

Grazing and automatic milking systems

Insights for
better farming



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Farm Management Support

Automatic milking and grazing has proved to be successful on many dairy farms around the world.

This brochure offers some tips and information about automated milking for grass-based management systems.

Grazing and automatic milking

Automatic milking and grazing has been proved to work successfully on many dairy units across the world. It does require a different approach compared to conventional automatic milking. And, as market leader in automated milking, Lely has years of practical experience and research results that, combined, allow the company to offer accurate management advice for successful automatic milking and grazing.

A key element is to find a management style that suits each individual farm, producer goals and preferences, and environmental circumstances. This brochure provides background information and practical tips on automatic dairy farm management in combination with grazing. Together with the Lely Farm Management Advisor tailor made solutions are made to make grazing and automatic milking to a success.

A solid foundation

There is a fundamental shift in the daily routine when grazing with the Lely Astronaut automatic milking system. Unlike conventional milking systems, cows visit the Lely Astronaut individually and at a time when they choose. Less time is wasted standing in the collecting yard and pressure on their feet is reduced. Less time wasted waiting for milking also creates more time for resting, grazing and drinking and, ultimately, producing milk.

Cow motivation

The objective with automatic milking is to attract the cows to the milking robot on a regular basis. When cows are housed, they are motivated to visit the Astronaut milking robot by concentrate feeding, rather than the desire to be milked. For cows, this concentrate complements the feed they receive at the feed fence.

This ‘free cow traffic’ principle extends to grazing management, however in a grazing-based system the motivation is access to fresh grass. There are a number of guidelines that need to be followed in order for the system to work.

Need for balance

Several grazing strategies are applied across the world, from full grazing to loafing. Where a partial mixed ration (PMR) is fed at the feed fence, it is typically balanced between 15% and 17% crude protein (CP). And many producers then feed concentrate, to yield, in the milking robot with between 18% to 20% CP. When housing the cows this is normally not an issue. But when cows go out for grazing this changes. Young fresh grass is typically rich in protein and low in fibre.

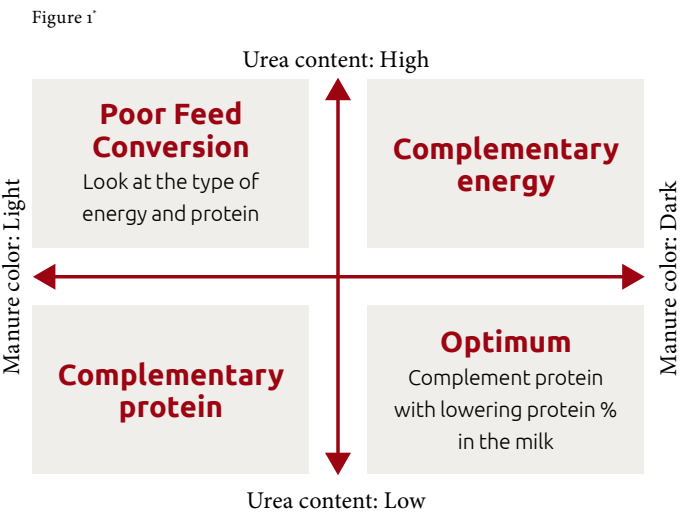
Sward quality varies throughout the season. This could result in CP intakes that are too high, resulting in excessive levels of urea. This is not always a problem, but there should be a balance between protein, energy and fibre. Supplying too much protein not only has a negative effect on cow efficiency, but it’s also wasteful.

Variation

The challenge is to monitor cows’ intake at grazing, as this can fluctuate each day. Factors such as the weather, palatability, grazing system, and grass varieties all play a role. With all this in mind, you need to balance cow rations accordingly. There are several tools that can be used to gain insight on intakes but, but the human eye, cow signals and common sense are also important.

Manure observation

Examining manure twice a day is a good indicator as to whether rations are adequately balanced. Do you see a lot of undigested fibrous material, is it thick or smooth? Maybe even take a sieve to judge the undigested part of the ration. When judging the manure be aware that you are looking at a ration that’s been digested during the previous 24 hours. Manure colour says something about protein and energy balance, when milk urea levels are also taken into account. Low milk urea, in combination with a light manure colour, indicates a protein shortage. High milk urea and light-coloured manure indicates poor feed conversion efficiency (see Figure 1).



Rumination

Rumination is another indicator. Do the cows ruminate enough? Low rumination could indicate too little fibre or structure in the ration. Excessive rumination could indicate that fibre levels are too high. A rule of thumb is that seven out of ten cows laying down should be ruminating at any one time and every bolus needs to be chewed around 60 times.

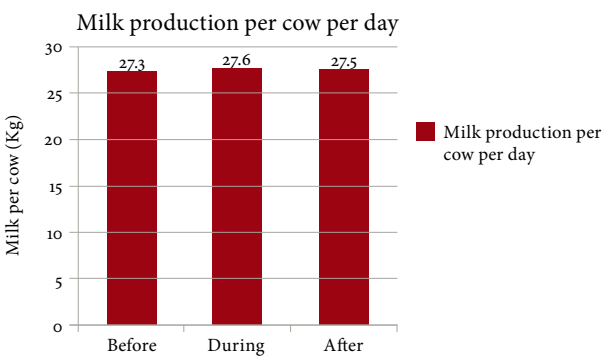
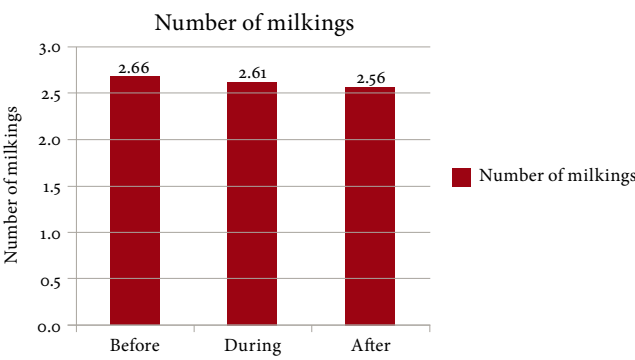
Correct balance

Achieving the correct ration balance means that you should be ready to adapt dietary changes, as and when needed. This starts with changing the type of concentrate before the grazing season starts, from a protein to a starch-based product. This also applies to grass-based and grazing systems with a PMR. And it is particularly important where a PMR is fed because it will avoid too much protein being fed in the basic ration and this, in turn, avoids waste and reduces costs. Secondly it allows the protein/starch level within the ration to be balanced at the feed fence. The ration protein/energy/fibre level can be corrected at the feed fence, as and when required.

Thinking about nutritional requirements and preparation before the season starts is important. You must draw on past experience and look closely at what’s available on your farm. If feed needs to be purchased on the spot when rumination levels drop, for example, it is difficult to correct this instantly. So discuss requirements with your local feed and farm management advisors for the best approach to the grazing season.

Collecting cows

Cows may get used to being fetched, so avoid this as much as possible and use other management tools (such as grass quality and allocations) to lure them back inside. This reduces queuing at the robots. Whichever technique is adopted, in all situations dairy producers are seeking successful grazing as well as enough milkings per cow per day, without an increase of workload. The key factor in realising this is to ensure that cows come to the Lely Astronaut automatic milking system throughout the whole day and to avoid a situation with too many cows queuing at the entrance of the robot.



Lely International research 2013 n= 200 Dutch farms applying grazing and automatic milking

Some simple steps to ensure that all cows are given free access;

- Cow tracks must be wide enough to allow lower ranking cows to easily pass dominant cows (between 1.80m (6ft) and 3.00m (10ft). If the herd size significantly increases, increase the wide of the cow tracks as well.
- Where there are water troughs on the cow tracks, it must be wide enough to ensure that lower ranking cows have adequate space to pass.

- Ensure that there is a clear route for cows to the milking robot once they enter through the one-way gate to the yard. This one-way gate (Texas Gate) should, ideally, be positioned by the fence line to guide cows through the return gate easily.
- Position the Grazeway to allow the lower ranking cows enough room and time to get access to the cow tracks. Also ensure that there is plenty of space around the Grazeway for good cow flow, particularly when the point of exit is changed.

The individual cow

Fundamentally the biggest change that you need to get to grips with is that your herd's group dynamic has changed and the cows' environment extends from the Astronaut, along the cow track and into the paddock. All herds have a hierarchy or 'pecking order'. At least 30% of cows in any herd are dominant and around 70% of the cows are passive. The system should allow for these lower ranking cows in the herd to have stress free access to milking, grazing, drinking and resting areas.

Ultimately the cow tracks for the herd must be designed to allow the (lower ranking) cow to feel comfortable and make an unhindered

journey to and from pasture and the milking robot. It is important to note that during the initial grazing training period cows may need to be encouraged or guided into the Grazeway until they become familiar with their new routine.

Visit behaviour at grazing

Let's first define visit behaviour. Visit behaviour is a combination of various reasons for a cow to visit the milking robot. This key performance indicator is used to analyse how eager the cows are to voluntarily visit the milking robot. For good visit behaviour when cows are grazing the robot has to be easily accessible.

Firstly, this means that there should be sufficient free time on the robot (a minimum of 10%) so a cow can enter the robot whenever she wants. Free time means the time that the robot is freely accessible and the entry gate is open. When there is less free time then low ranking cows, in particular, will not visit the milking robot often enough. This is because they do not have the opportunity or they are afraid to do so. Cows that are not milked at regular intervals have increased risk of udder health issues.

These intervals can be similar in systems without grazing, but we do see that the number of milkings shows a small decrease, of between 0.1 and 0.2 milkings per cow per day, on a herd level.

The space in front and around the robot is critical to achieve sufficient visits to the milking robot. The area around the milking robot is often busy, so any obstructions will disrupt the flow of free cow traffic and reduce the number of visits to the robot. So it is important that a cow can easily access the milking robot for milking and also exit the milking area once she is finished.

For good accessibility, the robot should be visible and easy to reach from anywhere in the cow house and, ideally, the cow house should be visible from the grazing block.

Farm data

- Number of cows: 240 Friesian cows
- Farm size: 82 effective hectares, plus a 44 hectare run-off
- Number of Lely Astronauts: 3x A4



Greg & Amy Gemmell – Manawatu, New Zealand

Situated at Bunnythorpe, near Manawatu in New Zealand, the Schnell family's dairy unit has seen many changes. It began as a horse farm before a switch to dairy and now it's a Lely robotic milking farm – with happy cows and even happier farmers.

Brian and Margaret Schnell purchased the property 32 years ago and Brian, who is an acclaimed restoration guru of all kinds of antique engines, has embraced the move to robotics, even though it is a far cry from the steam engines that he restores to original condition and takes his grandchildren for rides around the farm on. Brian and Margaret's daughter Amy and husband Greg Gemmell's journey into becoming herd-owning sharemilkers started in 2003 when Greg started managing the family operation. Now they are three months into their new venture and say that the conversion to robots has been much easier than they anticipated.

Currently milking with three Lely Astronaut robots, Greg and Amy's herd is made up of 240 Friesian cows. Approximately 75% are spring calvers and the remaining 25% calve in the autumn. "Our reason for switching to robots is that I've been working on concrete now for 25 years and I decided that another 20 years on concrete just wasn't healthy – for me or the cows," says Greg. But the robots are so much more than reducing the physical, repetitive work on the body. We can see that this is a complete farm and cow management tool, where we have the flexibility to structure our day, rather than working around milking times."

He previously milked the herd through a 24:24 herringbone parlour with ACRs and he says that he's happy with the decision to fill the pit and to look ahead to the future. The couple have not looked back since. Currently producing around 390kg milk solids per cow, on a grass-based system, Greg is hoping that within three years of having the robots, yields will increase to between 450kg and 500kg, with the help of the A4 Astronaut automatic milking system and by utilising a split-calving system.

Using Lely's ABC grazing system, cows alternate between three paddocks within a 24 hour period, meaning less pressure on pasture and more recovery time for paddocks between grazings. Cows are offered the incentive of concentrate being fed through the robot each time they visit, which encourages them to be milked more often, and they then move onto a new pasture allocation.

Greg is finding that just three months into having robots it is much easier to manage his pasture and that his paddocks aren't being grazed as hard as they were on the previous system. "Being able to manipulate where the cows are going to go and how they're going to graze is a really handy tool," he adds.



How to **start grazing**

There are various starting points for grazing. This could be single heifers calved during winter time or this could be a complete herd going out to grass. But let’s start at the beginning with young stock.

Young stock

For successful grazing you need to start by training young stock. Let them go outside and get used to the pasture, weather conditions and build up resistance against parasites, such as lungworm. Calves and young stock exposed to these parasites will have more resistance to them when they mature into milking cows. Another advantage of grazing ‘training’ is that when young stock knows what grazing is, they will only need to learn how to go through the Grazeway when they are milking cows.

Heifers

Heifers that calved during the winter will also need to be trained to pass through the Lely Grazeway and go out to pasture. Because these heifers are not familiar with going out to grazing, they will, most likely, remain indoors at first. Experience shows that they will quickly learn from the older cows, but some heifers may need to be encouraged or guided into the Grazeway until they become familiar with the new routine.

Cows

Starting with a whole herd, means treating them as a herd. Farmers who have already been using grazing for a long time have taught us that they do not use the Grazeway selection gate in the first week due to training.

The complete herd is moved to the pasture as one group. After a couple of hours grazing they are then moved indoors as a herd. By doing this, the cows learn what grazing is.

After one week, when you activate the Grazeway, the cows are getting used to the new system. They will easily adapt to the Grazeway with minimum training as they know what grazing is.

***Tip:** Training the cows should be done even before the grass really starts to grow so cows have time to adapt and grass cover is not wasted or lost.*

Grass **budgeting**

Herds' must have access to the optimum grass volume (kgDM/ha) during the grazing period. But how do we measure this and what tools can be used? What covers are optimum versus area allocated? The ‘grazing platform’ should be measured with a pasture meter every week. The grass covers and quality needs to be recorded so a weekly budget can be determined for the next seven days.

The cover you need to aim for depends on various variable and local factors. These include the grazing strategy that’s being used, but also soil type and grass varieties. The most successful grassland managers with Lely Astronaut robots in Ireland, for example, aim for the following.

Covers to aim for

- Between 1,100 and 1,400kgDM/ha (exclusive of 1,500kgDM/ha residual UK calculation)
- Post grazing cover at between 3cm and 4cm (more than 1,500kgDM/ha residual UK calculation)
 - It is important to consult with your local Lely Farm Management Advisor in relation to current grass quality figures, as well as the exact requirements of your herd

Variation

- Towards the end of the grazing season, be aware of lower energy densities in the same area of allocation
- To compensate for the reduction in energy density of the grass, allocation of a larger area may be needed.
- To compensate for lower dry matter intakes due to wet weather a buffer feed, such as baled silage, can also be fed.
- Spring allocation dependent on availability and balanced with grass silage.
- Reseeded grass will have a different energy density even at the end of the grazing season.
- Different varieties of grass, as well as different diploid and tetraploid ratios, can also impact on available dry matter and energy.
- The grass later in the season will also have a different value, including increased protein levels, lower fibre and digestibility

Tips when measuring grass

- Accuracy is the key, take at least 50 random readings across the whole paddock
- Make sure to record these readings to build up a history of grass growth per paddock

***Tip:** This information than can be used to determine which paddocks require reseeding.*

What size grazing area is required?

Dry matter intake will vary according to cow breed. But, as a general rule of thumb, maximum dry matter intake is approximately 4% of bodyweight. For example the maximum dry matter intake for a 600-kg cow is approximately 24kg per day. Once the required cow intakes have been estimated and the total available kg of dry matter per hectare is known, it is a matter of dividing the herds dry matter requirement into what’s available in each paddock and then give them the required grazing access using temporary strip fencing.

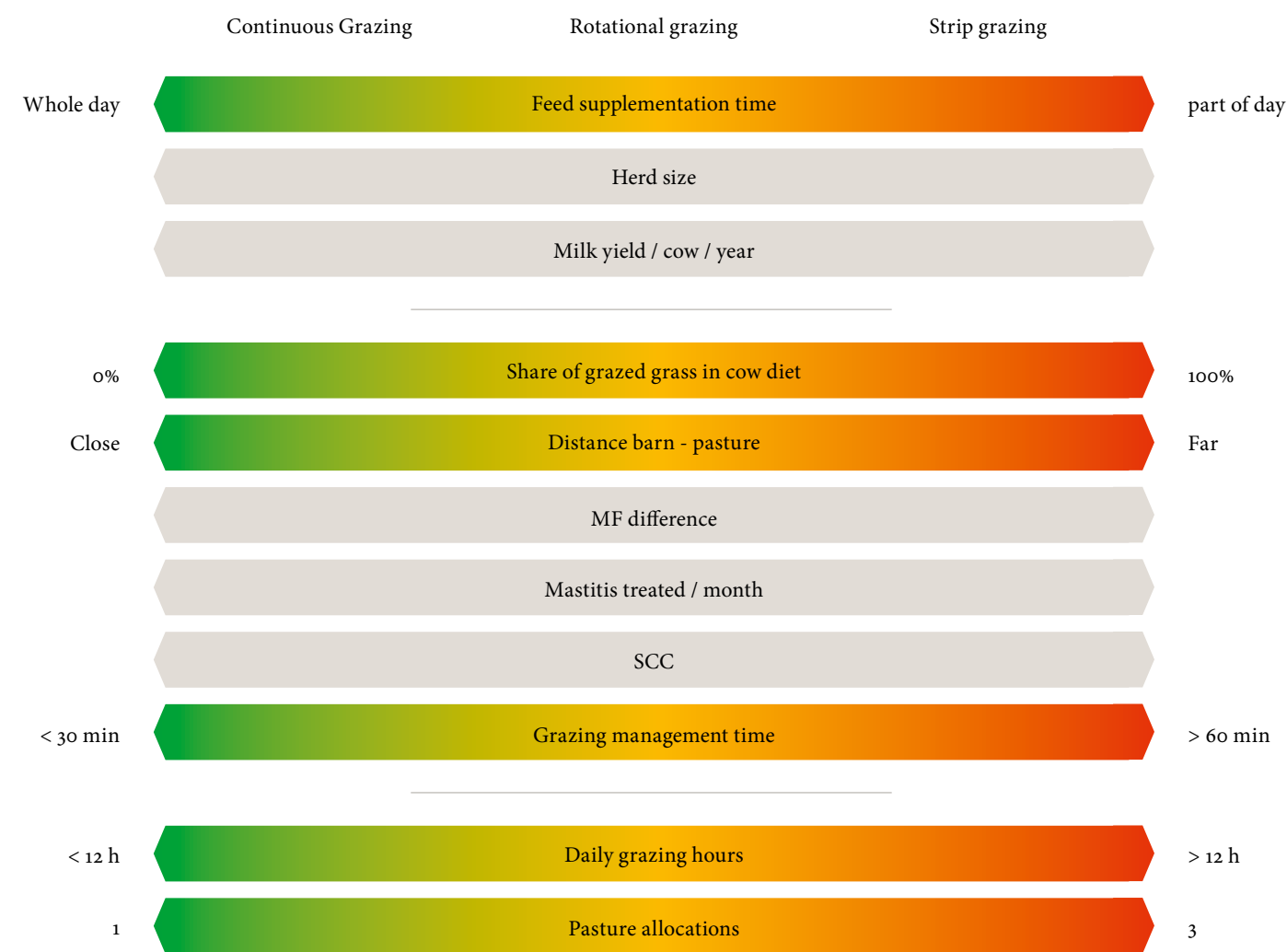


'Pasture meter' being used by Bert Philipsen

Choosing a strategy

Amongst others the choice of grazing strategy also includes whether you wish to graze your herd all day or for just part of it. Other important questions are: what percentage of the total diet comprises grazing? What is the distance between the cow house/ robots and pasture? How much time are you prepared to allocate to grassland management?

These factors are all key when choosing the most suitable grazing strategy for each unit. The illustration below shows different parameters which strategy would best fit the system, from continuous to strip grazing. For example when you want to supplement feed during the whole day continuous grazing is more applicable than strip grazing.



Five tips for successful grazing with the Lely Astronaut automatic milking system

1. Ensure a good infrastructure for the cows. Cow tracks must be wide, well maintained, and always accessible when the cows are in the field. Prevent narrow points where dominant cows can stop and restrict the access of submissive cows.
2. Full access to water in all the paddocks, with water troughs close to gateways to encourage cow flow. If positioned at the opposite end of the field cows are less likely to walk there to drink. Notice that a cow, depending on temperature and humidity, on average drinks three liters of water to produce one liter of milk
3. For larger fields, back fencing is essential to prevent premature grazing affecting crop regrowth. Consider a reseeding programme to ensure good sward quality across the platform throughout the grazing season and prevent old lays become less palatable.
4. Cows are more inclined to travel during daylight hours. Therefore keep cows closer to the cow house/ robots at night and let them travel further distances during the day. Keep the distance between grazing and the cow house/ robots no further than 1km where possible.
5. Be flexible to accommodate changes in the weather. Heavy rain fall or high temperatures, for example, are bound to have an effect on the grazing behaviour of cows. When possible provide the option for cows to be in the shade.



Farm data

- Number of milking cows: 200
- Number of Lely Astronauts: 2
- Year of installation: 2015



Fundo Los Castaños – Río Bueno, Region Los Rios, Chile

Edmundo Henriquez, manager of Fundo Los Castaños in Chile, shares his experience with the implementation of milking robots on his dairy farm. The farm, located 35 km from Río Bueno, has evolved from manual milking to robotization in 2015 with the installation of two Lely Astronaut robots.

The farm's objectives include increasing the number of milking cows to 200, automating calf rearing, adopting regenerative agriculture, becoming self-sufficient in electrical energy, and producing 100% A2A2 milk.

The transition to robotic milking was a process of adaptation for both Edmundo and the cows but resulted in improvements in udder health and milk quality. The implementation of robots allowed greater efficiency in the use of concentrate and better distribution of

resources. The robots also provide a large amount of information about each cow, which facilitates making effective decisions in less time.

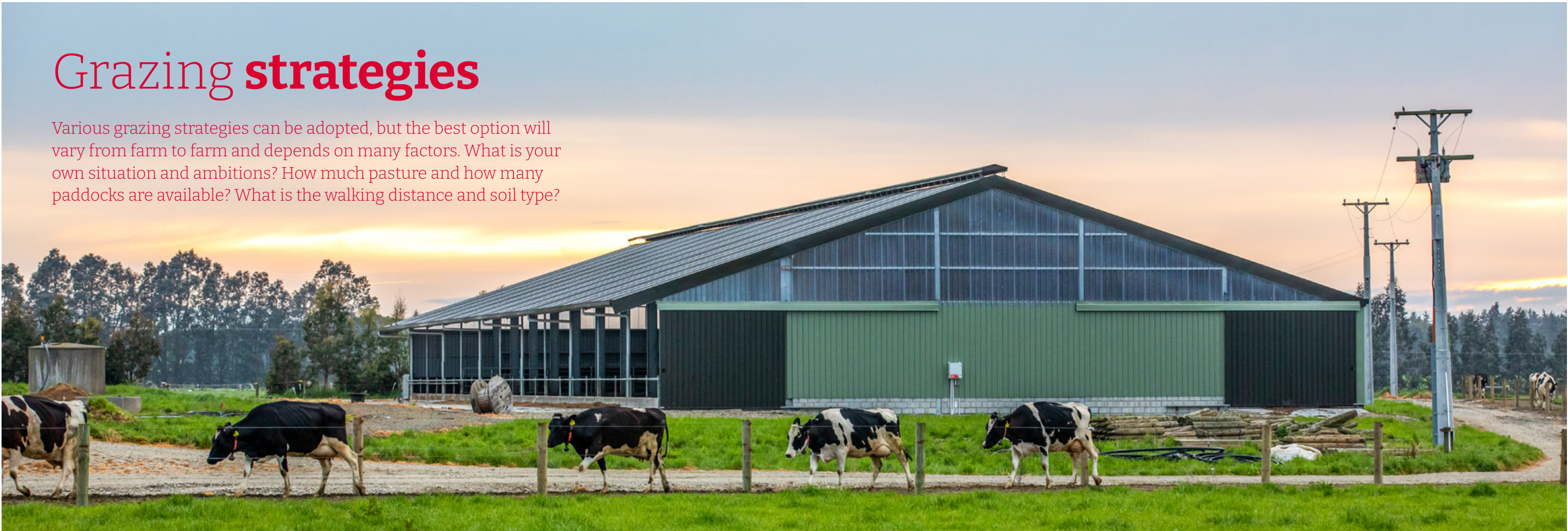
Edmundo highlights the scheduling flexibility and reduction of labor as notable advantages of the robotic milking system. Additionally, the use of the Lely Horizon platform facilitates the management of robots and decision-making based on the collected information. The implementation of robotic technology has changed his personal life, giving him more time to focus on improving other aspects of the business, such as grazing management and forage production.

In addition to the mentioned benefits, the implementation of milking robots has also impacted the profitability and productivity of the farm. Before robotization, all cows consumed the same amount of concentrate, regardless of their production. With the robotic system, concentrate consumption is adjusted according to each cow's needs, resulting in increased milk production. Edmundo points out that,

thanks to robotic technology, today some cows consume up to 10.5 kg of concentrate and produce over 40 liters of milk. The adoption of automatic milking has allowed Edmundo and his team to optimize resource use and improve farm efficiency, translating into positive results in terms of both production and animal health.

Grazing strategies

Various grazing strategies can be adopted, but the best option will vary from farm to farm and depends on many factors. What is your own situation and ambitions? How much pasture and how many paddocks are available? What is the walking distance and soil type?



Maximum grass

Max two cows per hectare



Abundant grass

Max three cows per hectare



50/50 grass

Max five cows per hectare



Grass

When the goal is to harvest as much home-grown forage as possible and at minimum cost, choose a strategy with a high score for grass. If utilising your own grass isn't high on your list of priorities then select a strategy with a lower score for grass. A strategy with a score of 5 for grass delivers more than one with a grass score of 1.

Ease of labour

When the amount of labour available to spend on grazing is limited, choose a high score for ease of labour. If you are able to spend more time on grazing management then choose a strategy with a lower ease of labour score. A strategy with the highest score takes, on average, 30 minutes per day less compared to a low score on this topic.

Grazing strategy

The number of cows per hectare (stocking rate) determines the space you have to base your strategy on. When you have a relatively low number of cows per hectare you will have more possibilities. This enables you to include your own preferences. When have more cows per hectare the number of suitable strategies is reduced.

Grazing skills

If you are really into grazing and are willing to invest time, choose a strategy with a high score for grazing skills. When grazing is just a part of your daily business and needs to be easy, opt for a strategy with a lower score for grazing skills. The higher this score the more important it becomes to act on weather changes.

Milk production

When a relatively high and stable milk production is important to your dairy business, choose a strategy with a higher milk production score. A lower score means that more fluctuation in milk production is likely.

Abundant grass

Max seven cows per hectare



Grass as a dessert

Max ten cows per hectare



Strip grazing A-B-A



Maximum grass

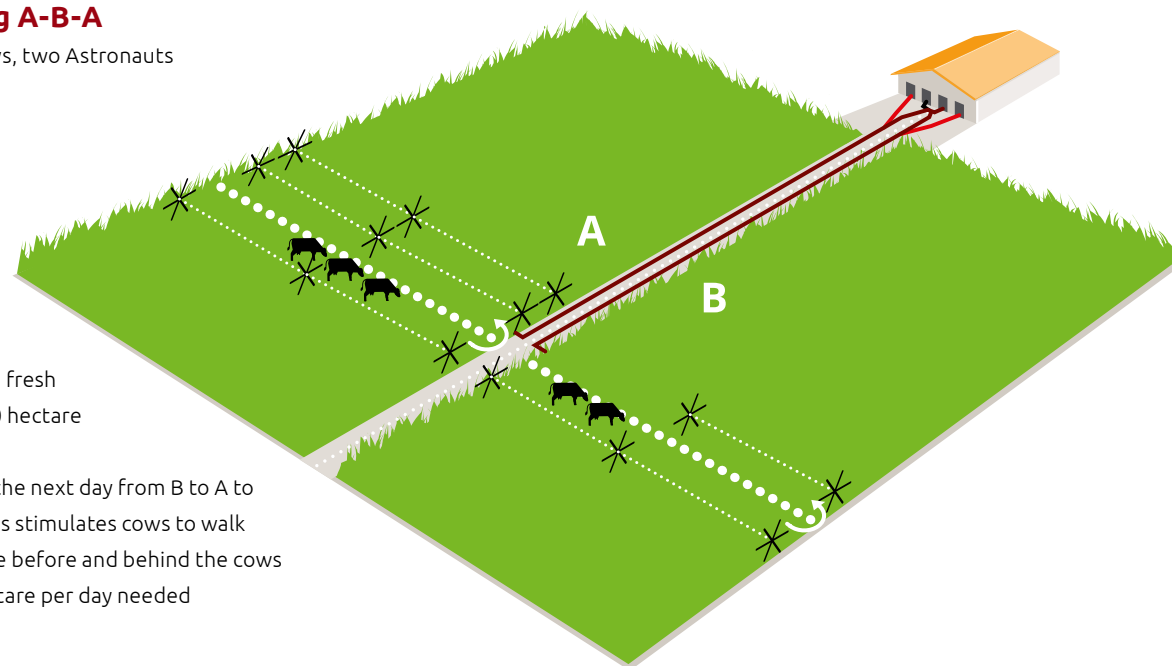
- Grass
- Ease of labour
- Grazing skills
- Milk production

- Max two cows per hectare
- 13kg DM intake fresh grass
- 18 hours grazing
- 2kg of additional feeding per day/cow
- Strip grazing
- Grazeway selection gate

Strip grazing A-B-A

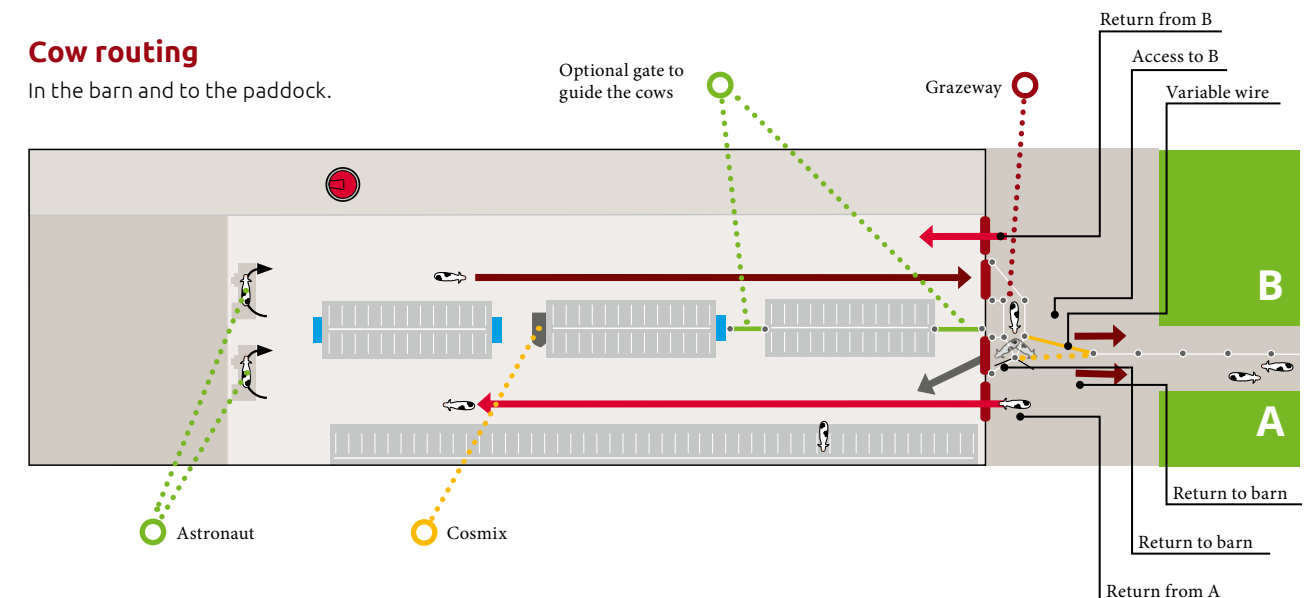
Example: 120 cows, two Astronauts and 80 hectare

- No fixed pastures
- Offers grass to the cows' need
- Three times/day a fresh strip, 0.25 till 0.50 hectare per strip
- From A to B, and the next day from B to A to B via the barn. This stimulates cows to walk
- Graze with a fence before and behind the cows
- On average 1 hectare per day needed



Cow routing

In the barn and to the paddock.



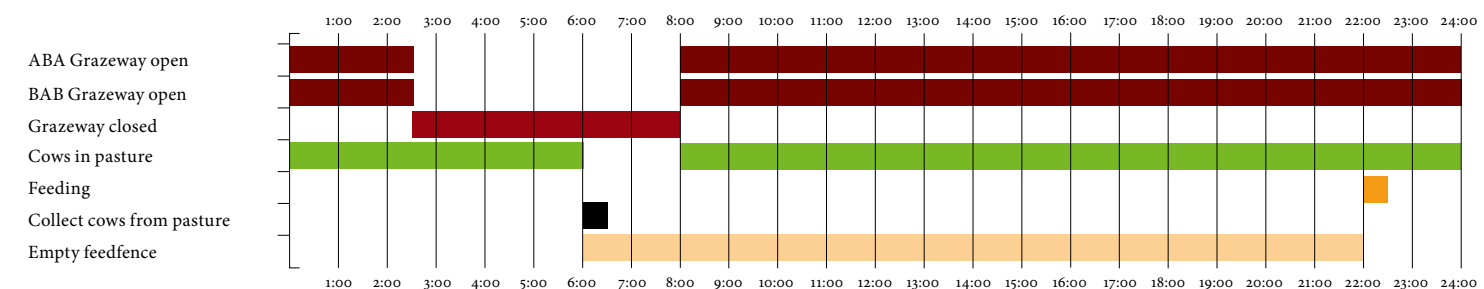
Management

24 hours overview

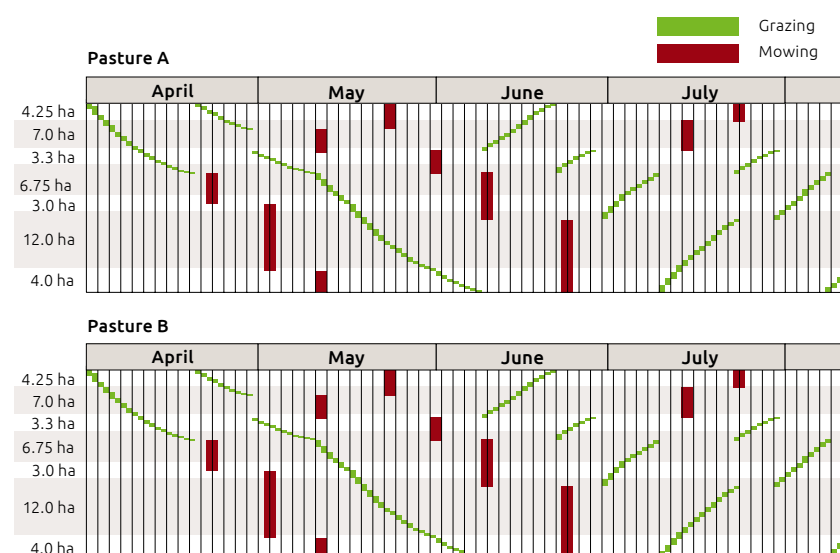
The times are indicative, the scheme can be adjusted to your own preferences

General tips

- Ensure the feed alley is (close to) empty two hours before the cows can go out for grazing
- Let heifers get familiar with the milking cows two weeks before calving
- Keep the numbers of milkings as steady as possible
- Give three fresh strips per day. Day 1 ABA, Day 2 BAB



Pasture calander



Grazing management

- The offer of grass is determinative, due to variable strip size a constant intake is possible
- Start grazing at minimum 12cm to maximum 20cm of grass length
- Stop grazing at a grass length less than 6cm
- Mow the pasture after two times to maintain palatable grass
- Start grazing when the soil temperature is above 8°C. Then the grass starts growing. This will create enough grazing possibilities for the first cut.

Tip: Offer more palatable grass to the cows later on in the day to keep them motivated.

Milkings

Target values (number of milkings/cow/day)

- 2.3 on average per day, with a maximum decrease of 0.4
- Low production cows (more than 250 days in lactation) minimum 2.0
- Cows until 100 days in lactation minimum 2.5.

Robot settings

- When starting the grazing season set the 'Near to be milked interval' of the grazeway on 100% for the cows to get used to it.
- After one month grazing reduce the 'near to be milked interval' to 95% (to maintain number of milkings)
- Lower the amount of protein/energy in the concentrate in relation to the amount of fresh grass intake

Strip grazing A-B-C-(D) without housing



Maximum grass

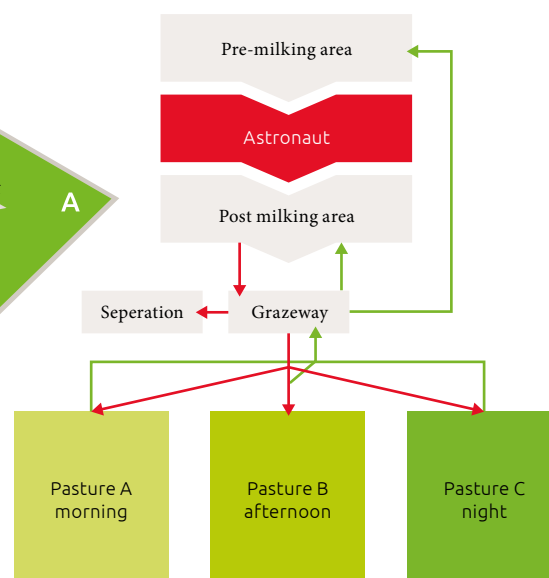
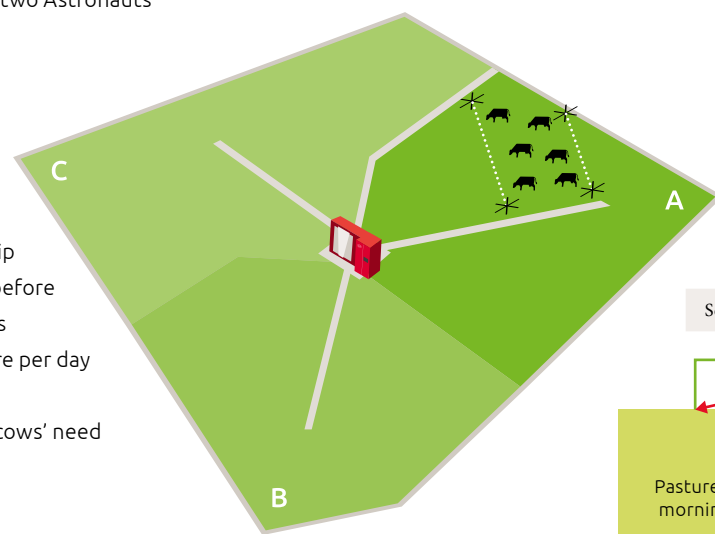
- Grass
- Ease of labour
- Grazing skills
- Milk production

- Max two cows per hectare
- 13kg DM intake of fresh grass
- 24 hours grazing
- 2kg or more of additional feeding per day/cow
- Strip grazing
- Grazeway selection gate

Strip grazing A-B-C-(D) without grazing

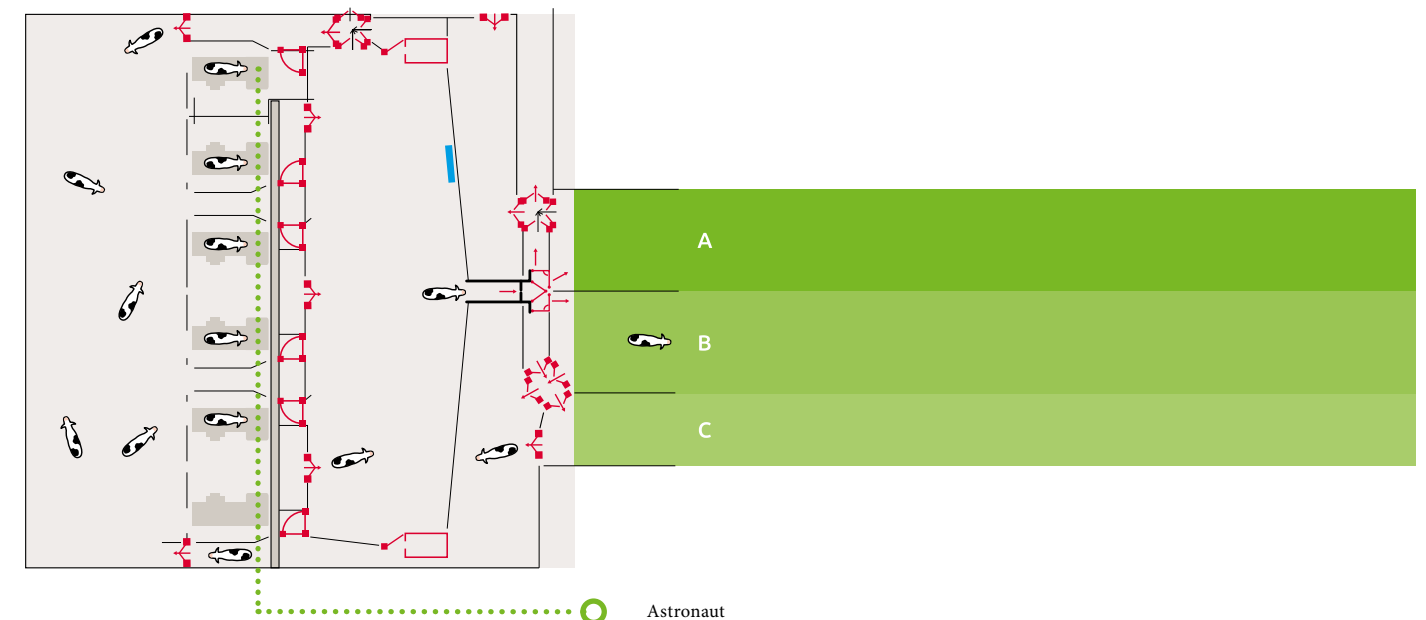
Example: 120 cows, two Astronauts and 80 hectare.

- Three times/day a fresh strip, 0.25 'til 0.50 hectare per strip
- Graze with a fence before and behind the cows
- On average 1 hectare per day needed
- Offers grass to the cows' need



Cow routing

In the shed and to the paddock.



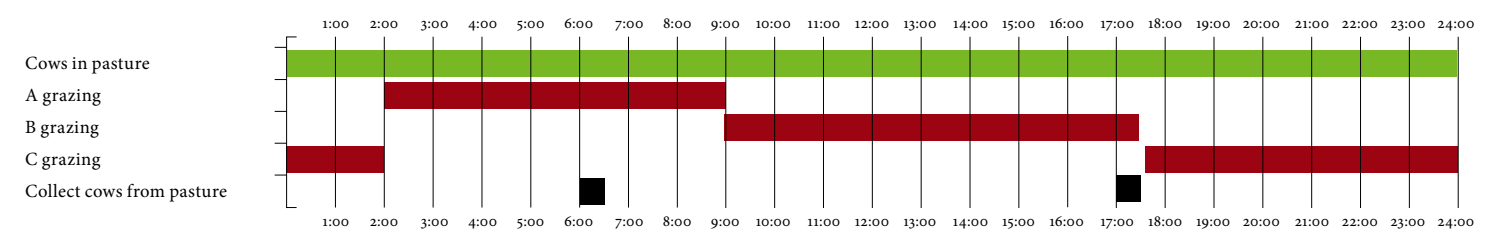
Management

24 hours overview

The times are indicative, the scheme can be adjusted to your own preferences.

General tips

- If a feed pad / feed alley is utilised, ensure it is close-to-empty two hours before cows leave to their next feed strip
- Introduce heifers to the automatic milking system (training mode) at least two weeks prior to calving
- Offer all milking cows three fresh pasture strips every 24 hours



Milkings

Target values (number of milkings/cow/day)

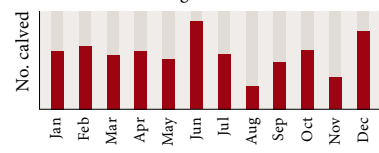
- 2.3 on average per day, with a maximum decrease of 0.4
- Low production cows (more than 250 days in lactation) minimum 2.0
- Cows until 100 days in lactation minimum 2.5.

Robot settings

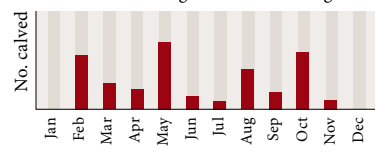
- Grazing cows are typically supplemented depending on local conditions and nutritional requirements.
- Concentrates and/or molasses are offered in the Astronaut or the Cosmix to improve cow flow as well as cow health.
- Adjust your protein and energy meals within the robot in relation to the amount of fresh grass intake.

Calving calander

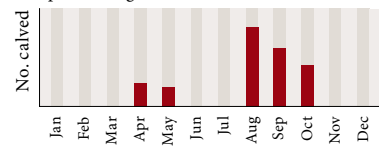
Year-round calving



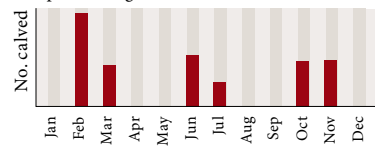
Year-round calving with batch mating



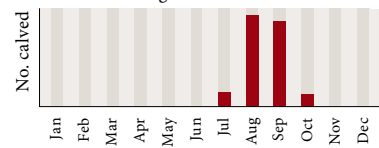
Split calving



Split calving



Seasonal calving



Grazing management

100% pasture based dairy farming systems are utilised in countries where grass growth is high for most of the year, and the climate is fairly temperate, removing the need to house cows. The calving of the cows is aligned with the grass growing season. Grazing pastures or fodder crops form the basis of the cows diet. These systems are mainly found in Southern Hemisphere countries like New Zealand, Australia, Chile and Argentina.

Tip: Offer more palatable grass to the cows later on the day to keep them motivated.

Strip grazing



Abundant grass

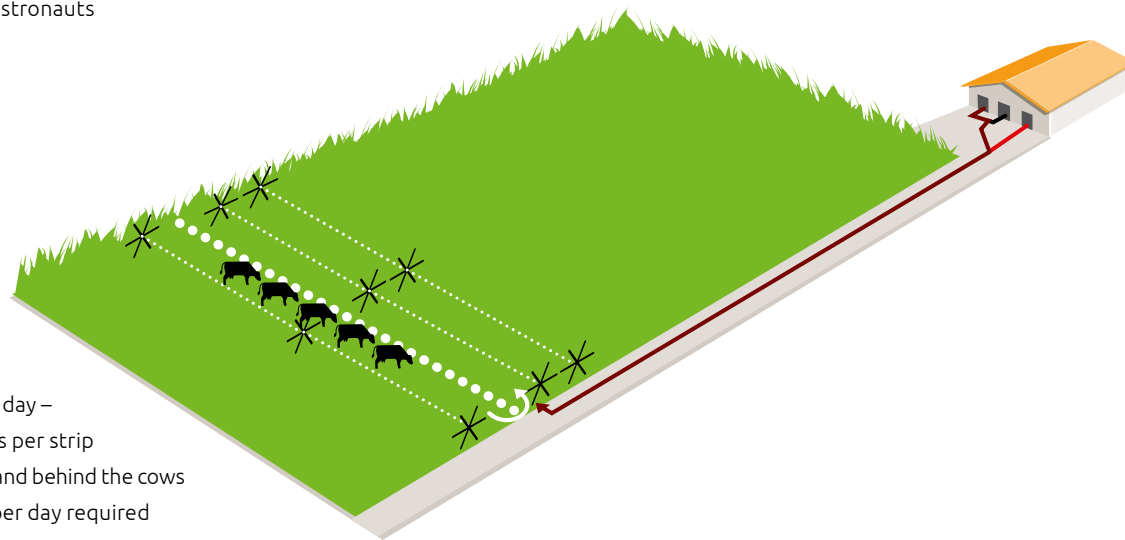
- Grass
- Ease of labour
- Grazing skills
- Milk production

- Max three cows per hectare
- 13kg DM intake fresh grass
- 15 hours grazing
- 5kg of additional feeding per day/cow
- Strip grazing
- Grazeway selection gate

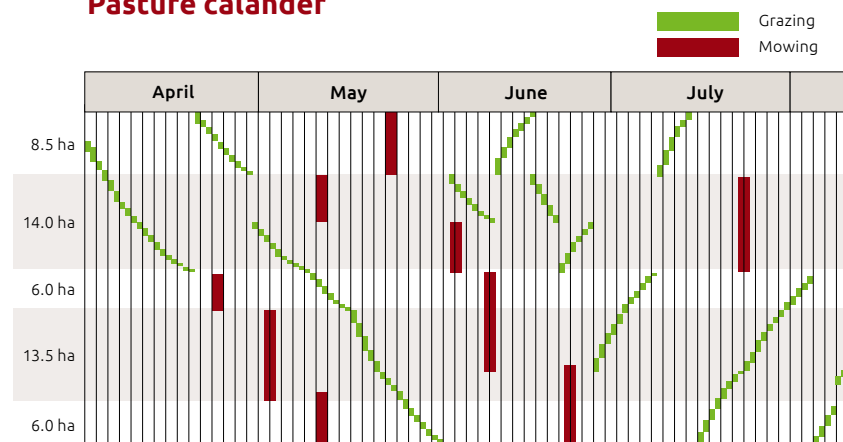
Strip grazing

Example: 120 cows, two Astronauts and 48 hectares

- No fixed pastures
- Offers grass to the cows' need
- Offer a fresh strip twice a day – from 0.30 to 0.60 hectares per strip
- Grazed with a fence before and behind the cows
- On average 0.8 hectares per day required



Pasture calendar

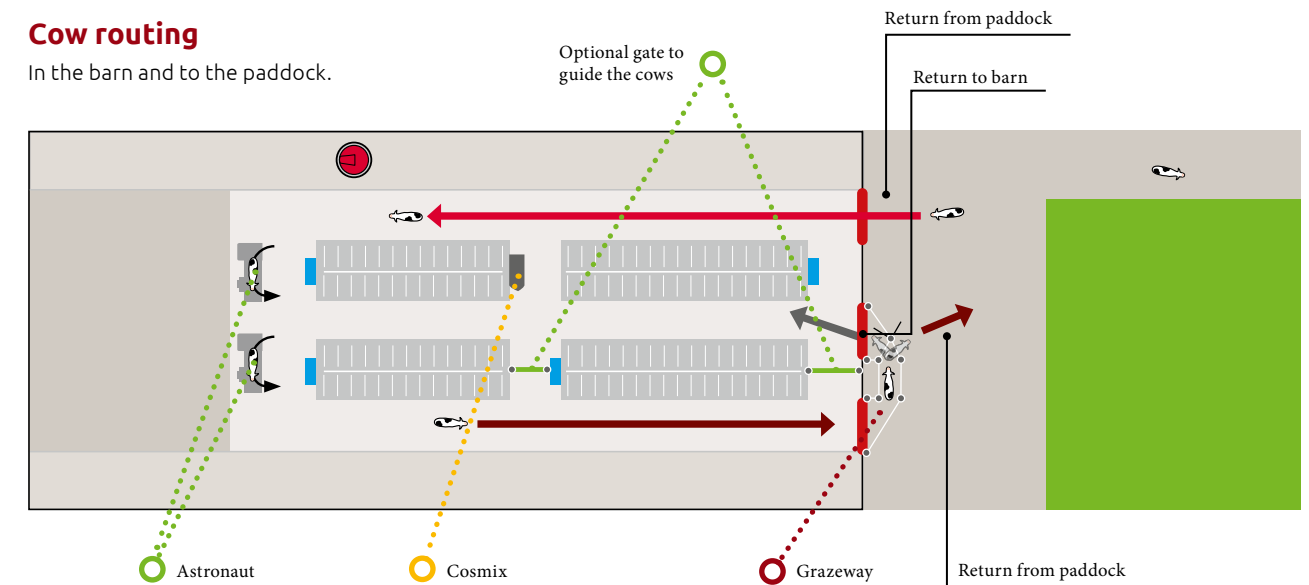


Grazing management

- The offer of grass is determining, due to variable strip size a constant intake is possible
- Start grazing at minimum 12cm to maximum 20cm of grass length
- Stop grazing at a grass length less than 6cm
- Mow the pasture after two times grazing in a row to maintain palatable grass
- Begin grazing when the soil temperature is above 8°C. Then the grass starts growing. This will create enough grazing possibilities for the first cut.

Cow routing

In the barn and to the paddock.



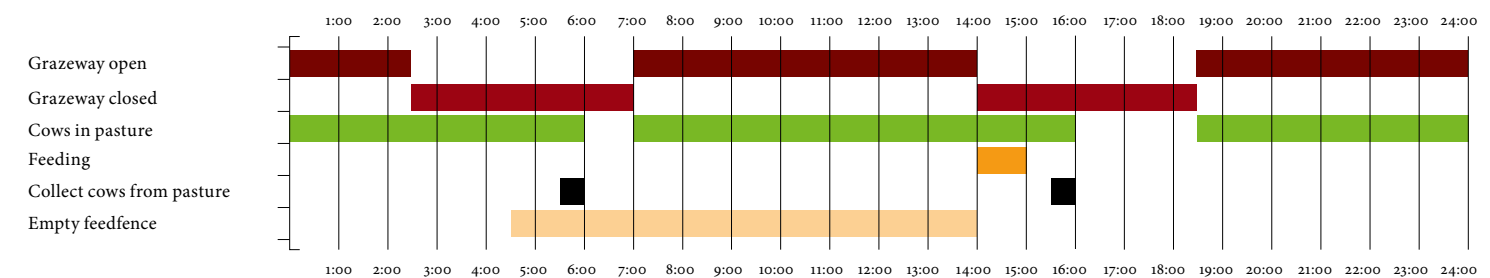
Management

24 hours overview

The times are indicative, the scheme can be adjusted to your own preferences

General tips

- Ensure the feed alley is (close to) empty two hours before the cows can go out for grazing
- Let heifers become familiar with the milking cows two weeks before calving
- Keep the numbers of milkings as steady as possible
- Offer a fresh strip twice a day, when the cows can go out for grazing



Milkings

Target values (number of milkings cow/day)

- 2.3 on average per day, with a maximum decrease of 0.4
- Low production cows (more than 250 days in lactation) minimum 2.0
- Cows until 100 days in lactation minimum 2.5.

Robot settings

- When starting the grazing season set the 'Near to be milked interval' of the grazeway on 100% for the cows to get used.
- After one month grazing reduce the 'Near to be milked interval' to 85% (to maintain number of milkings).
- Reduce the amount of protein/energy in the concentrates in relation to the amount of fresh grass intake.

Rotational grazing



50/50 grass

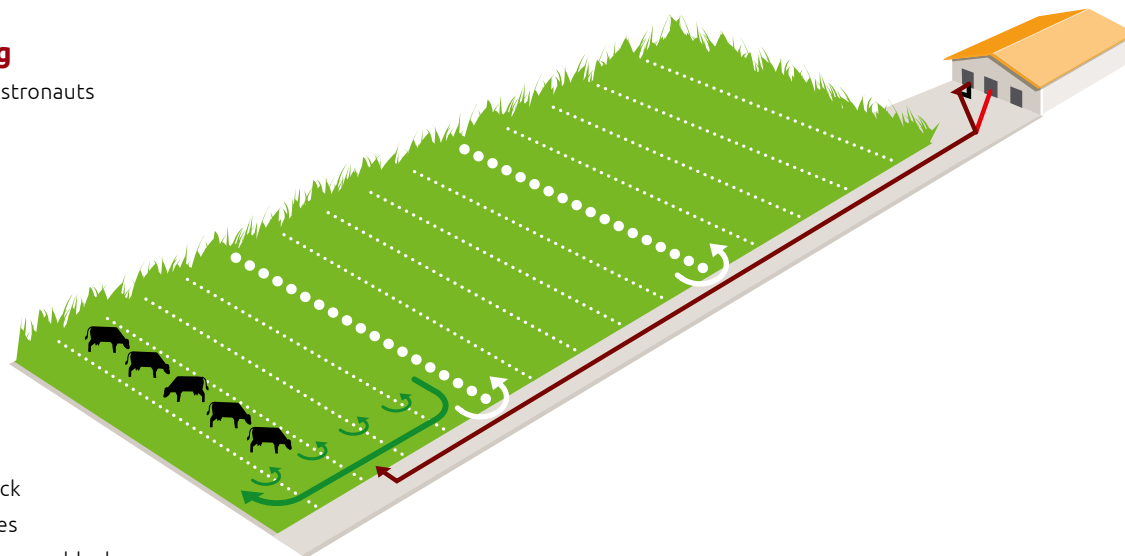
- Grass
- Ease of labour
- Grazing skills
- Milk production

- Max five cows per hectare
- 6kg DM intake fresh grass
- Nine hours grazing
- 9kg of additional feeding per day/cow
- Rotational grazing
- Grazeway selection gate

Rotational grazing

Example: 120 cows, two Astronauts and 30 hectares

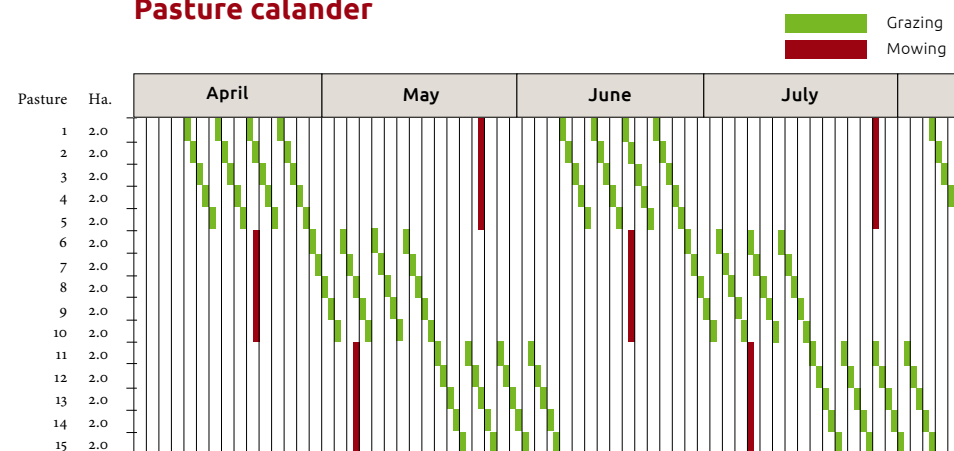
- Fixed pastures, regrowth determines intake
- Fresh pasture daily
- Remain 21 days in one block
- Three blocks of 30 hectares
- Five fields and two hectares per block
- Ensure equal sized paddocks



Grazing management

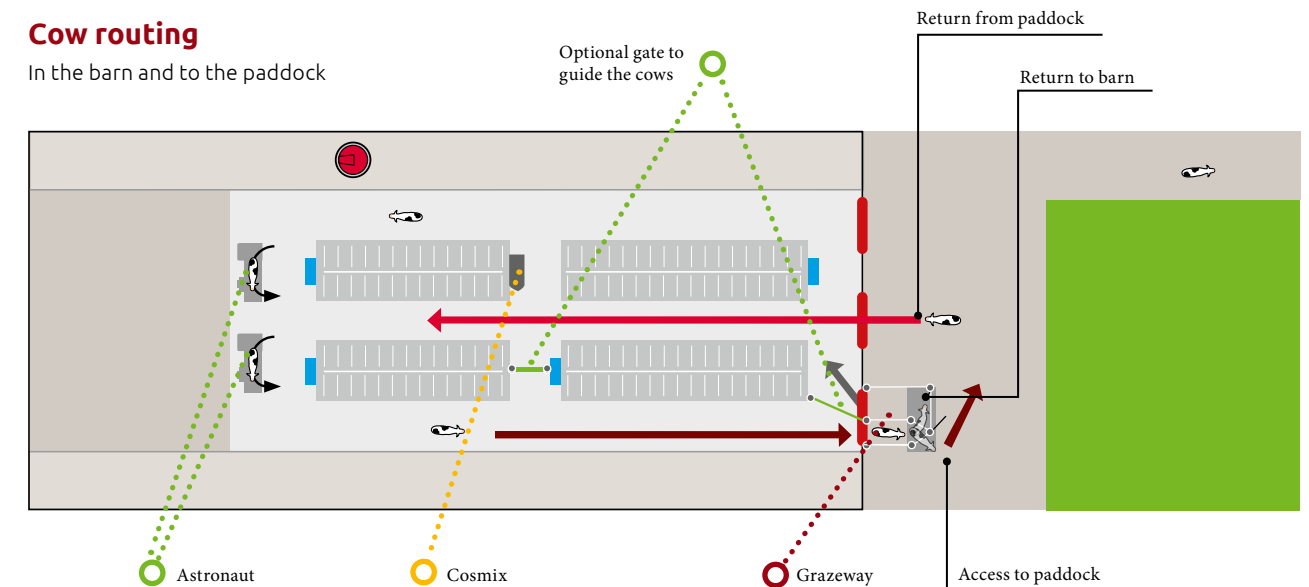
- The grass regrowth is available for intake per day
- Ensure the grass height stays at between 9cm and 11cm
- Later in the season the regrowth will be less, ensure you feed enough at the feed fence
- Average grass growth = spring 80 / summer 60 / autumn 40kgDM/ hectare/day
- Offer each day a new paddock and maintain the pattern
- Cows may graze the grass down to between 8cm and 10cm
- Start a paddock always with 'green'
- Begin spring grazing before the first-cut silage, as soon as there is enough grass

Pasture calander



Cow routing

In the barn and to the paddock



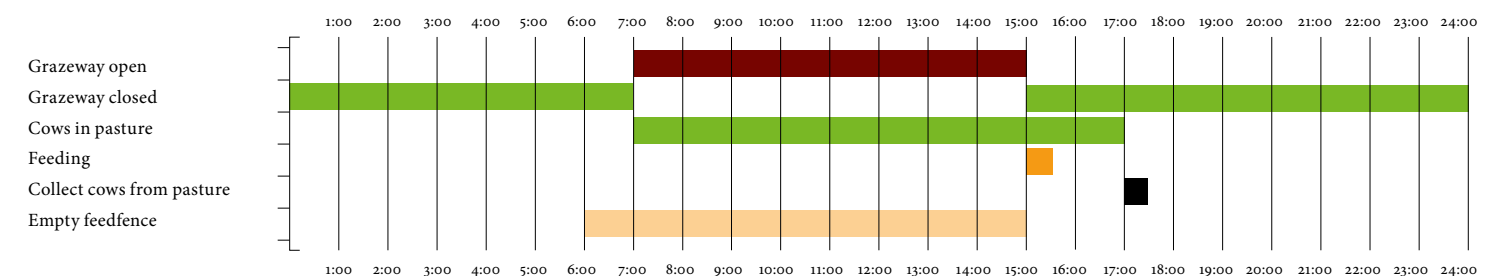
Management

24 hours overview

The times are indicative, the scheme can be adjusted to your own preferences

General tips

- Ensure the feed alley is (close to) empty one hour before the cows can go out for grazing
- Let heifers get familiar with the milking cows two weeks before calving
- Keep the numbers of milking as steady as possible



Milkings

Target values (number of milkings cow/day)

- 2.4 on average per day, with a maximum decrease of 0.3
- Low production cows (more than 250 days in lactation) minimum 2.0
- Cows until 100 days in lactation minimum 2.7.

Robot settings

- When starting the grazing season set the 'Near to be milked interval' of the grazeway on 100% for the cows to get used to it.
- After one month grazing reduce the 'Near to be milked interval' to 80% (to maintain number of milkings)
- Reduce the amount of protein/ energy in the concentrates in relation to the amount of fresh grass intake

Rotational grazing



Abundant grazing

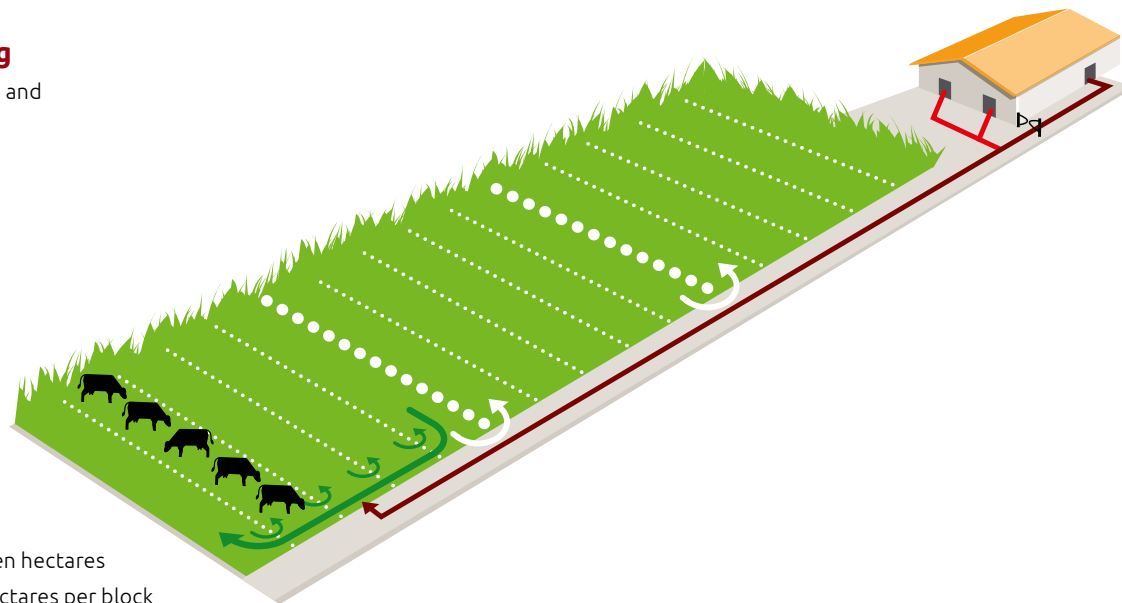
- Grass
- Ease of labour
- Grazing skills
- Milk production

- Max seven cows per hectare
- 4kg DM intake fresh grass
- Six hours grazing
- 11kg of additional feeding per day/cow
- Rotational grazing
- Grazeway selection via Astronaut

Rotational grazing

120 cows, two Astronauts and 20 hectares.

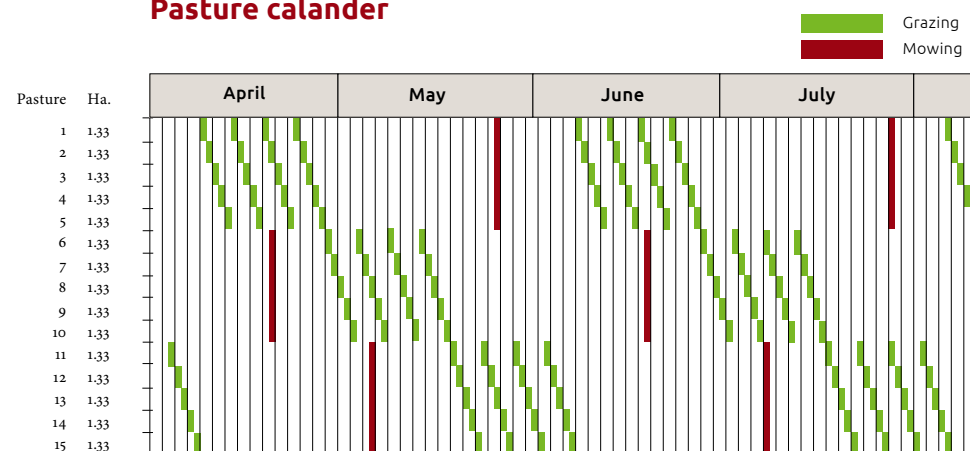
- Fixed pastures, regrowth determines intake
- Fresh pasture daily
- Remain 21 days in one block
- Three blocks of six or seven hectares
- Five fields of each 1.33 hectares per block
- Ensure equal sized blocks



Grazing management

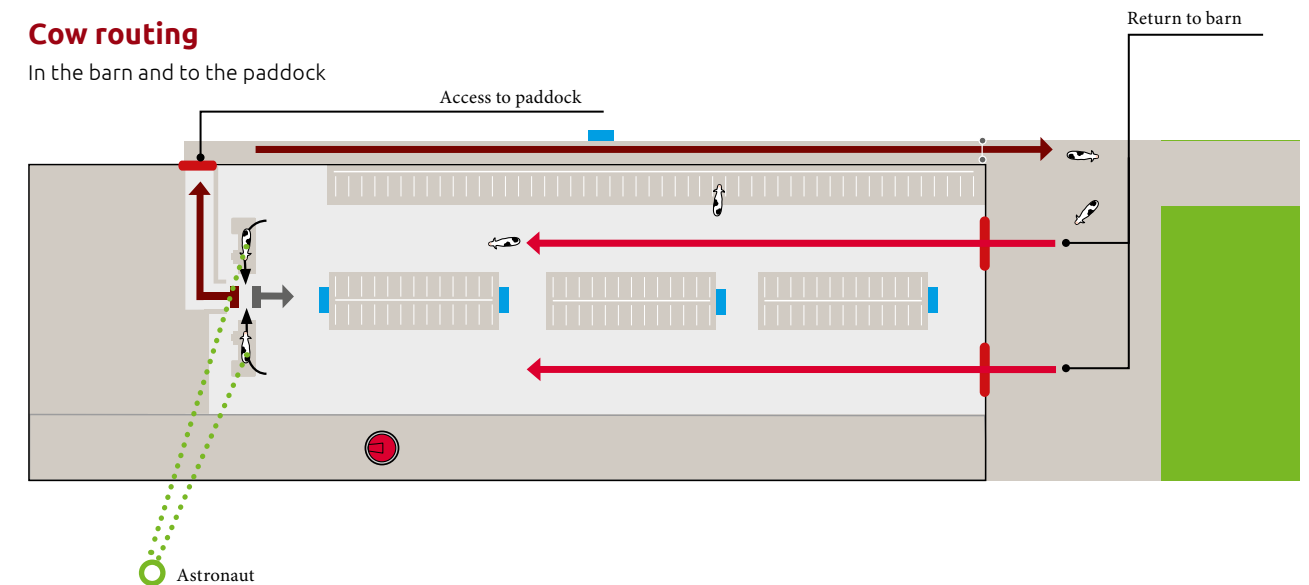
- The grass regrowth is available for intake per day
- Ensure the grass stays at between 9cm and 11cm long
- Later in the season the regrowth will be less, ensure you feed enough in the barn
- Average grass growth (per hectare per day) = spring 80kgDM/summer 60kgDM/autumn 40kgDM
- Offer a fresh paddock each day and maintain a grazing pattern.
- Cows may graze the grass down to between 8cm and 10cm.
- Start a paddock always with 'green'
- In spring start before the first cut as soon as there is enough grass

Pasture calander



Cow routing

In the barn and to the paddock



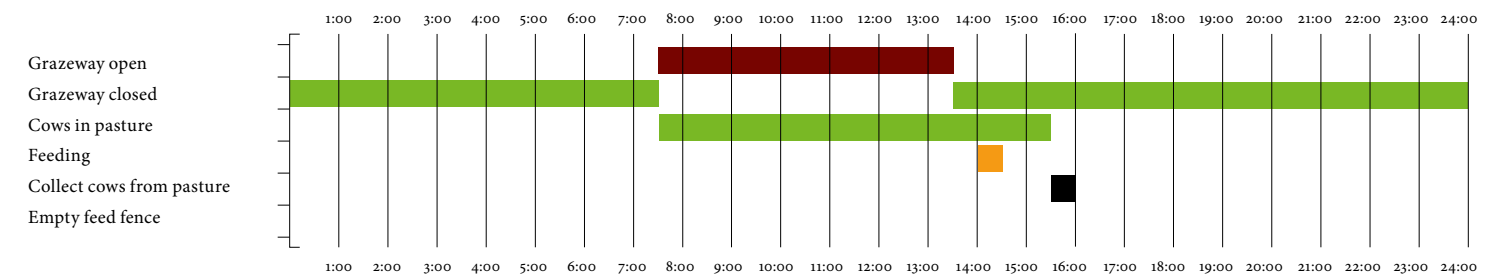
Management

24 hours overview

The times are indicative, the scheme can be adjusted to your own preferences

General tips

- The Astronaut also acts as a selection gate. After milking the cows can go out to grazing.
- Let heifers mix with the milking cows two weeks before calving
- Keep the numbers of milkings as steady as possible



Milkings

Target values (number of milkings cow/day)

- 2.5 on average per day, with a maximum decrease of 0.2
- Low yielding cows (more than 250 days in lactation) minimum 2.2
- Cows until 100 days in lactation minimum 2.6.

Robot settings

- At the start of the grazing season set the 'Near to be milked' interval of the Grazeway to 100%, to allow the cows to get used to it.
- After one month at grazing, reduce the 'Near to be milked' interval to 80% (to maintain the number of milkings)
- Reduce the amount of protein/energy in the concentrate in relation to the amount of fresh grass intake

Set stocking



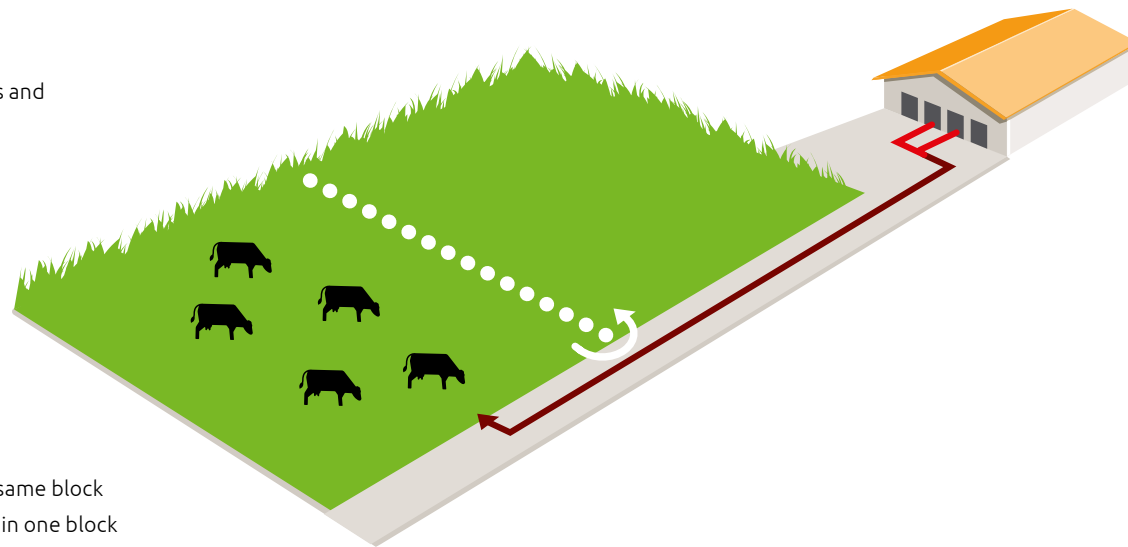
Grass as a dessert

- Grass
- Ease of labour
- Grazing skills
- Milk production

- Maximum of 10 cows per hectare
- 2kgDM intake fresh grass
- Three hours grazing
- 13kg of additional feeding per day/cow
- Set stocking
- No selection gate

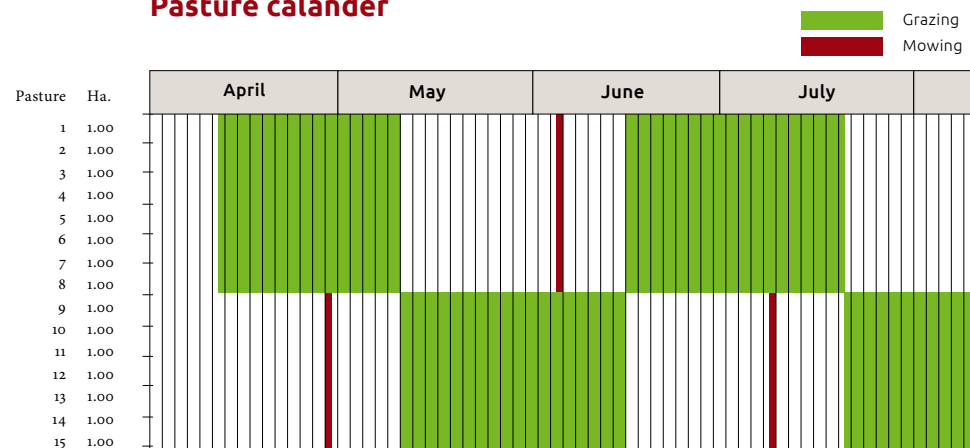
Set stocking

120 cows, two Astronauts and 12 hectares.



- Fixed pastures, regrowth determines intake
- Cows are each day in the same block
- Remain around six weeks in one block
- Two blocks of six hectares
- Ensure equal sized blocks

Pasture calendar

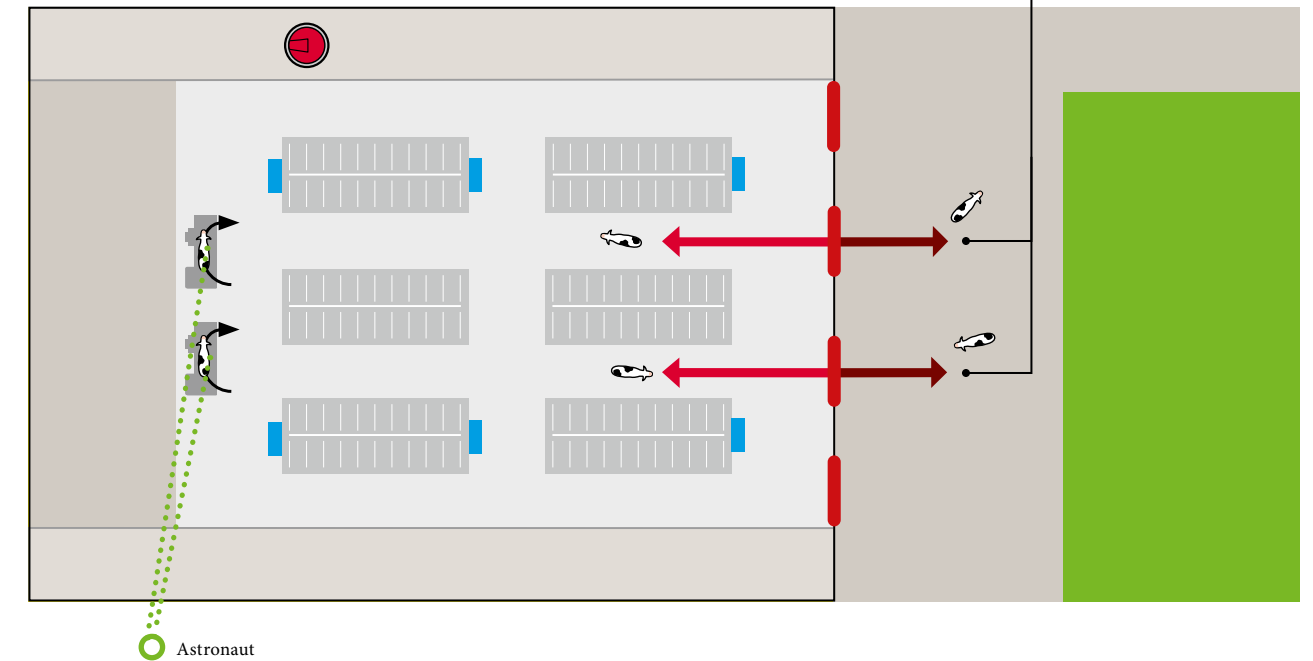


Grazing management

- The grass regrowth is available for intake per day
- Ensure the grass stays at between 9cm and 11cm long.
- Later in the season the regrowth will be less, so ensure you feed enough in the barn
- Average grass growth (per hectare per day) = spring 80kgDM/summer 60kgDM/autumn 40kgDM
- Cows may graze the grass down to between 8cm and 10cm
- Start a paddock always with 'green'
- In spring, start before the first cut and as soon as there is enough grass

Cow routing

In the barn and to the paddock



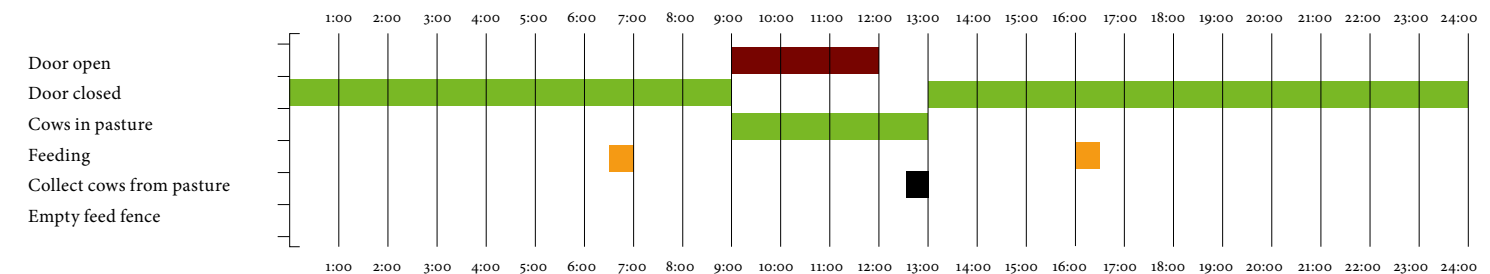
Management

24 hours overview

The times are indicative, the scheme can be adjusted to your own preferences.

General tips

- Use a Texas gate or a time switch to keep the cows indoors after grazing
- Keep the numbers of milkings as steady as possible



Milkings

Target values (number of milkings cow/day)

- 2.7 on average per day

Robot settings

- Settings remain the same as in winter time
- Reduce the amount of protein/energy in the concentrate in relation to the amount of fresh grass intake



Cow tracks

When grazing and automatic milking, cows will need to walk towards the pasture and back to the milking robot. So good cow tracks are an integral part of any grazing setup. Hoof health also becomes even more important in these circumstances. So the design and maintenance of cow tracks requires attention.

Cows will walk significant distances when grazing. It is, therefore, important to consider how the cows are moved and the nature and condition of the surfaces they are walking on. When cow tracks need to be laid, it is important to start with a surface that is stable and durable. It is advisable to dig out the top layer of the ground and fill it with a foundation material to stabilise the surface.

A layer of gravel, pebbles or sand to a depth of between 20cm and 40cm, depending on the material and soil conditions, is ideal. Avoid driving with tractors and other equipment on the cow tracks as much as possible to keep them in a good condition.

Walking surfaces



Asphalt

It is important that the cow track stands proud of the ground to aid drainage. And regular maintenance (two- to four-year intervals) is required to ensure that drainage remains effective. A small gutter alongside the cow track will help drainage and prevent water from pooling on the track. Cow track maintenance also depends on what material it has been constructed with.

Sand

Sand is widely used for building cow tracks. Underneath the sand, a bed of field stone, crushed concrete and possibly some gravel is often used for stability and to aid drainage. Sand cow tracks need extra maintenance and a layer of new sand during the grazing period, because large puddles can form during wet periods.

Wood chips

Wood chip-based cow tracks require a fresh supply of wood chips several times during a season, particularly if there are long wet periods during the summer. So it is important that these cow tracks are built up higher than the surrounding area to allow them to drain effectively.

Mussel shells

If shells are used as a material for building cow tracks, it is important that water can drain away and that the track is high above the surrounding level, as with wood chip-based tracks. This is achieved by always focusing on the sides, and these must be repaired periodically – typically every three or four years.

Parking grids

This is an ideal product to use when constructing cow tracks. Water can easily drain through the openings in the grids. But the bottom layer (foundation) must be stable, otherwise the grids can slip and tilt, which is a potential risk to cows' hoof health.

If you have access to used slats then these can also be a good material for building cow tracks. They are similar to parking grids and water can drain down between the slats and through the sand. However, here it is incredibly important that they lie on a flat and stable surface, so that they are not displaced.

Tip: Gateways, narrow tracks and areas surrounding water troughs require special attention as they are often covered with small sharp stones, gravel or flints (which can damage cows' hoofs) and are also liable to become muddy in wet weather. A thick rubber mat or other fixed surface around water troughs is also useful. It's important to prevent these areas from becoming trampled. Keeping these areas dry will help to protect hoof health.

Lely Grazing tools

The Lely Grazeway selection box gives farmers the opportunity to combine automatic milking with optimal grazing. The Lely Grazeway is installed outside or at the end of the exit point of the barn, where the cows go out to pasture. The cows’ new motivation for getting milked is that they know that they can go outside to graze after being milked.

Before the cow leaves for pasture, she is recognised at the Grazeway to determine if she still has to be milked or if she is allowed out to graze. Selection criteria are set through the Lely Horizon management program. This selection criteria is the so called 'near to be milked' interval setting. This setting is a percentage that indicates when a cow is allowed to go out for grazing before she is allowed to be milked. The graph shows an indication of this setting in relation to some parameters.

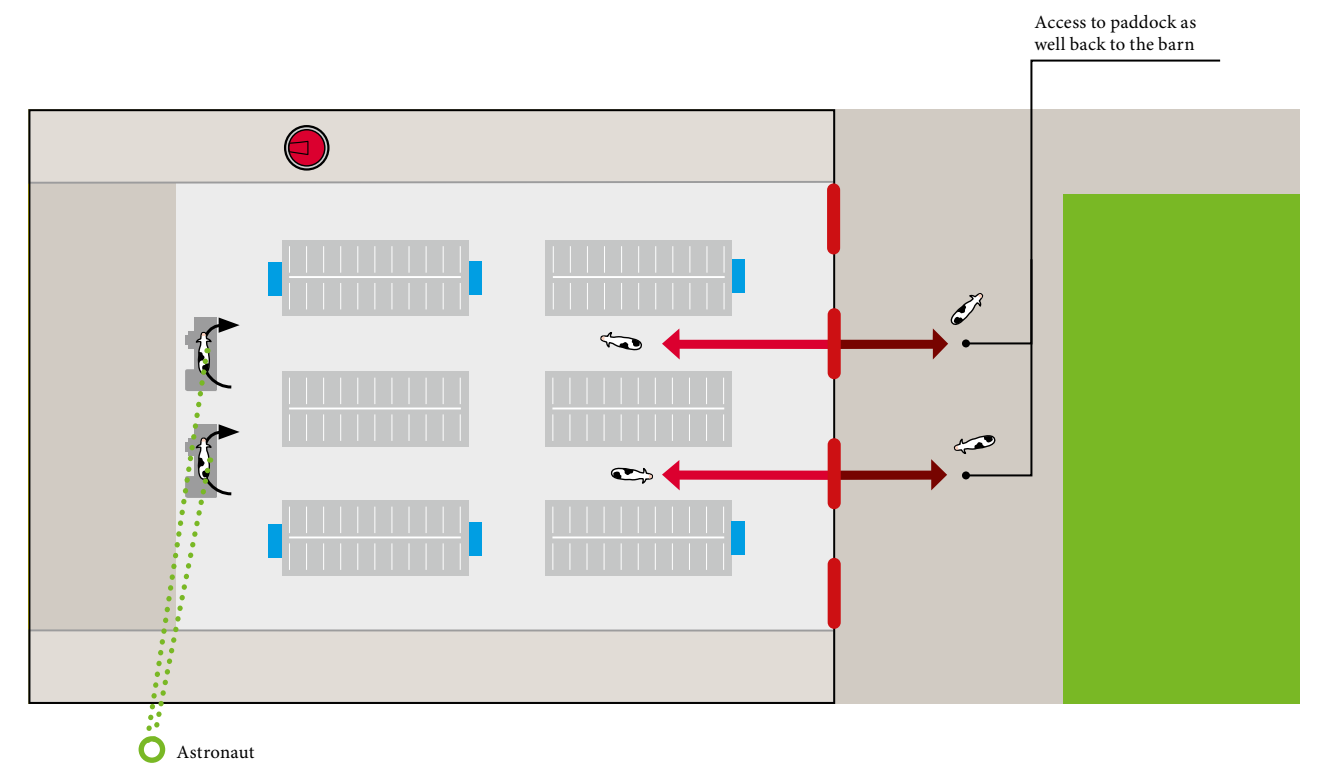
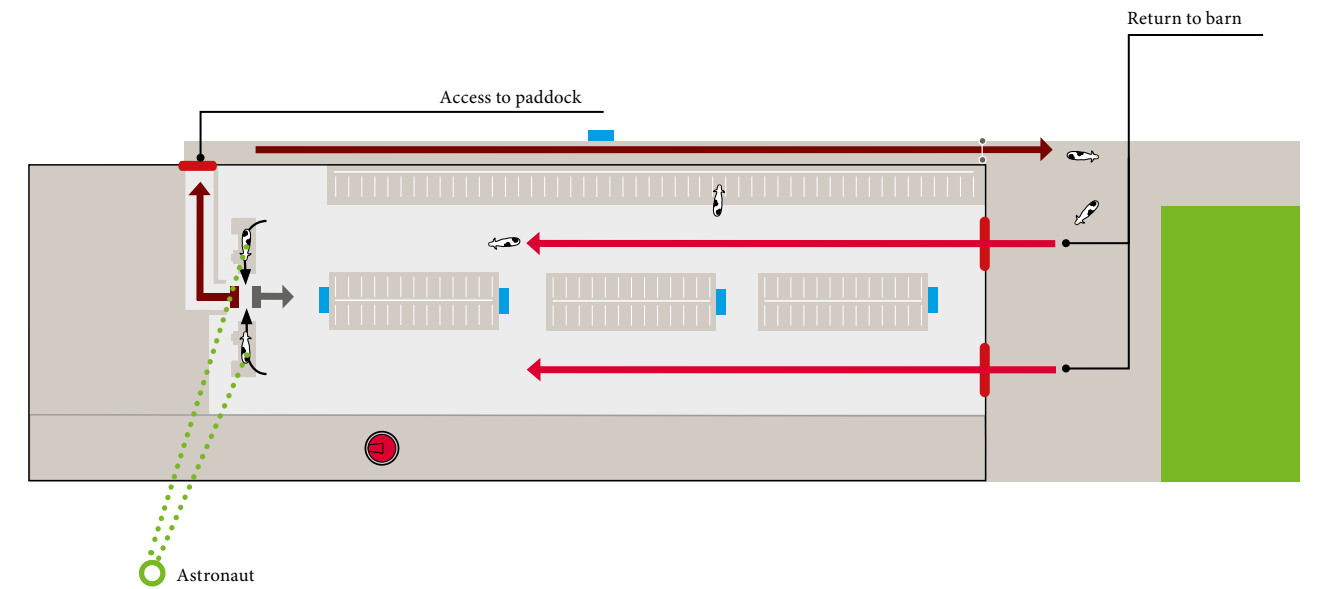
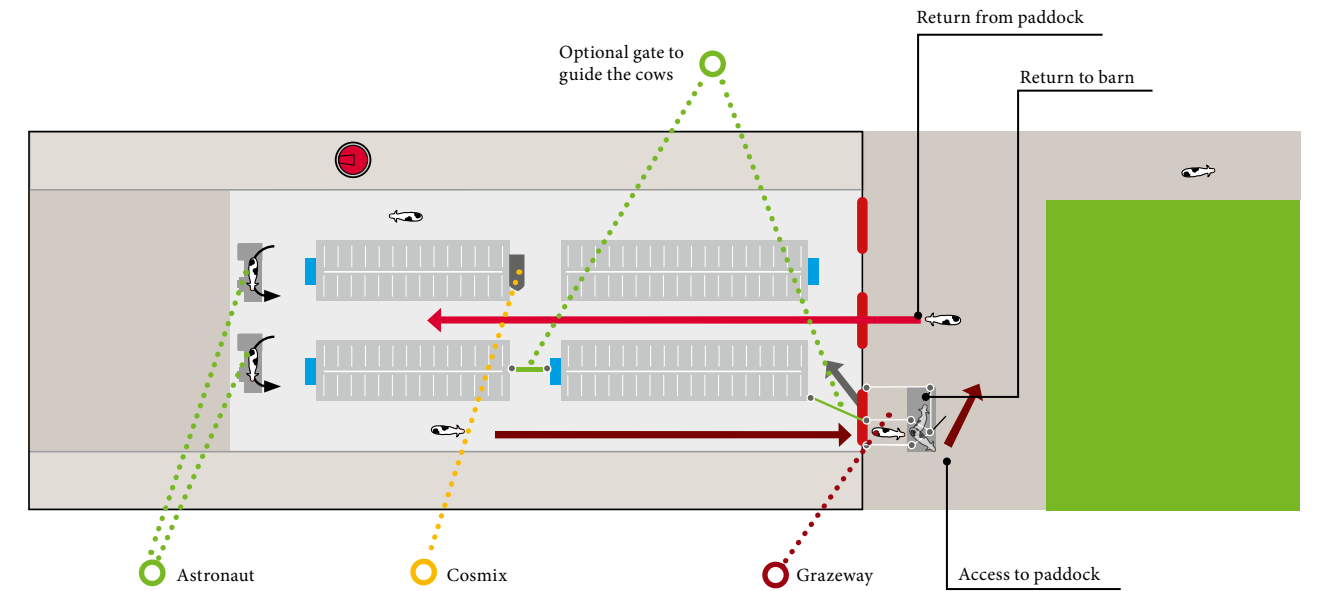
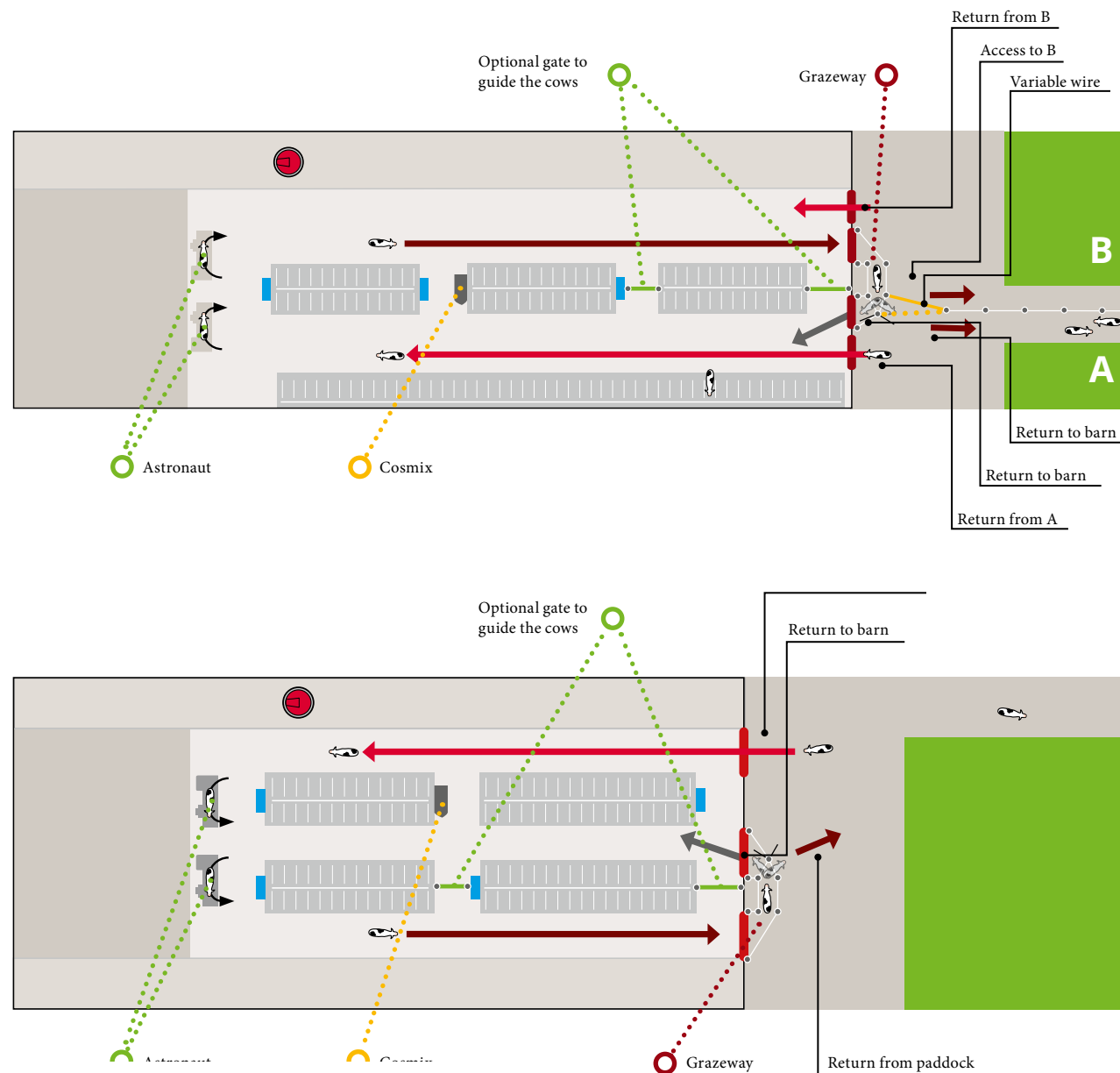
Near to be milked interval setting	100%	90%	80%
Training cows	Yes	No	No
Distance to paddock (m)	<400 m	<400 m	> 650 m
Fetching cows	Yes	No	No
% free time on milking robot	>20%	>20%	<15%
Hours of grazing per day	<5 h	5 – 7 h	>7 h

Grazeway



Location of the Grazeway

Part of the success of grazing in combination with automatic milking is the location of the Grazeway. In order to ensure smooth cow flow and free cow traffic, the Grazeway should be located outside or at the end of the barn, close to the paddocks and away from the milking robot. For a good location you need a minimum space of 5m x 5m so that cows can exit quickly and easily, particularly the lower ranked cows within the herd. The illustrations show various possible barn layouts in combination with grazing.



Farm data

- Number of cows: 140
- Number of Lely Astronauts: 3x A4v



René Søndergaard – Bedsted, Denmark

René Søndergaard is an organic dairy producer in Denmark. He owns Højbogård with 140 cows and sells milk to Thise Dairy. His herd's average milk yield is one of the highest in Denmark and during the past six years he has learned how to manage organic farming, grazing and milking robots successfully.

"We had deep straw bedding in combination with a conventional parlour, but I wanted something else. I have had surgery in both shoulders and I did not want to stand and milk cows anymore. So I thought milking robots were a very good alternative to a traditional milking set up."

The cows quickly got used to the robots and yields increased due to the cows being milked more times each day. The herd's average milk yield was already high, but René still saw a significant increase.

The grass fields are located just outside the barn and up to to 800 metres away. When the cows graze in the fields furthest away this results in a slightly lower milking frequency, but this is a price that René is more than happy to pay.

We have chosen organic farming and the cows are going out to graze. It costs me a little milk, but that is fine. I do not want to spend the summer chasing cows and stressing them. I want them to find their own way in the system we have."

"What I like about this system is that the cow has options. She can decide whether she wants to be milked, to eat some feed, to be milked, to eat some forage, to lie down in the sand bedding, or to go outside and eat grass. That said, cows cannot be allowed to decide

entirely for themselves – we decide how long they should be outside grazing. But other than that we do not chase them in, even though a robotic milking system combined with grazing can be a logistical challenge.

"In the beginning we learned how to teach the cows to find their own way. We have learned that there needs to be good quality grass in the fields – so they want to go out and graze. You need grassland around the barn and also you need the free cow traffic to work. Our robots are located at one end of the barn and it is here where the cows also get access to the grass fields. They come back in at the other end of the barn. This is also why the free cow traffic works smoothly – the cows coming in and going out do not pass each other."

Farm data

- Number of cows: 144 cows, including youngstock
- Farm size: 56 hectares
- Number of Lely Astronaut: 3x A2

Wilfried Groot Koerkamp – Flevoland, The Netherlands

In Biddinghuizen, Wilfried Groot Koerkamp's cows are grazing behind his modern barn built in 2014. This organic unit sees more than 100 cows being milked with A2 milking robots. "We have been grazing for many years and this has proved a success for our farm," says Wilfried.

Wilfried acquired his first Lely A2 milking robot in 2006 and now he has three on the farm. "With three milking robots we have some overcapacity," says Wilfried. "We were able to buy the robots second-hand at an attractive price. This overcapacity is certainly not necessary for successful grazing. In 2012 Wilfried converted to organic farming. He works with two organic farming companies that use crop rotation. "The switch to organic livestock was an economic choice. If you want to get a better price for your milk then you have to set yourself apart from the rest – you have to add value," he says. "After five years you can really see the difference it has made – and it's much more than you would expect."

Unique grazing strategy

Wilfried's cows spent time outside even before he switched to organic farming. "To me, grazing is vital. Apart from the fact that I am now obliged to do it, I like my cows to go outside," he says. "At our farm, the cows can enjoy being outside from the beginning of April through to November". He has developed his own grazing method, which works perfectly for his farm. "Our plot is made up of six blocks of 9.3 hectares each, two of which are grass-clover leys. The other four blocks are rented or sown to wheat, which is ensiled as whole-crop-silage. The rotation is such that there is always one block of grass next to the barn."

Since they built the new barn, they have used a fixed grazing system. "Here we also experimented with different methods," says Wilfried. "We saw that creating high grass uptake in combination with robotic milking does not go with rotational grazing."



The system that he now uses is a combination of strip grazing and rotational grazing and it's a unique approach that works well, according to Wilfried. "We split the block of grass behind the barn into strips of a hectare each and in two days they have grazed that strip bare. We move this strip backwards by moving a 'strip grass' wire so that the cows always have access to fresh grass. And, in addition, in the afternoon we open a piece of pasture next to the barn where the cows can also graze. This keeps the cows eager to graze and they consume enough dry matter".

Dry matter from pasture grass

"With so much clover in the grass you can't expect 24-hour grazing with no issues," says Wilfried, because then there would be too much of a chance of the cows suffering bloat. "By grazing for 12 to 14 hours on a summer day, I can keep that under control. The dry matter uptake from grazing is between five and six kilogrammes per cow. That's around 4kg of dry matter from the morning grazing and another 2kg in the afternoon. "The total feed uptake is composed of a third of fresh grass, a third of mixed feed and another third of grass pellets and concentrate. "We do it our way, which allows us to give our cows fresh feed, on demand, every day. The system has already had proven benefits on our farm."

Monitoring pastures

He monitors pastures by observing grass growth on weekly walks – he calls this the 'farm walk'. "At the time of the first-cut silage, I have sufficient rotational plots to provide the cows with between 500kg and 600kg of dry matter. I also go in regularly with the mower and clear up aftermaths. This grass then goes, separately, into round bales, which I can use as additional feed in the winter or for the older young stock".

Freedom to enter and exit

In the morning, starting at 7.00am, cows are allowed to leave the cow house, via the Lely Grazeway selection box behind the milking robots. "At around 10.00am, all the cows are outside," says Wilfried. When all the cows are outside, they are free to enter and exit the cow house and milking robots throughout the day. "You see the cows coming back to the barn at lunch time. Then they eat here and visit the milking robot. There is always a mixed ration available in the barn."

At around 5.00pm, Wilfried turns the one-way gate back to route the cows back to the cow house – they can come in but they can't go out again – not until the following morning. "This works perfectly. We don't have any cows to round up."



Grazing and Horizon

Key Performance Indicators

Successful grazing and automatic milking is a combination of various factors. Which strategy suits you and your unit the best? What is possible to achieve with the tools that you have and what are your personal and farm goals? And how do you know if things are going well and that you're on track to meeting your goals? The first step is to determine your goals, the second is to make it happen, and the third is to monitor what is happening.

The Lely Horizon management program is the prime source of information for your dairy farm. It delivers real-time insight with no extra work. You can take direct action yourself, when and where it is necessary, and you can also take preventative actions that are based on predictions.

Lely Horizon is designed for automatic milking with the Lely Astronaut. It also links to other Lely equipment, such as the Cosmix Feeding station, the Lely Vector automatic feeding system and the Lely Grazeway. Horizon translates real time data into usable information for a clear insight into the results of your work. It generates reliable data that you can use to make the right decisions – both in the short and longer term. In both instances, business optimisation is key.



Clear insight at a glance

The Horizon Dashboard shows all the relevant information for each cow. There are several parameters available, such as the number of times the cow is milked, milking behaviour, milk yield and milking speed. In just three clicks you can view all the data about your cows that really need attention.

Various key performance indicators (KPIs) can be used to monitor your cows' performance at grazing.

- 'Milk production per cow per day' shows the milk produced per cow during the past 24 hours, both as an actual figure and a seven-day average.
- 'Number of milkings' shows how many times a cow has been milked successfully each day. We aim for a herd average of between 2.5 and 3 milkings per cow per day.
- 'Number of refusals'. Each individual cow has access to the milking robot based upon her lactation and production phase. When a cow enters the milking robot too soon this is called a 'refusal'. The number of refusals per cow per day, as part of the total visit behavior, is an indication of her activity and willingness to visit the milking robot.
- 'Rumination activity'. Cows are ruminating which means they regurgitate the food to make it ready and more easy to digest for their second stomach, called the Omasum. The rumination activity is a good indicator for the cows' wellbeing. When deviating on cow level this could indicate heat or health issues, on herd level it could indicate feeding issues.

- 'Concentrates per 100kg of milk'. This key performance indicator shows how many kilogrammes of concentrate a cow eats to produce 100kg of milk. It indicates the balance between feed intake and production.
- 'Rest feed concentrate percentage' indicates the percentage of the available concentrate that is not eaten by the cows in the milking robot and/or Cosmix feeding station. As a rule of thumb, a maximum of 5% 'rest feed concentrate' is retained.
- 'Fat and protein percentage' indicates the level of milk constituents.

Managing your cows whilst grazing means also following trends in Horizon. How are the KPIs measuring up?. Slight deviations can be normal, but when the deviation is increasing and persisting then it's important to find out why. Is it grass related, for example tastiness or availability of grass? Maybe the cows' health itself requires attention or, when an additional ration is fed, is the ration still accurate?

It's rare that there's one single cause for deviations and solutions can be found by taking a multifactoral approach.

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