

## Eating behaviour

# 05

More than half of the variation in milk yields is caused by factors that have nothing to do with what cows eat.

## Feed Management

# 08

Roughage harvesting, ensiling and the silage removal process all affect the quality of the roughage.

## Feeding

# 22

Depending on the life or lactation phase of the cows, each group has its own nutritional needs.

# Smart feeding works



*Your feeding strategy has a major impact on your results*



*“Even though we have fewer cows, we’re going to deliver a tonne more milk with the same fat and protein levels.”*

*Roy Ammerlaan  
Marsum, the Netherlands*



## *Your feeding strategy has a major impact on your results*

Starting right from the harvesting and management of grassland and corn crops, being constantly alert to your feeding strategy and feeding pays itself back. The right ration composition, availability of water, and frequency of feeding all directly affect cow health, fertility and yields, and in turn the profitability of a farm.

Feeding according to the needs of your animals with several servings per day stimulates a healthy pH level in the rumen, and increases the ingestion of dry matter. The risk of subclinical or observable rumen acidification and hoof-related health problems diminishes, and fertility increases.

The basis of a healthy ration starts with the management of grassland and corn crops. Ensiling grass or corn with the highest possible density preserves nutrients better, and makes the feed more appetising. This can then be mixed with concentrate, or concentrate can be supplied separately to ensure a balanced and healthy diet.

Bespoke rations prepare young cattle for insemination earlier, provide lactating cows with sufficient energy for good milk yields, and smooth the transition period of dry cows. These rations will also reduce the rearing and fattening costs of beef cattle.

Automating your feeding makes it easier to assemble the right ration and feed it to the cows. Automated feeding saves time, which allows more flexibility in organising your daily work. Automated feeding can also make the feeding process more efficient, resulting in a more successful farm.

**Smart feeding pays off.**



"Research among 47 herds shows that milk yields vary by up to 13 litres of milk per cow per day. More than half of the difference is caused by factors unrelated to what cows eat, such as frequency of feeding, offering fresh feed, sufficient space by the feed fence, etc." (source: Dohme, 2008)

## Eating behaviour

### More frequent feeding for a healthier pH level in the rumen

Cows prefer to eat throughout the day. To ensure cows enjoy the best health and produce the highest quantity of milk, each animal needs 10 to 14 servings of feed per day. This feed must be made freshly using the right ingredients.

Eating more often stabilises the pH level in a cow's rumen, optimising ingestion and the use of the nutrients in the feed.

#### Healthy pH level in the rumen

The pH level in the rumen decreases after every meal because of fatty acids released when carbohydrates are fermented. A ration for highly productive dairy cattle often contains a lot of rapidly digestible energy in the form of concentrates. As a result cows need to ruminate less, producing less saliva. This can disturb the balance in the rumen, causing excessive drops in pH which can ultimately lead to subclinical rumen acidification. Feed then passes through the rumen too quickly, and the cow is unable to get the most

out of the ration. Bacteria that ferment the feed are also unable to do their work if the pH in the rumen is low. This leads to poorer utilisation of roughage, and temporary or even permanent damage to the rumen wall.

#### Feed intake

How much a cow can eat depends on how well it can digest, as full is full. Eating rapidly fermenting ration leaves more space for a fresh dose of feed in the rumen. The general rule is that a cow consumes 3% of its own body weight of dry matter per day.

#### Sorting feed

Cows select feed by searching out the most appetising parts of the roughage. This leaves the less tasty elements behind in the remaining roughage, which the cows are less inclined to eat. Sorting therefore leads to less feed intake and more feed left over.

This has 2 possible consequences to this: the animals that successfully sort feed (cows high in the ranking) ingest more concentrate in their feed, which lowers the concentration of fat in their milk and puts them at an increased risk of subclinical rumen acidification and laminitis. Other cows lower in the ranking absorb a higher percentage of roughage and get less energy than they should. This leads to lower peak yields, increased weight loss, and delayed conception.





### Fertility

During the first 60 to 120 days of lactation, a cow that receives too little energy from the feed uses its fat reserves for energy, resulting in a negative energy balance. This results in egg sacs and ova, vital for cows getting pregnant quickly, getting insufficient energy and nutrients in their maturation phase. Consequently this leads to the release of lower quality follicles and ova between 60 and 90 days after calving (the period in which most cows are inseminated for the first time). This can reduce the chance of cows becoming pregnant. Nutrition has to fulfil a lot of demands to ensure egg cells and embryos have the right quality.

### Hooves

Disorders in metabolism (subclinical or observable rumen acidification) affect the quality of the sole of the hoof and can lead to bleeding in the sole and chronic laminitis. It is important that cows have good roughage available 24 hours a day to prevent this. The feed must have the right structure, with enough, but not too much, protein. Protein utilisation can be measured via the urea content of the tank milk.

### Feed more frequently

Cows with access to 10 to 14 smaller and more precise portions every 24 hours maintain a correct

and stable pH level in their rumens. These cows also benefit from maximum feed ingestion and use the roughage as efficiently as possible.

### Conditions for eating properly

To eat properly, a cow needs frequent access to fresh feed at the feed fence; factors such as space, the correct ration, and the availability of water also affect eating behaviour.

### Time and space

For cows to eat healthily, enough space at the feed fence and beds for ruminating are very important.

Cows prefer to eat at the same time, so it is important there are enough places at the feed fence. Too little space is less of a problem if there is always fresh and tasty feed available, but it can become an issue if lower quality feed is left over for cows lower in the ranking. These lower ranking cows, which wait for animals higher in rank to eat first, eat faster and often less. This means such cows may not get the right nutrients.

### Enough fresh water

Water also plays an important role in both milk production and cow health. A cow needs 1 to 2 litres of water for every kg of milk produced. Cows like to drink large amounts of water, especially after milking

or eating. They can drink 10 to 20 litres of water in a short period, and may do so 7 to 12 times a day.

This means, depending on the weather and milk yields, a cow drinks 100 to 150 litres per day on average. To meet this need, sufficient water points are needed in the barn, meaning at least 2 open drinking troughs per 20 cows.

A cow produces saliva by ruminating, so it is important that the feed contains sufficient structure to stimulate rumination and consequent production of saliva. A cow produces around 200 to 250 litres of saliva every day, necessary to moisten the feed, supplement the rumen fluid, and create a buffer that prevents the acidity level in the rumen dropping too low.

### Good mixed ration

In addition to more frequent feeding, precision feeding is also important for correct eating behaviour and cow health.

Calculating rations requires time and attention from both the feed consultant and farmer. Every group of cows has different feeding needs, depending on age and lactation phase.

More frequent feeding means giving the right ration, containing all the nutrients that the group needs, more often. Good mixing ensures that the ration fed to the cows is the same all the way along the feed fence.

### Consequences of reduced eating

Cows that eat less due to issues such as conflict at the feed fence or uneven distribution of nutrients in a ration, will eventually suffer health problems which can affect their fertility and milk yields.

Subclinical rumen acidification can lead to hoof disorders. Hoof disorders reduce a cow's mobility, it will therefore visit the feed fence less frequently, ingests less feed, and produces less milk.





# Feed Management

## From grassland to feed fence

Good feeding is all about providing tasty, high-quality feed at the feed fence all day long. The soil, fertilisation and harvest all affect the quality of the feed. The better the ensiling of feed, the less chance of overheating and loss of feed, and the higher the quality of the ration at the feed fence.

Assembling the right rations for each group of cows requires feed from good quality silage. Feeding according to needs of your cows is very important for fertility and milk yields.

### Management of silage

Roughage harvesting affects roughage quality, and in turn the production and health of cows. Ensiling is an important step in producing feed. The amount of nutrients retained depends on how well the silage pit is preserved. Silage pit overheating is the main cause of feed loss, and makes the feed less tasty.

### Good preservation

Limiting oxygen is one of the most important factors in preserving grass silage. If the crop in the silage pit is exposed to oxygen for too long, it can overheat. The rise in temperature disrupts fermentation. The oxygen is driven out by building the silage layer by layer in the pit, and allowing sufficient time for compacting with machinery.

The length at which the crop in the silage pit is cut or chopped also influences overheating. The ideal cutting length of grass is around 5 to 7 centimetres. With grass silage, achieving a high density is easier

if the dry matter content is between 35% and 45% (ideally 40%). If the grass silage is drier for some reason, make sure that the wetter fields are added to the silage pits last to maximise compactness.

Compacting with machinery is difficult if the dry matter content exceeds 45%, especially in the upper layers. This results in more oxygen in the grass silage pit, and consequently an increased risk of overheating. The best idea is to create a dry silage pit with thinner layers.

The ideal dry matter content of corn is around 35%. The ideal chopping length of silage corn depends on the dry matter content. Corn containing less than 34% dry matter should ideally be chopped into 10 to 14 mm pieces. If the corn contains more than 38% dry matter, the ideal chopping length is 6 to 8 mm. Longer chopping sizes increase the structural value, but make it more difficult to compact the silage with machinery, which increases the risk of overheating.

It is then important to seal the silage pit airtight as quickly as possible, preferably with new or used silage foil, and then cover it with a silage cover.

The silage pit can also be covered with sand or sand/gravel bags.

### Management of silage removal

Silage must be removed quickly to keep the feed fresh. Try to make the silage pit in such a way that at least 1 metre is removed per week. Make sure the silage is cut straight to limit the penetration of oxygen, and clean up any loose feed every day.

The moment when you remove silage each day is the ideal time to check the feed visible in the silage pit for overheating, mould and rot. Immediately remove any contaminated feed to prevent the rotting process from spreading, or contaminated feed being fed to cows. The same applies to feed left

over in the feed wagon: remove after every feeding round, to avoid it becoming mixed with new, fresh ration during the next feeding round.

### Silage cutter

A silage cutter is a good way to ensure the quality of the silage pit is maintained when silage is removed, both during and after removal. A silage cutter cuts compact blocks of feed from the silage pit. This prevents too much oxygen entering the silage pit with the remaining feed, and the risk of overheating that might otherwise occur. Ultimately, it means less loss of nutritional value.

The silage cutter also produces neat blocks of feed that can be placed in a feed kitchen. The blocks are cut tightly, so they do not fall apart.



### Total Mixed Ration (TMR) vs. Partial Mixed Ration (PMR)

Depending on personal preferences and whether a milking robot is used, cows may be given feed in the form of a total mixed ration (TMR) or partial mixed ration with additional concentrate (PMR). PMR can also be adapted according to individual needs.

#### Total Mixed Ration (TMR)

TMR contains all the components of the ration, which are mixed and fed at the feed fence. The components are thoroughly mixed, using either a mechanical or automated system.

#### Partial Mixed Ration (PMR)

PMR differs in that a ration that does not contain all the energy that a group needs, is provided at the feed fence. Concentrates are then given individually to each cow. Cows can get this concentrate from special concentrate feeders or a milking robot.

Both methods have advantages and disadvantages. It is important that the feeding method matches the way a farm operates and its size. Studies show no differences in milk yields between feeding with TMR or PMR. PMR does, however, result in higher milk yields in early lactation, while TMR boosts milk yields later in lactation.





## *Loading and mixing*

After ensuring proper ensiling and the right composition of the ration, the next phase of feeding your animals begins: loading and mixing. Precise feeding will ensure that cows have access to a balanced ration over the entire length of the feed fence.

### **The importance of precise loading**

Feeding according to individual or group needs means feeding precisely. It starts with loading the components of the ration, the precision with which these are weighed determines how precisely the group of cows can be fed.

Automation can be an efficient tool here. Smart, precision software allows you to weigh and monitor the ratios of the ration very accurately, so you know the ration is always structured properly, regardless of how often you prepare feed.

If feed is brought from the silage pit and weighed manually, there is also a risk of the quantity varying. If this becomes a daily habit, it leads to consistent deviations in the ration with consequences for animal health and production, regardless of whether feeding is conventional or more frequent.

### **The importance of good mixing**

Mixing starts by placing the right ingredients in the feed wagon. Proper mixing is also required for precision feeding. The loading order, the length of the feed, the amount of feed in the mixing bin, the setup and condition of the blades and the mixing time all have an effect on the quality of the result. Longer feed is more difficult to mix, so demands more time and energy. Adding water to the ration, for example, may help to stop cows selecting feed.

Better mixing improves the consistency of the ration, and means you can be sure that the correct feed is distributed over the entire length of the feed fence. Distributing the components well will also reduce the tendency of cows to select feed, thereby lowering the risk of cows lower in rank suffering from rumen acidification.

Automation of mixing can also improve efficiency. A mixing system that you can fully adjust to the needs of a group of cows is more efficient and consistent than mixing manually.



# Feeding

## Appropriate feed for each group

Depending on the life or lactation phase of the cows, each group has its own nutritional needs. Fresh feed at the feed fence 24/7, tailored to the needs of the group.

### Feeding according to needs

Separating cows into groups based on their nutritional needs makes precision feeding easier. Roughly 4 groups can be distinguished:

#### Young stock

The quicker a young cow reaches the right weight, the earlier it is ready for insemination and milk production. Giving calves fresh milk more often, followed by ration tailored to their needs, increases feed intake and accelerates growth of the calf into an adult.

#### Beef cattle

Beef cattle also gain weight faster with more frequent feeding according to their needs. This considerably increases meat production, while the costs of rearing and fattening decrease at the same time.

#### Lactating cows

Once a calf has grown into a lactating cow, its energy intake needs to change and the ingestion of dry matter to keep the pH level in the rumen stable becomes more important. Feeding more often increases dry matter intake. This makes a cow more active, and it increases its production.

#### Dry cows

When cows are in the far-off stage in the first part of the dry period, they need a lean ration to allow the udder to dry up and not become fatty. In the close-up stage (the last three weeks before calving), the animals have more need for nutrients, but their feed ingestion capacity is low, partly due to the larger uterus. In the period after calving, concentrate helps

with the ingestion of sufficient feed, and ensuring rapid milk production.

Cows with access to 10 to 14 smaller every 24 hours can maximise roughage utilisation. More frequent feeding and the pushing of feed encourages cows to visit the feed fence more frequently to fill their rumens. If cows are given smaller portions, they are less likely to select feed, not least because the feed is always fresh and tasty. This also has a positive impact on animal health.

### Automated feeding

Automation helps make your feeding strategy more efficient throughout the feeding process. The software supplied with automation systems shows exactly how much a cow eats and produces, and how cows are doing in comparison with each other. If a cow's appetite or yield decreases, it may have health issues or need different feed. Automating does more than allow precision feeding: reports per cow also make it easier to make changes at an individual level.

### Grazing

Even when cows graze outside, there are benefits in using automated feeding. During grazing, feeding can be reduced or stopped completely to encourage the ingestion of fresh grass. When the cows return to the barn at the end of the day, the system can ensure that sufficient feed is on hand. The system measures the average feed height at the feed fence, so it knows when the feed has to be supplemented. This avoids leaving feed at the feed fence for too long, which would otherwise lose its freshness and taste.





# Management

## Monitoring, adjustments and plans

Precise individual feeding requires precise individual management. Every day, cows indicate their health and whether their diet is correct. This insight is important to be able to intervene quickly when needed. Planning, monitoring and adjusting is a daily routine.

Good feed management provides insight into feed intake, milk yields and dry matter ingestion. For example, how does feeding from a different silage pit affect yields, and what are the costs? What is the ideal feed efficiency? These are all relevant factors that directly influence cow health and production.

### Monitoring

Monitoring eating behaviour is a daily task precisely because feeding, eating and cow health are so closely intertwined. Factors such as whether the cows are active enough to visit the feed fence, if they are drinking enough, and their rumination situation can all be monitored with software. The better the benchmarks are set within livestock farming, the more accurate the data on eating behaviour per cow.

### Adjustments

Once insight has been obtained in these factors, adjustment is the next step. Should a cow eat more often, or be given different feed? How can rumination be influenced? Depending on age, lactation stages and genetics, each step should lead to an optimisation in feed efficiency: 1.5 - 1.7. Everything above or below is less than ideal, with a negative impact on both cow health and farm profits.

### Planning

The correct feed strategy is determined in collaboration with feed specialists/consultants.

## Feed experts in your area

### Expertise with roots in the agricultural sector

Your local Lely Center is a reliable partner in barn automation. Over the years, we have built up an extensive network of specialists who combine their experience in stall automation and feeding with local expertise.

Their main goal is to help you gain all the benefits offered by precision feeding.

#### **Certified service technicians**

It is important that you have complete access to qualified Lely service engineers through your local Lely Center. These engineers will make sure that the system is installed perfectly, set up the required routes, and provide the service you need for long-term, reliable use.

#### **Farm Management Support**

Our colleagues from Farm Management Support are there to provide you with advice on a range of subjects, from

installing Lely equipment in the barn, daily routines, automatic milking or the switchover to it, feeding, and the settings of management software.

The consultants will be on hand both when you buy a feeding robot and when you discuss the rations for your animals with your feed adviser. They have extensive experience and knowledge of what is happening at other farms, and will do everything possible to ensure you get the highest return from your feed strategy.

#### **Technical Service Support**

The Technical Service Support department is responsible for installing and maintaining our products. It is composed of skilled, certified engineers who know how our machines work down to the last nut and bolt. Every engineer works in his or her own area, and therefore knows the history, machines and farm details. The service department is at your disposal 24/7.

#### **Dairy farming is in our blood**

Lots of our employees started off working in agriculture, so they are aware of what is at play in dairy and beef cattle farms, and have the expertise needed to support every customer. Thanks to their extensive experience with other systems in the area, local service technicians and consultants are aware of every relevant aspect.

#### **More experience than any other in automating dairy farming**

We have been the market leader in dairy farm automation for many years, and also enjoy extensive experience in automatic feeding and feed pushing. In 2008, we introduced the Lely Juno feed pusher, and in 2018 we celebrated the sale of our 500th Lely Vector feed system. Our global presence and extensive network means you can rest assured, and rely on our knowledge of local conditions, laws and regulations.

### Lely Vector

The Lely Vector is an automatic feeding system that feeds cows according to their needs. The mixing and feeding robot travels autonomously between the feed kitchen and the barns, weighing and mixing the feed into a consistent ration. The Vector measures the feed height at the feed fence, so it knows when the feed has to be supplemented. Together with Lely T4C, the Vector provides real-time insight into feeding.



### Lely Juno

The Lely Juno feed pusher slides feed towards the feed fence, so that it is always within reach of cows. The feed pusher encourages the cows to visit the feed fence more frequently. It means that every cow, regardless of its position in the hierarchy, can eat according to its needs and stay in the best of health.



### Lely Cosmix

The Lely Cosmix feeder, along with the Lely Astronaut, ensures that each cow receives the amount of concentrate it needs. Cows that do not ingest enough during milking, heifers and dry cows can also get their concentrate from the Cosmix.

### Lely Calm

The faster a calf gets to the right weight, the faster she is ready for insemination and milk production. Giving calves unlimited access to the right milk for the first 35 days gets these animals off to a flying start. The Lely Calm is a drinking device that provides the right milk at the right temperature. It is linked to the Lely T4C, providing direct insight into milk consumption per calf.



### Lely Astronaut

This milking robot lures cows with the concentrates that are given during a visit to the Lely Astronaut. Just like the Lely Cosmix, the Astronaut is linked to Lely T4C, automatically collects milk data concerning each cow.

### Lely Qwes

Good understanding into cow health prevents diseases and production losses. The Lely Qwes cow recognition system measures the most crucial data of each cow every 2 hours. You can also decide to add a special sensor to measure ruminant movements. This is an important factor for reading the cow's eating behaviour in Lely T4C.



### Lely T4C

The Lely T4C management system was initially designed for use with the Lely Astronaut milking robot, and has been further developed over time for other automated feed solutions. It is, therefore, the ideal source of information for your dairy farm. T4C delivers real-time insight without any extra effort. You can directly intervene when and where it is necessary, and also act preventively based on predictions.

## Automated feeding with Lely

We have been supplying dairy farmers and beef farmers worldwide with a wide range of products for automated milking and feeding for many years. Above, you can read more about our feed products and robots that help you feed according to needs, supported by intelligent software for clear insight.

*"I now feed multiple times  
a day, with a different  
ration for each group."*

*Roy Ammerlaan  
Marsum, the Netherlands*

### *The Lely vector makes smart feeding work*

Frequent feeding reduces the loss of important nutrients, and encourages cows to eat small quantities more often. The feed heats up less, and stays fresher and tastier. More uniform feed ingestion keeps the pH level in the rumen more stable, enabling better utilisation of the feed. This has a positive impact on animal health, fertility, production, and last but not least your income.

Smart farming is a choice.

*Smart feeding starts at your Lely Center.*

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