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Cow Signals

A practical guide for dairy farm management







Jan Hulsen

Cow
SIGNALS

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dairy farm management

Jan Hulsen

ROODBONT PUBLISHERS

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Author
Jan Hulsen, Vetvice®

Translators
Klaas-Jan & Gerda Buist

Content editors
Sarah Baillie MRCVS, Mirjam Coert MRCVS, Jan Willem Downer MRCVS

Language editor
Joy Burrough, Science Editing & Translation, Wageningen, NL

Coordination
Uli Bartsch, Gerre van der Kleij

Photography
Cover photo: Marcel Bekken
Other photos: Jan Hulsen (unless stated otherwise)

Drawings
Marleen Felius

Design and layout
Erik de Bruin, Varwig Design

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ROODBONT PUBLISHERS

P.O. Box 4103, 7200 BC Zutphen, Netherlands
Telephone: ++31 (0)575 54 56 88
Fax: ++31 (0)575 54 69 90
info@roodbont.nl
Internet: www.roodbont.nl

VETVICE
Making veterinary knowledge work

Moerstraatsebaan 115
NL-4614 PC Bergen op Zoom
The Netherlands
Telephone: +31 165 304 305
Fax: +31 165 303 758
E-mail: info@vetvice.nl
Internet: www.vetvice.nl

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Introduction

Modern dairy farmers are hard-working and need to know a tremendous amount. They are deluged with information about cattle husbandry, housing, and farm business management. There is so much to know that sometimes it is difficult to see the wood for the trees! With the expansion of farming enterprises, workloads, and the need for detailed knowledge, dairy farmers and their advisers could find themselves in the situation where they are losing sight of the cows. But the bottom line is that dairy farming is about cows.

A cow gives out signals about her well-being and health. She does this through behaviour, posture, and physical traits. You can make use of these *cow signals* to optimise your farm's profitability. The first step involves careful observation, followed by searching for causes, and then translating all of this into practical solutions. And you should be asking yourself certain questions over and over again:

- What do I see?
- How has this come about?
- What does this mean?

Knowing how to read the signals

This practical guide was compiled for and with dairy farmers and veterinary surgeons to provide them with additional tools for observing and using cow signals. Our goal is to prevent dis-eases, improve cow comfort, and optimise production. Recently, a dairy farmer asked me 'A couple of days before a cow falls sick, how can I tell that something is already going wrong, so I can save on vet's bills, not lose yield, and improve the cow's comfort?' That question touches on the issues fundamental to this book. The challenge is to pick up as many signs as possible before real problems occur, to evaluate risks before they claim victims, and to notice symptoms before the disease fully shows itself.

Another reason to look at cow signals more purposefully is the danger of 'farm blindness': thinking that what you see every day on your farm is normal. This is a potential danger for everyone and means that you might no longer notice what's happening around you. Making a point of including specific observation times in your daily routine, discussing matters critically with colleagues and advisers, and visiting other farms all help to reduce this risk.



A book on observing

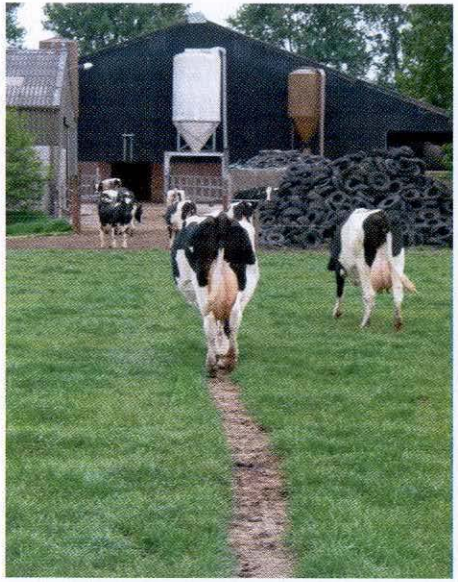
Cow Signals is not a textbook but a guide on how to observe and evaluate. So it contains more than 250 pictures and illustrations that clearly show what observations can be made. Looking at the examples and working through the picture quizzes will help you to look at your own cows from a new perspective. And it will help you to look through a cow's eyes – at the cowshed, for example.

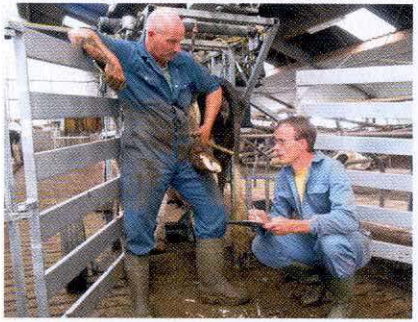
When writing this book, I decided not to approach the subject by focussing on individual aspects of farm enterprises, disciplines, or the anatomy of the cow. So you won't find chapters about milk production, housing, or lameness. The book focuses on both the place where you make the observations and the reason why you are looking. Lameness, for example, will be mentioned at various places, but from different viewpoints (sometimes literally). In the cowshed you will look at conformation, at pasture you can evaluate locomotion, and in the parlour you can see all four legs in detail from the front, side, and rear. And when foot trimming, the sole provides additional information.

The format of *Cow Signals* will encourage you to 'graze' through the book more than once. Every time you pick up the book you'll find something new and interesting. The text can be searched easily using the index at the back.

Wishing you pleasant reading and observing.

Jan Hulsen,
author, veterinary surgeon, and cow enthusiast.





'Not knowing something
is forgivable.
But not seeing something
is stupid'

A farmer

CHAPTER 1

Don't just look: **observe!**



Set aside time each day to carefully observe your animals.

Aim to notice everything that can be noticed about a cow, a calf, a bull, or a group of cattle. Try to pick up the signals that cows are giving out all the time – that's the challenge of cow-focussed management – and use this information to improve and maintain your herd's productivity. You'll find this pays!

In order to understand why a cow is behaving in a particular way, try to get under her skin. You have to make sure that you notice all the signals she sends out, because they provide important information for farm management. Looking and seeing are not the same. You can look at something without really noticing anything, but *looking and noticing* – in other words, observing – provides information that can directly improve management.

You can observe in two ways:

1. **Focussed observation**
   You are looking for things to evaluate. Is everything as it should be, or might the situation pose a potential risk?
2. **Open-minded observation**
   Forget about any excuses and preconceived ideas you might have and look around as if you were viewing the situation for the very first time.

Asking questions

When making your observations, always ask the following questions:

What do I see?
Describe the situation objectively.

Why has this happened?
Try to identify the cause.

What does this mean?

a. Is this a signal from a single animal or are more animals involved (group signal)?

b. Is everything OK, or do I need to take action?

When evaluating 'Is everything OK, or do I need to take action?', you compare the observation with a standard. In this book, we present these standards as cow signals, since they provide measurable parameters for our goal: a comfortable, healthy, and productive cow.

In our daily lives, many standards are expressed in measurable units, such as centimetres (for the size of cubicles) and kilograms (of bedding, dry matter intake). These are derived standards because they provide information about the means and not the goal. A 10 cm layer of sawdust bedding, for example, is a means of ensuring comfort when the cow lies down. But the same goal can be achieved with a rubber mat, or sand. For this reason, the standards should always be a matter for discussion. In practice, the measurements that we choose depend on our own situation. You only need to select the most relevant ones and those that can be changed. Clearly, the measurements chosen will vary, depending on the particular situation.



1. What do I see?
A calf is sucking another calf.

2. Why has this happened?
The calf has a need to suck and satisfies this desire, nearly always choosing the same calf.

3. What does this mean?
The teats of the calf being sucked can become injured and therefore are susceptible to infections, or growths.

The solution:
Separate the calf doing the sucking, because otherwise it will just find another calf to suck.

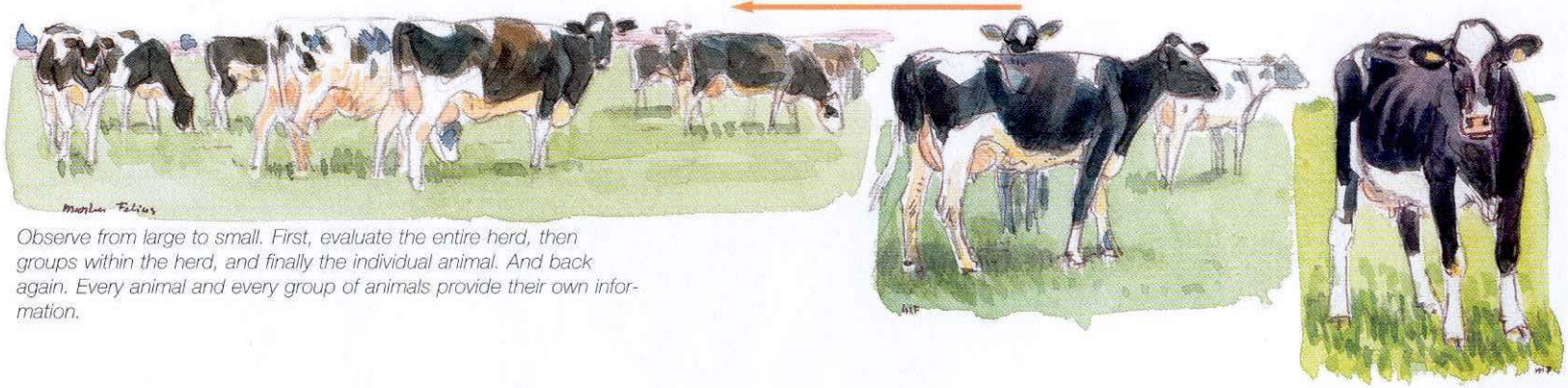


1. What do I see?
All of these in-calf heifers have injured hocks.

2. Why has this happened?
The heifers have had to lie on a hard, rough surface. The problem is exacerbated if the cubicles are too small.

3. What does this mean?
The animals experience pain when walking, may develop infections, and prefer not to lie down.

The solution:
Increase the size of the cubicles and provide a soft base.



Observe from large to small. First, evaluate the entire herd, then groups within the herd, and finally the individual animal. And back again. Every animal and every group of animals provide their own information.

From large to small

Observe from large to small, from many to few, and from far to near. But remember, things that catch your eye can only be evaluated well if kept in context. So you also observe from small to large. Most people tend to move closer when they see something interesting, even though it is often better to take a few steps back.



These calves prefer the outside row of cubicles to the two rows in the middle. In this situation, critically evaluate their comfort and climate.

Observations begin with the largest group of animals, followed by a smaller group within that group, and ending up with an individual animal. While observing, you need to focus but also keep an open mind. Ask yourself questions such as:

Is the herd 'uniform'? If not, what are the differences between animals – in their coats, size, cleanliness, body condition, abdominal fill, or something else? Which animals are affected? Are they part of a group that is at risk? How are the animals distributed throughout the building? Do they prefer a particular area because, for example, the cubicles are more comfortable there or because the climate is better? How many cows are in the passageways? How many are in the cubicles? What percentage of the cows is lying in the cubicles? Is it the minimum target of 85 percent?

For these observations, checklists can be very useful.

Evaluating the herd

- Distribution in the space provided
- Use of passageways and cubicles
- Movements, congestion, and conflicts
- Uniformity

Evaluating the animal

- Alertness
- Coat
- Growth
- Cleanliness
- Condition
- Rumen and abdominal fill
- Skin injuries
- Swelling and pain
- Behaviour
- Posture and locomotion
- Production
- Has something changed? Is there anything else?

Evaluating cow signals

In order to evaluate cow signals well, they should be kept in context. This means that you need to think about the relationship between the circumstances, the cow, and the cow signal.

Genuine cow signals are repeated

If cow signals are really genuine, they will be repeated. Kicking off a cluster only once doesn't necessarily mean anything. But if the same cow does this repeatedly, she doesn't like being milked. Why not? If several cows are kicking off the clusters then there may be a common cause: over-milking, the vacuum level is too high, teat injuries, or severe fly irritation. So you should ask yourself: does this happen frequently, at other times, with other cows, on other farms?

Why is the cow doing this?

There are generally three reasons why a cow behaves the way she does:

1. The behaviour **satisfies a need**. The cow wants something. Examples: eating, lying down, being nosy.
2. The behaviour is a **reaction to a stimulus** in the environment. For example, she tries to avoid being hurt – so she moves away from people and dominant cows, or jumps after touching an electrical fence.
3. The behaviour is due to a **physical urge** caused by disease, pain, hormones, or calving.

The question 'Why is the cow doing this?' therefore provides us with some valuable information.



Clear identification of the 'at risk' animal or sick animals means that you can locate them quickly during a herd check. For this reason, some farmers identify fresh calvers with a halter, by putting a rug on them, or using a marker.



Many farmers don't like to see muck in the cubicles. However, ten percent of the cubicles should have some muck in them, because if the smaller heifers do not pass dung in the cubicles, then the cubicles will be too small for larger cows.

The calves want to lie on the slats but can't because of the gate. Why do they want to lie down? Is the reason to do with social order, cubicle comfort, shed climate, cubicle climate, or overcrowding?





It's an old wives' tale that cows prefer to stand with their front feet higher than their back feet. On a hill you rarely see this behaviour – they will graze uphill as well as downhill. However, when lying down they often prefer to have their front end somewhat higher.

Look and compare

If you don't know whether something is normal or not, compare the animal in question with another. Do this on your own farm first, and then have a look elsewhere. A comparison with completely different situations can provide really useful information.

Be prepared

In the shed make use of your eyes, nose, and hands. 'Paper' information plays a supporting role too in the form of action lists, milk production data, and fertility and disease charts. Notes from previous inspections together with the day's action lists are helpful when making observations. In this way, observing begins in the office.

Work systematically

Cow-focussed management depends on a routine and a structured approach to observation. Use checklists when doing your rounds. Work with daily and weekly schedules in order to make effective and efficient use of time. These observations are additional to those made at other times, such as milking and feeding.

Ensure that every animal receives attention:

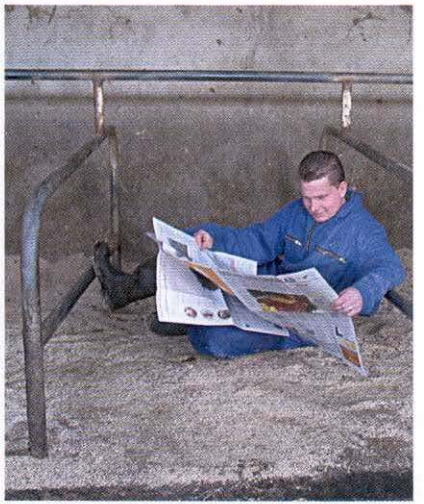
- Evaluate the dry cows, down-calving heifers, and milking cows three times a day.
- Look at the young stock and the bulling heifers twice a day.

Invest in routines

Routines and an intelligent set-up improve the quality of daily checks. Don't forget to walk among the heifers and dry cows. Walking through the cubicles is preferable to just going down the feed passage. Make gaps in the feed barrier, to provide easier access to the animals. A well-placed foot crush ensures that you can examine a lame cow whenever necessary. These are all examples of simple things that can help provide you with a lot of information.

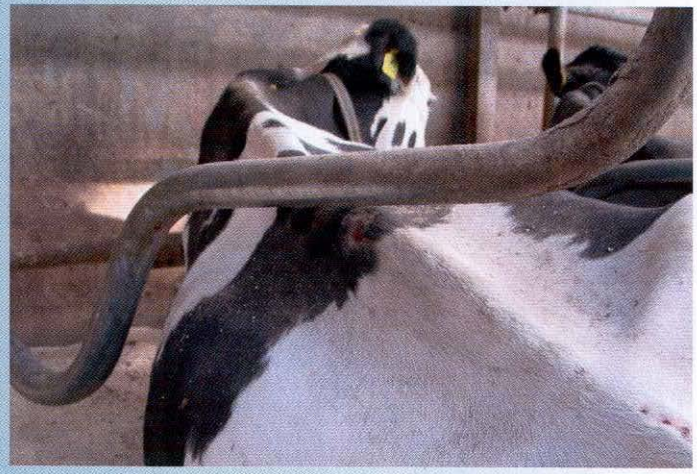
Sufficient lighting and a good view of the whole shed are necessary in order to observe all of the animals. Here, the central structure limits the view.





Sufficient lighting means you should be able to read a newspaper easily anywhere in the shed.

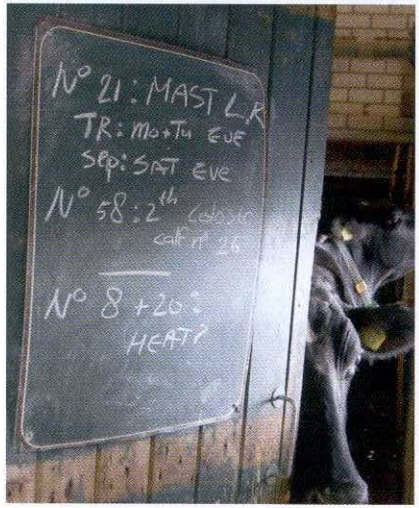




It is important to make the connection between cause and effect. We see the effect (lump on the back) and look for the cause (cubicle). By the way, the cow in the picture on the left has not eaten enough and appears to favour her left hind leg.

Valuable reminders

Nobody can remember everything accurately, so write things down on a notepad, blackboard, or computer. With data from previous observations on hand, new observations can be kept in context. On farms with a workforce of more than one, exchanging information helps ensure everyone is up to date. In addition, writing things down forces you to describe clearly what you see, which will help you sharpen your observations.

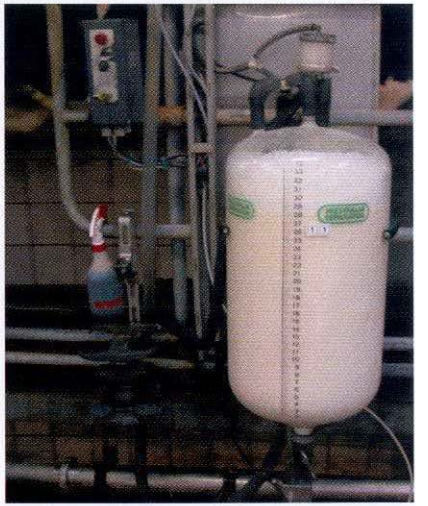


Poor cubicle design causes swollen hocks and skin injuries on large and heavy cows and cows that have difficulty walking. The cows have difficulty getting up and lying down.





Pregnant heifers are susceptible to mineral deficiencies because their ration is often not supplemented with concentrates. This manifests as reduced resistance to infections at calving (mastitis), retained placenta, and the birth of weak calves, etc.



High-yielding cows are vulnerable, so often function as signal animals in the herd.

Risk groups

Certain groups of animals are at greater risk than others. Animals in risk groups are the first to send out the signals indicating that something is going wrong. Spotting something abnormal in an animal from a risk group should set alarm bells ringing, because it's a group signal and other animals are likely to develop similar symptoms.

Every risk has its own associated risk groups and every group has its own associated risks. High-yielding cows, for example, will be the first to show that there is a problem with the ration. Risks are always present. The challenge is to limit them, identify them early, and respond quickly, so that they do not cause too much damage.

Indicator animals

If certain risks first become apparent in certain groups of animals, you can use these groups to monitor these risks. The cows in the risk group then function as indicator animals. For example, if you're worried about the availability of forage because access to it is limited, then monitor the animals that will have a problem first: the heifers in the milking herd. If their production and food intake are disappointing, this is an indication that more forage needs to be provided.

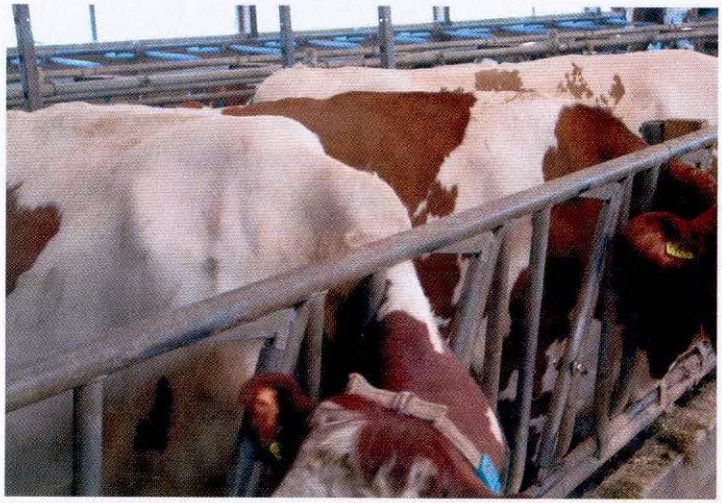
Risk groups, risks, and cow signals

Some randomly selected examples of risk groups, risks, and the cow signals used to monitor them

Risk group	Risk	Cow signal
Freshly calved cows	Metritis Mastitis	• Slow • Fever (> 39 °C /102.5 °F) • Swelling, discharge
	Milk fever	• Slow, decreased appetite • Cold ears • Weak muscles, unable to stand up • No fever
	Insufficient energy intake	• Slow • Poor rumen fill (score ≤ 2) • Smell of acetone on breath and in milk • High fat and/or low protein
Cows in heat	Insufficient energy intake	• Insufficient rumen fill • Reduced feeding time
	Injuries	• Activity of a cow in heat • Restlessness, evasive actions
Calves that are not protected against lung worm	Lung worm infection	• Coughing • Weight loss



This cow has milk fever. This signal may indicate that all dry cows are at an increased risk of milk fever. The dry cow and down-calving management need to be evaluated critically.



Tall cows are the first ones to indicate that the top rail of the feed barrier is too low. When in doubt about the correct height of the top rail, check the necks of tall cows.

Risk locations

In addition to risk animals, there are also risk locations that can be identified on a farm. These are places where animals could be injured or be at risk from dangers in their environment. Risk locations require regular monitoring and assessment. Implement improvements if the risk of injury is high.

Examples of risk locations

- A long, rough track. Heavy wear of the hooves and possible injury from small stones.
- Pasture. At pasture, cows are very susceptible to extremes in the weather – sun, wind or rain – which can lead to reduced food and water intake.
- The yoke. Minor shortcomings caused by frequent use can lead to major problems, and if animals try to escape through a damaged yoke they may be injured.
- Cold, wet bedding for calves. Calves are very susceptible to draughts and damp.



The unfenced ditch is the habitat of the liver fluke snail. The risk of liver fluke is greatly increased because the most palatable grass grows along the water's edge. Having cows and sheep graze together increases the risk, as sheep and goats excrete large numbers of liver fluke eggs.



The modification shown here reduces the risk of cold air and draughts over the calves. The board on the wall can be folded down during cold periods to provide a more comfortable environment.

Times of risk

Times of risk are identified as periods with an increased risk of disease, ailments, and discomfort. This can be related to season, age, stage of lactation, and certain activities (moving cattle, mixing groups). Make more frequent checks during these times. In many cases, stress and change play an important role. Stress causes a decrease in food intake and weakening of the immune system. It is essential to be prepared for these risk periods and to monitor them. What might happen? Often, preventive measures can be taken to ensure animals get through these periods without problems. Responding rapidly to problems can prevent serious consequences. Plan ahead and then you'll be able to assess whether everything is as it should be and detect problems promptly.

Examples of times of risk

- Drying off
- New cows in the herd
- Calving
- Dietary changes
- Weather changes
- Busy or absent farmer
- Moving cattle
- Heat stress
- Standing for more than an hour
- Restlessness



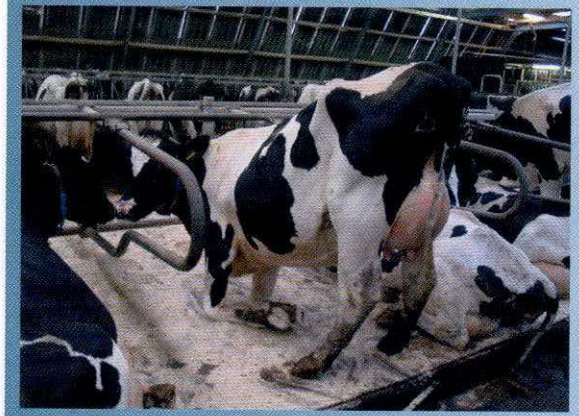
Cows in heat create risks, for themselves and other cows. On concrete, cows can slip and fall and risk breaking a bone, treading on teats, and other injuries. Separating a cow that is in heat can prevent some of these risks.



Young calves experience lots of changes, such as weaning, changing pens, and combining groups. In order to make the best management decisions it's important to monitor their growth and development, and their comfort.



Judging by the hairy appearance of this heifer, it's autumn. Is there still enough palatable grass? The abdominal fill of this animal indicates that she hasn't eaten enough.





Why aren't these cows doing what they want to? The heifer can't stand up properly because the neck rail is obstructing her. Perhaps the floor is also too slippery. The high step is an obstacle for the cow in the straw yard.

Not completing intentional movements

If a cow looks as if she intends to do something, makes an attempt to do it, but then stops, you should ask yourself why she didn't follow through her intention and what circumstance or stimulus made her change her mind. When you have learned to recognise a cow's normal behaviour and the things that might inhibit this, you will have acquired valuable information about underlying relations in a herd, housing, or the health of a cow.

One cow is looking for food, the other one is looking straight ahead and is dribbling saliva. It appears that these animals would like to eat more but the leftovers are not very appetising.





Picture Puzzle

What is this cow telling us?

Apprehensive eyes and ears suggest nervousness. She seems to be walking cautiously. Possible causes are slippery slats, lameness, bullying in the herd, or maybe deficiencies (e.g. magnesium) and poisoning (e.g. lead).

Unclassified notable observations

An observation which defies explanation is an extremely valuable type of cow signal. A collective term has been invented for this: unclassified notable observations (UNO, 'You know'). At first glance, the findings may appear to be insignificant, but on reflection and after further consideration, the observations will begin to stick in your mind.

Of course, not every UNO will give cause for concern. However, after recognising a potentially harmful UNO, you'll try to find an explanation for why it's happening. If you fail, then ask advisers, other farmers or search on the internet. The quest for an explanation will, hopefully, end with the exclamation 'Oh, that's why!'

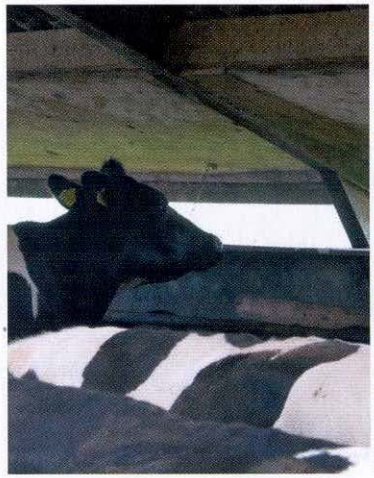
When evaluating UNOs, use the same three steps used to evaluate cow signals:

1. Describe exactly what you see.
2. Ask yourself – or someone else – what the cause is.
3. Determine what influence the signal has on comfort, health and production, and decide whether or not to take action.



Example 1

1. *This cow is drinking dirty water as she comes in from the field.*
2. *She is doing so because she's thirsty and the water is there. Is she the only one doing this? (Some cows lick objects and drink dirty water for no apparent reason.)*
3. *The behaviour is undesirable because dirty water may contain germs and toxic substances. One solution is to supply clean drinking water at easily accessible locations in the field.*





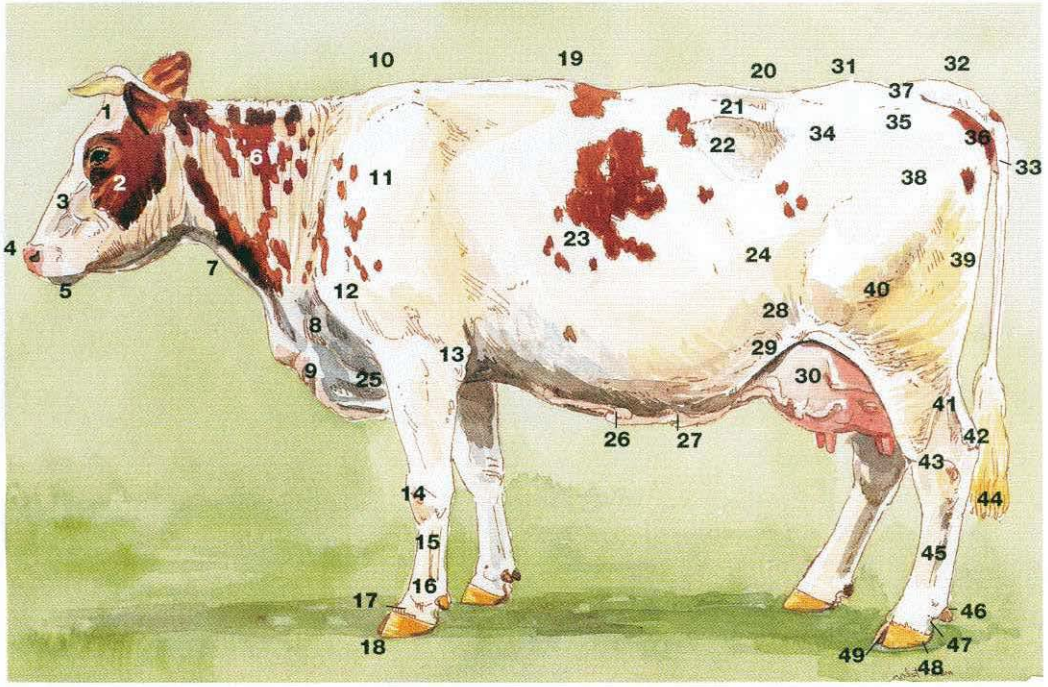
Example 2

1. *The cow on the left has her nose near the air intake and appears to be looking outside.*
2. *She's doing this in order to breathe in the fresh air, and also out of curiosity.*
3. *A shed must have good ventilation, because a milking cow generates a lot of heat which she breathes out. Fresh air at the nostrils is particularly important. An open sidewall in the shed (picture on the right) ensures good ventilation and provides an outside view.*

Anatomy of a cow

In order to fully understand the cow and to be able to talk about her, you need some knowledge of her anatomy. Where is the knee, for example? Which part of the leg are we talking about? Where are the lumbar vertebrae, the paralumbar fossa, dewlap, tail hollow, and suspensory ligaments? As well as knowing the anatomy, it is also important to know what certain terms refer to: the height at the withers, for example. Even farmers with years of experience can use the wrong names for certain structures. It would be a shame if this stood in the way of gaining a full understanding of cow signals. For this reason, there's a short section on anatomy at the end of this chapter. See the pictures on this page and the next.

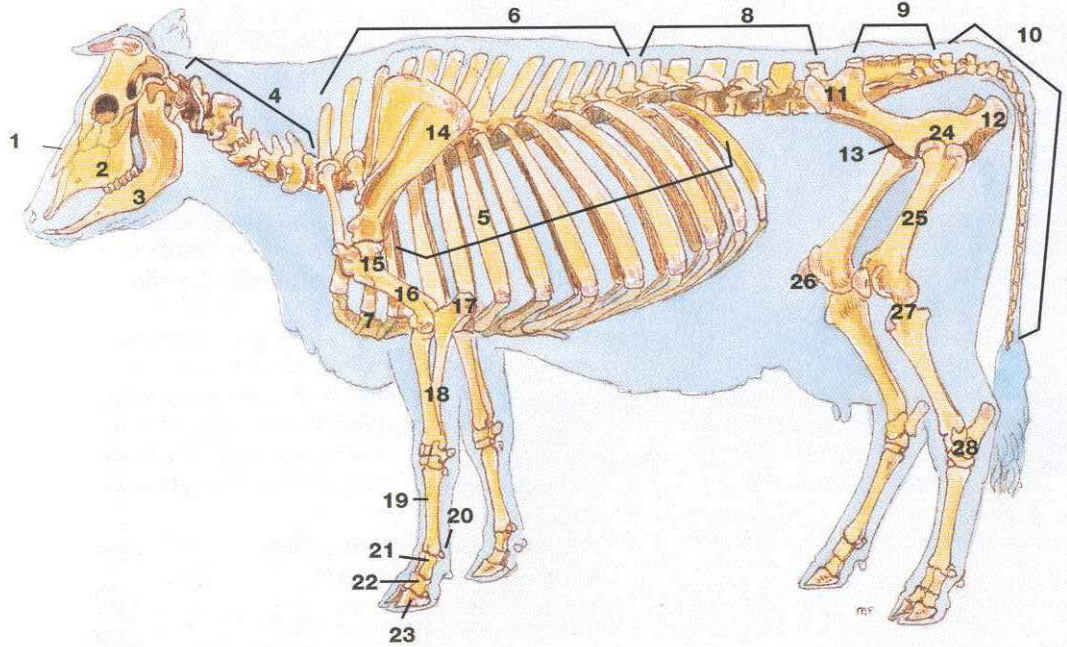
1 forehead
2 cheek
3 bridge of nose
4 muzzle
5 chin
6 neck
7 throat
8 breast
9 dewlap
10 withers
11 shoulder blade
12 point of shoulder
13 elbow
14 knee
15 front shin
16 fetlock
17 coronary band
18 hoof/claws
19 back
20 loin
21 transverse processes of lumbar vertebrae
22 paralumbar fossa
23 chest wall, ribs
24 flank

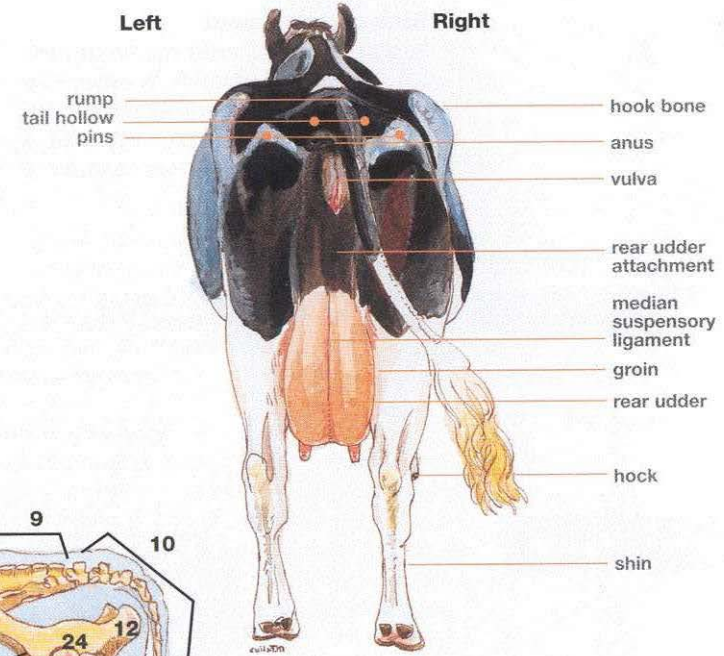


25 brisket
26 milk vein
27 navel
28 lower flank
29 inguinal fold
30 fore udder
31 rump
32 tailhead
33 vulva
34 hook bone
35 rump plate
36 pin bone
37 ligaments
38 hip joint
39 thigh
40 stifle
41 Achilles tendon
42 hock
43 hock joint
44 switch
45 rear shin
46 dew claw
47 pastern
48 heel
49 interdigital space

The skeleton

1 nose bone
2 upper jaw
3 lower jaw
4 cervical (neck) vertebrae
5 ribs
6 thoracic vertebrae
7 sternum
8 lumbar vertebrae
9 sacrum
10 coccygeal (tail) vertebrae
11 ilium (hook bone)
12 ischium (pin bone)
13 pelvis
14 scapula (shoulder blade)
15 shoulder joint
16 humerus
17 elbow joint
18 radius & ulna
19 metacarpus (shin)
20 fetlock
21 proximal phalanx
22 middle phalanx
23 distal phalanx
24 hip joint
25 femur
26 patella (knee cap)
27 stifle joint
28 tarsal (hock) joint





Viewed from behind, the cow has a pear/apple appearance or shape. On the right, the pear shape is due to the weight of the intestines or the calf. On the left, the rumen gives the apple shape.

Don't just look: observe!

Risk management

To a large extent, risks can be controlled. We can distinguish between two types of risk: known and unknown. You can control known risks by using a good management strategy. In order to minimise unknown risks, it is important to be alert at all times. The damage caused by these risks will depend on how effectively you respond.

Prevention and damage control

Prevention	How?	Examples
= reduce the likelihood of a risk occurring	• Guarantee success.	• Excellent silage and food management.
	• Incorporate risk-reducing strategies into daily routines.	• Calve all cows in a clean, safe, and accessible area. • Maintain a closed herd (do not buy in).
	• High-quality housing and equipment.	• A well-functioning self-locking yoke. • An accessible, well-functioning foot-trimming crush with sharp hoof knives to hand.
	• Ongoing alertness and control.	• Go on courses and stay up to date on technical issues. • Be willing to change. • Check the young stock and dry cows twice a day. • Try to prevent 'farm blindness' developing.

When the risk happens

Damage control	How?	Examples
= ensuring that any damage resulting from the risk is minimised	• Identify the risk quickly • Act quickly. • Act effectively.	• Thorough checks. • Discipline. • Have the necessary knowledge, skills and equipment, and use them.

Success factors

Avoiding risks and working out what has gone wrong are important steps in improving any farm's management. But even without doing this, you can continue to improve your farm. A successful farm is not determined by the absence of mistakes but by the proper development of the prerequisites for success. Successful entrepreneurs identify and focus on key factors within their business that will lead to success.

These factors depend on the objectives of the business. On a farm some of the goals could be cows that produce an average of 10,000 litres of milk, consume a lot of forage, and remain healthy. To achieve this, you'd need cows with:

- good health, especially feet and legs;
- high genetic potential for conformation and production;
- a capacity to consume lots of food and to utilise it effectively.

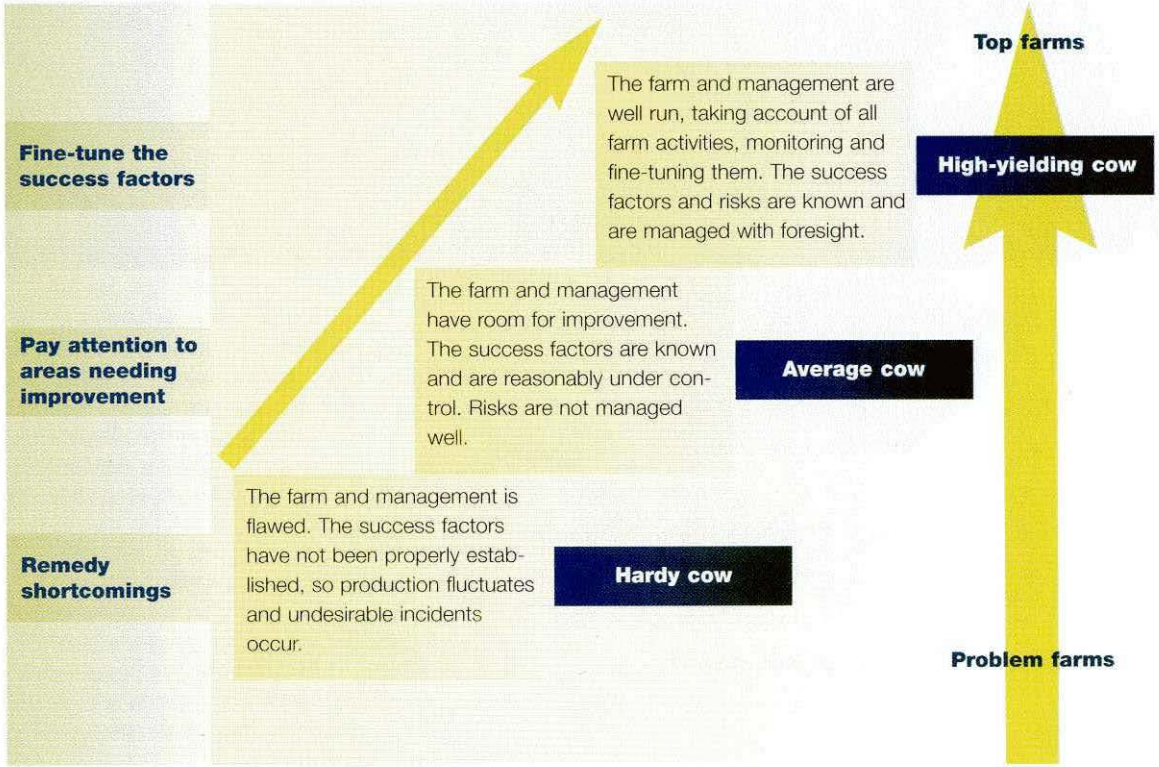
Plus farm management with:

- high-quality risk management;
- optimal availability of food, with high quality, palatable dietary components in the right proportions;
- good housing and outstanding care.

Monitoring the success factors

Monitoring the success factors is the most important part of animal and farm checks. At any particular moment, you must determine whether everything is as it should be (all farm activities, health status) and whether this is likely to continue (risk management).

A farm can develop into a first rate operation if you eliminate management mistakes, control risks, and then concentrate on fine-tuning the whole operation. The cow types listed on the right-hand side of the chart represent those best suited to the particular type of farm management listed on the left.



CHAPTER 2

At grass

You spend less time working with your cows when they are at grass, and therefore you see them less often. Checks then become more important.



Though pasture provides a pleasant setting for a cow, coming close to the natural environment, it's not ideal. Much of the natural behaviour of a cow may be observed at grass. This is true for various aspects of social behaviour, such as play, group behaviour, and establishing the pecking order. The cow's movements are also more natural at grass. You can watch how a healthy cow lies down, stands up, and grazes.

Unhindered by cubicles, narrow alleys, and the like, at pasture it is easier for you, the farmer, to notice how the cow is feeling. Which cow signals can you observe when you spend some time leaning over the gate watching the cows, or when you're walking through the herd?

Health, standard values, and risks

Observing animals at grass provides information about their normal behaviour and needs. Pasture often provides the gold standard for cow-focussed management and housing.

At pasture there are also dangers that do not exist when cows are housed, such as gut and lung worms, and disease transfer between neighbouring herds during 'over-the-fence' contact. Pregnant heifers and dry cows are at even greater risk, as these groups rarely receive supplementary food. The way a cow walks, her rumen fill, and an animal standing alone all represent signals that could indicate that there is a need to keep a closer eye on individuals or groups of animals.

The ultimate grazer

Moving her head from side to side, the cow eats all of the grass within her reach. She then takes a step forward and repeats the process. When palatable grass is available, a cow eats approximately 1kg of dry matter per hour. To enable a cow to eat in the same way at a feed barrier, the trough should be 10 to 15 cm above floor level.



Sunburn on white skin, which is more sensitive. Cause: liver disease or exposure to certain plants (St. John's wort, buckwheat). Animals become very ill and need to be moved indoors quickly, away from direct sunlight.



During sunny, hot periods, cows seek out a shady place to keep cool. During extremely hot weather, cows reduce their food intake considerably. Rumen fill then becomes an important signal to check.

Checks at pasture

When at pasture, checks are invaluable. A number of traits require special attention.

- **Hair colour, shine, abnormal behaviour and diarrhoea.** Changes in behaviour are the first signs of disease, discomfort, and pain. The animal is slow, has difficulty keeping up with the group, eats and drinks less or at different times, and separates itself from the herd.
- **Rumen fill, abdominal fill, and condition score.** These provide information about food intake over the last twenty-four hours, the last couple of days, and in recent weeks, respectively.
- **Uniformity of the herd.** Are there differences between animals? What are they? Why have they arisen? What does this mean?
- **Grazing behaviour.** Grazing behaviour provides information about food intake, risks from poisonous plants, and internal parasites. Where and what are the animals eating?
- **Specific checks for cows that are being grazed very extensively.** Special attention is required in the spring when the cows are calving, and then during the service period and pregnancy. Pay particular attention to the level of food intake during periods of reduced grass growth. At certain times, the availability of minerals also requires consideration.
- **Things to note.** Make a point of looking out for wounds and injuries, ticks, signs of fly irritation, itching, eye infections, mastitis, and lameness.



This bull is itchy because of a lice infestation. He has scratched his ribs bare with his horns and has licked his rear end repeatedly.

Disease risks at grass

Grazing behaviour has a considerable effect on the development of risks in certain areas. The risk of gut and lung worm infections is much higher when animals only graze a small area of a pasture, and around feed troughs and when there are not enough places to drink.

Acorns

Cows rarely or never eat poisonous plants unless there is not enough food available or when the plants are in hay or silage. There is one exception: acorns. Cows are fond of acorns. Ripe acorns contain only traces of poisonous substances, but unripe acorns are poisonous and can cause intestinal problems, diarrhoea, and even death.

Permanent pasture and suckler cows

Grazing permanent pasture presents specific challenges. The quality of the grass varies greatly, and wild flowers, bushes, and trees also grow there. The terrain is also more variable than improved grassland.

Like your animals, you the farmer need to get to know an area. At first this will involve fairly intensive monitoring. Additional tests, such as blood samples, dung samples and post mortems can provide a lot more information. The animals need to become familiar with the fencing, find water, and establish a social order within the group.

When there are lots of cattle in one group, it is difficult to separate a single animal or a small group. The herd tends to group together and the separated animals will keep trying to rejoin them. Solution: collect all the animals in an enclosure and then separate the animal you need.

In dry years, animals graze the wet spots where grass is still growing. This increases the risk of infection with gut and lung worms, and of the dangerous parasite liver fluke, which spreads via snails that live along the water's edge.

Picture puzzle *What is happening?*



This udder has been sucked completely empty. The teat skin is glistening with saliva and a chewed piece of grass from the calf's mouth has been left behind on the teat.



A cow's senses

It is helpful to be familiar with the cow's senses so that you can identify with the animal. However, this is not easy because cows are put together differently to humans.

Cows hear differently to people

While humans hear best between 1,000 and 4,000 Hz, a cow hears best around 8,000 Hz. So she hears higher notes better than we do, and can hear some sounds that we cannot hear at all. Cows' normal vocalisation and calls are within their optimal hearing range. Humans are probably better than cows at pinpointing the source of noise.

Cow meets dog. The cow is making use of her most important senses: vision, hearing and smell.



Don't feed smelly food

Cows have very good noses and smell plays an important role in their behaviour. Therefore, they select their food on the basis on smell. They find dung particularly unpleasant. Cattle do not graze close to their own cowpats, unless absolutely necessary (when food is limited). It's natural for grassy tufts to form around cowpats; if there are none, this could indicate that there is not enough food. Cows also dislike the smell of saliva. So when housed, their food and troughs need to be clean and smell fresh, not be contaminated with dung, saliva, or snot from other cows.

During grazing, cattle avoid cowpats because of the smell. This is how the typical grassy tufts develop around cowpats.



Vision

Since her eyes are positioned on the side of her head, a cow has almost 360° vision except for a small section, directly behind her. However, she can only gauge distances straight ahead, as this requires information from both eyes. For this reason, it is wise to approach a nervous cow from the side or at an angle, so she doesn't realise that you are getting closer. A calm cow, on the other hand, should be approached from the front, because she wants to see you clearly. Cows have poorer long-distance vision than humans. They also appreciate light and dark in a different way to humans. (See chapter 3).

The cow's visual range. Cows only have three-dimensional vision directly in front of them and use this to estimate distance.





Cows match each other's behaviour. They eat at the same time; they lie down at the same time.

Threatening behaviour is a subtle means of confirming social order. Here the cow on the right is threatening the cow on the left, who then displays submissive behaviour.



Group behaviour

Cows are herd animals. Most types of behaviour normally occur within the herd and take place at the same time. The lead cows start grazing and then the rest follow suit. This is commonly seen on dairy farms. When the cows get to the pasture in the morning, the entire herd starts to eat and subsequently lies down. Some hours later, the animals all get up together and start to graze again, facing the same way. After a while this pattern becomes blurred and a range of activities can be seen simultaneously.

A cow's herd-type behaviour is synchronised with daylight: eating after sunrise, lying down in the middle of the day, eating again in the evening. If you feed cows in the morning, this coincides with their natural behaviour.

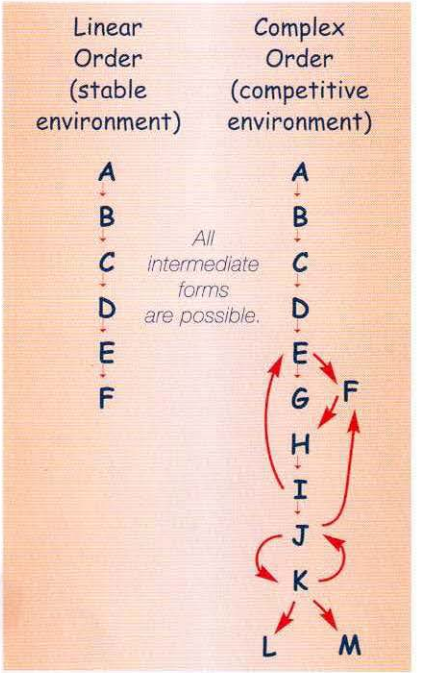
Groups within a herd

Every herd has a social structure. Most of the time, each animal is part of a group of ten to twelve animals. This group often contains animals that are of the same age and were reared together. This small group is then part of a larger group of fifty to seventy cattle. It is thought that this is the maximum number of animals that a cow can remember.

In the wild, herds consist of several groups: adult cows and calves, heifers, and – maybe – young bulls. These herds tend to fall apart when they exceed two hundred animals.

Social order

Social order among cows can vary greatly in structure. If there is no competition for food or space, then the order will be simple and linear. For example, at pasture when there is plenty of grass. However, the more competition, the more complex the order.



Social order does not always have to be linear. Very complex orders frequently exist in larger herds, due to the pressure from competition for food and space.

Source: (Beilharz and Mylrea, 1963)

Climbing the social ladder

Social order is about the right to eat first. Apart from a cow's character, ranking is determined by age, size, and weight. Older cows are often at the top, while heifers start at the bottom. Dominant cows are usually surrounded by low-ranking animals. Cows regularly compete to improve or maintain their position. Conflicts occur especially among animals that have virtually the same rank. When new animals are introduced, competition for position takes place and is often decided in the course of one day. Using subtle signals, cows continually reaffirm their position. A dominant cow can do this with the swing of her head, and the lower-ranking animal then makes an evasive move. For smooth social interaction, sufficient space is necessary so that the animals can avoid each other and can easily display their dominance or submission.

Affection and fear

Licking each other confirms a social bond but does not play a role in establishing order, neither does mooing. When mooing, an animal is trying to say 'I'm here'. This is important between a dam and calf, for bulls, and for animals that are separated from their group. Cows also tend to moo when they are in heat and are hungry.

Every animal has an imagined personal space or escape zone. Within this space, the cow will respond to an intruder either by escaping, socialising, or attacking. The size of this space varies. In an environment with little competition, cows are calm and have a small personal space. There is also a difference between breeds. When a cow encounters people or animals she doesn't know, or mixes with horned cattle, she feels threatened and will enlarge her escape zone. Stability is created through security and trust. Cows feel more secure if they know that there is plenty of food, where the escape routes are, and have confidence in the behaviour of stockmen. This explains why cows are anxious when on slippery floors, when very lame, or when in the presence of unpredictable personnel. The more you are around the cows, the calmer they will be. You may be able to get closer to timid cattle by car or tractor than on foot because you are perceived to be less of a threat. Heifers are always more timorous than mature animals. However, on account of their natural curiosity and after positive experiences, they become more confident.



An illustration of a cow's personal space. As soon as someone enters the imaginary dark green space, the cow will attack or flee. Only trusted friends are allowed to enter.



Bulls are always dangerous, especially when they have a small flight zone.

Lying down and getting up

When a cow is at grass, the processes of getting up and lying down give a good indication of the space that a cubicle should provide. At the front, the cow needs sufficient space to be able to lunge forward. The front half of the mature cow is heaviest: 55 percent of the total body weight. Proper positioning of the legs, with sufficient grip, is important in order to use the least amount of energy and effort. The cow also needs to be able to stretch out her front legs.

- *First the cow lifts her head and brings her front legs under her chest.*
- *She stretches her head forward to counterbalance her back end. The front legs function as the balancing point. This cow is now more than 3 m long.*
- *The hind legs are positioned under the body. Her head is almost touching the ground.*
- *The head is being retracted again and the cow has put one front leg forward in order to keep her balance.*
- *Finally, the fourth leg is in place and the animal can begin walking, but not until she has taken a moment to stretch.*







A comfortable cow lies with her head forward and at an angle. Often she has a front leg stretched out.

Heat (oestrus)

A fertility cycle lasts between 18 and 25 (average of 21) days. Good heat detection requires patience on the part of the stockmen, plus a settled herd. Obser-ving twice a day for 30 minutes sometimes provides more information than observing three times for 20 minutes. Approximately 60 percent of heats occur at night. Only half of the cows display a standing heat and the heat periods of many cows last less than half a day, sometimes as little as four hours. Both bulls and heavily pregnant cows are very helpful for detecting cows in heat.

Heat signals

Heats can be scored. The following list is handy for this, but what matters at the end of the day is the overall picture. A cow scoring 50 to 100 points in 24 hours is very likely to be in heat. If she scores more than 100 points, then she's almost certainly in heat. Serve a cow twelve hours after deciding she is in heat.

Bulling string	**3 points**
Restlessness/fighting	**5 points**
Being jumped by others, not standing still	**10 points**
Sniffing and licking the vulva of another cow	**10 points**
Resting chin on the rump of another cow	**15 points**
Jumping other cows	**35 points**
Jumping front end of other cows	**100 points**
Standing heat	**100 points**

Source: Van Eerdenburg, 2003


1.

1. *Cows with elevated oestrogen levels are the most responsive to a cow that is in heat. Sometimes they also display oestrus behaviour. This includes cows that are mid-cycle (ten to twelve days after a heat), in late pregnancy, and those with ovarian abnormalities (cysts).*

2. *Resting the chin on the rump on another cow is a gesture that registers an intention to jump. This behaviour is one of the stronger signals of heat.*

3. *Here the cow being jumped is walking away, which means that the cow doing the jumping is more likely to be the one in heat.*

4. *Here the cow being jumped is standing still, so she's the one in heat.*

5. *The state of the uterus and ovaries provides information about the heat. This can be determined by doing a rectal, but this requires skill and specialised knowledge. The uterus contracts when touched. Clear, stringy slime is discharged from the vulva. One ovary (occasionally both) contains a large follicle. After ovulation, the empty ovulation fossa can be palpated.*


2.


3.


4.


5.

Flies can cause a lot of irritation. The problem is more common in areas with many trees. The photograph below shows a fly surrounded by other fly bites. Fly control reduces the irritation and cows are more settled. It also reduces the risk of summer mastitis (an udder infection) and New Forest disease (pink eye).





Attention to cow comfort

Although pasture is the most natural environment for cattle, it is still necessary to consider the cow's comfort. However, certain aspects may be beyond your control. Wind, rain, and dampness are unavoidable. In these situations, animals really appreciate shelter. At a minimum, they must always have a dry area where they can lie.

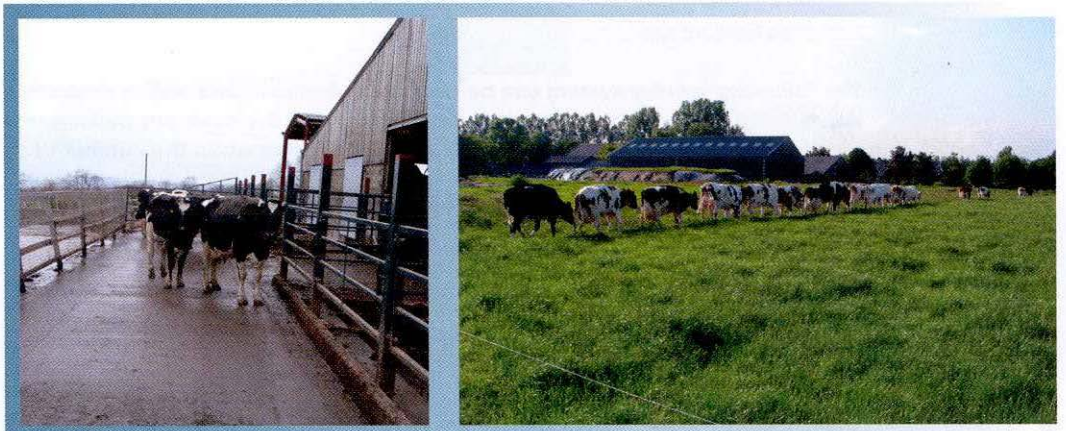


The cows should have easy access to plenty of clean drinking water at grass, too. That is not the case here. The cow on the right has a poorly filled rumen, as do the other two cows, and so none of them will produce optimally.

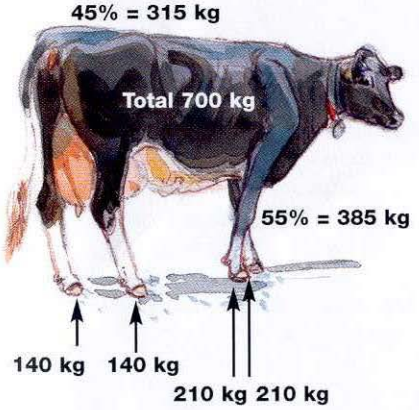
Hooves at pasture

Pasture provides a healthy environment for hooves. The ground is soft and provides a good grip. There are also fewer bacteria waiting to threaten hoof health. However, a cow often has to travel quite a distance to and from the pasture along a hard track. Cows usually walk in a line. When walking over a rough surface, hooves are worn down and injuries can occur, especially during wet periods when the hooves are softer.

There is also a social order, even when cows are walking in a line. Dominant cows push and can bring the line to a standstill. Driving cows in an impatient way leads to fighting and sudden movements, and may frighten the cows. Then the cows don't get time to see where they are putting their feet. A good path is shock absorbent and has a smooth surface, without sharp stones. Always remain calm when driving cattle.



The farm track is a high-risk area for hoof injuries, whatever the surface. Solutions: maintain good hoof health, ensure good drainage of farm tracks, remove small stones, move cows calmly, when foot trimming do not remove too much horn, and for the track base use soft material that provides good grip.





Each leg of a cow carries a significant weight load. The weight is evenly distributed when the cow stands squarely on all four legs. When she walks, the load increases substantially: when one leg is moving the other three take the weight. Due to uneven wear, the outer claw grows faster than the inner one, which results in greater weight being placed on the outer claw.



When cows are lying down at pasture, their behaviour provides a lot of information about their well-being. Lame and stiff cows lie in a less upright position. In addition, they have a much greater tendency to lie on their side compared with healthy cows. They also hold their head lower.

Locomotion score

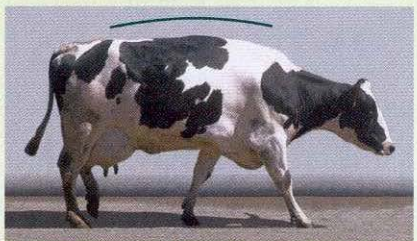
The following scoring system can be used for individual cows and to evaluate overall herd status. When doing this, make sure, that the cows are walking on a level, hard surface with sufficient grip. Take action when the number of cows scoring 2 and 3 increases.
Points to note: infection levels, foot trimming, and nutrition.

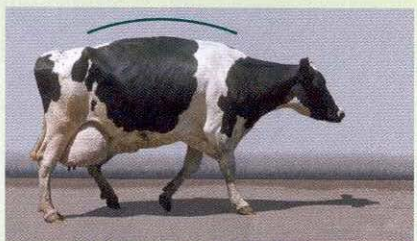

Back when standing: straight & level


Back when standing: straight & level


Back when standing: arched


Back when moving: straight & level


Back when moving: arched


Back when moving: arched

Locomotion score 1
The healthy walk
The animal stands and walks normally. She places all hooves with confidence; the rear hooves are placed where the front hooves were.
Conclusion: good.*

Locomotion score 2
The slightly abnormal walk
The cow stands normally but arches her back when she starts to walk. Her head is held lower and extended from the body. Her gait is slightly abnormal.
Conclusion: this cow needs attention.*

Locomotion score 3
The lame cow
The cow arches her back both when standing still and when walking. She takes short steps with one or more legs.

Conclusion: this cow requires treatment today.*

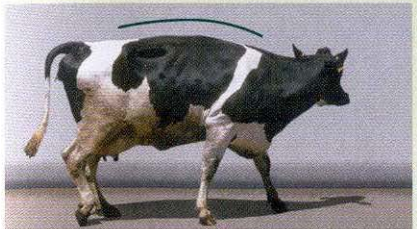
Source: Steven L. Berry, DVM, MPVM
Univ. of Davis, CA, and Zinpro® Corporation (1997)



Back when standing: arched



Back when standing: arched



Back when moving: arched



Back when moving: arched/can't assess

Locomotion score 4

The very lame cow

The animal tries to reduce the weight on one or more feet. She arches her back both when standing still and when moving.

Conclusion: this cow needs immediate treatment and nursing care.*

Locomotion score 5

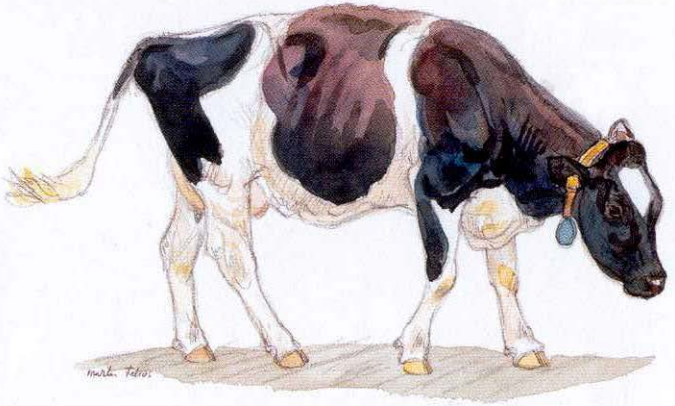
The crippled cow

The animal has an arched back. She refuses to stand on a particular hoof, or limps. She prefers to remain lying down, or has great difficulty when trying to get up.

Conclusion: this very lame, sick cow needs intensive care and professional treatment.*

*These are my conclusions. J.H.

Picture Puzzle *Which leg is affected?*



The cow 'falls' onto the sound front or rear foot. As she does so, she uses her head as a counterbalance in order to relieve the sore foot.

- *when lame on one of the front feet, she throws her head up as she puts weight on the sore foot and then her head comes down when she lands on the sound foot.*
- *when lame on one of the hind legs, she swings her head down when putting pressure on the sore foot and then the head goes up when she stands on the sound foot. The front legs act as the point of balance.*

This cow is lame in the right front leg.

Types of lameness and causes

- Lameness evident when standing: pain in bones and joints, usually of the lower limb. Moving is not painful, but bearing weight is. The cow swings the foot forward smoothly, but then tries to avoid putting weight on it.
- Lameness only evident when moving: pain in tendons or muscles. Locomotion is painful. The animal tries to move the leg as little as possible but does not have difficulty bearing weight. Combinations also occur.

CHAPTER 3

When housed



A cubicle shed with sufficient light and cows lying down, but very crowded.

Sustainable dairy farming depends on the optimum health, welfare, and productivity of the animals. In our climate, cows are usually housed for at least six months of the year, and during the grazing period the milking herd comes in at least twice a day for a couple of hours to be milked. Therefore, the farm buildings are an important part of the enterprise.

A cowshed is a system in which various factors interact: the lay-out (feed barrier, calving pen, ventilation), dimensions (width of passageways, roof height), materials (concrete or rubber floors, straw yards), management (hygiene, feeding, stocking density) and the animals, to mention just a few. Lame cows place a higher demand on the floor area and the cubicles than healthy cows, and need more space to move. The availability of forage and concentrates influences the social order in the herd and therefore the need for space.

So, what standards should a good facility try to achieve? Ultimately, one constant factor determines the standard: the cow. People translate these cow requirements into specifications on the building plan. As cows, their diet, and people change, the norms need to be modified continually. An expert's opinion is always necessary, combined with good farm sense, in order to find the best solutions. In practice, this means weighing up the pros and cons and compromising between having too much or too little.

The five freedoms of an animal

1. Freedom from hunger, thirst and malnutrition.
2. Freedom from discomfort.
3. Freedom from pain, injury, and disease.
4. Freedom to express normal behaviour.
5. Freedom from fear and distress.

J. Webster, (1999)

The European regulations for animal welfare are based on the five freedoms of an animal mentioned above. One can measure these using cow signals.

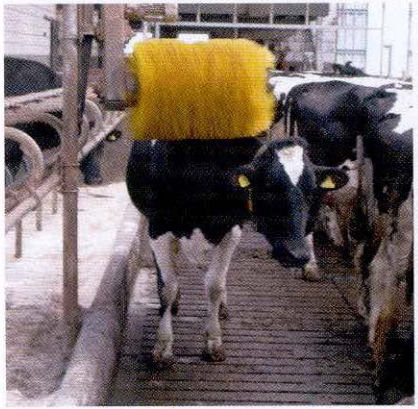
Use a critical eye

In order to evaluate animals in a shed, work from large to small. Start by looking at groups of animals. Where are the animals located? When cows and calves avoid certain places in the shed, there are many possible causes: for example, draught, heat, cold, and poor air quality, as well as cubicle comfort, slippery floors, and social conflicts.

Differences between animals

Assess whether the herd is uniform or whether there are marked differences between the animals. Pay attention to:

- **Animal development.** Are the heifers much smaller than the cows? If so, focus on heifer rearing.
- **Condition.** When more than ten percent of the animals are too fat or too thin, this indicates that there is a long-term imbalance between food intake and utilisation. Focus on trough space, availability of food during the day, hoof health, the way cows select their food, and fibre content.
- **Hair colour, coat shine, and cleanliness.** A glossy coat is a sign of a healthy animal. A dirty coat is always a bad sign.
- **Abdominal and rumen fill.** Variation is the result of differences in food intake in the last 24 hours or few days. Why did the cows eat less? Are we dealing with risk groups? High-yielding cows and those close to calving must reach their optimal food intake as soon as possible.
- **Other signs:** for example, wounds.



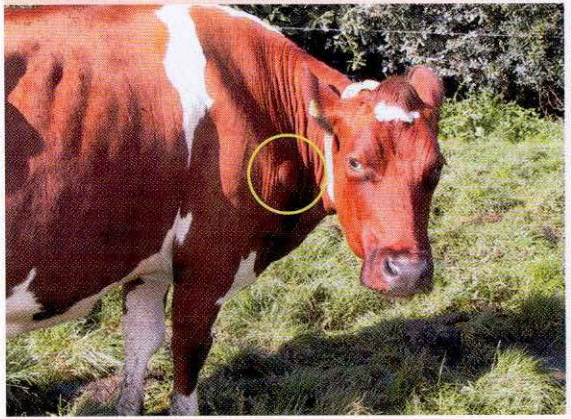
A high enjoyment factor! Grooming is pleasurable, so the cow is drooling in anticipation as she walks towards the rotating brush. The brush begins rotating when activated by the cow.



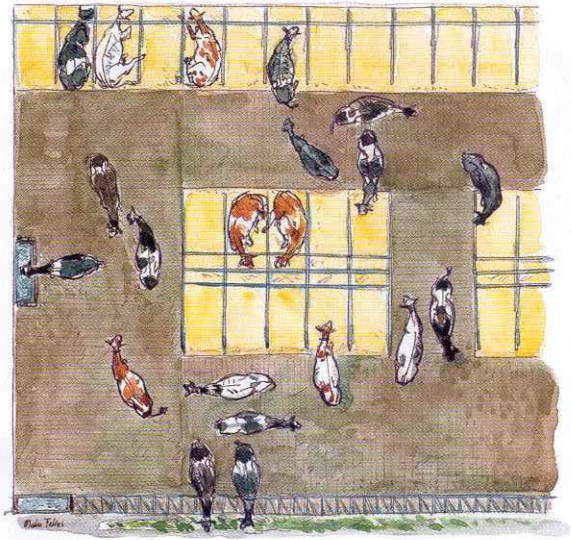
Dung on the cows indicates that little attention is given to cleanliness, or that the cows have had loose dung recently. Good hygiene reduces the risk of infections. Loose dung suggests problems with the diet, or disease.

Picture puzzle

Approximately one third of the cows in this herd have a lump on the shoulder. What does this mean?



Either the yoke is improperly constructed or installed, or the cows have to reach too far to get at their food. Improving their access to the food will prevent this.



The width of passageways is best expressed in terms of cow lengths and cow widths. The animals should be able to move past each other easily.

Space and social order

There shouldn't be anything preventing the cow having easy access to her food, the drinking water, or her bed. Every animal needs a certain amount of space in order to feel comfortable. For example, cows need to have enough room to pass each other without touching and they should be able to escape and find a safe haven. Cows with horns increase the need for space and escape routes.

Every herd has a complex social order. There are small groups with bosses and their subordinates, and leaders and followers. Bosses are those animals that are allowed to eat first; leaders initiate activities. A dominant cow forms a serious obstacle to a low-ranking animal, who only dares to pass the other cow when she feels safe. She needs to be able to escape, and in order to do that, must have enough space, healthy feet and legs, and sufficient grip on the floor. Cows that are lying down do not participate in the competition for social order.

The most common cause of fighting is competition for food; this occurs when palatable food is not available throughout the day. In the struggle to get to the tastiest food, the lower-ranking animals will always end up eating second.

Heifers have a low social rank and don't know all the cows in the herd. Due to their timidity, they lose out when competing for food. Rumen fill, milk yield, and cows that stand about aimlessly rather than, for example, eating or resting, provide information about the comfort within the herd.

Picture puzzle

What do you see in this cubicle shed if you are told that there are two water troughs and that food is only available where the cows are currently eating?



The shed is overcrowded, which causes food intake to fall. Solutions: provide more feeding space, space out the concentrate dispensers, install more drinking troughs and pay close attention to hoof health, the grip provided by the floor, heifer rearing, and management of the freshly calved heifers.



For optimal movement, two cows should be able to pass each other behind a row of cows that are eating. Cows that are lying down are out of the way and so do not take part in conflicts that arise while cows are moving around.

Risk locations

Every shed has its own risks and risk locations. By observing every location in the shed thoroughly, with or without the cows, you can prevent many problems. Risks are found not only in specific areas, but also under certain circumstances.

Examples of times of risk when housed

- Changes in the weather
- Warm weather, high humidity, frost
- Mixing groups (heifers, dry cows)
- Unrest
- Cows in heat
- Relief milker
- Drying off
- Ration changes



The cow has calved in a roomy, safe calving area, but the dung contains lots of germs that could infect the uterus and udder, as well as the calf's navel and mouth. This can cause mastitis and metritis, and navel infection, diarrhoea, and Johne's disease.



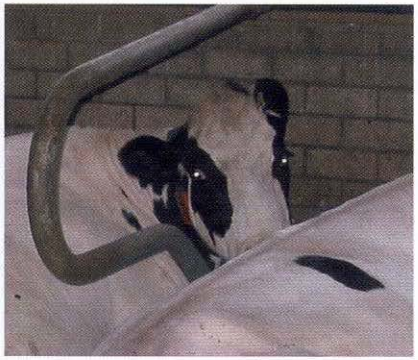
The uneven slats increase the risk of hoof injuries and the drinking trough is located at a corner, beside a concentrate dispenser. There is a lot of cow traffic here and possible competition, but cows like to drink without being interrupted. Faced with this situation, low-ranking animals would hesitate.



This slippery concrete passageway is a high-risk area. A cow in heat could cause a lot of damage, to herself and to others. Roughen the concrete or use a rubber mat, remove the muck daily. High-risk passageways severely hamper cow traffic between feed and resting area and water.



When the trough is positioned high enough, cows will not defecate in the water. However, the presence of a step puts a lot of pressure on the hooves. There is also quite a risk of slipping – for example, when a cow is being chased. Cows prefer to drink on the level.



Cows have a reflective layer (tapetum lucidum) at the back of their eyes, which enables them to see better than humans do in dim light. However, a lot more light is required to stimulate their biorhythm than for ordinary sight.

Light and climate

Cows are sensitive to the amount of light in the shed and prefer a comfortable climate.

Light and dark

Cattle are daytime creatures with a seasonal rhythm. The winter is the natural time for cows to be dry and heifers to be springing to calve (8 hours of light and 16 hours of darkness). The summer is the optimal time for lactation (14 – 16 hours of light and a minimum of 6 hours of uninterrupted darkness). These conditions stimulate milk production, the animals feel well and are more likely to show signs of heat. It is possible that an artificial winter for dry cows could have beneficial effects on their health.

Cold and heat

Cows perform optimally at a comfortable temperature. At a temperature below -5 °C the cow uses energy in order to maintain her body temperature. Above 20 °C the cow begins to use energy to stay cool. Above 25 °C, food intake begins to decrease. The overall temperature is also influenced by factors such as air movement and humidity.

Roof insulation helps to keep the heat of the sun out during the summer while keeping the building warmer in winter. Large fans can be used to provide extra ventilation. Pay careful attention to the water supply during cold and hot weather. Also consider clipping cows when they are housed.

For a cow, the level of light should be at least 200 lux. Check this with a lux meter.



Less than 50 lux (dim light) is perceived by the cow as night time. Solution: ensure the skylights are clear, increase the size of the air intakes, or install electrical lighting.



Ventilation

Milking cows produce a lot of heat, which they have to get rid of in order to avoid becoming overheated. They do this primarily through their respiratory system by evaporating moisture from their lungs. The skin also plays a role in the cooling process, especially at temperatures over 22 °C. For optimal heat loss, the humidity should not be too high. Animals breathing heavily, and condensation on walls, ceilings, and equipment are signs of poor ventilation. In addition, cows that are breathing heavily prefer to remain standing, sometimes with their front end higher than their rear. This is so that the intestines put less pressure on the diaphragm and the cow can breathe more easily. Ventilation is important, particularly around the head.

Floors

On slippery floors there is a risk that cows will slip and get injured. The cows will then move about less because they are afraid of conflicts with other cows. Using scrapers, the floors can be cleaned easily. This also has a beneficial effect on hoof health: hooves dry better and there will be a lower burden of infection. However, the scraper hinders the cows and, fearful of stepping on it, they may take measures to try and avoid the area. For this reason, cables are better than chains and encased rods. The wider the passageways, the calmer and more settled the animals will be.

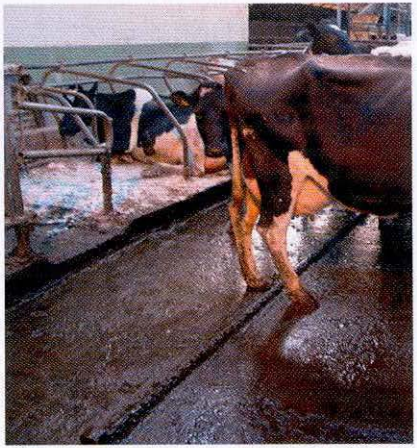
Cow signals associated with slippery floors.

- Slipping when being rounded up or when taking evasive action.
- Animals are more apprehensive.
- Poor expression of heat.
- Looking for less slippery areas in passageways: for example, the animals walk along the sides.
- Walking carefully with their legs placed apart and their head low. Taking small steps and negotiating corners with care.
- Low-ranking animals and heifers look for safe havens, such as dead-end alleys.

The presence of cobwebs is a sign that there is insufficient air movement. Check the air movement close to the cows.

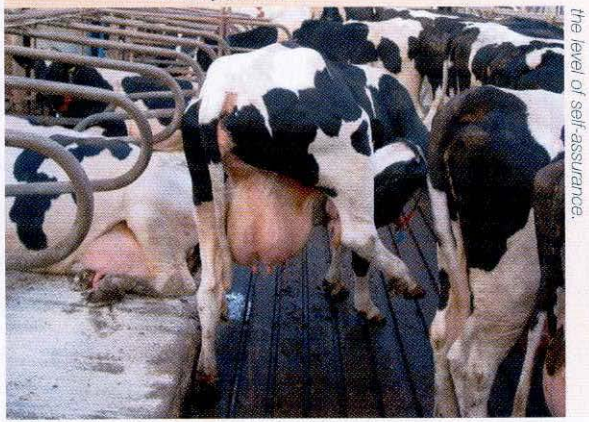


The scraper chain can catch cows unawares.



Picture puzzle

Concrete can become very slippery. In this picture, what could be the consequences?



Concrete can become very slippery. In this picture, what could be the consequences? For the cow to be able lick herself in this position, she must feel very self-assured. A slippery floor, a crowded shed, and an unsettled herd all reduce the level of self-assurance.

Hoof score

Hoof problems can cause cows great pain and directly affect production because lame cows visit feed barriers and concentrate dispensers less frequently. It is therefore important to detect symptoms early. The hoof score chart found below can be helpful in this regard. A variety of symptoms may occur simultaneously.

	Score 1	Score 2	Score 3
Foul-in-the-foot (dermatitis interdigitalitis) An eczema-like infection, that begins in the cleft between the claws and extends to the heel. In the heel area, small cracks and cuts develop, and in some cases the horn tissue separates completely. • Cause: bacteria. • Risk groups: all. • Treatment: foot trimming, formalin footbaths. • Prevention: reduce risks of infection (foot trimming, footbaths, dry floors).	 *Mild inflammation of the skin, with a putrid yellow discharge between the claws.*	 *Severe inflammation of the skin, which also affects the heels (cracks, punctures).*	 *Extensive moist inflammation of the heels extending into the interdigital space.*
Digital dermatitis or strawberry footrot (dermatitis digitalis) Usually a discrete area of infection affecting the skin at the coronary band. • Cause: bacteria, low resistance. • Risk groups: heifers, freshly calved cows. • Treatment: foot trimming, dry wipe the affected area and apply antibiotic spray (repeat after 24 hours). Or, bandage for three days. • Prevention: reduce the level of infection in the environment (effective treatment of infected animals, treat foul-in-the-foot, optimise resistance).	 *A round, discrete lesion that causes slight pain (healing or mild case).*	 *Slight deterioration of the hoof tissue at the coronary band. Painful, bleeds easily.*	 *Large, strawberry-like, extremely painful lesion. Bleeds easily.*
Laminitis (laminitis) Any yellow/red discolouration of the sole. The redness is due to bleeding; yellow/orange colour results from serum leaking through blood vessel walls. • Cause: see page 44. • Risk groups: heifers, around the time of calving, animals on high levels of concentrates. • Treatment: anti-inflammatories, soft surfaces, encourage plenty of drinking, cold hosing, foot trimming to maintain good hoof balance. • Prevention: sufficient fibre in the ration, correct ratio of fibre to concentrate. Introduce dietary changes gradually. Good cubicle design. Treat infected animals promptly and thoroughly.	 *A small localised discolouration.*	 *Discolouration of approximately one-third of the sole.*	 *Discolouration of almost the entire sole.*

With thanks to PTC+ (Horst) and the Animal Health Bureau (Deventer).

Other causes of lameness



Healthy hooves
A healthy hoof. The hoof wall and the entire sole are weight-bearing. This animal has been at pasture, and as a result the wall is slightly overgrown.



Solar ulcer
Solar ulcers are inflammatory lesions in the sole area. They occur as a result of either laminitis or bruising to the sole (or both). Soft hooves are more likely to be affected.



Combinations of digital dermatitis and foul-in-the-foot
Both digital dermatitis and foul-in-the-foot occur under similar conditions: wet feet, dirty conditions. They often occur together, in which case, the cow will show signs of both.



False sole
False or double sole happens after acute laminitis or radical dietary changes. In many cases you see few other signs of laminitis.



White line disease
The white (or pink) line forms the connection between the sole and the wall. If there is a break in the continuity, then white line disease occurs. There are both mild and severe forms. Most important causes are laminitis and trauma (bruising).



Interdigital growths
Interdigital growths occur between the claws and develop because there has been a long-standing lesion in the cleft. This could be either foul-in-the-foot or digital dermatitis. The lesion could have developed from an infection in the cleft.

Hoof scoring aids management

Hoof lesions are signals which can be used to make improvements in herd management.
The following rough classifications can be helpful:

- Laminitis: metabolic problems, errors/changes in diet and food intake, housing problems (overcrowding, slippery floors, poor cubicles).
- Digital dermatitis: infectious disease, associated with low resistance and high risk of infection.
- Foul-in-the-foot: infectious disease, associated with high risk of infection.
- Solar ulcers, white line disease: trauma, when the herd is unsettled, and/or slippery or uneven surfaces. This can be associated with laminitis.

More information about hoof lesions can be found on page 73 and pages 80/81.

With thanks to PTC+ Oenkerk (NL) and GD, Deventer (NL).

Hoof problems: the consequences

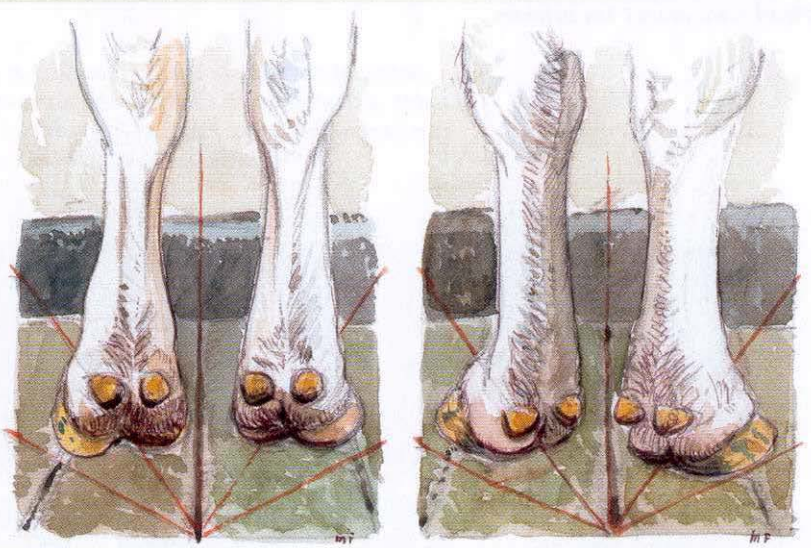
With foul-in-the-foot (dermatitis interdigitalis) often the outer claw grows faster than the inner claw. This causes the position of the claw and leg to change: the hock turns inwards and the claw rotates outwards. Foul-in-the-foot exists on nearly every dairy farm, so check regularly for signs and take action promptly.

Preventive measures include keeping floors dry and clean, formalin footbaths, good nutrition with emphasis on sufficient fibre.

Treatment: foot trimming and formalin footbaths (4 litres of standard formaldehyde solution per 100 litres of water).



The interdigital cleft of the right foot is virtually parallel with the spine (score 1). The left leg is turned outward, swollen and painful. This is a score of 3: treat immediately.



Leg score

The leg score gives an impression of the stance of the hind legs and can be used to manage foot problems. It is related to the height difference between the inner and outer claw and the way the cow places her foot. Cows rotate their feet outwards to relieve painful areas of the sole and are more likely to do this on slippery floors, when they walk with more weight on their heels.

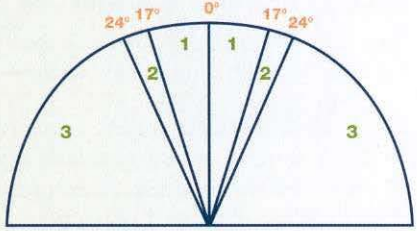
Leg score 1: the ideal situation; but infections or haemorrhages can still occur.

If there is a high proportion of leg scores 2 and 3, you should look at the technique and frequency of foot trimming, and other factors affecting stance.

Leg score 2: the placement of the hooves could be better. Suggests a high incidence of foul-in-the-foot and/or a need for regular, corrective foot trimming.

Leg score 3: undesirable situation. The cow or cows need immediate attention (trim hooves and treat).

(From J. van Amerongen)



Leg score calculator





A lot of strength is required to lift the heavy front end off the ground. When the neck rail is in the way, the cow takes her time. Difficulties when getting up can lead to damaged teats.

The need to lie down

In the cowshed, cows like to lie down for 14 hours per day. Lying down is important because:

- The cows rest.
- Their feet rest and dry off.
- More space is available in the passageways.
- When cows are lying down, up to 30 percent more blood circulates through the udder.

If cubicle comfort is not optimal the cows will not lie down unless they are very tired and then they will lie down for longer than normal. As a result, they will eat and drink less. The number of times they eat decreases and the likelihood of selective food intake increases. In addition, certain problems will soon start to appear, such as swollen hocks.

Cubicles

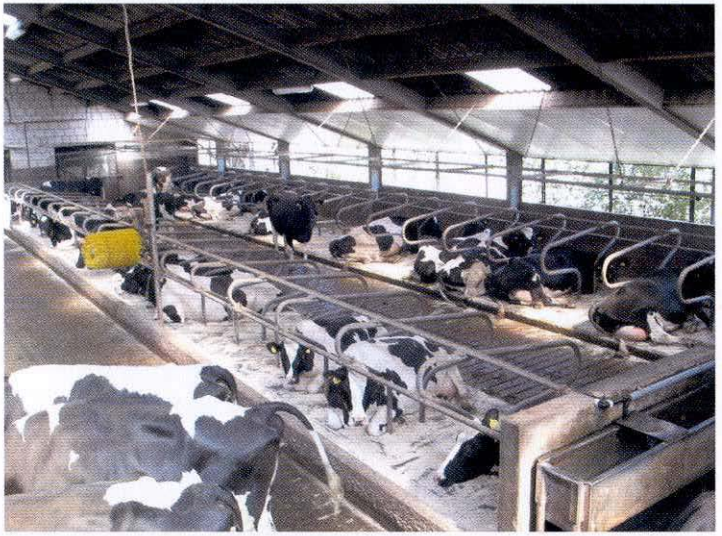
A cubicle is a compromise between space and hygiene. When a cow needs to defecate, she passes dung regardless of where she is. For good hygiene, which will help to prevent skin and udder infections, it is essential that cows do not defecate in the cubicles and that the cubicles are cleaned several times a day. Small heifers will always defecate in their cubicles. Poor cubicle design can make standing up or lying down difficult. If this is the case, the cows will lie down for abnormally long periods and could have injuries to their knees and hocks.

The cubicle floor is also important. It should be soft with sufficient grip. Sand or a layer of sawdust (more than 10 cm deep) is the most comfortable.

Brisket locator and neck rails

A brisket locator prevents the cow from lying too far forward in the cubicle. It should be rounded, with a little give and not too high (approx. 10 cm). Head rails should not hinder the cow when she stretches her head. Therefore they should be positioned at less than 20 cm or higher than 90 cm. The dividers should encourage the cow to lie straight, without risk of bruising.





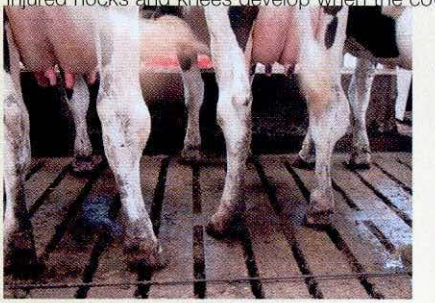
A cow in a cubicle should lie down quickly. If more than 10 percent of resting cows are standing, cubicle comfort needs to be improved. In the photo above, the cubicles are clearly too short and there is not enough headroom to lie down easily.



With the head stretched forward at an angle, cows can easily swallow, regurgitate and chew the cud. This heifer has found the lowest point of the partition.

Signals that mean the cubicles need improving

Injured hocks and knees develop when the cow repeatedly lies down and gets up.



Bruises *result from forces at right angles to the hock, which occur when the cow lands heavily on the floor of the cubicle, and from the pressure on the hock when lying down and getting up. This suggests that the cubicle surface is too hard or there is insufficient bedding.*



Abrasions *occur as a result of forces parallel to the skin over the hock: rubbing back and forth. Abrasions may indicate that the cubicle surface is too rough, bedding is too coarse, the cubicle surface is too slippery, or the cubicles are badly built.*

Picture Puzzle *What do you see here?*



The heifer is unable to stand squarely before she lies down. The neck rail is too far back. The animals that are already lying down have their back ends over the rear kerb and one leg resting on the slats; this is because the brisket locator is too far back. Due to limited space, the animals have difficulty standing up, especially if the surface is slippery.

Factors that make matters worse in cubicles:

- **Wet cubicles:** soaking of the cow's skin leads to hair loss; skin infections will develop more easily.
- **Acidosis and related problems:** cause laminitis. Toxins in the blood stream damage small blood vessels, particularly in the hooves and joints. This results in pain and a stiff gait. Cows have difficulty lying down and getting up, which will lead to bruised hocks.
- **Lameness/weakness:** cows have greater difficulty getting up and lying down and will need to use their head as a counterbalance even more than normal. This means they may end up falling forward. They also land heavily and will end up with abrasions from the cubicle floor.
- **Large and heavy cows:** these animals need a lot of strength and space to get up and lie down.

The cow's needs and the evaluation of the housing

Cow requirement	Cow signal	Measurements for a 700 kg Holstein cow, based on analysis of videos	Cubicle dimensions expressed in terms of body measurements*
A good starting position when she wants to lie down.	Cow stands squarely in the cubicle.	Neck rail at 2.15 m, measured diagonally from the rear kerb. Height: 1.27 m	Neck rail at: 0.83 x WH** Bed length: 1.2 x WH
Able to lie down, using the head as a	Able to lie down, using the head as a counterbalance.	Cubicles with open front end.	Deterrent strap: 0.7 x WH
Soft landing on comfortable bedding.	Cow lies down almost immediately. Hocks and knees are unblemished.	-	≥10 cm of bedding, mattresses, rubber mats with bedding. Width: 2.0 x hook bone width.
Cubicle is long enough, with room for the head.	Cow lies straight.	Cubicle length: 2.75m. Brisket locator at 1.80 m from the rear kerb.	Open fronted: length 1.8 x WH Wall at front: length 2.0 x WH Brisket locator: 1.2 x WH from rear kerb.
Cubicle is wide enough.	Cow can lie comfortably on her side.	Cubicle width: 1.22 m	2 x hook bone width.
Able to chew the cud comfortably.	Cow can stretch her head forward at an angle.	-	-
Able to lie with a leg stretched forward.	See cow requirement.	Soft, rounded brisket locator, no higher than 10 cm.	-
Can get up easily.	Cow stands up in one smooth movement, with her head stretched forward as a counterbalance. No hindrance from neck rail.	See above (neck rail, open fronted/wall fronted cubicles).	See above (neck rail and head rail).
Comfort of the cubicle as a whole.	≥90 percent of the cows are lying in cubicle. ≤10 percent of the cows have damaged hocks and other injuries Cows are clean Animals can get up and lie down with ease.		



Cows prefer a not too hard but rounded brisket locator, so they can stretch their front legs.
The proper distance of the brisket locator from the rear kerb is determined by the cow herself = pin bone to dewlap (HF cow: 1.80 –1.85 m)



A shock from the electric cow trainer teaches the cow to defecate outside the cubicle. Position: 15 cm behind the point of the shoulder, 5 –15cm above the cow. Improper positioning leads to difficulties getting up, teat injuries, reduced food and water intake, and poorer expression of heat.



A good starting position for lying down. The cow is standing with all four legs squarely on the bed and has enough space to stretch her head out – 'lunge space'. She doesn't need to lunge under the neck rail. A thick layer of sand, sawdust, or straw provides a soft bed.



The cow has plenty of space to lie down. She can stretch her front legs over the low, rounded brisket locator. A long enough bed, enough headroom, and guidance from the partitions ensure that she lies in the correct position.



This tethered cow can easily lunge forward, using her head as a counterbalance, and isn't impeded by her chain, or by any pieces of the partition. The soft mat provides grip, a soft landing, and comfort.



These cows have no headroom when lying down or standing up. There is a mark where the cows have hit the wall. Solution: lengthen the cubicle by demolishing the wall, leaving the front open to provide fresh air and better lighting, while taking measures to protect the bedding from driving rain.



Because the brisket locator is too far back, the cubicle is too short. The cow is lying at an angle. In this cubicle, the brisket locator is not even necessary: the wall ensures that the cows won't lie too far forward.

Looking and understanding

So far in this book we have discussed a number of issues that might have given you new insights, but not every question has been answered As well as providing answers, critical observation will also lead to new questions and insights. Here are some more telling examples.

Why is this cow pushing her head into the other cow? Is this social behaviour? Or a sign of discomfort? It seems likely that this behaviour stems from some sort of discomfort, maybe colic or indigestion.



Just like tongue-rolling, food throwing is a stereotypical behaviour: a behaviour that is repeated continuously without an obvious cause. It can become a big problem on some farms. A trough that is too high (more than 15cm above floor level) encourages food throwing.





Cows in the collecting area, ready for milking. Despite having been rounded up, many of the animals still keep a certain distance between themselves. Being too pushy when rounding up could frighten cows and lead to conflicts. The resulting sudden movements could increase the likelihood of hoof problems.

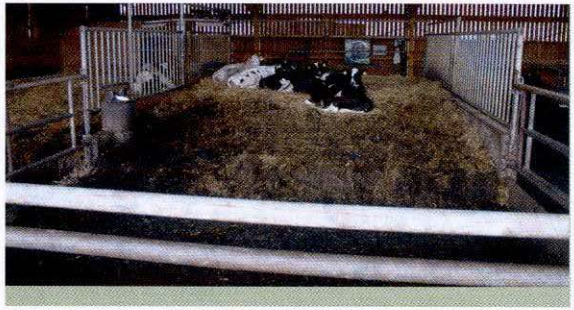


This is how a cow sleeps, with her head on her side. A cow sleeps for only twenty minutes to half an hour per day. Many cows with their heads on their sides may indicate indigestion, which is usually due to acidosis.

Straw yards

A straw yard offers cows a very comfortable bed, provided the straw yard is well managed and used properly. This means no overcrowding and making sure that the bed is firm and dry.

Water troughs, salt licks, and other pieces of equipment that are in frequent use, should be located in concrete areas rather than in the bedded area. Around the water trough a wet area has developed due to water spillages, urinating, defecating, and trampling by lots of feet.



The walls can be opened and closed. In winter, this helps to keep the warmth in, the rest of the year this helps with ventilation. Avoid draughts over the animals. Good ventilation removes any gases coming off the bedding and dries the straw.



The quality of the straw bed is determined by:

1. Straw management. The bed should support the cow's weight as she walks. In dairy herds, absorbent, clean, and dry straw should be added at least once a day. Avoid mouldy, dusty straw.
2. Fluids. How much is added with urine, dung, water spillages, rain, etc., and how much is removed as slurry, through evaporation and in other ways.
3. Stocking density and cattle movements. How often do cows stand and walk in particular areas? Busy areas will get wet.

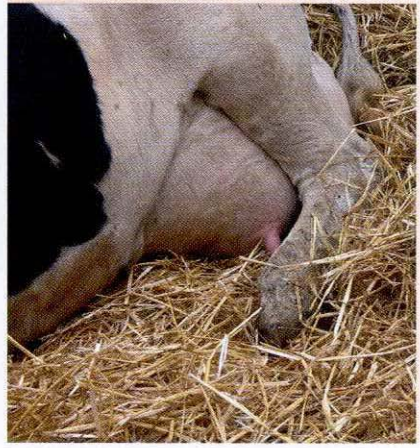
Straw management can be monitored by assessing how dirty the cows are: 'dirtiness' scoring. Or by counting the number of udder wipes used during milking.

Guidelines for dairy cattle

- 1 kg straw/m² at least once a day. After cleaning out the yard: double the amount
- When calculating the area for bedding, don't include wet patches and unventilated areas.
- 1 m² of bedded area per 1,000 litres annual production (annual production 9,000 litres = 9 m² per cow). Min. 6 kg and max. 12 kg straw per cow per day.

Picture puzzle

The straw bedding contains many germs, some of which could cause skin and udder infections. How do you keep the risk of mastitis to a minimum?



Always keep the straw clean and dry.
Cows should be kept standing for half an hour after milking e.g. at the feed barriers, to give the teat (streak) canal time to close.
Breed and select cows for good udder health.
Prevent draughts at the level of the cow and her udder.
Keep the animals in good health; optimise nutrition, treat sick animals promptly and effectively.
Pay particular attention to cows that lie down for prolonged periods.

Cleanliness score

The amount of dirt on the cows gives an idea of the level of hygiene on the farm. It is a group score. The dirtier the cows, the higher the chance of udder and skin infections. Research has shown that a one-point rise in the herd dirtiness score resulted in an increase in bulk milk somatic cell count of 50,000 cells/ml.

The presence of dirty cows also tells you that other management factors may need to be improved. Check ventilation, nutrition, cubicle dimensions, and the cleanliness of passageways.

		Score 1: target	Score 2: acceptable	Score 3: danger zone	Score 4: too dirty	Score 5: unacceptable
	**Udder** Includes fore and rear udders, and udder floor and teats.					
	**Lower rear legs** Area from point of hock to floor including hoof.					
Herd Tally Use to score herd or pen of cows when individual cow ID is not important. Score each cow and place check mark in cleanliness score box for each cow's overall cleanliness score.						

Source: Chiappini et al. J.K. Reneau, Univ. of Minnesota.



The amount of dirt on the cows tells you whether enough straw is being used. The number of wipes needed to clean the udders is also an indicator. If lots of wipes are being used, the bed is probably too wet.

Clean and dry surroundings are healthy and pleasant for cow and farmer alike, enabling them to work well and deliver quality.



CHAPTER 4

While eating and digesting



Every cow must have unlimited access to palatable food and in the correct proportions throughout the day. And the same applies for water.

Cow nutrition focuses on achieving maximum dry matter intake and a healthy rumen. A number of factors contribute to rumen health. Nutritionists tend to focus on issues such as the ratio of energy to protein, and ensuring that the ration includes sufficient fibre and minerals, but we should remember to think about all of the factors that affect the eating behaviour of the cow.

Calculated rations rarely correspond exactly to what the cow actually consumes, because of natural variation and the need to make assumptions. Therefore, the ration calculation acts as a starting point, which needs to be verified and possibly modified on the farm.

Steps in the feeding process	Cow signal	
Ration calculation		
Feeding	Availability	
Intake	Selection	Rumen fill
Digestion	Dung Health	Production Growth (condition)

The structure of this chapter follows this table.

When evaluating nutrition, health and production you look to the past as well as the present with the aim of achieving even better results in the future. Information from the past helps you to learn and to understand the current situation. It can be used as the basis for setting new goals like 'Next year I want to produce 300 litres more milk per cow and to halve foot problems'. The cow signals you notice can be used to evaluate the current situation and to make healthy production a reality for the future.

When looking back, important cow signals include:

- condition score changes;
- annual and monthly production figures, and milk records;
- the number of metabolic diseases (displaced abomasums (DA), milk fever, and ketosis);
- the total number of illnesses;
- the number of cows culled, with the reason for culling;
- fertility records.

When assessing the situation and making changes, the important cow signals are:

- rumen fill (food intake and rate of passage);
- milk production today and yesterday (food intake and energy to protein ratio);
- dung (food intake and digestion);
- selective feeding (a well mixed ration and palatability of the ingredients);
- food wastage (food intake and selective feeding);
- chewing the cud (fibre);
- hoof health (locomotion score).



The cows have finished their food. Have all of the animals had enough to eat and in the correct proportions? Should they be given more food now or later? If five to ten percent of the food is left over this indicates that the milking cows are at their maximum forage intake.

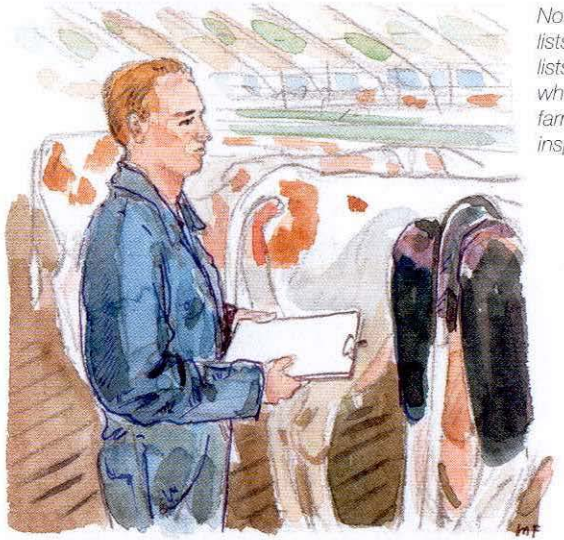


Rotting and heating up reduce palatability, which in turn decreases food intake. Good ration management starts with good quality food.

Information derived from production data

Milk production data provides valuable information about individual cows as well as groups. The standard values are affected by the genetic potential of the herd, as well as the ration.

Problem	Check point
A severe negative energy balance or ketosis.	Difference between milk fat and milk protein percentages (>1.0 negative energy balance, >1.25 ketosis).
Acidosis	Low fat percentage.
High incidence of social conflicts.	Heifer production below expectation.
Low resistance levels in the herd.	Disappointing production from older cows and low milk protein (<3.2). Too many sick cows.



Notes, action lists and check-lists are helpful when organising farm and animal inspections.

Rumen score: food intake and digestion

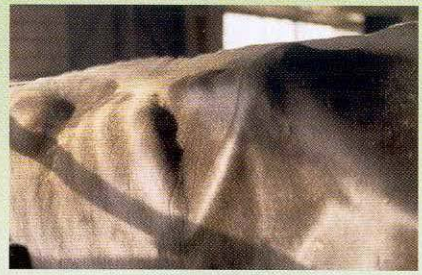
The rumen score is an indication of the food intake and the rate of passage over the last few hours. When looking at the cow's left flank from behind, in effect you are evaluating the rumen fill. The fill is based on a combination of the amount of food consumed, the rate of digestion, and the rate of passage on to the abomasum and intestines.
The rate of digestion and the rate of passage are affected by the characteristics of the dietary components (rapidly or slowly degradable in the rumen), the particle size, and the ratio of the dietary components in the rumen.

When to score?

- If there is a reason.
- To train yourself.
- As a part of your daily/weekly checks.



Score 1
A deep dip in the left flank. The skin under the lumbar vertebrae curves inwards. The skin fold from the hook bone goes vertically downwards. The paralumbar fossa behind the last rib is more than one hand-width deep. Viewed from the side, this part of the flank has a rectangular appearance.
The cow has eaten little or nothing, which could be due to sudden illness, insufficient or unpalatable food.

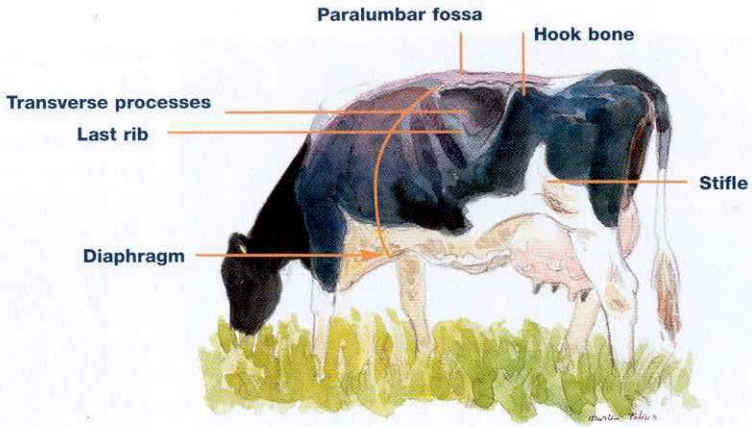


Score 2
The skin under the lumbar vertebrae curves inwards. The skin fold from the hook bone runs diagonally forward towards the last rib. The paralumbar fossa behind the last rib is one hand-width deep. Viewed from the side, this part of the flank has a triangular appearance.
This score is often seen in cows in the first week after calving. Later in lactation, this is a sign of insufficient food intake, or a rate of passage that is too high.



Score 3
The skin under the lumbar vertebrae goes vertically down for one hand-width and then curves outward. The skin fold from the hook bone is not visible. The paralumbar fossa behind the last rib is still just visible. This is the right score for milking cows who have a good food intake and when the food is in the rumen for the correct amount of time.

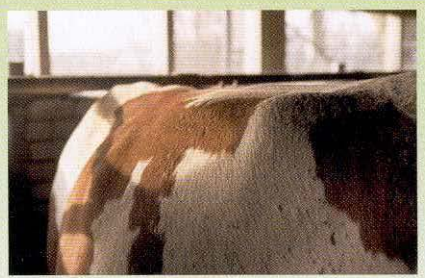
The rumen is located on the left side of the cow against the body wall. In a high-yielding Holstein Friesian cow giving 40 litres a day, for example, the rumen volume is about 150 – 200 litres. Such a cow consumes approximately 24 kg of dry matter per day and passes 40 kg or more of dung.





Score 4

The skin under the lumbar vertebrae curves outwards. No paralumbar fossa is visible behind the last rib.
This is the correct score for cows nearing the end of lactation, and for dry cows.



Score 5

The lumbar vertebrae are not visible as the rumen is very well filled. The skin over the whole belly is quite tight. There is no visible transition between the flank and ribs.
This is the correct score for dry cows.

Source: D. Zaaijer, W.D.J. Kremer, J.P.T.M. Noordhuizen (2001)

Picture Puzzle *What do you notice about the abdominal fill of this cow?*



When you stand behind a cow at least 60 days into lactation, the abdomen should be visible on both the left and the right sides, protruding further than the thighs. That is not the case here. The rumen and intestines are empty: this cow has not eaten enough in the last few days, or there is not enough fibre in the ration. Her dirty back end suggests very loose dung.
Look for answers to the following questions: Why has this happened? Is the food unpalatable? Is the cow ill or very lame? Is she scared to eat? Or is something else wrong?







By rinsing a dung sample in a sieve you can get a good impression of how well food is being digested and how much the cow is chewing her cud. Less than half should remain. Similar to the situation when you score dung, you don't want to find bits of food, such as grains of maize, that should have been digested. The fibre should show signs of having been chewed and digested. Accurate dung scores on a gloved hand provide similar information.



The dung splattered on this cow's rump suggests that she has recently had loose dung on her tail, caused by diarrhoea. Diarrhoea and very loose dung suggest either that the ration is not balanced, or that the cow is ill. This cow has a rumen score of 2+. She has not eaten enough in the last few hours.

Dung

Dung is a mirror of the digestive system. By looking closely at the dung, you get an indication of the balance of the ration. You need to pay attention to consistency and the level of digestion. Consistency relates to the ratio of the amount of solid to the amount of water. If there are lots of abnormal breakdown products from the food, the contents of the intestines will retain a lot of water. Other reasons for loose dung include the presence of toxins or excessive minerals.

When evaluating digestion you are looking or feeling for bits of undigested food. Ideally, every component of the ration should be digested. If parts are not digested, either they are indigestible or there was not enough time for complete digestion to take place. The latter occurs, for example, when the rate of digestion for the energy and protein components are not balanced (ration formulation). From the time food is eaten until it is passed as dung takes between one and a half and three days.

Dung score A: looking at and feeling fresh dung, to assess digestion.

This scoring method is based on taking a close look at fresh dung that has just been passed, and feeling the dung with your hand.



Score 1

The dung glistens, feels like a creamy emulsion, and is homogeneous. No undigested food particles can be felt or seen. This is the ideal score for milking and dry cows.



Score 2

The dung glistens and feels smooth and homogeneous. There are a few undigested food particles that can be seen and felt. This is acceptable for milking and dry cows.



Score 3

The dung appears slightly dull and does not feel homogeneous. After closing and opening your hand, bits of undigested fibre remain stuck to your fingers. This dung is acceptable for in-calf heifers and dry cows, but not for milking cows.



Score 4

The dung is dull in appearance and contains some coarse undigested food particles, which are clearly visible. After closing and opening your hand, a ball of undigested food remains in your hand. Adjust the ration.



Score 5

Coarse food particles can be felt in the dung. Undigested ration components are clearly recognisable. The dung has a dull appearance. Adjust the ration.

Source: D. Zaaijer, W.D.J. Kremer, J.P.T.M. Noordhuizen (2001)

Dung score B: consistency of fresh cow dung

Fresh dung is scored in two different ways: by eye and by treading in the dung with your boot.



Score 1

So watery that it's barely recognisable as dung. This comes from cows that are very ill.



Score 2

A thin custard but recognisable as dung. When the dung lands on a hard surface, the splatter goes a long way. This happens when grazing young, rich grass, and when there is some imbalance in the ration.



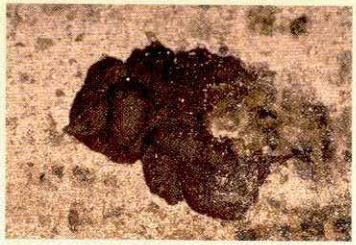
Score 3

A thick custard, forming a cowpat to a height of 2 to 3 cm. A soft plopping sound can be heard when the dung lands. Boot test: when the boot is lifted, there is no footprint left in the cowpat and the dung doesn't stick. This is the ideal consistency for dung; the ration is visibly well digested.



Score 4

The dung is thick, makes a heavy plopping sound when landing, is well formed, and stacks in rings. The height is a finger's length or more. Boot test: when the boot is lifted, the dung sticks to it and a footprint is left behind. This indicates that there is an imbalance in the ration. For dry cows and in-calf heifers this may be acceptable, but always check the composition of the ration anyway.



Score 5

Stiff balls of dung (similar to horse droppings). Boot test: an impression of the boot is left on the top of the dung. Dry cows and in-calf heifers often pass this sort of dung. This indicates that the ration is not balanced and needs to be adjusted.

Source: D. Zaaijer, W.D.J. Kremer, J.P.T.M. Noordhuizen (2001)

Ration preparation

Feeding the rumen

Mature cows eat between 7 and 12 meals a day and each meal lasts approximately 45 minutes. Total eating time: about 6 to 8 hours. Heifers eat more frequently and consume less at each meal. In order to correct acidosis caused by rapidly fermenting food, there should always be sufficient fibre in the rumen, cows should produce a lot of saliva (chewing the cud), and the rumen wall should absorb the fatty acids quickly. Think about the ratio of forage to concentrate

To maintain a healthy rumen, a cow needs to eat:

- sufficient fibre;
- forage and concentrate at approximately the same time.

Fibre content of the diet

For fibre to be effective the particles should be longer than 0.6 cm, so aim to work with forage 4 cm long. Proper stimulation of the rumen wall encourages cudding. The amount of time a cow spends chewing her cud provides valuable information about the fibre content of the ration. A cow should chew her cud for 8 to 10 hours per day. In total, a cow chews for about 16 hours per day, while eating and cudding. At any one time, more than 50 per cent of the cows lying down should be chewing their cud; two hours after feeding, this should be as high as 90 per cent. A cow starts to chew her cud about 45 minutes after eating. If the basic ration contains insufficient fibre, cows will sometimes look for additional high-fibre food, such as straw or hay.

Low-fibre rations increase the risk of a very low rumen pH developing. The bacterial flora can be affected to such an extent that toxins develop.

The cow will lie down for about three-quarters of the time when she is chewing her cud and each cud-chewing period lasts half an hour or more. A cow normally chews each cud 50 to 70 times. Rations with a lot of fibrous material (straw, grass-seed hay) require more chewing per cud. Cud that is chewed less than 50 times indicates insufficient fibre. High-yielding cows produce about 300 litres of saliva a day when cud chewing is optimal.



Food quality is extremely important. Both heating up and rotting decrease the nutritional value and will produce an unpleasant smell. Remember: palatability is essential for optimum dry matter intake. You must also get the amounts of each component correct and mix the ration well.



Photo: Christien Bas, danace





Problem

These two pictures represent an imaginary shed, which has easy access to the concentrate feeders but very poor access to the feed barrier. Heifers and freshly calved cows are likely to eat the concentrates but may not consume enough forage. How do you minimise the risk of these animals developing rumen problems?

Possible solutions:

- Initially provide only a little concentrate in the feeders and slowly increase the amount.
- Manage the heifers and freshly calved cows as a separate group.
- Ensure the maximum number of eating spaces is available throughout the day.
- Pay close attention to hoof health.
- Ensure that the basic ration contains enough fibre.

Food intake

Selective feeding

Cows select their food on the basis of taste, not the nutritional value. This is easy to do with dry mixes and when food particles are long (>7 cm).
Investigate selective feeding by looking:

- at eating behaviour;
- for variations in dung from cows that are eating the same ration;
- at the ration diet and the leftovers;
- for burrowing into the food.

When eating palatable food containing long fibre, a cow will use her tongue to pick out the longer bits. Shorter pieces of food are dropped and then eaten off the ground. You will see cows burrowing holes and shaking out the food.



These cows much prefer maize silage to grass silage. So, the ration of the dominant cows will contain too much maize silage and that of the lower ranked cows, too little.



By examining food with this sieve box, you can quickly determine whether the cows are being too selective. Here three samples have been evaluated: food from inside the trough, food on the edge of the trough, and untouched leftovers. As the proportions are similar, this suggests the cows are not being selective.

Location of the feed barrier and trough

The cows must be able to approach the feed barrier safely and every animal should have enough space to eat in a relaxed manner. A space for every cow in the herd would provide the optimal feeding environment. Being herd animals, cows like to eat at the same time. The continuous availability of palatable food interrupts this behaviour. On farms with robotic milking machines, this behaviour almost completely disappears, since the cows are no longer rounded up for milking.

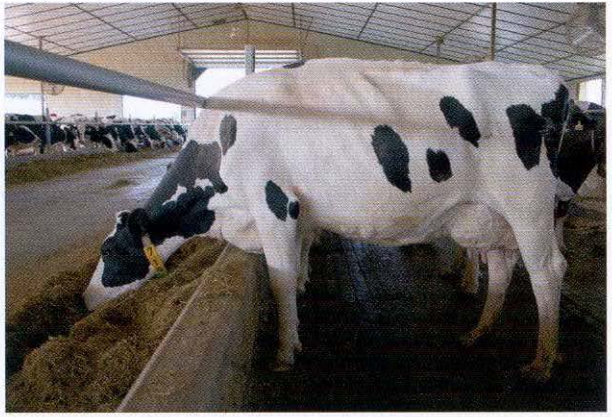
Placing heifers in a separate group will result in higher production and a lower risk of acidosis. They will be more relaxed when eating, which means they will eat more often and consume smaller meals. As a result, they will have greater dry matter intake. Competition at the feed barrier means that cows will be in a hurry to eat, and may consume too much at any one meal. The floor of the food trough should be between 10 and 15 cm above the walkway. If the cow can adopt her naturally low head position when feeding, she will eat in a relaxed manner and produce lots of saliva.



The bottom part of this yoke is too high, which means the cow has to strain when eating. This may cause lumps to develop on the dewlap. Solution: lower the bottom part of the yoke.



Cows cannot get out of self-locking yokes easily. Two horizontal pipes give the cow more room to escape but have the disadvantage that animals cannot be locked in. Position of upper rail/cable: 0.85 x withers height (1.15 – 1.25 m) and 20 – 25 cm further forward than the lower rail.



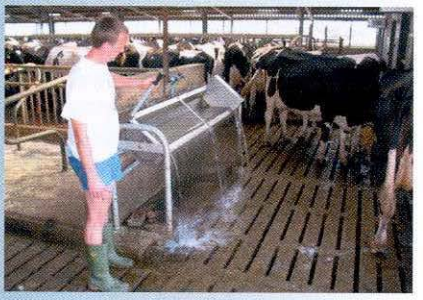
The wall and the feed through position the cow, not the neckrail. Make sure the feed is within close reach and the wall isn't too wide. This neck rail could be moved away from the cow a bit more, so she doesn't have to touch it.

Water

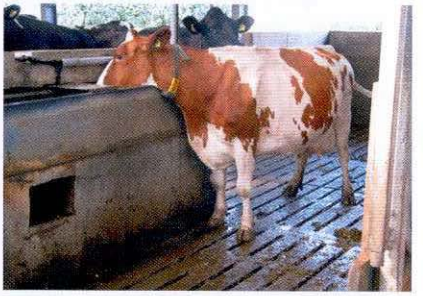
Unlimited access to fresh drinking water is just as important as having sufficient fresh food. If cows do not drink enough, dry matter intake will decrease; this has a detrimental effect on digestion. Cattle prefer to drink from a large water surface at a low level and like to be able to stand quietly and safely while drinking. If cows have the option, they always choose the cleanest, freshest water.

When cows get up, they often follow the same routine: drinking, eating, drinking. They also like to drink immediately after being milked. So, water troughs should be placed in multiple positions throughout the shed and close to the feed barriers. As a rule of thumb: one large trough for every twenty cows, or a smaller one for every ten cows.

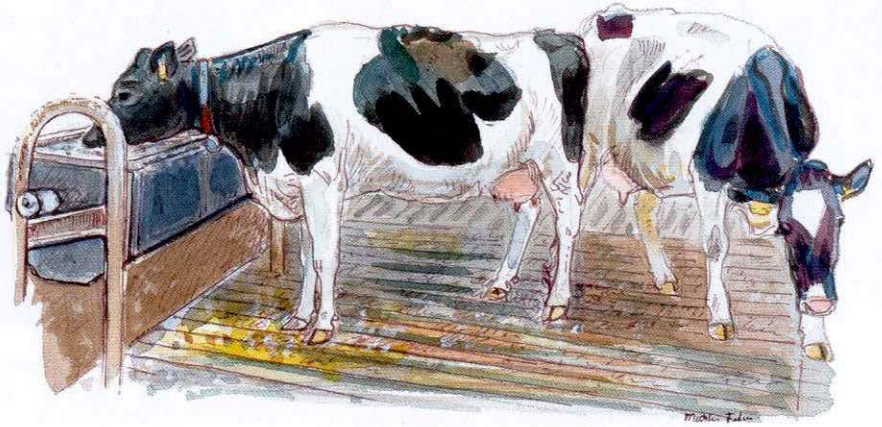




Dirt at the bottom of the trough will give the water an unpleasant taste. During warm weather, bacterial growth will occur, which causes the water to smell and creates a health risk. Empty the trough daily and clean it out thoroughly once a week.



This cow has to stretch quite a long way in order to drink from this water trough, which is rather high. When the water level is low, she will barely be able to reach. Smaller cows, such as heifers, will have great difficulty drinking from this trough.

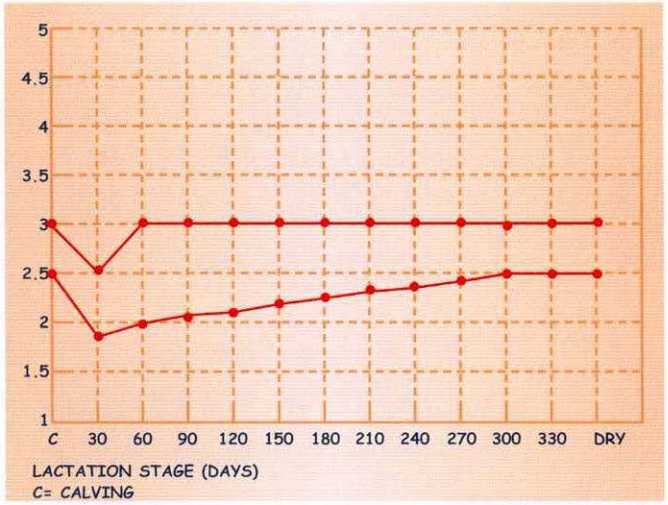


A cow drinking in a relaxed manner will do so in three stages: an initial tasting period, a longer tasting period, and then drinking. During the winter when the water is cold, a cow will often use her tongue to play with the water before drinking. Warming the water ensures that the cows will drink more and therefore eat more.

Body condition score

The body condition score provides a subjective estimate of the amount of fat between the pin bones and the tail-head, over the hip area, and covering the lumbar vertebrae. Changes in condition take place over a matter of weeks or months. The condition score increases when a cow's energy intake is too high and decreases when it is too low. A skinny cow has a score of 1, an obese cow a score of 5. Everything in between is scored on a scale from 1 to 5. In that way, a measuring standard develops that makes it possible to follow trends in body condition and to feed cows according to their energy requirements.

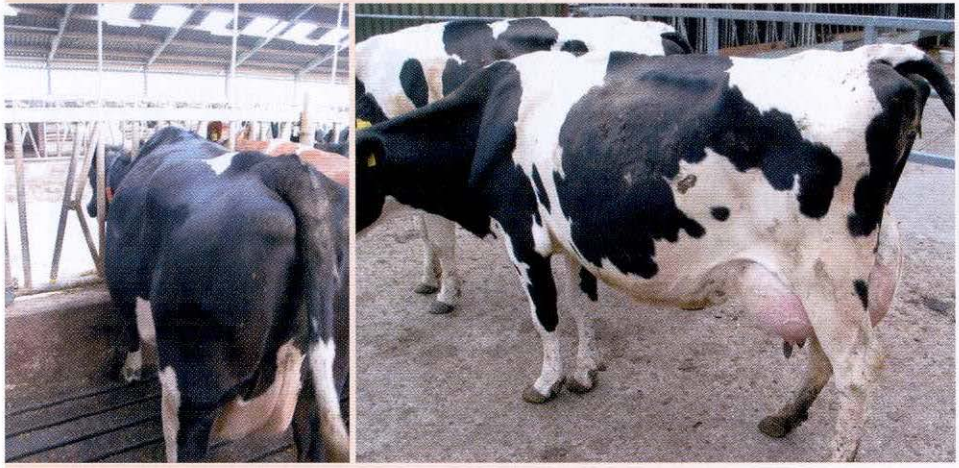
For an overweight cow there is a risk that around the time of calving and in early lactation she will eat too little. A cow that is too thin has a poor immunity. A sharp fall in condition will lead to fertility problems and low resistance to disease. Fertility problems include cystic ovaries, inactive ovaries, poor or non-existent heats, and a poor quality corpus luteum. The condition score should not decrease by more than 0.75 points over the course of a lactation.



A cow's body condition score should fall between the two curves. Then the cow is neither too fat nor too thin and her energy intake will meet her needs.

Picture puzzle

What is your assessment of the condition score and rumen fill of these cows? The cow in the left-hand photo is in the fourth week of lactation (picture taken at 1.30 pm), the cow on the right is two months into her lactation (picture taken at milking time). What action should be taken?



The whiter cow has a condition score of barely 2 and a full, deep rumen (score 4+). Her high food intake results in a high milk yield, which is also evident from her udder. Score 4 means that the rate of passage through the rumen is on the low side. The question arising is 'Is this cow consuming enough energy?'

The black cow has a condition score of 3.5 and an empty rumen (score 1). She has not eaten enough today; ask yourself why. Action: check the food intake of other cows. Provide an energy supplement to counteract the risk of ketosis and fatty liver.

Condition scoring of dairy cows

Score	Condition	Detailed Description	Visual Guide
1	Poor	*Tail head* – deep cavity with no fatty tissue under skin. Skin fairly supple but coat condition often rough.	
		Loin – spine prominent and horizontal processes sharp.	

Score	Condition	Detailed Description	Visual Guide
2	Moderate	*Tail head* – shallow cavity but pin bones prominent; some fat under skin. Skin supple.	
		Loin – horizontal processes can be identified individually with ends rounded.	

Score	Visual Guide
2.5	
	

Score	Condition	Detailed Description	Visual Guide
3	Good	*Tail head* – fat cover over whole area and skin smooth but pelvis can be felt.	
		Loin – end of horizontal process can only be felt with pressure; only slight depression in loin.	

Score	Condition	Detailed Description	Visual Guide
4	Fat	*Tail head* – completely filled and folds and patches of fat evident.	
		Loin – cannot feel processes and will have completely rounded appearance.	

Score	Condition	Detailed Description
5	Grossly Fat	*Tail head* – buried in fatty tissue, pelvis impalpable even with firm pressure.

Source: Department for Environment, Food & Rural Affairs, 2001

Target scores

Dairy Cows	Cows	Heifers
pre-calving	2.5-3	2.5-3
pre-service	2-3	2-2.5
drying off	2.5-3	

What does the condition score tell us?

Reference point	Evaluation	Signal	Possible actions
Average score	Within normal range	Good: the cows are getting enough energy.	- Maintain the current situation.
	High	Risk that food intake will be poor at the beginning of lactation.	- Ensure that cows are not too fat when they enter the dry period. Pay attention to dry matter intake of fat cows at the beginning of lactation.
	Low	Insufficient energy intake and poor resistance to disease.	- Improve dry matter intake. - Increase the energy density of the ration.
Spread of scores	Wide	Big difference between cows in both energy intake and energy requirements.	- Determine how intake differences develop. - Standardise the requirements; establish production and breeding groups.
	Narrow	Good: the cows have sufficient energy.	- Maintain the current situation.

If you find any problems, then you need to investigate further.

'One-off' body condition scoring of a group

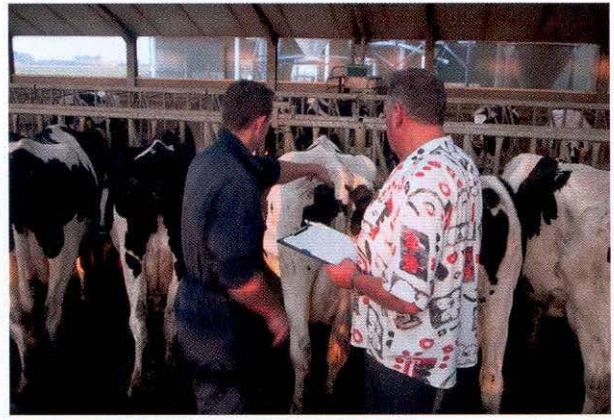
A practical example:
On the day that the newly formulated ration arrives, the farmer scores all the cows that are more than sixty days into their lactation. Then, he calculates the amount of concentrate as follows:

- Condition score < 2.5 : add 10% more cake to the ration (than the recommendation). But pay attention to fibre!
- Condition score 2.5-3.0 : follow the recommendation.
- Condition score > 3.0 : feed 10 % less than the recommendation.

It is particularly important to use this method for heifers, as they need to continue growing. When the ration is well balanced, the cost of extra cake will be repaid with a higher level of milk protein.

Scoring cows repeatedly

- The condition score is within the normal range: the feed management throughout lactation is correct.
- The condition score is below the normal range and changes by less than 0.75 points: the feed management throughout lactation is correct, but the overall condition could be improved.
- The condition score decreases by more than 0.75 points in early lactation: energy intake is too low. Critically analyse the dry cow management and the feeding around the time of calving and in early lactation.
- Cows become over-fat towards the end of lactation: fine-tune the ration in relation to requirements, check the energy to protein ratio.



With practice, fifty cows can be scored quite quickly. If you use a computer you can match the score with the cow and easily draw graphs and analysis the data. Even when working with pen and paper, you still have a lot of useful information at your fingertips.

Risk groups

On every farm there are groups of animals that are susceptible to shortcomings in the ration. These groups require more monitoring than others. They can also be used as a means of monitoring the risks, as indicator groups. Separating risk groups from the rest of the herd reduces the risks. This sounds very theoretical, but happens frequently in practice. Think, for example, of the separate pens used for freshly calved cows and heifers, about having production groups within the herd, and an individual pen for a sick cow. Separate housing for freshly calved cows and heifers also leaves more space for the rest of the milking herd.

Picture puzzle *What should you do if you see this when rounding up the cows?*



The thin dung indicates that the cow is ill, or that her ration is unbalanced. She could have eaten too much concentrate relative to her forage intake. This could be a group signal. Check whether she belongs to a risk group for acidosis and whether she is ill. If you are in doubt as to whether this is a group signal, then check at least five cows from the same risk group.



Heifers

Risks: inadequate food intake, acidosis, and hoof problems.

In heifers the connective tissue becomes particularly weak at the time of calving. Rations too high in energy or rich in protein result in udder oedema and soft hooves. If the mineral ratio is wrong this may also contribute to the development of oedema. In addition, the animals do not eat enough forage compared to the amount of concentrate – a particular problem if there isn't enough space at the feed barrier. Then there is a high risk of laminitis. The combination of weakened connective tissue and laminitis means a high probability of hoof problems occurring.



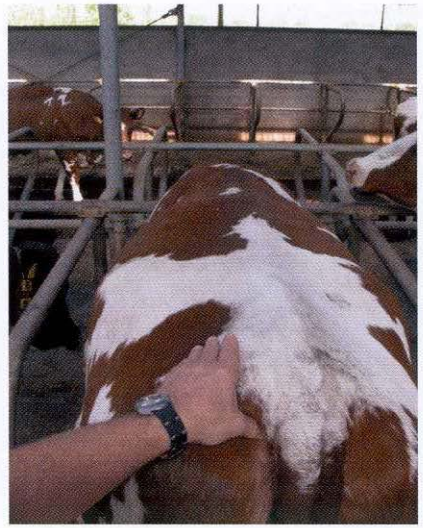
Freshly calved cows

Risks: milk fever, ketosis and fatty liver, acidosis, metritis, and mastitis.
The cow in the photo above has not eaten enough since she calved, so she needs extra care and attention. The dung on her coat indicates that she has been lying in a dirty pen, which increases the risk of udder and uterine infections. She is already holding up her tail to show that her temperature should be taken!



Cows in the first two months of lactation

Risks: inadequate energy intake, acidosis and displaced abomasum (DA).
A healthy rumen bulges out like an apple, feels firm and juicy when pressed, and contracts firmly about twice a minute. During the first 6 – 8 weeks of lactation, forage intake may be too low, which can cause the rumen to become acidic due to a surplus of rapidly degradable food. An acidic rumen is poorly filled, does not contract firmly and the content is mushy. The dung is poorly digested, smells acidic, and alternates between thin and thick. The cows do not chew their cud properly, or for long enough. In the cubicles you will find lumps of discarded cud.



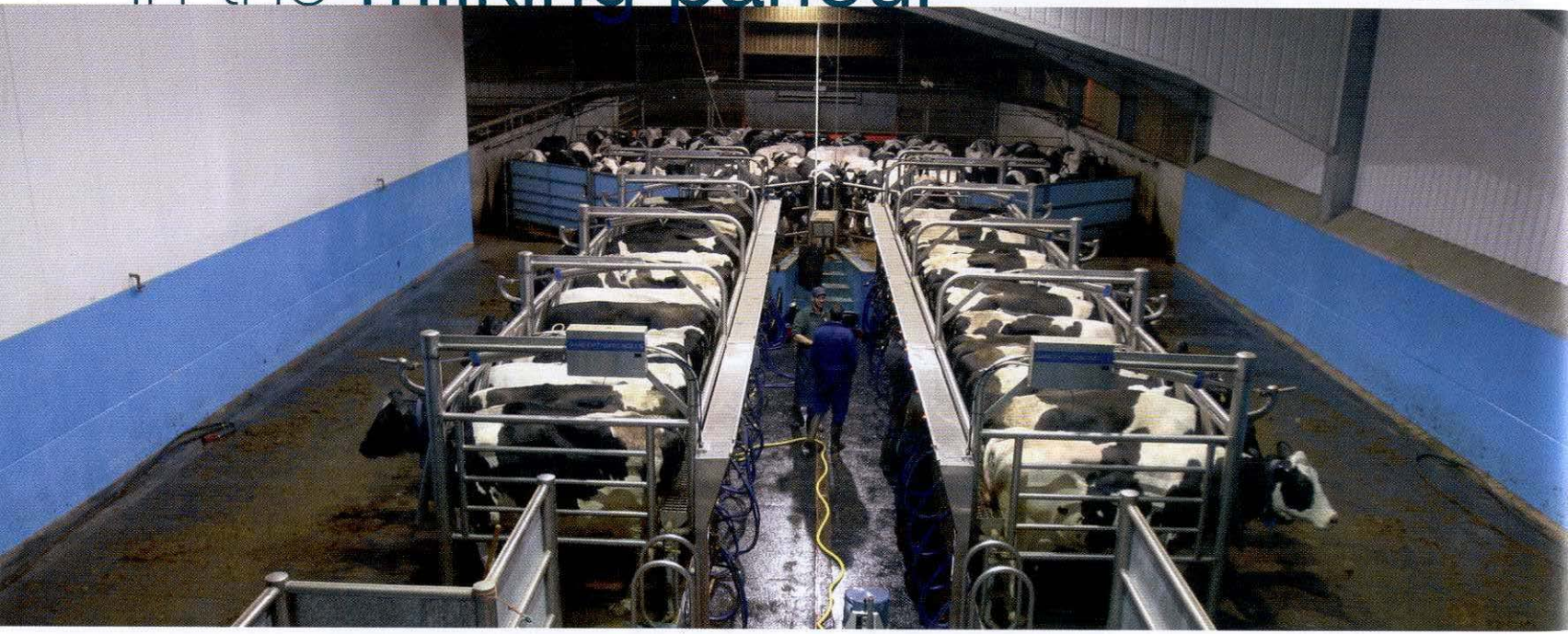
Cows at the end of lactation

Risks: getting over-fat, reducing concentrate intake too quickly.
Monitor: condition score, fat and protein in the milk. The cow in the photo has a condition score of 4 and is in just the right condition to enter the dry period. She shouldn't get any fatter. Getting too fat is usually the result of too much energy and too little protein in the ration, or a ration that is too rich in relation to production.

CHAPTER 5

In the milking parlour

In and around the milking parlour you have the oppurtunity to perform excellent cow observations.



The cows enter the parlour one by one. They then stand for at least five minutes, when you can get a good view of the udder, belly, and legs. Before you put on the cluster, you feel the udder and teats, and draw and assess the foremilk. Then the cow is milked. How much does she give? As a daily routine, milking provides many opportunities to watch out for cow signals.

For many farmers, milking is the best part of the day. They enjoy the peace and quiet as well as the close contact with the cows. Peace and quiet in a milking parlour is a good sign. The animals are relaxed and so it's easier to notice whether they are healthy or showing signs of illness. Restlessness occurs when there is fear or pain or irritation.

Milkers who are relaxed and 'animal-focussed' enhance the calmness of the cows. Often they have a good feel for the cows and know everything about every animal. However, not all farmers have this knack and instead have to work hard to collect and remember the information. If several people milk the cows, important information, such as cows that have been treated with antibiotics, must be recorded and passed on effectively. A good way of doing this is to hang a clipboard where it's clearly visible to the milker.

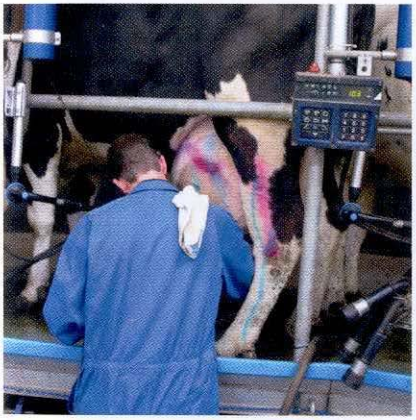
Learning to see more

It takes time to teach yourself to become aware of the things you are looking at, particularly in the parlour. You need to develop good routines. For example, always evaluate the foremilk, rumen fill, the hocks and hooves.

A relaxed milker affects the milking positively. Ensure that there is good lighting, especially on the most important area: the bottom of the udder. A good parlour should be warm in the winter and cool in the summer, free from draughts and flies, and provide a pleasant working environment.



Plenty of light in the working area (minimum of 250 lux) provides a pleasant working environment and allows you to see everything clearly. Hang lots of lights in strategic places. A fan provides fresh air, discourages flies, and helps to keep any fumes from the footbath out of the parlour.



Know your cows. This herd uses an automatic cow identification system. The cow behind the marked cow is number 103. Many farmers can recognise their cows just as quickly from their udders as from their heads or markings.



The better the view of the cow, the more information you can gather. If it is difficult to see the cows clearly in the parlour, then you will need to do more monitoring in other places.

Behaviour entering the parlour

The cows shouldn't be nervous at milking time. Pay close attention to their behaviour: how keen are they to come in? If they are nervous, what is the cause? Is milking painful? Do they have unpleasant experiences in the parlour? Or is the floor too slippery?

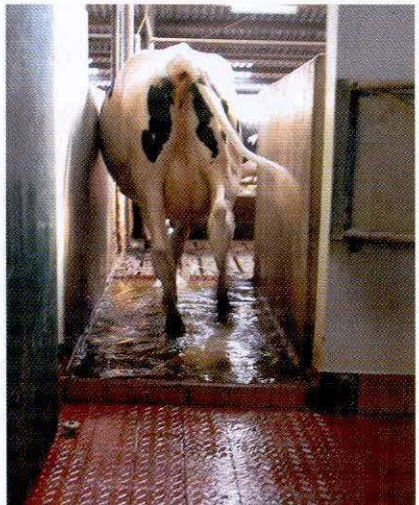
Cows often enter the parlour in the same order. This is a reflection of the social order in the herd. If a cow does not enter in her normal position, something unusual is probably going on.

Rough handling while rounding cows up leads to conflicts and some cows having to take off abruptly. The cows will injure themselves and will have more hoof problems. They will also become more anxious. Restlessness, fear, and pain cause the stress hormone adrenaline to be released. This in turn inhibits the release of oxytocin, the hormone that makes the cow let down her milk. As well as causing milk let-down and uterine contractions, oxytocin also creates a thirst, which explains why cows like to drink during and after milking and also after calving.

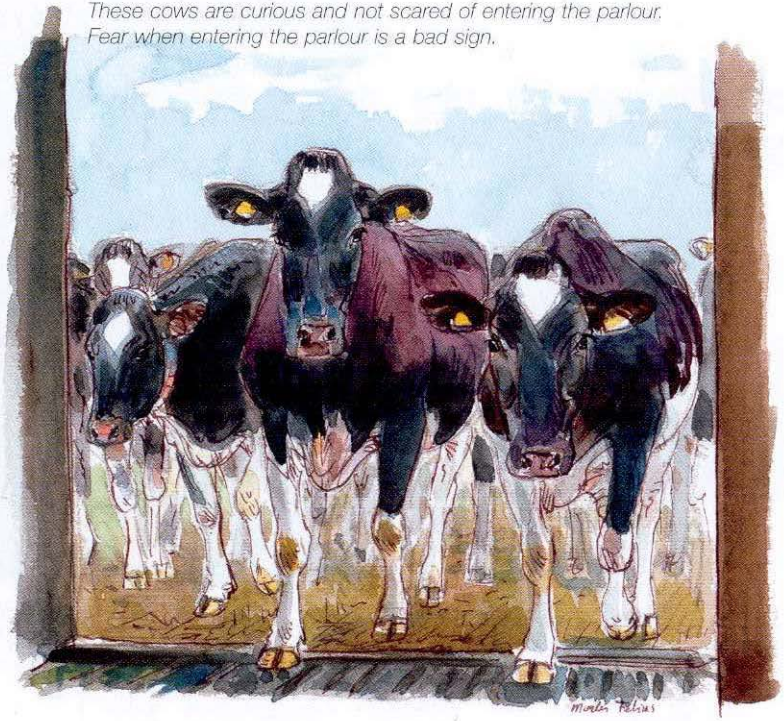
Behaviour leaving the parlour

Cows should be able to leave the parlour quietly and in a relaxed manner. This means that they should not have to worry about slipping or being chased. Sharp bends and slippery floors are risk locations for the animals and make them nervous. Cows also dislike steps. A slope is an acceptable alternative, with the milking area at the highest point.

Jumpy cows and sudden movements are the first signs that the animals are unsettled. Sharp protrusions, electric wires and a traffic jam at the exit all act as obstacles. Avoid risks and remove any obstacles.



Cows need to get used to a footbath. They should go through it calmly so that they don't have a bad experience (slippery bottom, formaldehyde concentration too high). The floor of the footbath should be at the same height as the floor before and after. In a well-designed footbath, cows should have to take at least two steps in the bath and the coronary band should be submerged, even for the last cow going through (approx. 3 m long and 15 cm deep).



These cows are curious and not scared of entering the parlour. Fear when entering the parlour is a bad sign.

Peace and quiet during milking

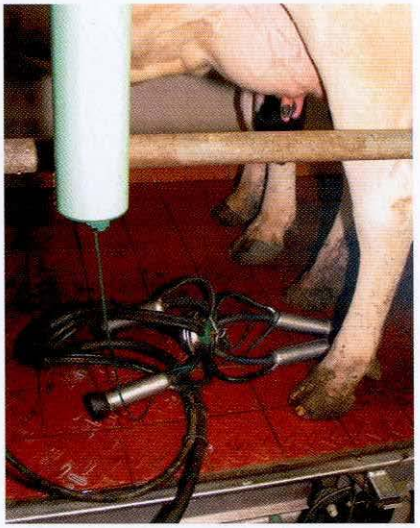
Putting on the cluster, milking itself, and removal of the cluster should all take place quietly. If the milker is calm, then the cows barely notice the milking process.

If the cows are unsettled and jumpy, there could be a variety of causes: pain, fear of the milker, and demanding concentrate. Dunging and urinating are also signs of anxiety.

Another signal is how the cow responds to the sucking noise of the cluster. She should not jump. A fearful response might be due to being punished previously for kicking off the cluster.



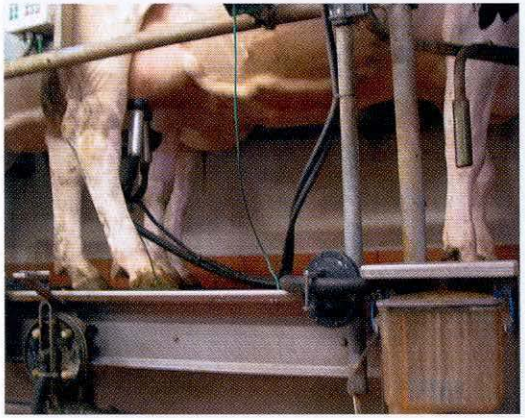
How do the cows behave when the cluster is being attached? The cow should stand still so that the cluster can be attached quickly without air being sucked in.



If cows are unsettled or kick off clusters this should make the person doing the milking think twice. Why does the cow do this? Is it just in her nature, or is something annoying her?

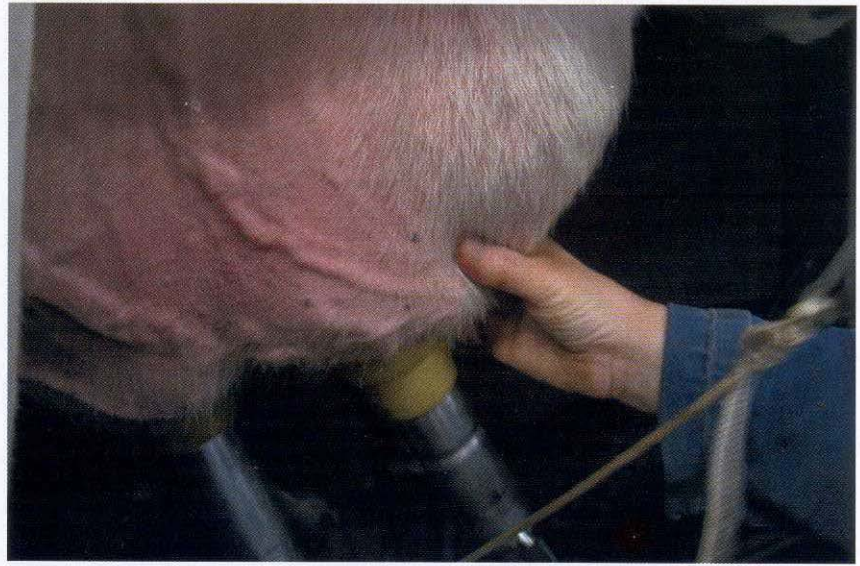
Causes of unrest in the parlour

- Milking machine not functioning properly.
- The milker being rough.
- Not enough space: the cows are uncomfortable.
- Rewarding restless behaviour with extra concentrate.
- Abrupt removal of the cluster.
- Teat injuries (sore teats).
- Fly irritation.
- Stray voltage on the cluster or other equipment.



The cluster should be attached between 60 en 90 sec after pre-treatment of the udder. The milk should start to flow almost immediately and keep on flowing: signals that indicate that the preparation was done well. Poor milk let-down can be a sign of restlessness, fear, or pain.

Using your hand, you can easily feel how much milk remains. If too much milk remains, milking is not being done properly. The support arm places the cluster directly under the udder so that it can function properly.



If both the milking machine and the milker do their job properly, then the cluster will be removed smoothly. The cows barely notice.



Using a routine

Cows are creatures of habit. Research has shown that cows milk out better if you follow a routine when prepping and putting on the cluster rather than working in a more haphazard way.

Removing the milking unit

The rear quarters of the udder always contain more milk than the fore quarters. At the end of the milking process, all quarters should be milked out. Take off the cluster when the rear quarters are empty. This does mean, however, that for a time the front quarters are over-milked.

Behaviour during milking

While she is being milked, the cow will often seem to be in a daze. She is very much at ease. Often she will chew her cud. In some parlours the cows receive concentrate, other farmers provide water, and many give them nothing. Concentrates encourage the cows to come into the parlour and stimulate milk let-down. Be consistent and precise when providing concentrates, because cows learn to demand more by behaving restlessly and kicking off the cluster. This behaviour develops because it is rewarded with extra concentrate. Some cows are even able to operate the concentrate lever themselves.

Cleanliness and hygiene

Cows have to be clean. Why? Firstly, because good hygiene prevents disease. Also because dirt is a negative signal, indicating the animal is or has been ill (diarrhoea), or that something untoward has happened recently (she fell, or was jumped on). If the cows are always dirty then it's difficult to spot any changes in the degree of cleanliness.

Dirty udders and teats

Dirty udders and teats increase the likelihood of mastitis.

Two types of bacteria can infect the udder:

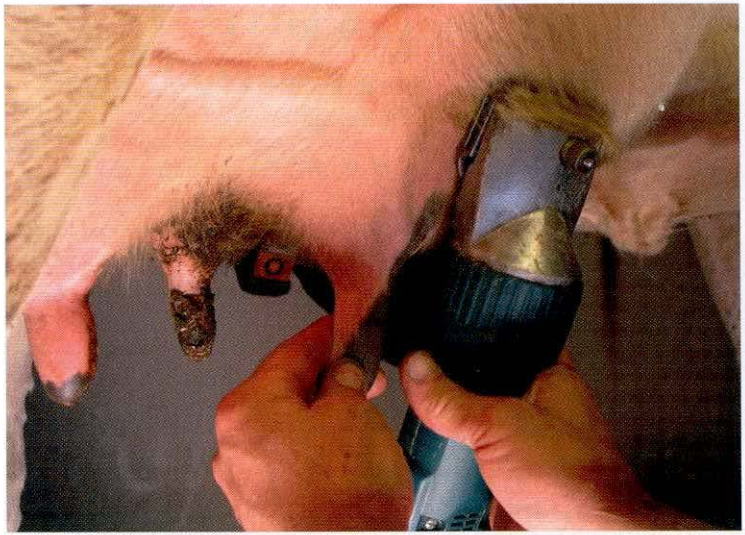
1. **Contagious micro-organisms** that live on the cow's skin. These are transferred from cow to cow in the parlour.
2. **Environmental micro-organisms** that live in the cubicles and straw yards, contaminating the udder there.

Dirty hooves

Dirty hooves indicate either that there is a lot of dung on the slats, or that the dung is very loose and so the hooves are wet for a large part of the day. A scraper or another method of cleaning will provide a drier and cleaner environment for the hoof.

Dirty, wet hooves:

- are more susceptible to disease (soft hooves and skin, dung contains micro-organisms);
- will make the footbath ineffective;
- transfer bacteria to the teats.



Dirty udders harbour all kinds of bacteria and are also difficult to clean properly. Clipping improves hygiene, ease of working, and the udder and teats are more clearly visible. Clean udders also help to prevent milk being contaminated with dirt and bacteria.



If hooves are dirty, a footbath will have little effect. The treatment simply doesn't get to where it's needed. For reasons of hygiene, hooves shouldn't be hosed in the parlour.



This photo shows a third reason to aim for clean, dry hooves. Environmental micro-organisms such as E. coli and Strep. uberis are found in dung, and the hoof brings them in close contact with the teat canal.

The floor of the cubicle can cause hair loss due to rubbing or abrasion (lack of bedding and/or floor covering). This hock is also swollen as a result of bruising which occurs when the cow lies down, repositions herself, and stands up in a cubicle that has a hard base.



Hocks

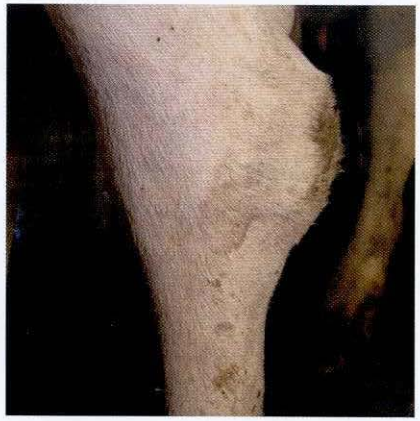
During milking, the hocks are at eye level. This makes the parlour the best place to assess the health of the hocks. Monitoring in the parlour allows you to determine the number of hock injuries and their nature. Bald patches are acceptable, but bruising and infections cause pain and discomfort and are serious signals.

Take action if there are too many injured hocks or knees. The cause will be the cubicle floor or design, and/or lameness.

Targets for cubicle injuries

Bald patches	maximum 30% of all cows
Bruises	maximum 10% of all cows
Skin infections	maximum 10% of all cows

Set your own targets.



As the result of bruising, fluid collects under the skin over the bony part of the hock and after some time this becomes encapsulated. A fluid-filled cushion forms which does not directly cause the animal discomfort: the thick hock. However, this is a signal that the cubicles are uncomfortable.



Due to abrasions and dirty or wet cubicles, the skin on the hock may become infected. If this extends to the subcutaneous layer, the cow will walk stiffly. In severe cases, the joint also becomes infected. Then the animal becomes very lame and will not recover.



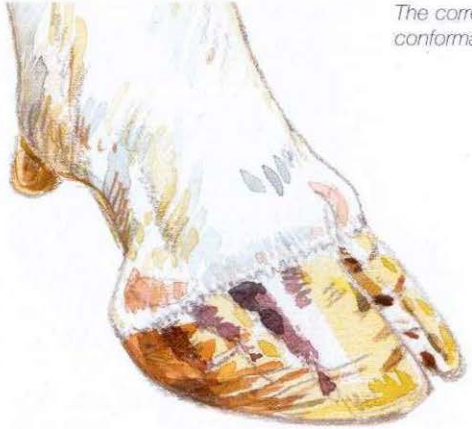
Here, the point of the hock is very dirty and has become inflamed. Sores decrease both the well-being and resistance of the cow. Scabs cause irritation and encourage infections.

Hooves

What is true for the hocks also applies to the hooves: the milking parlour is the ideal place to assess the top of the hooves. The underside, however, is more easily examined in the shed. First, assess the overall health, hygiene, and stance. You should then make a point of looking for signs of pain, swelling around the coronary band, and laminitis.

Conformation

As a farmer, you need to pay close attention to the conformation of the hooves. Abnormalities occur because of irregular growth, together with uneven wear. This is affected by foul-in-the-foot, laminitis, and genetics. Poor foot trimming can also be the reason why too many cows are not standing properly. A hoof grows approximately 0.5 cm per month (1 to 2 mm per week).



The correct hoof conformation.



When laminitis occurs, the attachment of the hoof wall to the underlying bone weakens and the hoof tip turns upwards. In the parlour this is visible as a dent at the front of the hoof (thick line) and diverging growth lines (thin lines).



The hoof conformation of this cow is correct but her pasterns are very weak. At the other extreme, a very steep pastern decreases the shock absorbency of the legs.



There is clear swelling and redness at the coronary band: this is due to an infection in the hoof area, usually as a result of foul-in-the-foot.



Cows with sore hooves regularly lift their legs. Spraying cold water on a hoof with an open wound – often digital dermatitis – causes an immediate pain reaction. Affected cows will try to avoid the footbath.

Evaluating milk

Drawing foremilk is the best way of ensuring that the milk is all right. The first few strips open the teat and flush away the bacteria in and around the teat orifice. The milk can then be evaluated; using a dark surface makes this easier.

When there is something wrong with the milk, you may see clots of milk protein. In severe cases, these may also contain blood proteins which have leaked into the milk through blood vessel walls.

Mastitic milk has a higher salt content than normal milk. This fact is used when measuring the conductivity of milk as an indicator of mastitis. If mastitis is diagnosed too late, treatment will also be too late, increasing the likelihood that other cows will become infected. The sooner the cow is treated, the greater the chance of success.

If the milker uses hygienic practices – ensuring that his hands remain clean – drawing foremilk will not increase the chance of spreading mastitis-causing bacteria.





Photos courtesy of Animal Sciences Group at Wageningen University, Lelystad.

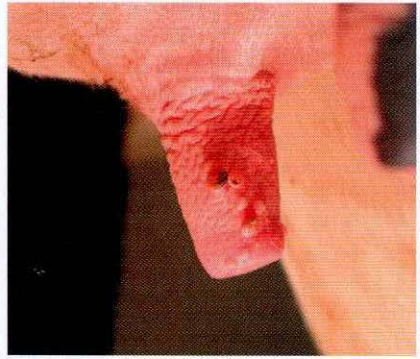
Ultrasound images of the same teat before (left) and after (right) milking. As a result of milking, the teat wall has become thicker and the teat canal has opened, which means bacteria can enter more easily.



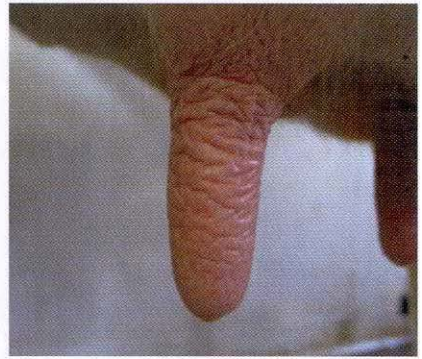
This cow has had mastitis for a long time; her milk is virtually colourless.



Blood clots and red discolouration of the milk are caused by burst blood vessels in the udder. This occurs quite commonly in heifers because the udder is growing rapidly and there is oedema. Sometimes the symptoms develop because the cow has slipped or fallen. The bleeding will stop of its own accord.



Warts are caused by viruses. In themselves they are not harmful unless they are close to the teat canal. Then they will hinder the milk flow and increase the likelihood of bacterial infections.



Smooth supple teat skin. Dry or injured skin can be painful and is an ideal breeding ground for bacteria. Some teat dips have a skin-conditioning component (glycerine and lanolin) as well as a disinfectant. When spraying or dipping ensure that at least the bottom third of the teat is covered on all sides.

Teat health

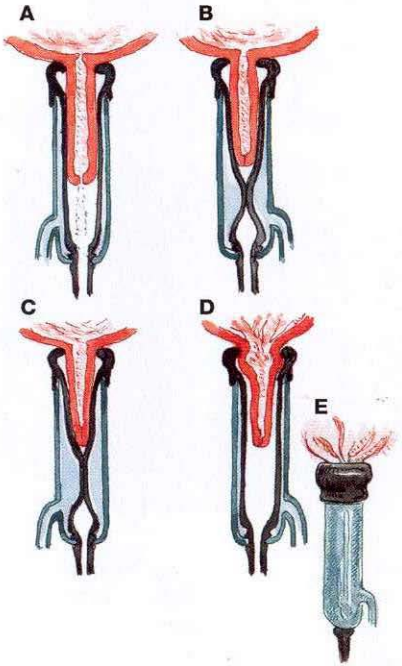
For the teats, milking is an intensive process. Healthy teats and a well-functioning milking machine are the prerequisites for success, together with correct teat shape, proper teat placement, and appropriate milking speed.

Calluses at the teat ends

The teat end together with the teat canal form a crucial barrier against invading bacteria. Forces on the teat end during milking cause calluses to develop. Calloused rings that are frayed rather than smooth greatly increase the likelihood of udder infections and mastitis.

They are caused by:

- A vacuum level that is too high.
- Milking cows for too long.
- Continued milking when the quarter is empty (over-milking).
- The pulsation ratio of the milking machine isn't properly set (adjust the pulsator).
- The liners don't fit (abnormal teat shape/the wrong liner).



When functioning properly (A & B), the milk is drawn out of the teat by the vacuum during the suction phase. The liner then closes during the rest phase.
If the teat has a pointed end, the liner closes too tightly under the teat canal (C) and the teat end becomes calloused. This is more likely to happen to heifers and cows with small teats.
Illustrations D & E show a liner that is creeping up due to vacuum leakage around the teat. The mouth of the liner is too wide. After removing the cluster, a mark from the top of the liner can be seen at the teat base.

Signals that the milking machine is not set up correctly for the cow



The teats should be dry when the cluster is removed. If they are wet, the milk isn't being removed quickly enough from the cluster and is shooting back and into the teat, with the risk of the udder being infected with bacteria from the teat skin or from a previous cow.



If the liner fits properly, the vacuum is much lower at the top of the cup than at the teat end. With small teats (heifers), liners that are too large, or wet prepping, the vacuum can become excessive. The cows then become unsettled and the teat ends become congested with blood, which is painful.



When the vacuum at the teat end is too high, small haemorrhages develop in the skin. This occurs when there is congestion at the end of the teat. The cows then object to being milked because of the pain.



The 'pinch' line is the result of the teat being stuck in the liner. This is caused by a liner that is worn out, stiff or too wide, or a pulsator that has an excessive rest phase (d-phase).

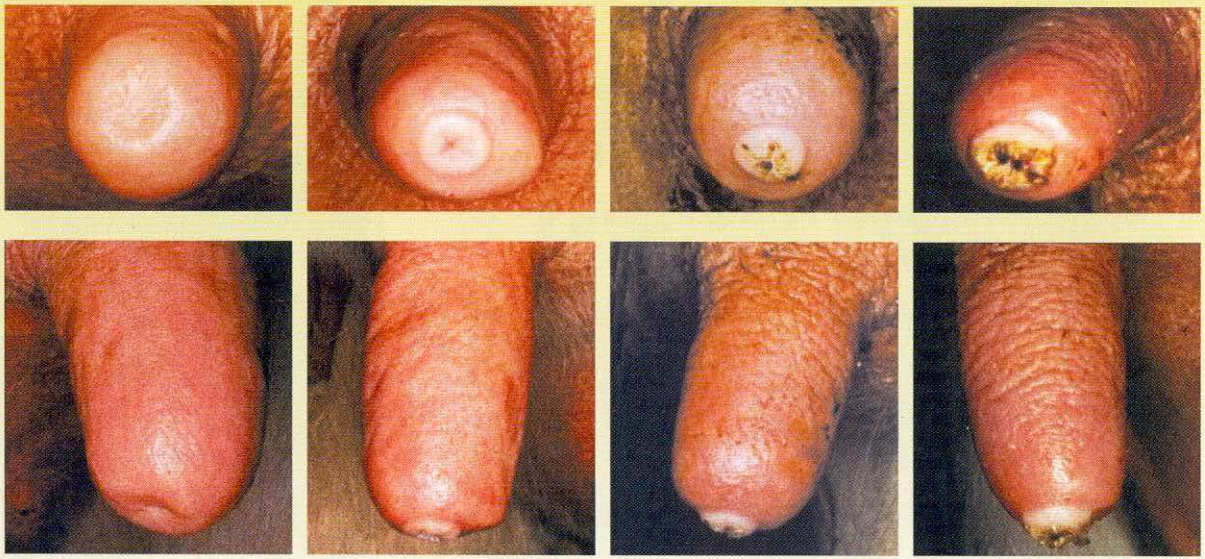
Photos courtesy of Animal Sciences Group at Wageningen University, Lelystad; T. Hemmau, Centre d'Elevage

Teat score

The teat score provides an answer to the question: is the milking process going as it should or does the milking machine or the milking technique need to be adjusted (using a dynamic machine test)? Teats can be scored in the parlour immediately after removing the cluster. Do this monthly.

When to take action?

- If more than 20% of the cows have a teat score of 3 or 4.
- If more than 30% of the cows between the second and fifth month of lactation have smooth thick calloused rings (score 3).
- When the overall score is significantly worse than it was last time.



Score 1

No callus.

Score 2

Smooth, fairly thick calloused ring.

Score 3

Moderately rough calloused rings, with some fraying at the edges.

Score 4

Very rough calloused rings with a lot of fraying.

Source: Animal Sciences Group at Wageningen University , Lelystad
The Animal Sciences Group at Wageningen University in Lelystad has developed a more detailed teat scoring method. For an experienced user, this provides further useful information.

Rumen fill

There is great variation between milking parlours with regard to how good a view you get of the cows. In all parlours, however, you can get a good idea of the volume of the rumen, which gives a good indication of the content and the thickness of the fibre layer. Cows standing with their left side to the milker provide an excellent view for evaluating rumen fill. With practice, you can also learn to get a good impression from the right side.

Depending on how long milking takes, the rumens of the last cows milked will not be as full as those of the first cows. It is also important to consider the stage of lactation when evaluating rumen and abdominal fill. Maximum dry matter intake should be reached by ten weeks post calving. When the cow is five months pregnant, the uterus visibly occupies some of the abdominal cavity.



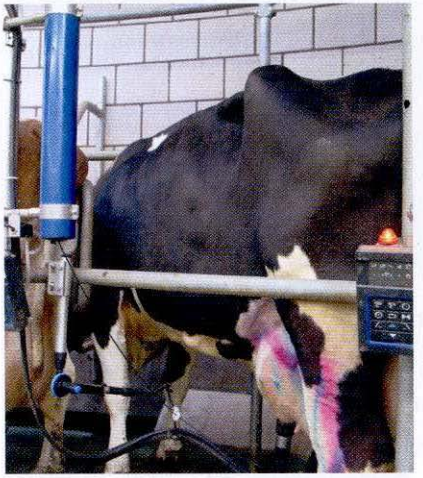
Rumen score: more than 4.
The right-hand cow has a deep rumen that is well filled.



Rumen score: more than 3.
This cow has a large rumen with lots of capacity. The bulging means that there is a thick fibre layer but the rumen is not as full as in the cow in the photo top right.



Rumen score: between 2 and 3.
This heifer doesn't have a large rumen capacity. Judging by her udder, she calved between two and six months ago. At this stage, her dry matter intake should be very high. The level of fill is average.



Rumen score: between 1 and 2.
This cow has not been eating well for several days. Her rumen and abdomen are sunken and empty.

CHAPTER 6

Robotic milking



Automated milking does not mean that the cows require less attention. On the contrary, there is an even greater need for cow-focussed management.

On farms with robots the cows come to be milked on their own accord and are enticed with palatable concentrate. However, the system doesn't work if the cows won't come in. Essentially, there is very little difference between a farm with a parlour and one with a robot, although in the latter, shortcomings in herd management will have greater consequences.

In terms of cow-focussed management, a rapid response is critical. A dairy farmer must respond quickly and effectively to cow signals. While a lame cow can be pushed into a parlour, she will not walk into the robot of her own accord.

Success factors for robotic milking

The success of robotic milking depends on the ease with which the cows can walk to the robot and on the quality of management by the herdsman. If cows are to make regular trips to the robot they need to have healthy feet, be active, and have a good appetite, and the shed needs to have a suitable layout. The quality of herd management depends on the type of farmer, the risk management strategy, and early diagnosis of disease.

Masses of information

The robot both collects and produces lots of information that can be useful to you, the herdsman, in your daily routine:

- Number of visits per day, number of refusals (cows returning too soon), and failures to attach the cluster.
- Cows that have not been milked for more than 14 hours.

indicators of the cow's activities

- Milk production per cow.
- Conductivity of the milk.
- Temperature of the milk.
- Colour of the milk.
- Clots in the milk filter.
- Milking time and speed.

indicators of mastitis

Farms using robots aim for more than two milkings per day. The advantages include higher milk production and less stress on the udder. In practice, the number of milkings per cow averages between 2.5 and 2.7. It is important that high-yielding cows are milked three to four times daily while less productive cows may visit the robot less frequently. If a cow returns too soon, the robot refuses to milk her.

Picture puzzle *What do you see here?*



The robot must be clearly visible to the cows, as is the case here. In this well-lit shed you can see that many of the cows are standing in the cubicles and that the red and white cow in the foreground has quite an empty rumen. The passageway is quite narrow, slightly more than one cow width, which gives only limited space for cows to move around.



The display from the robot provides a lot of cow-specific information. The yield per quarter is displayed.



By linking the robot to a management system the farmer can get more insight into the overall situation.



A three-teater: the front left quarter has been milked and the cup has been removed. Most robots remove each cup separately when the quarter is empty. As a result, there is very little over-milking and stress on the teats is minimised.



The robot has to be accessible from the cubicles and there shouldn't be any obstacles between the cow and the robot. A waiting area is not ideal (creates an obstacle), but is often unavoidable. A cow should be able to remain in contact with the herd. It is best if there aren't any cubicles in the waiting area. The cows that still need to be milked are moved into the waiting area by the farmer, after which the animals visit the robot on their own. There must be enough space at the entrance of the robot and the waiting area for every cow to be able to come and go in comfort. After milking, a cow can rejoin her group, guided by the one-way gating system.

Cow traffic

Experts agree that it's better to allow the cows to move around freely. Controlling the way cows move around can disguise problems. Cow traffic is regulated using one-way gates that take the cows past eating and drinking areas, the cubicles, and the robot, when in fact visits to the robot should be voluntary.

Hoof health

Hoof health is particularly important on farms with robots, as the cows must go to the robot willingly. If they are experiencing pain when walking, the number of visits will fall.
So, develop a strategy for hoof health. **Group foot trimming** – a variation of herd foot trimming – is an effective method. This strategy involves trimming plus hoof scoring twice per lactation: one month before drying off and fifty to eighty days after calving. Foot trimming in early lactation (risk time) helps to combat foul-in-the-foot and provides information about the presence of laminitis. However, when foot trimming is done too soon after calving the bleeding due to laminitis is not visible. The trimming just before the dry period prepares the hooves for the new lactation.



There must be enough room at the entrance and exit to the robot, so that cows are not hindered in any way.



A rubber floor offers a softer surface and provides more lateral support for cow's feet than concrete. The rubber provides grip and some give. The cow feels more secure because she is much less likely to slip and can escape safely. She then takes larger steps and walks about more. A straw yard also has these advantages.

Traffic through the footbath

On farms with robots, careful attention should be given to the location of footbaths. The usual spot for a footbath is near the exit from the parlour, but there may not be enough room at the exit from the robot.
Other ways of ensuring the hooves are cleaned are:

- Place footbaths in passageways that the cows walk through voluntarily.
- Place a footbath in a strategic location, through which the cows can be driven.
- Use a foot shower: a concentrate feeder where the hooves are rinsed off and then sprayed with a disinfectant.

Always check that the treatment is effective and isn't having any adverse effects. Visits to the robot, drinking, and food consumption should not suffer. Cows with sore feet are particularly likely to avoid footbaths.

Factors that prevent hoof problems

- **Low infection risks:** keep the floors and hooves clean and dry, treat infections promptly and effectively, use preventive footbaths, and maintain a closed herd.
- **Good feeding strategy** (especially to prevent laminitis): sufficient fibre in the ration, ensure that rapidly and slowly degradable ration components are eaten simultaneously.
- **Optimum immunity:** optimal feeding, good management of the transition period, and integration of heifers into the herd.
- **Avoid injury:** peace and quiet in the shed, level floors, and walkways with sufficient grip, some give (not too hard) and no loose stones, and good foot trimming.

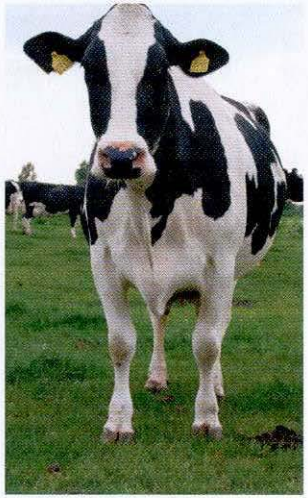
This footbath is situated at the entrance/exit to the waiting area. Even cows that have not yet been milked have to go through it. On this farm, cow traffic is controlled: the cows have to pass through the robot in order to get from the cubicles to their food.



While the cow is drinking from the water trough she stands in a footbath and her coronary bands are immersed. She has just been milked and is thirsty.







No two cows are the same. This is clear from the chest width and rib length of these two animals. A wide front leg placement provides space for the heart and lungs as well as a good forage intake (space for the rumen).



When a timid heifer gets up from her cubicle, first she encounters fresh drinking water, then palatable, high-quality forage, then concentrate, and then drinking water again, after which she eventually lies down again. Between eating forage and concentrate she visits the robot. This is the ideal situation.

Active cows are keen to eat

A robot relies on the cow being active and taking the initiative: walking to the robot herself. She is motivated by her desire to eat.

But how do you get an active cow that wants to eat? For a robot-based system, perhaps certain breeding traits should be more heavily weighted than others: for example, forage intake capacity, good legs, and udder conformation. Rearing your own heifers also has a big influence: some farmers who use robots have a preference for particular bulls because these sire more 'determined' or 'independent' daughters. Teat placement is also an important factor to consider when breeding.



A cow that is raring to go for her next lactation emerges from the dry period in good health and eager to eat. Achieving this depends on good dry cow management and the way the animal is looked after in the weeks around calving (transition period).

Know thyself

On a farm with a robot, cow signals need to be picked up early and effective action should be taken quickly. Before deciding to purchase a robot, you need to realise that you will have to perform more checks and provide a higher level of care. This is easier for some people than for others. Farmers fall into several categories (see right). Although a technically-minded farmer finds the idea of a robot attractive, a cow-minded farmer will actually be more suited to robotic milking.

Types of farmers

- **Cow-minded farmers** are particularly interested in animals. They take particular care to solve problems and make animal-focussed improvements. A cow-minded farmer has a feel for cattle: he knows whether an animal is content or not, often without even having to think about it.
- **Techie farmers** prefer to solve problems using technical solutions: equipment, buildings, and standard operating procedures. They need much more motivation in order to respond to cow signals quickly and effectively.
- **Cost-cutters** avoid expenses and prefer not to invest. Their farm management is conservative. They work reactively and have difficulty thinking preventively.
- **Entrepreneurs** view the cow as a production unit and think in terms of groups, figures, and plans. An entrepreneurial farmer wants to work in a structured way and needs clear criteria: that cow is doing well, that cow should be culled, and that cow needs extra care.

(Based loosely on the work of J.D. van der Ploeg et al.)



Picture puzzle *Evaluate this shed for cow comfort.*



There is food all the way along the feed barrier. More than 80% of the cows are lying in the cubicles (on a mat with sawdust). A fan, roof insulation, an open ridge, and open sides all help to ensure that the climate in the shed will be comfortable. The passageway is two cow lengths wide and there aren't any cows walking around that shouldn't be. This means that there is plenty of space for movement and easy access to the feed barrier. The robot also appears to be easily accessible. There is a cow brush and a rubber mat on the floor.

Health: how do you assess this?

With robotic milking, the cow's health is even more important than on farms with other milking systems. If a cow is feeling unwell, she will let herself be chased into the parlour, but is unlikely to visit the robot, as illness makes her slow and less active.

When evaluating the health of an animal, proceed from large to small. It is best to observe with an open mind rather than making judgements or excuses. Having someone else come and look with you can help you see more and draw better conclusions.



Sunken eyes, hanging ears, very skinny, empy abdomen, and a dirty skin. This cow has been ill for quite a long period. Now she is in a comfortable environment, but she should have received good treatment much earlier.

Signals of good health



- The cow is alert and active: she does what she wants to do and is aware of her surroundings. Her eyes and ears are attentive and she is curious about noise and other stimuli. The frequency of visits to the robot and computerised feeders is also a useful indicator.
- She has a glossy, smooth, clean coat without any blemishes. Cows that don't feel well soon lose the shine on their coats and their hair may stand on end.
- The cow has a good appetite and drinks well. Food intake is evident from the rumen and abdominal fill. If food intake is poor for a long period of time then the cow will lose a lot of weight. When a cow is not drinking enough or is losing excessive fluid, the eyes become sunken and the skin becomes tight (see rumen, dung, and condition scores).
- She walks and stands without any signs of pain or discomfort. When in pain, or lame, a cow arches her back. Irritation in the pelvic area causes the cow to hold up her tail. If having difficulty walking the cow first makes movements indicating she is about to walk, followed by obvious head movements when she starts walking (see locomotion score).
- The cow is well cared for, with good housing. Cow signals such as overgrown hooves, mange, and lice are indicators of poor care; they should have been attended to a long time ago. Unclipped udders and backs, and dung caked on the cow's skin all suggest a lack of care (use a hygiene or care score, pp.49 + 93).
- The scores can provide a great deal of insight into the group's overall health status.

Disease and discomfort: how do you assess this?

Ask a farmer 'How can you tell if an animal is ill?' and he'll probably answer 'If it's a calf, I can tell from the ears, if it's a cow, I can tell from the eyes'. It's true that when an animal is ill, the muscle tone of the ears decreases and the eyes soon become less alert. Other signs include lethargy, reduced appetite, standing apart from the group, a dull coat, an empty udder, abnormal dung, and a disappointing milk yield. Often the farmer notices the sick animals because they look slightly different from the others in the group. If you are familiar with the animal and know its normal behaviour well, the signs of illness are easier to detect. The earliest signals are subtle, requiring skill and experience as well as effort to recognise them. Therefore, when making checks ensure that you do this at times of risk and look specifically at animals in risk groups.

Temperature

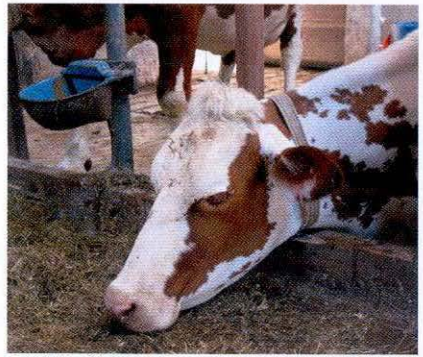
A high temperature is an early and clear sign of disease and is part of the immune response and inflammatory process. A sick cow that isn't running a temperature may have a digestive disorder, or could be in shock, which occurs when the circulation is failing. In this situation, the cow is cold to the touch, especially her ears, lower limbs and udder. Take a cow's temperature by placing the thermometer in the anus. N.B. If the cow has very bad diarrhoea there may be air in the rectum and you can get a false reading.

Normal values for cattle

Age	Temperature	Respiratory rate	Heart rate (pulse)
Newborn calf	38.5 – 40.5 °C (101.3 – 104.9 °F)		100-130 / minute
Calf 1 year & under	38.5 – 39.5 °C (101.3 – 103.1 °F)	30-50 / minute	80-110 / minute
Cow	38.0 – 39.0 °C (100.4 – 102.2 °F)	10-30 / minute	50-80 / minute

Pain

When in pain, cattle try to reduce the pressure on the sore part, take shallow and rapid breaths, and are less aware of their environment. As a result of pain, they also eat and drink less. The eyes are sunken and the skin becomes tight. An animal in pain will often withdraw from the group. In the shed, the cow will lie in a cubicle, at pasture, she may lie close to a fence. Lame cows are more easily startled because they are less able to get away. This becomes very obvious in sheds with slippery floors.



This cow is very ill. Noticing the signs as early as possible is paramount. Her lethargy and sunken eyes are very noticeable.



Cows with a negative energy balance have elevated levels of acetone in their blood, their milk, their urine, and on their breath. Some people can smell acetone, even when several metres away from the cow.



Taking a cow's temperature is easy and gives you immediate insight into her health status without involving a vet.

CHAPTER 7

Heifers and dry cows



Good management of risk times is important, to ensure heifers and dry cows remain healthy.

How can you tell in advance that a cow will become ill? By looking for the right things, on the right animals, at the right time. At least twice a day take the time to evaluate all the animals, focussing on risk groups and risk times.

Most problems occur within risk groups and at risk times. In these situations, you have to be particularly alert.

Dry cows and heifers are examples of risk groups as they go through many risk times and may not receive enough care when the farmer is busy. This is unwise, given that future production depends on these animals.

Universal or farm-specific

Certain risk times affect all heifers, while others apply only to certain farms. Times of risk that apply to all farms are easy to list: birth, the first few days of life, disease outbreaks in calves, moving, weaning, ration changes, mixing groups, certain types of weather and climatic changes, a different herdsman, transportation, and many others.

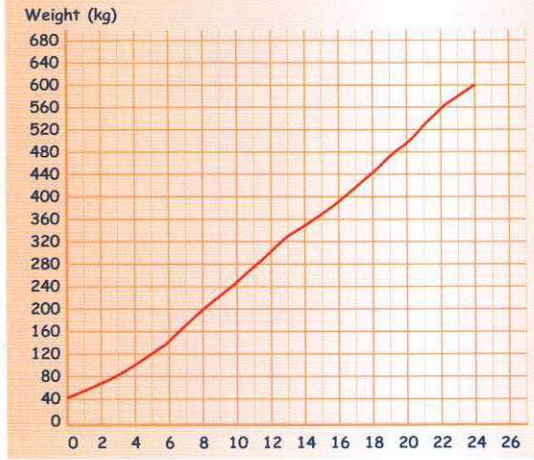
Farm-specific risk times become appa-

rent when walking among the animals and discussing management strategies. Risks can be avoided if there is good risk management, and this will safeguard the success of the farm.

Growth and development

Looking at the growth curve of young animals provides useful information. Disappointing growth points to a risk period. Variation within an age group may occur because of disease or as a result of differences in food intake. Are the weights disappointing? If so, the animals in question have gone through a period of poor growth.
Combine measuring growth with body condition scoring. An animal with a normal chest circumference but too much fat may still be too small to serve.

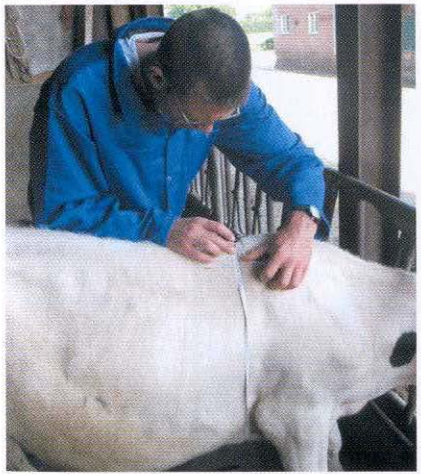
Growth chart for Holstein Friesian heifers calving at 24 months



This graph compares weight with age for young stock. A single measurement can be used to determine whether growth is on track and helps to ensure that each heifer will be the correct weight when she calves.

For most breeds and farms, the following rules apply:

- 45% of mature weight; puberty begins.
- 55% of mature weight; ideal time to serve.
- 85% of mature weight; desired weight at calving.



Measuring the chest circumference provides a reasonable estimate of body weight. When this is done regularly (at least twice a year), you get a good impression of the calves' growth rate and can identify the periods when growth does not meet expectations.

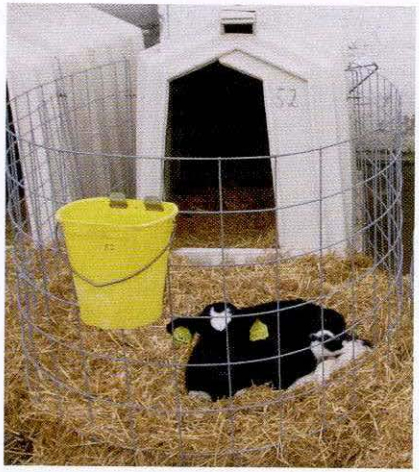
In the first year of life, cattle are susceptible to infection with Johne's disease. Calves should not be exposed to dung from older cattle, because – together with milk – this is the major source of infection. Food in a trough is less likely to become contaminated with dung than food on the floor.



The first days of life

The first days in a calf pen are a challenging time for a newborn calf. Make sure the calf gets sufficient colostrum: at least five litres on the first day, with at least half during the first twelve hours. This, together with clean, comfortable housing, is the key to success during the first month of life. The following signals are good indicators of the quality of the care of newborn calves:

- the number of cases of diarrhoea;
- mortality rate (record the age);
- the number of navel infections;
- growth and food intake.



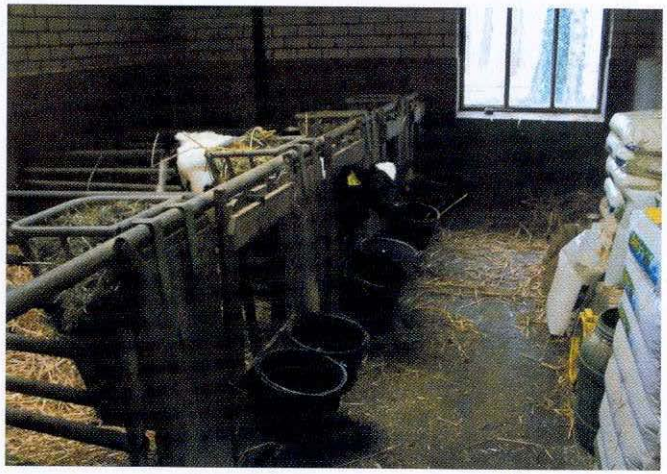
Other cattle are a source of contamination for the young calf. Hutches are a good way of preventing contact between animals. The sides and bottom should be well cleaned. Use clean utensils and always work from the youngest to the oldest.



Check the navels regularly: for example, every Monday and Thursday. The cord should be soft, thin, and non painful. The calf shows pain by kicking or struggling.



As part of their routine, calf buyers always check a calf's navel. They do this for a good reason. An infected navel lowers resistance and can lead to a lot of other problems.



These calves are lying in a clean, fresh pen with a good layer of clean straw. They have unlimited access to palatable hay, concentrate, and water. However, the close contact between animals means disease can spread quickly.

Changes

During times of risk you should try and minimise the consequences for the animals. One way to do this is to make changes gradually and not to combine changes such as weaning with moving pens; instead spread them out.

Change takes many forms: at a social level, in feeding, care, housing, and climate. The first change for a calf often involves moving from a single pen to a group pen. After weaning, there is clearly a major change in the calf's life: no more milk. From this point on, the calf will be moved regularly and there will be many ration changes; each change presents a risk.

Times when the most common types of diarrhoea occur

- *E. coli:* the first few days
- Cryptosporidiosis: from 5 days of age
- Rota or corona viruses: 10 – 14 days
- Nutritional diarrhoea (when milk ends up in the rumen): from 2 weeks until weaning
- Coccidiosis: from one month of age



The oesophageal groove ensures that the milk goes directly into the abomasum and does not end up in the rumen. For the groove to function properly the milk needs to be of good and constant quality and a strict daily feeding routine should be followed. Variation increases the likelihood of milk ending up in the rumen and diarrhoea.



Clay-like dung caused by milk rotting in the rumen. Affected calves are thin, have a potbelly and a dull coat.



Here is one way of achieving a gradual changeover from a straw pen to a slatted floor. When the calf is about six months old the hooves can withstand a concrete floor and the ability to maintain body temperature is well enough developed for the calf to lie in cold cubicles. Slats specially designed for calves are available.



Calves with a glossy coat, well muscled back and good abdominal fill. The pen walls and the calves are clean. These are all signs of good health and good growth.

Picture puzzle

What do you see? Why has this happened? And what should you do?

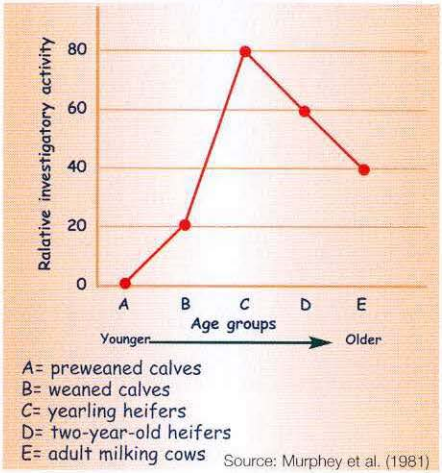


The smallest calves are thin and have quite empty abdomens. They are being chased away from the food by the bigger calves. Solution: avoid overcrowding, ensure there is enough feeding space and unlimited access to good food. Or, separate animals of different sizes.

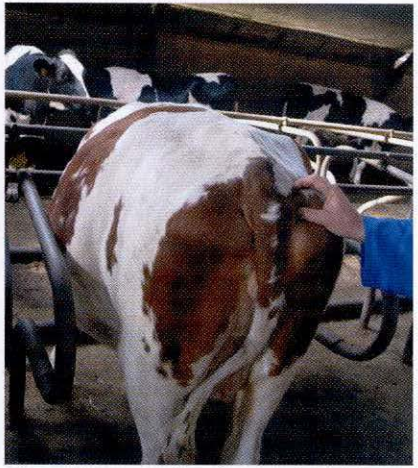
Young animals learn quickly and are eager to explore. For example, if the make-up of their group changes a number of times, each time they quickly learn to adjust to the new group.



Social behaviour



From this graph it appears that heifers are the most eager to learn. Of all of the age groups, they display the most inquisitive behaviour.



Condition scoring is essential when adjusting the ration. The risk of getting fat increases greatly after puberty. This heifer has a body condition score of 4 (ideal is 3.5) . Her rumen is well-filled: score 4.

Cows learn

Just like other animals, cattle learn from negative experiences (punishment) and rewards. The best type of reward is something tasty, such as concentrate. Therefore, they will learn to use automatic feeders fairly quickly.

There are two kinds of negative stimuli. First of all, pain. The cow associates pain with the situation in which she finds herself at that moment. A painful injection makes her wary of the person who injected her and of the place where she was injected. Pain after slipping near a water trough will result in a mental block about returning to that particular trough.

The other negative stimulus comes from the intestines. This has a longer feedback time and remains in the animal's memory for a long time. Using this mechanism the cow learns to recognise and avoid poisonous plants and food that will make her ill. So cows have a long memory for negative experiences – such as eating bad silage.

Rearing young stock

The aim of heifer rearing is to produce an animal that is well prepared for a long, profitable life as a milking cow. Therefore, she must be mature enough. If she still needs to do a lot of growing in her first and second lactations, she will have a low social rank and produce less milk. A Holstein Friesian heifer's height at the withers should not increase by more than 3 cm during this period.

In addition, a heifer in her first lactation should be in good condition and have strong hooves. At the beginning of lactation, the health of her hooves is under great pressure. In order to build up resistance, it is a good idea to let the heifers have contact with the dung of mature cows a few months before calving. This will also result in better colostrum with more farm-specific antibodies.

The heifer should be introduced into the herd six to eight weeks before calving. This allows for initial contact with the milking herd. Preferably, introduce several heifers at the same time to a group of dry cows with approximately the same calving date.



On many farms, young stock and heifers already have foot infections. Good monitoring, including leg and hoof scores, provides information about the severity of the symptoms. Initial action: footbaths. The slats shown here have been roughened to provide better grip for the heifers.



Young stock need to be moved before the cubicles or the yokes become too small. These cubicles are clean and well-bedded, but too small.





In order to develop a rumen with a large capacity, a calf needs to consume plenty of forage throughout its life. Palatability and availability of food are therefore important. Dung as well as rumen and abdominal fill provide daily information about this.

Dry period

The dry period is a bit like a holiday. The first few days are stressful because of the changes and because the habit of 'being at work' (producing milk) has been broken. This is followed by a period of rest and contentment. At the end of the dry period the cow must be completely ready for a year of hard and healthy work, but here the comparison ends. Her work is to achieve a major physical event: the birth of her calf, and then her metabolism must immediately work at full power.

The period around calving therefore represents the time of greatest risk in the cow's life. Adequate preparation and outstanding care are key factors if this transition is to take place without problems. Investing in optimal dry cow management will be repaid with fewer problems in the following lactation, and a higher milk yield. The dry period lasts an average of eight weeks,



A dry cow ration needs to be well-balanced. Intake is important and depends on the palatability and availability of food. Food intake and stress levels are influenced by the stocking density, ventilation, heat, and the availability of clean drinking water.



The condition of dry cows should not change, or at worst should increase only slightly: a maximum of 0.25 points. But the cows must eat as much as possible to maintain their intake capacity. Loss of condition should be avoided at all costs. Daily evaluation of rumen fill, leftovers, and dung, as well as a weekly body condition scoring are therefore all very important.



Drying off is stressful, so monitor every cow closely. Consult with professionals about the right course of action. For example, what should you do if the cow leaks a lot of milk? In the picture, the left rear quarter is very full. Is the cow developing mastitis?

These dry cows are clean and are lying down in a dry and clean environment. However, the space to walk around and lie down is limited. Exercise has a beneficial effect on the cow's vitality.



during which time the cow should go through two groups, where she is managed and fed differently: what the Americans call the 'far-off' group and the 'close-up' group. Cows in the far-off group are between drying off and three weeks prior to calving. After this the cow is moved into the close-up group.

Far-off group

At the time of drying off, the cow is producing 15 litres or less. This can be influenced by feeding. Preferably, dry off the cow in one go, and always use a very hygienic technique to insert dry cow tubes into each milked-out quarter. Afterwards, move the cow from the milking herd into the resting group. Here she receives a very basic ration, but always with plenty of water available.

If cows are clean and dry this means that the environmental hygiene is good. When hygiene scoring, evaluate the area around the tail, udder, and abdomen, as well the thighs and legs.

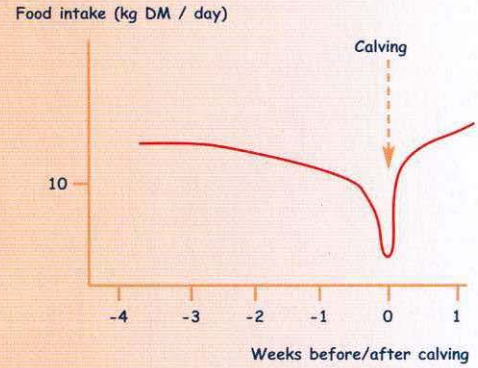


The transition period

At the beginning of the transition period	Monitor
A condition score around 3.5.	Body condition scoring.
Maximum dry matter intake.	Rumen fill, weigh food.
Proper mineral balance.	Blood and urine analysis.
Healthy feet and legs.	Leg, hoof, and locomotion score.
Good overall health.	Cow is alert, lively, and raring to go.

During the transition period	Monitor
Optimum ration.	Ration formulation, dung, disease and milk production.
Continuous availability of palatable food and water.	Food intake, rumen fill, and check water troughs.
Outstanding hygiene.	Cleanliness of cows, environment.
Comfortable cubicles, spacious and well ventilated housing.	Lying behaviour, space, and climate control.
Minimal stress.	Evaluation of changes, food intake, and behaviour.
Good quality care and control of conditions.	Evaluation of care and risk management.

Food intake around calving



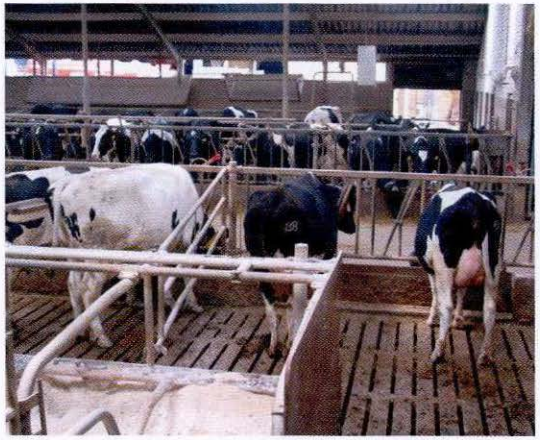
During the dry period the dry matter intake of the cow slowly decreases, mainly because the uterus is occupying more and more space. On the day she calves, the cow does not eat very much because of the calving process and the associated stress. The stress occurs because of social conflicts, deficiencies in the housing, and dietary changes. Severe stress can result in the cow going a number of days without eating enough. The cow's dry matter intake on the day of calving is a good indicator of the quality of the dry cow management. The more the cow eats on this day, the better start she will get to her lactation.





During the dry period, the teat canal is closed by a keratin plug. These plugs develop over several weeks. In approximately ten percent of cows, the closure is incomplete, bringing a continuous risk of mastitis during the dry period, particularly immediately after drying off and just before calving.

The two groups of dry cows here are clearly separated. The far-off group is on the left and the close-up group is on the right (the cow on the right is clearly bagging up).





A successful lactation begins with a cow that is healthy when she emerges from the dry period. This cow has a good appetite immediately after calving. This is a very good sign. A cow must continue to eat around the time of calving.

Close-up group

It takes four to six weeks for the rumen to completely adjust to a new ration. This is one reason to start feeding the milking cow ration three weeks before calving. Another reason is that this means the cow will not have to deal with a dietary change at calving.

During the transition period, all types of unrest, discomfort, and stress are undesirable. Whatever can be prevented should be prevented. Radical changes in housing and feeding are not a good idea. This also applies to social isolation: the cow should remain in eye contact with the herd.

Introducing new cows into the close-up group will lead to conflicts. After one or two days a new order will be established and peace and quiet returns. On the day that the cow calves, avoid group changes, unless she has been separated from the group so that she is not bothered by competition.

Around calving

Success at this extremely risky time for the cow depends on good management by the farmer. But what is good management? The practical implementation differs from farm to farm, but the basics apply to every farm and every farmer:

- Use set routines: Standard Operating Procedures.
- Set goals and check whether you achieve them.
- Improve the standard operating procedures when necessary.
- Check every animal thoroughly.
- Intervene quickly and effectively.

Examples of goals for successful management of calving

- 95% of the cows calve in the calving pen.
- < 5% of the cows have a retained placenta at eight hours or more post calving.
- < 10% develop metritis.
- < 5% develop milk fever (hypocalcaemia).
- < 5% calf mortality within the first 24 hours.
- < 5 % displaced abomasums.



Cows that have just calved are very vulnerable. Therefore you should check them carefully at least three times a day. Farmers have different strategies, such as having a straw yard for dry cows, taking temperatures at set times, and clearly identifying the freshly calved cows once they are in the herd.



A cow will separate herself from the group when she is ready to calve. However, in a group this may be difficult, which can lead to unrest and stress. Calving in the group also means poorer hygiene, fewer monitoring opportunities, and less control over circumstances. Can you intervene if things go wrong? And when should you intervene?





Calving signals

Just prior to calving the udder fills up (bagging up). Often there is also swelling (oedema) of the udder. The vulva swells and loosens. Once the ligaments are completely slack, the cow usually calves within 24 hours. These connective tissue ligaments run from the spine to the pins (see picture). The body temperature falls by between 0.5 and 1 °C (0.9 to 1.8 °F) in the last 24 hours before calving and this can be used as an indicator.

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