Baling hay saves storage space and avoids waste during feeding.

- Bale hay by digging a hole in the ground (about one metre long, half a metre wide and half a metre deep) or build a wooden box of the same size.
- Use the rake to gather the hay and put it into the hole or box using a pitch fork.
- Once the hole is full, the hay can be lightly compressed and tied together.

Storage

After drying, hay should be stored indoors or where least contamination will occur. If termites are a problem, clear and destroy the termite mounds within a radius of at least 100 metres around the storage space.



- Cut hay should be dried as quickly as possible.
- Spread the hay with a rake.
- Dry the hay for about four hours.
- Bale hay for easy storage.
- Dig a hole 1 m x 0,5 m x 0,5 m.
- Fill with hay, compress and tie together.



D. Building a hay rack

Once your hay has been cut and baled, it needs to be stored in a safe, dry place. It also has to be protected against termites.

Building a hay rack solves many problems:

- A hay rack is easy to build and will not cost you a lot of money.
- It is a good way to keep the hay clean and dry.
- Less hay is wasted if it is kept on a rack rather than on the ground.
- To protect the hay against termites, let the legs of the hay rack stand in buckets filled with old motor oil.

Pick a site

First you should pick a location for your hay rack. Your hay rack should be:

- In a barn or storeroom or at least in a shaded area.
- Close to the area where your animals are fed.

Materials

- Four strong wooden poles of three metres each.
- Two strong wooden poles of two metres each to hold your structure in position.
- Wire mesh or wooden slats made from clean-cut branches to serve as the rack.

Important things to remember

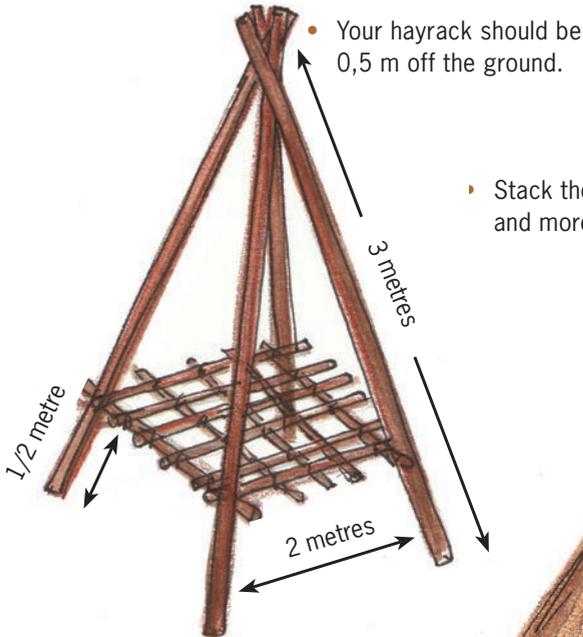
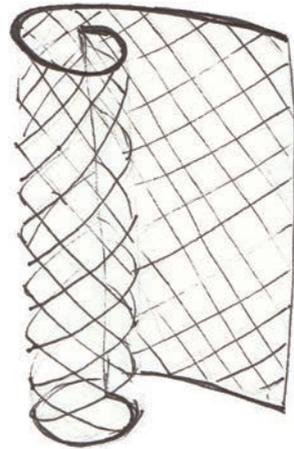
- Your hay rack should be at least half a metre (0,5 m) off the ground so that the hay will stay dry and clean at the bottom.
- Stack the hay loosely at the centre of the rack, but more densely around the perimeter (outside).
- It is better to build a few racks than only one.
- You can also thatch your rack if it is not in a barn, to protect it from sun and rain.

Feed your cows

There should always be fresh hay in your hay rack. Be sure to allow for at least 10 kg of hay per cow. If you have a lactating cow, you may put some more hay onto the rack.

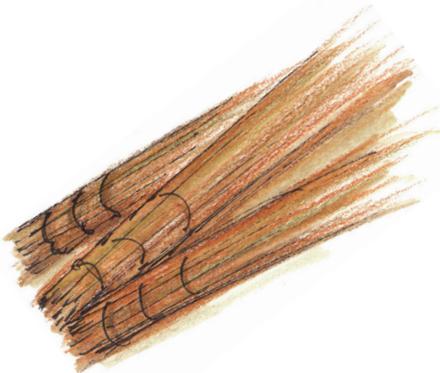
Check that the hay is dry. Wet hay will form mould and will have a sour smell and the cow will not eat it.

- Use wooden slats or mesh wire for the rack.



- Stack the hay loosely in the middle and more densely on the outside.

- Thatch your rack to protect against sun and rain.



E. Silage crops

The process of making silage is called ensiling and it is used to achieve optimal preservation of nutrients through fermentation. Efficient fermentation ensures a more tasty and digestible feed, encouraging optimal feed intake that leads to improved animal performance. Thus silage is a type of preserved feed with a very distinctive aromatic sour smell, which it gets from the fermentation that takes place while the crops are in the silage pit.

In certain dry areas, cowpeas can also be used as a silage crop. However, the following crops are the ones commonly used to make silage.

Maize

Maize remains the most common silage crop in South Africa. Quick growers produce more grain, relative to the vegetative material (leaves, stalks and roots), while longer growers produce more vegetative material. Cereal grain crops can also be used to make silage.

Sorghum

Sorghum silage is ideal for cows in later lactation. Sorghum can be produced under less favourable conditions. In terms of tonnage, it has an advantage above maize, but when it comes to quality, it is no match for maize. The best fields will be used for maize silage, while the rest will be planted with sorghum. Sorghum can also be planted later.

Canola

In the winter rainfall areas, canola is an option. Palatability (taste) for cows may be a problem because of its cabbage taste. The taste is not noticeable in milk. The best option is to mix canola silage with another silage such as maize. Because canola is a winter crop, it can be established in irrigated maize fields. Canola is a very good rotation crop that counteracts root-rot.

Roundbale silage

Any crop can be wrapped in plastic and ensiled, as long as the stems are not too hard and do not press holes in the plastic. A benefit of plastic ensiling is that any overproduction can be preserved for later use.

Hay crops can also be wrapped immediately after cutting and is then referred to as haylage.



- Any crop can be wrapped in plastic and ensiled.



Maize



Sorghum



Cereal grain

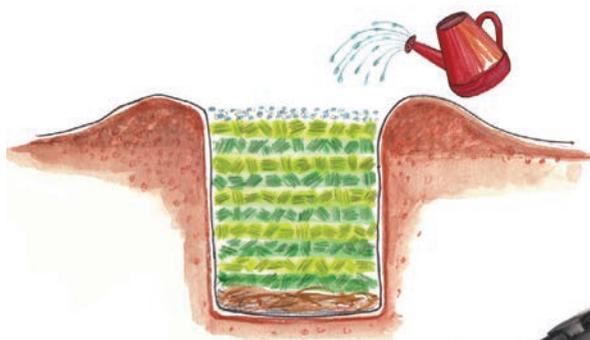


Canola

F. Making silage

Crops such as maize, sorghum, cereal grains, various grasses and legumes work well for silage production. Make your own silage by using a pit. Ensure that the edges of the pit are slightly raised from the ground to prevent water from running into the pit once it is covered.

- Line the sides of the silage pit with black plastic bags, leaving enough plastic to fold back over the sides of the pit (this will cover the silage when you are done).
- If plastic is not available, cover the silage with sacking and put ground onto the sacking.
- Line the bottom of the pit with old hay or straw.
- Spread a thin layer of cut grass over the surface.
- Chop the crop into pieces of about 1 to 2,5 cm in length with a chaff cutter.
- Compact with a wooden plank by pressing down as hard as possible.
- Molasses can be mixed with the crop as each layer is built.
- Spread another layer of chopped crop and compact again. Keep going until the pit is full.
- Spread course salt onto the silage surface and lightly water the salt into the silage mass.
- Fold the plastic covering the edges of the pit, over the silage.
- Make a run-off for rainwater around the pit.
- Place a layer of old hay or soft straw onto the plastic sheeting (or ground onto sacking).
- Place old car tyres onto the hay. Use logs or similar heavy objects if you don't have tyres.
- The silage is ready to be used after 40 days.



- Line the silage pit with plastic bags.
- Mix silage layers with molasses.
- Compact after each layer.
- Spread course salt and water.

- Cover with plastic.
- Put a layer of straw, hay or soil on plastic.
- Hold in place with tyres.
- Start using after ± 40 days.



G. Constructing a bunker silo

The design of a silage bunker is very important if you want to produce proper silage. Silage is the end product of the fermentation of a high-moisture crop. A wide selection of crops can be harvested as silage. Silage is better suited as an ingredient in total mixed rations.

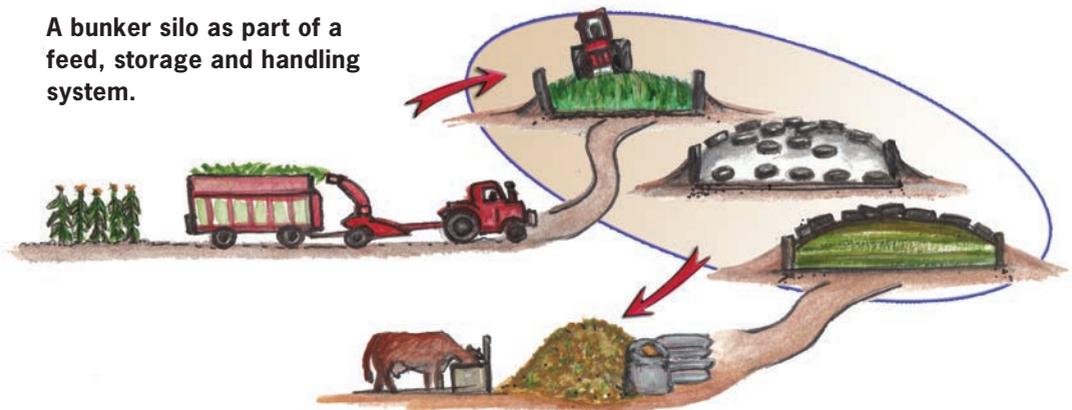
Site selection

- **Drainage:** select an elevated location that allows rainwater to drain from the site.
- **Ground water:** construct the bunker at least 60 m away and above existing wells.
- **Feeding:** locate the bunker as close to the feeding system as possible. Remember that you will have to move the silage to the cattle.

Site preparation

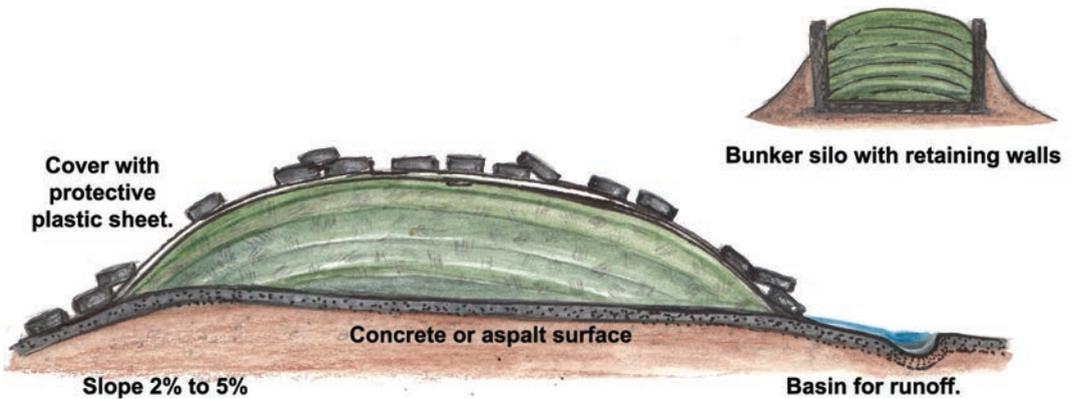
- Make sure that the surface is well prepared for vehicles.
- Concrete makes the best all-weather traffic surface, while asphalt is the next best alternative.
- Slope concrete floors 25 mm per 2,5 m for drainage of water and silage moisture.
- Use a 2% to 5% surface slope to drain runoff away from the bunker.
- Collect runoff in a storage basin for later disposal.

A bunker silo as part of a feed, storage and handling system.



Design criteria

- **Face removal rate:** a minimum amount of silage must be removed from the silo face each day to keep ahead of spoilage in warm weather. Design the bunker to remove at least 200 mm per day. In larger operations, design the bunker for a 300 mm removal per day.
- **Bunker width:** the minimum width is determined by the packing tractor width. Determine the minimum width by multiplying the packing tractor width by two. If using a 2,5 m wide tractor, the minimum bunker width is 5 m for full coverage of the silage while packing.
- **Bunker height:** the maximum height is usually limited by cost. In some cases, it can be limited by the maximum safe vertical reach of the silage unloading equipment.
- **Bunker length:** length is usually determined by the quantity of forage that must be stored.



H. Pasture crops

In certain parts of the country, irrigated and planted pasture is a very important nutritional system. Common planted pastures are grasses such as ryegrass and kikuyu, and legumes such as clover. It is natural for cows to wander and graze for a large part of the day, therefore it is very good for their physical as well as mental health to provide plenty of pasture for dairy cows.

Because of the nutritional limitations of pastures, supplemental concentrates consisting of maize, good quality protein sources and minerals should be provided, either in the milking parlour or in a post-parlour feeding system.

Proper soil health and fertility will ensure a good growth environment for pasture crops. Manure can help to improve and maintain soil fertility by providing the necessary nutrients and organic matter. Management is the key to healthy, productive pastures.

Forage produced on well-managed pasture is one of the most cost-effective feeds that can be produced and utilised. If properly managed, grazed forage is of higher feed value than any form of conserved forage, because harvesting are frequent and there is no storage or harvesting losses.

A clear understanding of how grasses grow is very helpful in managing pastures effectively. For advice on what type of cultivated pastures to plant, you should contact your pasture scientist or local extension officer.

Japanese radishes

The benefit of Japanese radishes is that it provides excellent grazing during the winter months. Plant density is very high – up to 25 kg per ha. It is the ideal crop to establish on silage fields for winter grazing. The tubers are commonly used after chopping as part of TMR.

Oats

Once oats have gone to seed, its lifespan is over. There are two types of oats: quick growers for haymaking and silage, and long growers for grazing. If you want oats ready for grazing in winter, you must make sure that you plant it in time.

Ryegrass

Ryegrass is the crop used most often as pasture for dairy cows. There are annual and perennial ryegrasses, and among annuals there are the Westerwolds and Italian varieties. Westerwolds are more resistant to cold. Its lifespan is shorter than Italian ryegrass. A combination of the two types is therefore the best strategy.

Perennial ryegrass

Perennial ryegrass can be divided into three groups, namely early, medium and late types. Make sure that you select a type that gives you grazing when you need it. Perennial ryegrass

is most effective in our mist belt regions. If it is planted outside its natural zone, its lifespan (of no more than three years) is shortened. Continuous sowing of new seed is required.

Stooling rye

This is an annual pasture crop. It is a slow rye that grows throughout winter and will produce as much as four grazings. The fibre content of rye is high and it is more resistant to drought.

Kikuyu

Kikuyu plays an important role in our country's bigger pasture regions. In most cases it is planted in combination with other crops. It needs a lot of water and its growing season is from November to February. During the rest of the year, other crops such as ryegrass are planted among the kikuyu. One of its biggest benefits is that it stabilises soil against slopes.

Clovers

Clovers are perennial and are mainly planted in combination with other pastures, such as ryegrass and kikuyu. Red clovers are fast growers and provide grazing quickly, but have a short lifespan – after two or three years the red clovers start disappearing. Then the white clovers take over. A mixture of the two types is advised.



Japanese radishes

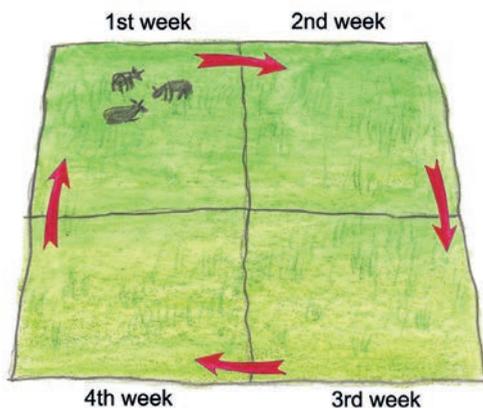


Oats



Grazing systems used by farmers usually help match the nutritional demands of the livestock with the supply of forage. The choice of the most appropriate grazing system on a dairy farm should take account of the farm layout, land quality, rainfall and the management skills of the farmer. Grazing systems range from continuous to rotational grazing, camps or strip grazing.

Animals graze selectively; they eat the highest quality grasses first and leave the rest for last. What is left is then subjected to increased trampling and polluting with manure and urine. Do not leave the animals in a specific grazing area for too long. In order to maintain high and consistent levels of milk production, lactating dairy cows should be given fresh camps after every milking or every second milking.



- Grazing systems range from continuous to rotational grazing, camps or strip grazing

I. Natural grazing

Grazed grass, in comparison to other feeds, remains the cheapest source of feed available. Difficult grazing conditions, as well as increases in both herd size and milk yield, have resulted in a reduced dependence on grazed grass in dairy herds. Keep in mind that for milk production purposes, natural veld has serious nutritional limitations. However, it can be used effectively for lower producers, heifers and even dry cows.

J. Supplementary feeding and licks

Supplementary feeding and licks are used because of nutrient deficiencies when using natural grazing and/or irrigated pastures.

A dairy cow feeds for two reasons: to produce milk and to maintain its body reserves. If fed more than it needs, the cow will become too fat and encounter health problems. If it is underfed, the cow will produce less milk and lose body condition.

There is a great variety of concentrates suitable for feeding dairy cattle, ranging from the individual ingredients that can be used on the farm to mix rations, to the ready-mixed commercial compound feeds. No single concentrate is suitable for feeding on its own. The representative of your feed supplier will be able to advise you on what and how much concentrates to feed.

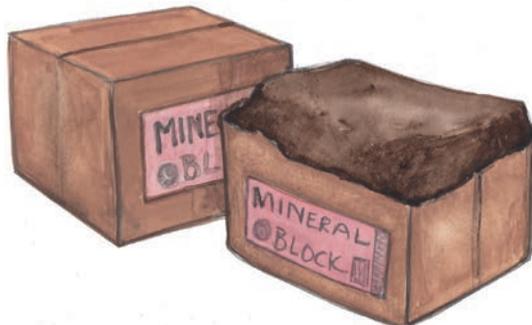
Feeding concentrate

- Concentrates are made up of high energy sources such as grains, high-quality protein sources such as oil cake meals, minerals, fish meal and vitamins.
- You can mix your own concentrate or buy it from your nearest feed manufacturer.
- The ratio for a lactating cow should be one kilogram of concentrate per two to three litres of milk.
- This means that a cow producing 10 litres of milk per day, should be fed three to five kilograms of meal per day.
- When feeding concentrate, one should also consider the cow's age, stage of lactation, etc.

Minerals

Dairy cattle need about 21 minerals in their nutrition, in order for them to be healthy and produce enough milk. These minerals are normally found in the feed that cattle eat and only small amounts are additionally required.

Mineral licks are sometimes necessary on the dairy farm, e.g. for heifers on natural grazing. Without essential vitamins and minerals, major health problems arise that could have been avoided by supplementing animals with loose mineral or salt blocks.



Farmers provide salt licks for their dairy cows to encourage healthy growth and development. Typically a salt lick in the form of a block is used. Basic salt licks provide cows with a tasty source of pure salt to supplement their everyday intake. Body weight, growth rate, pregnancy, age, lactation phase and milk yield all affect how much salt individual cows need per day.

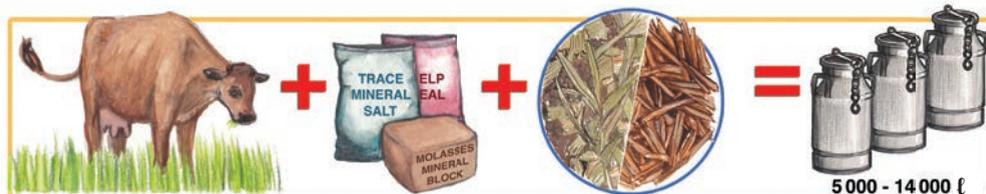
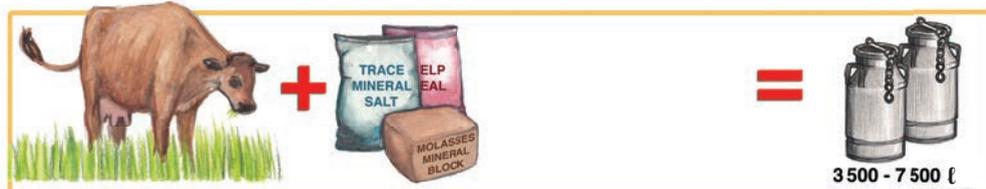
Vitamins

Cows that fail to become pregnant, that have a shorter gestation period, or that show a high percentage of retained placentae and abortions, may be showing these signs due to a lack of vitamin A. Cows with a vitamin A deficiency usually have dull and watery eyes. The eyes will regain their form within a day or two if the cow is injected with vitamin A.

The golden rule

Always make sure that your cow has enough good quality roughage and clean drinking water available. Your dairy cow must never be hungry and thirsty.

If you suspect that your cows are lacking certain vitamins and minerals, do not try to diagnose the problem yourself. You may end up spending a lot of money on the wrong product, or feeding your cow the wrong supplement, causing her harm. Contact your feed consultant or veterinarian for advice.



Grass

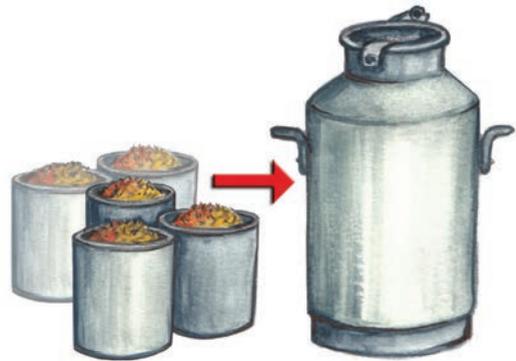
Concentrates + Roughage or TMR
(Buffer feed)

Production
per lactation

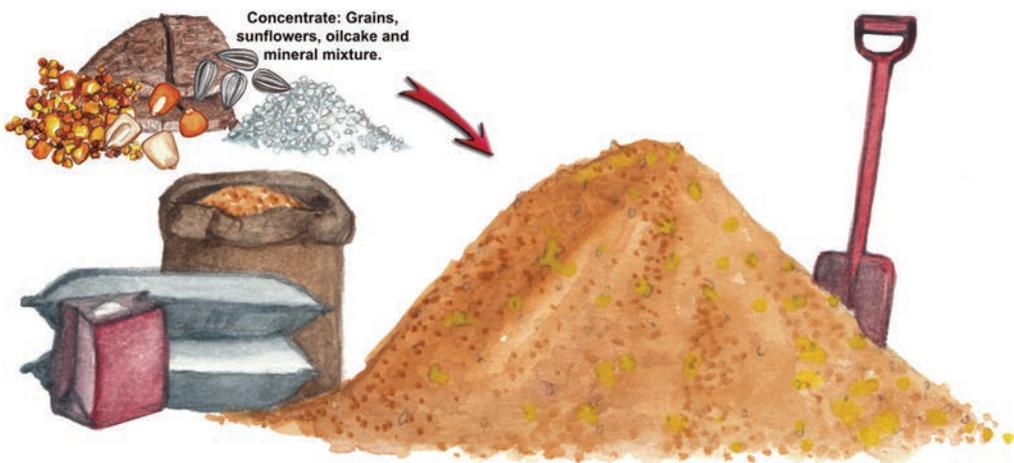


- Vitamin A is good for eyesight.
- Vitamin D is good for strong bones.

- Vitamins and minerals are found in feed and feed supplements.
- Always give good roughage and clean water.
- Mix your own concentrate or buy it readily mixed (dairy meal).



Feed 3 to 5 kg dairy meal per day = 10 litres milk



- Use supplementary feeding according to instructions.

5.2

Feeding practices

A. Heifers

The nutritional management of dairy heifers requires a systematic approach to meet growth targets. Nutrition and growth rate affect age of first calving and lifetime productivity of a heifer.

One cannot expect heifers to produce a high yield of milk if you neglect their feeding, e.g. if you only start feeding them concentrates once they have calved. Heifers should receive high-quality feed and should have access to clean, cool water all day.

The nutritional systems that can be used for heifers are:

- TMR formulated for heifers.
- Pasture-based system, supplemented with concentrates specifically formulated for heifers.
- Roughage, such as hay, supplemented with concentrates.

Protein is extremely important in the diet of growing heifers to ensure adequate frame size, wither height and growth. Grazed forage can be an excellent source of feed for growing dairy heifers. However, it is important to properly manage the pasture so that it will provide good intake of nutrients.

It is also essential to supplement heifers on a pasture-based system with grain, minerals, and other forage sources to ensure that they receive enough nutrients and attain desired growth rates. In addition, be sure to deworm the heifers at least twice per year. Monitor body weight, wither height and average daily gains to make sure your feeding programme is on target.

The required amount of feeding for a heifer per day is approximately 2,5% of its body weight.

B. Cows in milk

The feed a dairy cow consumes is used for the production of milk and to maintain its body reserves. If the cow is fed more than what is required for the production of milk, the surplus is laid down as body reserves or fat. If the cow is underfed, its body reserves are used for the production of milk and it will quickly lose condition.

The amount of milk produced can be increased by supplementary feeding of the lactating cows. They should be fed concentrates in the ratio of one kilogram concentrate per two to three litres of milk. However, cows should not only be fed according to production. Factors such as age and the stage of lactation should also be taken into account and the diet increased accordingly.

The nutritional systems that can be used for cows are:

- TMR formulated for lactating cows.
- Pasture-based system, supplemented with concentrates specifically formulated for lactating cows.
- Roughage, such as hay, supplemented with concentrates specifically formulated for lactating cows.

C. Dry cows

Once a cow has calved, it will start producing milk. While the cow is producing milk, it will usually become pregnant again. While preparing for its next calving, the cow needs to save its energy. During this “energy-saving” period, milk production is gradually slowed down and the cow becomes “dry” and without milk. It is then referred to as a dry cow.

Remember that the dry period is both the end of one lactation and the beginning of the next. Careful attention to proper feeding and management are critical to obtain maximum dry matter intake, good health, increased reproductive efficiency, and optimum milk production in the following lactation.

Dry cow nutrition is divided into two phases. During the first phase, they receive mostly roughage, such as good quality hay and/or silage, or graze on pastures. Approximately three weeks before calving, they should receive a specially formulated dry cow ration consisting of roughage as well as concentrates to prepare them for the demands after calving. It will also help reduce any late gestation weight loss that the cow may experience in response to increased foetal growth.

5.3

Feeding facilities and equipment

A. Feed storage facilities

Ensure appropriate storage conditions to avoid feed spoilage or contamination. Provide an appropriate vermin control programme for stored feed.

Protect hay and dry feeds from moisture. Keep silage and other fermented crops under sealed conditions. Have an appropriate system in place to record and trace all feed or feed ingredients received onto the farm.

B. Feed troughs

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

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, it can lead to competition and domination for feed. It can also cause damage to troughs and consequently, loss of food. This is reduced if troughs are firmly anchored to the ground.





C. Drinking systems and water quality

When providing watering facilities for dairy animals, remember that the amount of trough space available will have an influence on their performance. Water troughs should be designed with the safety of animals in mind, in order to avoid injuries. It should also be easy to clean and maintain.

Provide quality water and check and maintain the supply of water regularly. Many contaminants can enter water supplies and this could threaten the health and safety of people and dairy animals, and could compromise the milking equipment if rinsed with the contaminated water. Contact the relevant authorities and have the water tested if there are any concerns about the suitability of the water for animals to drink.

