

**A welfare assessment system for dairy cows on pasture
and the comparison to a welfare scoring system for cows in cubicles**

the cow related problems

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Abstract

In Uruguay, and other countries with a warm climate, cows are held on pasture all year long. To score the welfare of the cows in countries like Uruguay it is necessary to convert the current system for cows in cubicles to a system for farmers who keep their cows all year long on pasture. During six weeks, 34 dairy cow farms in Uruguay with Holstein Friesian cows were studied in order to make a welfare scoring system for pasture-based dairy farms that is comparable with the barn-based cow comfort system from van Eerdenburg et al ⁶. The study was divided in seven phases. The first phases consisted of studying the life of cows in cubicles and on pasture. After that the barn-based scoring system was converted and new parameters were added to and deleted from the system. Subsequently is determined how to measure the parameters and points were assigned. In the last phase the scoring system is validated. The result is a scoring system with 86 parameters. These parameters are divided in 13 categories: general, milking parlour and waiting area, waiting area, milking parlour, exit milking parlour, water, feeding sites, walkways, loading site, pastures, farmer and staff, environmental management and animal health. The maximum score that can be obtained in both the barn-based and the pasture-based system is 500 points. In this way it possible to compare the scores between farms from both systems. The validation of the system showed that the scores that were produced agreed with the opinion of the experts. Both environmental and cow related parameters are included in the system. This paper mainly focuses on the cow related parameters.

More research is required in order to improve and fine tune the scoring system and to find an answer to the question: are cows that live on pasture happier than cows that live in a barn?

Introduction

Since a long time people are caring for the welfare of animals. In 1965 Ruth Harrison wrote the book 'Animal Machines' to get our attention with respect to the welfare of livestock ^{5,15}. But how can we define animal welfare? This is proven to be a difficult question to answer. The key words are feeling happy and being healthy. The Brambell Committee was one of the first who designed a definition after the publication of Harrison's Animal Machines in 1965. According to this committee welfare is: *a wide term that embraces both the physical and mental well-being of the animal. Any attempt to evaluate welfare, therefore, must take into account the scientific evidence available concerning the feelings of animals that can be derived from their structure and functions and also from their behaviour* ⁵. Nowadays the five freedoms, compiled by the Farm Animal Welfare Council in 1993, are there to give us some guidance. They show the minimum requirements the farmer should provide for his animals, they include ^{15,30}:

1. being free from thirst, hunger and malnutrition
2. being free from physical and physiological discomfort
3. being free from pain, injuries and illnesses
4. being free to perform the normal behaviour
5. being free from anxiety and chronic stress

Symptoms of chronic stress could be disturbed behaviour, organ damage, decreased reproduction, increased disease susceptibility, fear and/or pain expressions or decreased vitality ¹⁵.

In the past decades, keeping livestock in the western society is characterized by scale enlargement, specialization and mechanization of production. This means that farmers see their animals more as products and not as living creatures ¹⁵. Maybe this is why in the western society the last few years animal welfare has become more important. The consumer wants animal-friendly produced meat, milk and eggs and in the Netherlands we even have got the "Partij voor de Dieren" (= party for the animals), to stand up for animal rights and animal welfare in the parliament. For the farmer it is also important to keep his animals under the best conditions as possible, because the better the welfare of the cow, the higher the yield will be. In other words: 'a happy cow, a happy farmer'. A happy cow produces more milk and more milk means more money for the farmer. On the contrary we have to ask ourselves: "is a cow with a very high milk production happier than a cow with an average milk production?" According to Abeni and Bertoni (2008) there is a relationship between high producing herds and reduced levels of welfare ¹.

In the Netherlands, the main way of keeping cows is in cubicles. Van Eerdenburg et al. developed a scoring system for the level of cow comfort of these barn-based dairy cows. It can be used on every farm where they keep cows in cubicles. This system consists of multiple parameters that are important for cow comfort on dairy farms. Van Eerdenburg et al. examined if there is a relationship between the cow-comfort (score) and the milk production. The results showed some positive relations between comfort scores and milk production ⁶. In other countries, like Uruguay, cows are the whole year around held on pasture due to the difference in climate. To score the welfare of the cows in countries like Uruguay it is necessary to convert the current system for cows in cubicles to a system for farmers who keep their cows all year long on pasture. In this paper a scoring system is described for cows on pasture. The differences between the two systems are also addressed. Veterinarians may use the scoring system to advise farmers where to make changes in the environment or for example how to handle the animals differently to get a better score. In this way welfare can easily be improved.

Materials and Methods

Farms

This study was conducted in November and December 2009.

34 farms were visited in Uruguay by two investigators to avoid subjective scoring. The farms were visited during 6 weeks, started on the 16th of November until the 29th of December.

The investigators travelled along with a veterinarian who is a mastitis expert. At all the farms they were working with Holstein Friesian dairy cows.

Phases

The study was divided in seven phases.

Phase 0: Studying the life of cows in cubicles.

Phase 1: Studying the life of cows on pasture.

Phase 2: Converting the barn-based scoring system.

Phase 3: Adding new and deleting of barn-specific parameters.

Phase 4: Determining how to measure the parameters.

Phase 5: Assigning points to the parameters.

Phase 6: Validating the scoring system

Phase 0: Studying the life of cows in cubicles.

Before studying the life of cows on pasture in Uruguay, it is necessary to know how cows are kept in the Netherlands. The studying took place at a Dutch farm for two days. In this way it was possible to get an idea of the work that needs to be done at a barn-based farm and to see how the cows live there.

Phase 1: Studying the life of cows on pasture.

To set up a comparable scoring system it is important to know exactly how the cows live in Uruguay. Five farms were visited in order to observe the cows during the day to find out what a day looks like for a cow. The environment, the cows, the waiting room and milking parlour were studied by taking pictures and making notes. It was also important to determine the distribution of the time how long the cows are in the pasture and how long the whole milking process takes, this includes getting the cows out of the pasture until bringing them back.

Phase 2: Converting the barn-based scoring system.

The scoring system for cows on pasture is based on the scoring system for barn-based dairy cows. To make a compatible system it had to be similar.

For all the various parameters of the barn-based scoring system was decided if it was important and useful for the new scoring system.

Phase 3: Adding new and deleting of barn-specific parameters.

When converting a barn-based scoring system some new parameters need to be added to the system, for example the distance to the feeding places. After studying the cows for a while, it appeared that certain cows were negatively affected in their welfare as indicated by signs of lameness, skin lesions, the eyes not being shiny, and lean cows. Some cows were restless, got scared very easily and they tried to get away when they were approached by human beings. The parameters that are causing this are added to the system. Barn-specific parameters, like cubicle dimensions, were not applicable and therefore deleted from the system.

Phase 4: Determine how to measure the parameters.

After collecting all the parameters and put them in the system it was important to determine how to measure them.

For parameters like locomotion, body condition score, rumen fill and cleanliness of the cow we used the existing score systems^{3,7,25,33}. Body condition score, rumen fill and locomotion score can all be easily found in the book cowsignals¹⁸. Other parameters like water temperature and the speed of cows walking are measured with measuring equipment. For behavioural parameters the possible reactions of the cow were investigated. This was also done for some environmental parameters, but then by documenting the situations seen at the farms. The different reactions and sights that were documented became options to choose from. For example, for the cleanliness of the surface of the feeding site this resulted in: clean, a small layer of faeces/mud, or a big layer of faeces/mud.

During the study, pictures were made of the situations encountered. By using these pictures it was easier to choose between the different options.

Also a questionnaire was designed to get important information about some parameters, especially about animal health. This was necessary because, for example, it cannot be determined how many cows have had mastitis in one year during a single farm visit. For the questionnaire see appendix 6.

Phase 5: Assigning points to the parameters.

After setting up the system, a score was assigned to every parameter.

The height of the score depended on how important the parameter is for the welfare of the cow. For example the percentage of mastitis is more important in comparison to the floor of the feeding places. Therefore, a higher score is awarded to the percentage of mastitis. However, mastitis usually lasts a few days, while a bad floor is bothering the cows every day of the year. This is taken into account, because the floor is used in several parameters. This means the floor of the feeding places gets less points then mastitis, but the floor also gets points in the category waiting room, milking parlour, outlet and walkways. The total score for floor is therefore higher than the total score for mastitis.

To make the pasture-based system comparable to the barn-based system, it was important to compare the scores of the parameters.

For example behaviour and time in the waiting room is as important for pasture-based cows as it is for barn-based cows. But the walkways are more important for pasture-base cows then it is for barn-based cows. Therefore it gets a higher score assigned in the new scoring system. This is because the pasture-based cows have to walk much more on the walkways than barn-based cows have to.

Some parameters are divided into different options. Each option has a different score. The best option gets the highest score.

For example the maximum score for cow behaviour is 5 points.

Cow behaviour is divided in 3 options:

curious	5 points
not fearful	3 points
fearful	0 points

Some parameters that are about cow health are very important. If the health of the cows is very bad, points are subtracted.

% milk fever per year

0%	→	5 points
0 – 5%	→	0 points
5 – 10%	→	-2 points
10 – 15%	→	-5 points
> 15%	→	-10 points

Every category consists of several parameters. For all those parameters there is a score. There is a maximum and a minimum score for each category. If the minimum score is not reached, the difference between the score and the minimum needs to be subtracted from the total score. For example:

Category general
maximum points 20
minimum points 8
score farm 6
total score 4

Phase 6: Validating the scoring system.

The last phase consisted of validating the scoring system.

During the study a score sheet was made. This sheet can be used when a farm is visited. For the score sheet see appendix 1.

The scoring system was used at several farms. Together with the veterinarian a ranking of the farms was made. The farm which seemed to have the ‘happiest’ cows was number 1 and the farm which seemed to have the ‘saddest’ cows was the lowest in ranking.

After the ranking the scores were determined. If the system would have the right scores, the number 1 farm would have the highest score and the farm lowest in ranking would have the lowest score.

Results

Table 1 summarizes the various parameters of interest for cow comfort on pasture-based dairy farms with the number of points that can be acquired. Indications for the black coloured points can be found in the explanation below. These are mainly the cow related parameters. The points can be summed per chapter, and counted for the entire farm. If the minimum score for a chapter is not reached, the difference between the score and the minimum needs to be subtracted from the total score.

Table 1. Parameters for cow comfort on pasture-based dairy farms and their points.

SCORING SYSTEM FOR COW COMFORT ON THE DAIRY FARM			
	Minimum	Maximum	Points
General	10	20	
Fear behaviour		5	
Stretching when raising from the pasture		3	
Tails are hanging straight and relaxed		3	
Broken tails		0 (-100)	
Bellowing		4	
Environmental noise		0 (-5)	
Flies		0 (-5)	
Tail docking		0 (-5)	
Cleanliness score		5 (-5)	
Milking parlour and waiting area	2	5	
Behaviour		3 (-3)	
Max. time waiting before entering the milking parlour		2	
Waiting area	8	17	
Shade		5 (-5)	
Presence of a ventilation system		1	
Presence of sprinklers		5	
Slipperiness floor		2	
Cleanliness floor		2	
Flatness floor		2	
Milking parlour	8	18	

Placing of feeding troughs		3	
Space		3	
Slipperiness floor		1	
Cleanliness floor		1 (-1)	
Flatness floor		1 (-1)	
Stairs and slopes		1	
Walking related to the placement of the shafts		2	
Light		2	
It smells nice		1 (-2)	
% kicking cows		3 (-3)	
Exit milking parlour	3	6	
Floor		1 (-1)	
Mud		2 (-2)	
Surface		2	
Rubbish and obstacles		0 (-2)	
Slopes		1	
Water	16	33	
Ad libitum water available		10	
Type of place to drink		3	
Cleanliness		5	
Temperature		5	
Distance from the pasture with cows to the place to drink		3	
Sufficient amount and size of drinking troughs		5	
Safety of the drinking trough		2	
Feeding sites	13	27	
Additional feeding sites in the pasture		10	
Surface		3	
Cleanliness of the surface		3	
Feeding place per cow		3	
Contamination of the feeding site		0 (-3)	

Distance from the pasture to the feeding site		3	
Quality		5	
Walkways	9	18	
Floor		3	
Mud		5 (-5)	
Surface		3	
Rubbish and obstacles		0 (-5)	
Walking distance		3	
Slopes		2	
Speed of cows walking		2	
Loading site	3	6	
Steepness		1	
Safety		2	
Flatness floor		2	
Straight end		1	
Pastures	35	70	
Shade during hot hours of the day		20 (-20)	
Food availability		20 (-20)	
Mud		10 (-10)	
Rubbish and obstacles		10 (-10)	
Presence extra pasture		5	
Mud extra pasture		5	
Farmer and staff	34	68	
Relevant education farmer		5	
Relevant education staff		5	
Way of herding		10 (-10)	
Way of treating the cows during herding		20 (-15)	
Way of treating the cows around the milking parlour		20 (-15)	
Use of automatic driving aids		10 (-10)	

Environmental management	5	10	
Rest during hot hours of the day		5	
Milking hours aligned to the climate		5	
Animal health	100	202	
Hair		5 (-10)	
% lameness / year and locomotion		25 (-25)	
Hocks		20 (-60)	
Carpus		20 (-60)	
Claws		20	
% mastitis /year		15 (-15)	
Abomasal dislocation		10 (-15)	
Filling of the rumen		5 (-10)	
% milk fever /year		5(-10)	
Acetonaemia		5 (-15)	
Body Condition Score		17	
% Rumen acidosis / year		15	
Fertility		25 (-10)	
Calving		15	
Cow mortality		0 (-500)	
Total		500	

EXPLANATION OF THE PARAMETERS

GENERAL

Fear behaviour:

When you calmly approach the cows that are grazing in the pasture without making sudden movements there are a few ways in which the cows can react. The cows can be curious and approach you; they don't move, but don't look scared either; or they can be scared and walk away. Livestock have wide angel vision and they are easily frightened by shadows or moving distractions ¹¹. Tame cows that are willing to approach people give more milk ¹⁰.

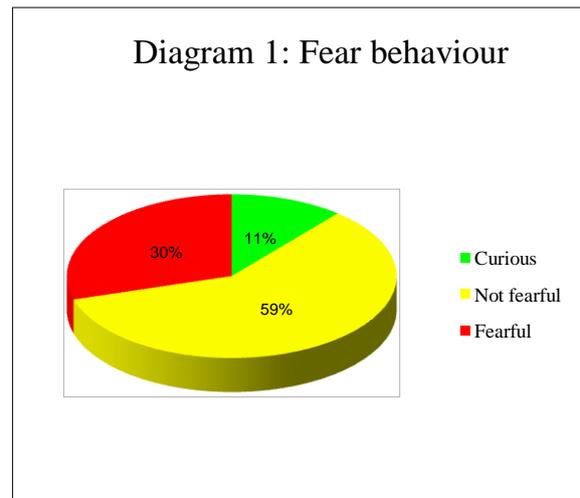
For curious animals give 5 points.

For not fearful animals give 3 points.

For fearful animals give 0 points.

On 27 farms the fear behaviour was investigated. On three farms the animals were curious and tried to approach people. On sixteen of the farms, the cows were not fearful. On eight farms (30%) there were fearful cows. See diagram 1.

Almost 1/3 of the cows were tested as fearful. This may be due to the way of keeping the cows. The cows are mostly in the pasture during the day without people around them, while there is more human-animal contact in a barn-based system.

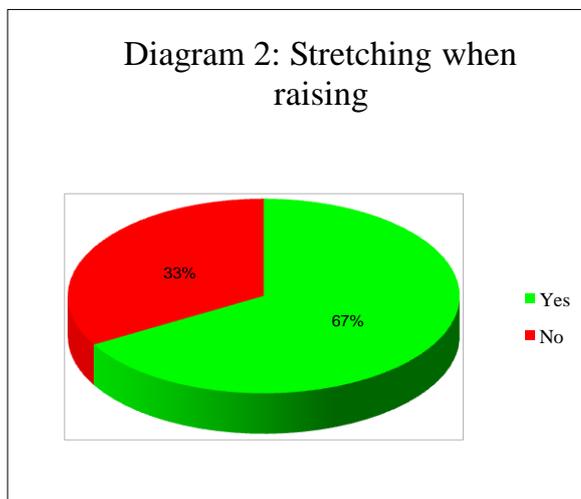


Stretching when rising from the pasture:

If a cow lies comfortably in the pasture and is not forced to stand up quickly, she will stretch when standing up.

If she stretches: 3 points.

If she doesn't: 0 points.



At six of the farms that were visited, there was investigated if the cows lied comfortably in the pasture and got the time to stretch when they were rising from the pasture. It was not possible to investigate this parameter on more farms, because the cows were already standing in the waiting area most of the times. In other cases the pasture was too far away. The results were that at four of the six farms the cows had the time to stretch. At two of the six farms they didn't have the time to stretch. See diagram 2.

One third of the cows don't get the time to stretch when standing up. The main way of getting the cows out of the pasture is on horseback. Apparently this is not the best way for the cows to be herded.

Tails are hanging straight and relaxed:

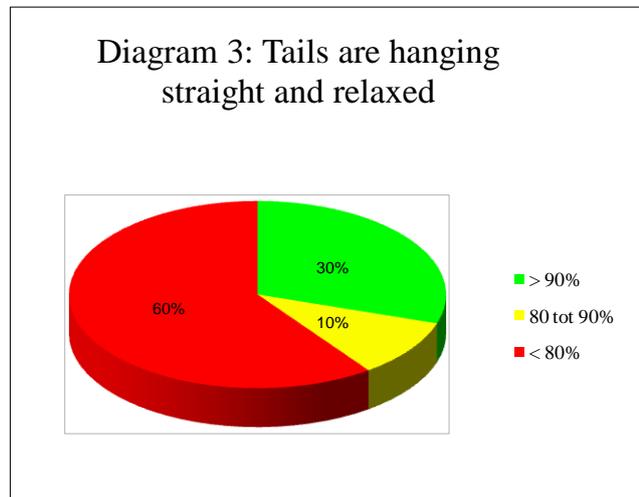
A non-stressed or non-agitated animal will have her tail hanging straight down and relaxed. Excited animals can keep their tail straight up. If a cow is bothered by flies or other insects, her tail will be swinging through the air to keep the insects away.

If more than 90% of the cows in the pasture have a relaxed, straight tail give 3 points.

When you see this in 80-90% of the animals give 2 points.

Otherwise: 0 points.

If the tails were hanging straight and relaxed was investigated on twenty farms. On six farms the tails of the cows were relaxed in more than 90% of the herd. On two farms there were straight and relaxed tails in 80-90% of the cows. At twelve farms less than 80% of the cows had a straight and relaxed tail. See diagram 3.



At almost two third of the farms cows were constantly swinging their tails. Flies and other insects are apparently a big problem for cows living in a pasture. Animals with their tails straight up due to excitement or agitation were not seen.

Broken tails:

Sometimes there are cows that refuse to go into the milking parlour. In a situation like that, there are farmers that use the tail to move the cow into the right way. If the cow is handled very roughly the tail will break. Livestock with mastitis is sometimes marked by a string around the tail. When this string is done to tight, the tail will die and fall off. Use of tails by cattle is a fly-avoidance behaviour. The welfare of cows with shorter tails is reduced because of their inability to avoid flies and the disruption of grazing behaviour by the use of alternative fly-avoidance behaviours¹⁷. Cows with docked tails should be excluded.

If less than 1% of the cows have a broken tail: 0 points.

Subtract one point per percentage of broken tails. For example, in case of 8% of broken tails, subtract 8 points.

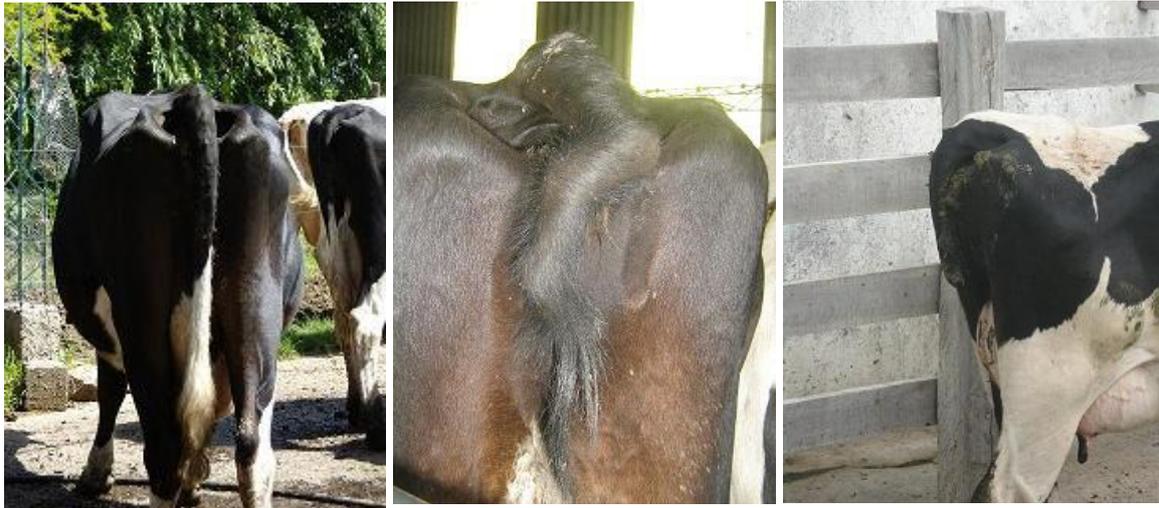
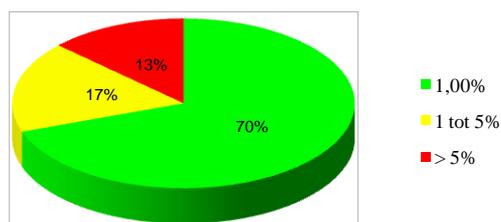


Figure 1. Examples of tails: Normal, broken and tail that fell off due to a string that was too tight.

Diagram 4: Broken tails



The percentage of broken tails was scored on twenty-three farms. On sixteen farms less than 1% of the cows had a broken tail. On four farms 1 to 5% of the cows had broken tails. And on 3 farms more than 5% of the cows had broken tails. See diagram 4.

On almost one third of the farms there were cows with broken tails while there should be none. The cause can be found in impatience of the staff. They try to force the cows into the milking parlour because they want to milk the cows as quick as possible. Due to this pressure, cows are not willing to enter the milking parlour. The milking would be more efficient when the staff is patient.

Bellowing:

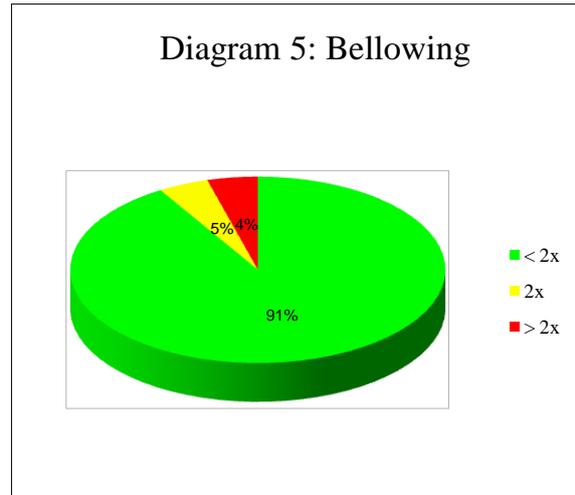
The assessment of stress and discomfort should contain both behavioural and physiological measures. One of the behavioural indicators of discomfort is vocalization¹². Animals in oestrus or with cystic ovarian follicles will bellow often and should be excluded. Also recently-calved cows that are looking for their calves should be excluded.

If there is less than 2 times bellowing per 30 minutes give 4 points.

Twice per 30 minutes: 2 points.

If there is more bellowing than two times per 30 minutes: 0 points.

Bellowing was investigated on 23 farms. On twenty-one farms bellowing was less than 2 times per 30 minutes. On one farm the cows bellowed two times in 30 minutes. There were two farms where a cow was bellowing more than two times per 30 minutes, but on one of the farms this was due to a cow that was looking for her calf so she was excluded from this investigation. See diagram 5.



Bellowing due to discomfort is just a small problem.

Cleanliness score:

If the exit, the walk ways or the pasture is very muddy or covered with faeces, the cows will get dirty. It is unpleasant to walk over muddy paths and to get dirt up to your belly. It increases the chances of sickness, for example mastitis and other infections, because there are a lot of bacteria in mud and faeces. According to DeHart et al cows should be kept clean to reduce teat-end exposure to coliform organisms²⁴. Recent studies have established a significant association between udder and hind limb cleanliness scores of lactating dairy cattle, and measures of subclinical mastitis such as rate of intramammary infection and linear somatic cell score^{25,28}. In another study teats from dirty udders were significantly more likely to test positive for Klebsiella after udder preparation than teats from clean udders. This provides evidence to support the notion that cows with a poor hygiene are at a greater risk of exposure to Klebsiella mastitis pathogens²⁴.

We used a cleanliness scoring system for this parameter which is broken down into 5 general areas, namely the tail head, flank, belly, udder ad rear legs²⁵ (appendix 2):

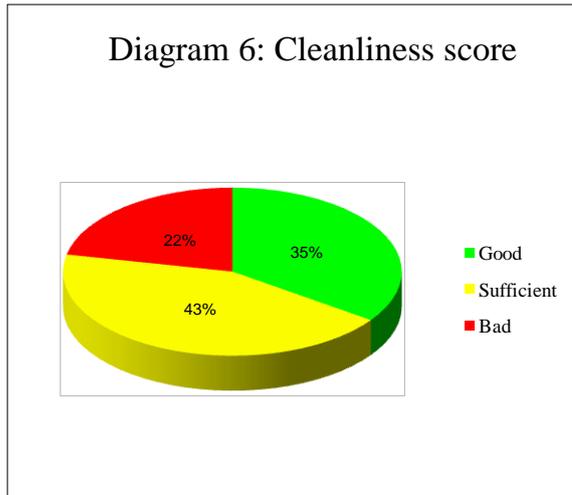
1. A totally clean cow.
2. The heel and the bottom of the legs are slightly covered with mud or faeces.
3. The rear legs are covered to about the heel, the rest of the body is clean.
4. The upper rear limbs of the cow are dirty and the ventral abdomen and udder of the cow are slightly covered with mud or faeces.
5. The cows are covered with dirt all over the body.

Check the current number of animals and determine the sample size according to the table in appendix 7. Calculate the average score of these cows.

Good, an average between 1 and 2: 5 points.

Sufficient, an average between 2 and 3: 0 points.

Bad, an average more than 3: -5 points.



The cleanliness of the cows was scored on twenty-three farms. On eight farms the cows were clean. On ten farms the cows scored an average between 2 and 3. On five farms the cleanliness of the cows was very bad, they scored an average higher than three. See diagram 6.

In total the cows were dirty on almost one third of the farms and almost one half scored sufficient. This could be due to the bad weather conditions out there during the period of research. On the other hand, the cleanliness should always be good, no matter what type of weather present.

MILKING PARLOUR AND WAITING AREA

Behaviour:

Cows and other animals tend to develop fear memories which are linked to either bad places or prominent objects or of a person wearing a certain type of clothing. It would be very detrimental for milk production if a cow becomes afraid of the milking parlour. Research on the brain by Joseph LeDoux¹⁰ shows that animals can experience fear memories that cannot be erased. In other words fear memories are permanent. Over time, animals can learn to override a fear memory and become less fearful of the place where a scary experience occurred¹⁰. Cows that don't fear the milking parlour will be waiting quietly in front of the waiting room and will enter the milking parlour voluntarily. Cows that are not feeling comfortable, will be waiting as far as possible in the back with their backside turned to the milking parlour. These cows have to be forced into the milking parlour.

Cows are facing the milking parlour, waiting in front: 3 points.

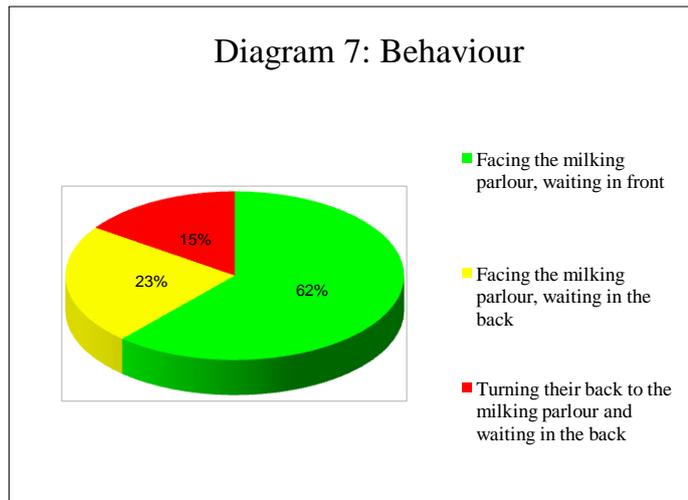
Cows are facing the milking parlour but are waiting in the back: 0 points.

Cows turn their back to the milking parlour and are waiting in the back: -3 points.



Figure 2. Examples of waiting behaviour: cows waiting in front and facing the milking parlour, cows waiting in the back and facing the milking parlour, cows waiting in back and turning their back to the milking parlour.

The behaviour of the cows in the waiting area was scored on twenty-six farms. On sixteen farms the cows were not scared. They were facing the milking parlour and waiting in front. On six of the farms the cows were facing the milking parlour, but waiting in the back. On four of the farms the cows were scared and waiting in the back with their back turned to the milking parlour. See diagram 7.



On 15% of the farms the cows fear the milking parlour. This is quite a lot, but not so strange considering the state of some of the milking parlours. They are mostly very old, dark, small, with self-made shafts and slippery stairs. And because of that not cow-friendly.

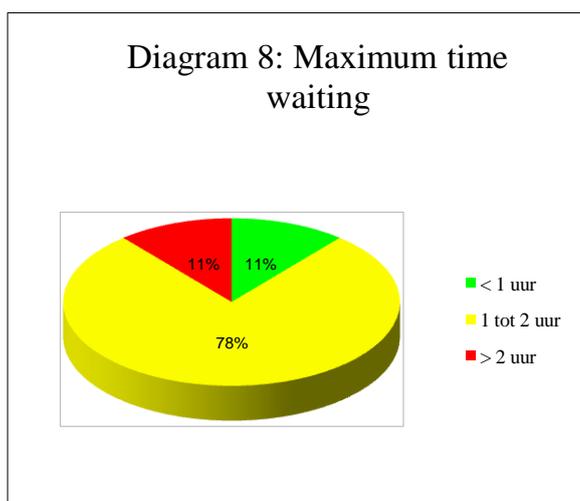
Maximum time waiting before entering the milking parlour:

For the well-being of the cow it is not good to have to wait a long time in the waiting area before getting milked. The cows are standing on the concrete, not being able to lie down or eat and the udder will be swollen and heavy.

If the cows are waiting less than an hour, give 2 points.

If the cows are waiting between 1 and 2 hours, give 1 point.

Otherwise: 0 points.



The maximum time waiting was scored on eighteen farms. On two farms the cows were waiting less than one hour before getting milked. On fourteen farms the cows had to wait between one and two hours. On two farms the cows had to wait more than two hours before being milked. See diagram 8.

Worthwhile to mention is that the two farms where the cows had to wait less than one hour were small farms with 22 and 27 cows. The two farms where the cows had to wait more than 2 hours were a farm with 74 and 265 cows. At the first farm the cows had to wait 2 hours and five minutes, at the second 2 hours and fifteen minutes.

MILKING PARLOUR

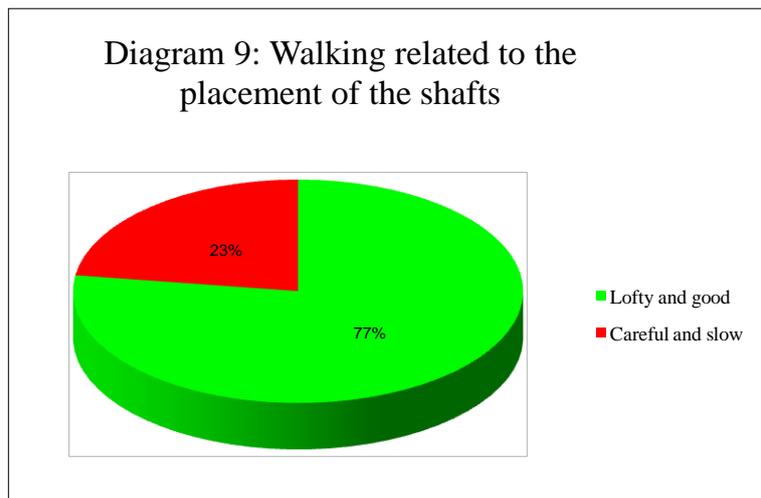
Walking of the cows related to the placement of the shafts:

Shafts are placed at the entrance of the milking parlour and in the milking parlour itself. The shafts may not cause any nuisance to the cows. If the shafts are not well placed (to high or too low) or have sharp endings, the cows can hurt themselves. The cows will walk slow and careful in the milking parlour.

If the cows are walking lofty and good give 2 points.

If the cows are walking careful and slow give 0 points.

The walking of the cows related to the shafts was investigated on 22 farms. On 17 farms the shafts caused no problem for the cows. On five farms the cows walked careful and slow because the shafts were in the way. See diagram 9.



On almost one quarter of the farms the cows have got problems with the placement of the shafts. This would mean that one quarter of the milking parlours is not suited for the cows.

% kicking cows:

Cows that kick during the milking process, are not comfortable with you touching their udder. This can be due to udder problems, for example an infection. Rousing et al found a relation between kicking during milking and teat lesions. Cows with teat lesions were more likely to kick during milking and often kicked more than once²⁷. Kicking is a behavioural indicator of discomfort¹². Or if people are yelling inside the milking parlour, the cow may become fearful and it may kick^{9,11,13}.

Check the current number of animals and determine the sample size according to the table in appendix 7.

If 0-5% of the cows kick: 3 points.

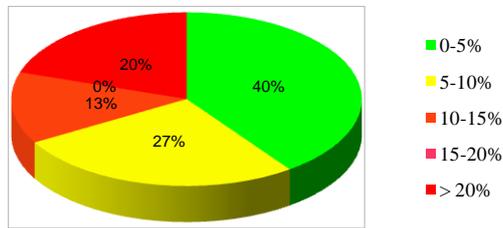
If 5-10% of the cows kick: 2 points.

If 10-15% of the cows kick: 1 points.

If 15-20% of the cows kick: 0 point.

Otherwise: -3 points.

Diagram 10: % kicking cows



The percentage of kicking cows was scored on fifteen farms. On six farms there was a percentage between 0-5% of kicking cows. There were between 5 and 10% kicking cows on four farms. On two farms cows scored between 10 and 15%. No farms had a percentage of 15-20%. At three farms there were more than 20% of the cows that kicked. See diagram 10.

In total there are a lot of farms with kicking cows that were seen during the investigation. Probably a lot more than normal, because the investigation took place at farms with mastitis problems.

WATER

Ad libitum water available:

According to the five freedoms water should be available everywhere and every time. This means there has to be a drinking place in every pasture, the waiting area and the exit of the milking parlour. And there has to be water in it all the time.

Place to drink filled with water in every pasture, the waiting area and the outlet: 10 points.

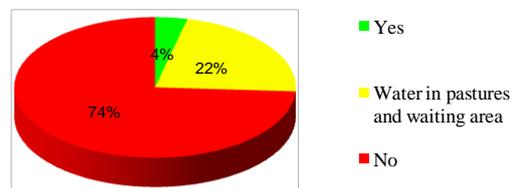
Drinking place filled with water in the pastures and the waiting area: 5 points.

Otherwise: 0 points.

Ad libitum water was investigated on twenty-seven farms. The cows had ad libitum water on one farm. On twenty farms the cows could not drink everywhere. Six farms had places to drink in the pasture and waiting area. See diagram 11.

Apparently it is difficult for the farmers to provide water to the cows everywhere they go, while this is a basic need and very important in a country with a warm climate.

Diagram 11: Ad libitum water



Type of place to drink:

A constructed drinking place contains water out of the service pipes. A natural drinking place contains groundwater with its natural vegetation. This water can be contaminated with for example a pond snail (*Lymnea trunculata*) which can cause liver problems when ingested.

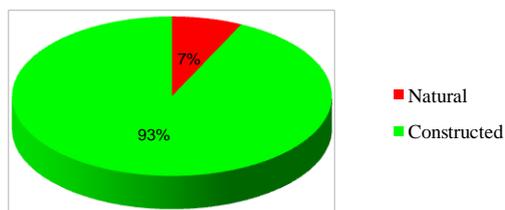
If there are constructed drinking places: 3 points.

If the drinking places are natural: 0 points.



Figure 3. Examples of places to drink: a natural drinking place and a constructed drinking place.

Diagram 12: Type of place to drink



On twenty-eight farms the place to drink for the cows was investigated. On two farms there were natural drinking places. Constructed drinking places were present at twenty-six farms. See diagram 12.

More than 90% of the farms have got constructed drinking places, which is best for the cows.

Cleanliness:

Water troughs are a major source of exposure of cattle to enteric bacteria, including a number of food borne pathogens. An adequate supply of clean, fresh drinking water is widely considered essential for optimal cow health and maximum milk production ²¹.

If the water is clear and clean give 5 points.

If the water is a bit dirty give 3 points.

If the water is muddy or dirty in any other way give 0 points.

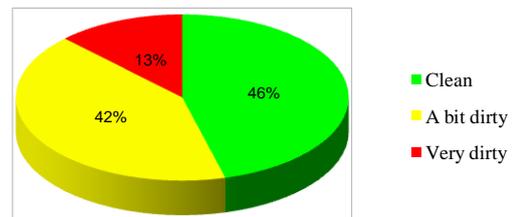


Figure 4. Examples of water cleanliness: clean, a bit dirty and very dirty.

The cleanliness of the water was scored on 24 farms. On eleven farms the drinking water was clean. On ten farms the water was a bit dirty and on three farms the water was very dirty. See diagram 13.

Apparently it is difficult to prevent the water from getting dirty. One of the reasons is the fact that a lot of troughs are not in the shade, but standing in the sun. This gives algae and bacteria the chance to grow.

Diagram 13: Cleanliness



Temperature:

Given a choice of water temperature, cows prefer to drink water with moderate temperatures (15-25°C) rather than very cold or hot water²⁹. A cow drinks about 25 litres per time²⁹ and this all ends up in the rumen. Chilled water will decrease the local temperature substantially and the flora will function on a less efficient level. Furthermore a lot of cold water in the rumen does not feel nice. Water at 10°C has a greater cooling effect than water of 28°C and lowers the respiration rate^{20,23}. Cows that drink cooler water can increase dry matter intake and milk yield²³, but water consumption declines as the drinking water temperature decreases²⁰. On a hot day a cow will prefer a little bit colder water, but not less than 15 degrees. Drinking warm water in a warm environment is even less appreciated.

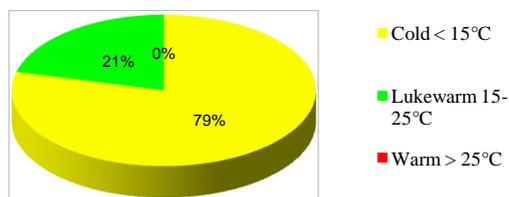
If the water is cold, < 15°C, give 2 points.

If the water is between 15 and 25 °C, give 5 points.

If the water is warm, give 0 points.

Measure the temperature by hanging a thermometer into the drinking trough for 2 minutes. The results in this investigation are obtained in another way, namely by dipping a finger in the water.

Diagram 14: Temperature



On nineteen farms the temperature of the water was investigated. On fifteen farms the water was cold. On four farms it was lukewarm. There were no farms where the water was warm. See diagram 14. Expected was a problem with warm water in the troughs due to the warm climate, but this did not seem to be a problem. Instead there were more troughs with cold water. The method that was used is not accurate, the possibility exists that cold water was actually lukewarm and that lukewarm was warm.

Distance from the pasture where the cows are to the place to drink:

It is not good for the well-being of the cow if she has to travel a long distance to drink some water. This costs a lot of energy and will go at the expense of the production and welfare. Measure the distance by counting steps. One step is approximately 0.5 meter.

If the distance is less than 500 meter give 3 points.

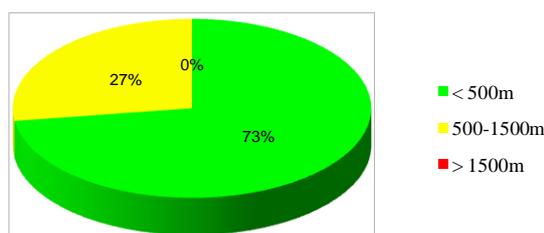
If the distance is between 500-1500 meter give 1 point.

Otherwise: 0 points.

The distance from the pasture where the cows are to the place to drink was investigated on eleven farms. On eight farms the cows had to walk less than 500 meter. On three farms they had to walk between 500 and 1500 meter. On not one of the farms they had to walk more than 1500 meter. See diagram 15.

Overall the distance to walk is not too bad, but it will always be further than for cows living in a barn.

Diagram 15: Distance pasture - drinking place



Sufficient amount and size of drinking troughs:

Troughs exist in different sizes. In order to be a drinking trough, there has to be water in it. A small drinking trough, minimum 65 centimetres, is suited for one cow. Out of an average drinking trough 2 to 5 cows can drink at one time. A big trough is sufficient for more than 5 cows at once. The bigger the trough and the more there are the less fighting there will be for the water. There will be more aggression around a small trough than around a big one. Cows may consume 30 to 50% of their daily water

intake within one hour after milking²⁹, so it is very important that the cows have got enough space to drink from the exit of the milking parlour to the pasture.

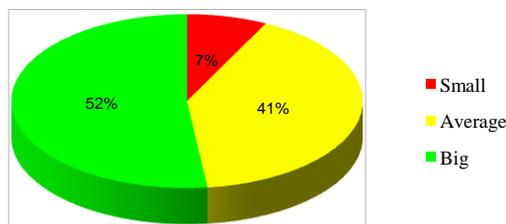
0 points: if there is not enough space for the cows to drink and the cows lower in rank are chased away.

5 points: in case there is no fighting for the water and all the cows get the chance to drink whenever they want.



Figure 5. Examples of drinking troughs: small, average and big.

Diagram 16: Size of the drinking trough



The size of the drinking trough was investigated on 27 farms. On two farms small drinking troughs were seen. On eleven farms there were average drinking troughs and on fourteen farms there were big drinking troughs. See diagram 16.

If the amount of troughs was sufficient was not investigated, because this was included in the system after the research in Uruguay.

Safety of the drinking trough:

A drinking trough has to be safe so the cow can't injure herself and cannot by accident fall in it. The drinking trough must be without sharp edges and rubbish to protect the cow from trauma and the walls have to be high enough to protect the cow from falling in the water.

If the trough is safe: 2 points.

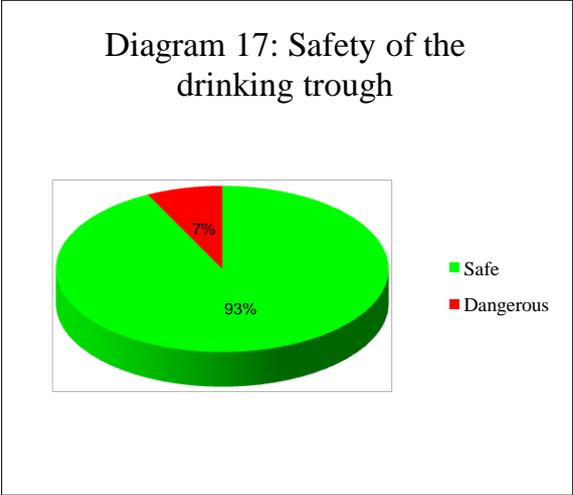
If the trough is dangerous: 0 points.



Figure 6. Examples of safety: a safe and a dangerous drinking place.

On twenty-seven farms the safety of the drinking troughs was investigated. On twenty-five farms there were safe drinking troughs. On two farms the drinking troughs were not safe for the cows to drink from. See diagram 17.

More than 90% of the drinking troughs is safe, this is a pleasing result. It shows the good will of most of the farmers to keep their property clean and safe for the animals.



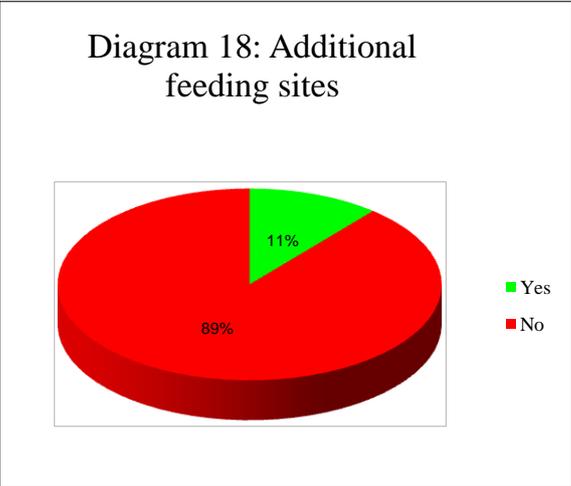
FEEDING SITES

Additional feeding sites in the pasture:

Additional feeding sites in the pasture are required at times of scarcity and drought to prevent the cows from malnutrition.

If additional feeding sites are present give 10 points.

If not: 0 points.



The presence of additional feeding sites was investigated on only nine farms. On one farm there were additional feeding sites. On eight farms there were no additional feeding sites. See diagram 18.

At the time of the investigation there was no scarcity and drought in Uruguay, instead it rained a lot. Additional feeding sites were not necessary.

Surface:

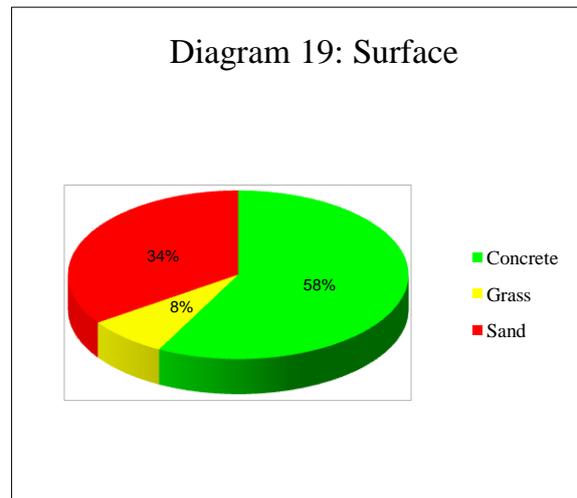
It is good for the well-being of the cow to stand on a good surface while eating.

If the surface is of concrete give 3 points.

In case of grass: 1 point.

And in case of sand: 0 points.

The surface of the feeding site was investigated on twenty-six farms. On twenty-five farms the surface was made out of concrete. On two farms the cows were standing on grass. On nine farms the surface was made out of sand. See diagram 19.



Cleanliness of the surface:

The surface where the cow is standing on while eating has to be clean. Keeping cows out of the mud increases their productivity and reduces endoparasitic and foot problems⁸.

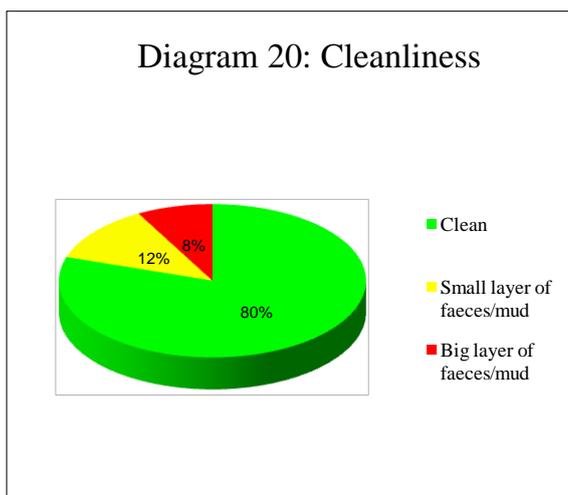
If the surface is clean give 3 points.

If the cow is standing in a small layer of faeces or mud give 0 points.

If the cow is standing in a big layer of faeces or mud give -3 points.



Figure 7. Examples of cleanliness of the surface: clean, a small layer of faeces/mud and a big layer of faeces/mud.



The cleanliness of the feeding site was investigated on 25 farms. In twenty cases the feeding sites were clean. On three farms there was a small layer of faeces or mud on the ground. On two farms there was a big layer of faeces or mud where the cows had to stand in. See diagram 20.

Feeding place per cow:

Every cow should have its own feeding place, with a minimum of 65 cm, to prevent the cows lower in rank from getting less food.

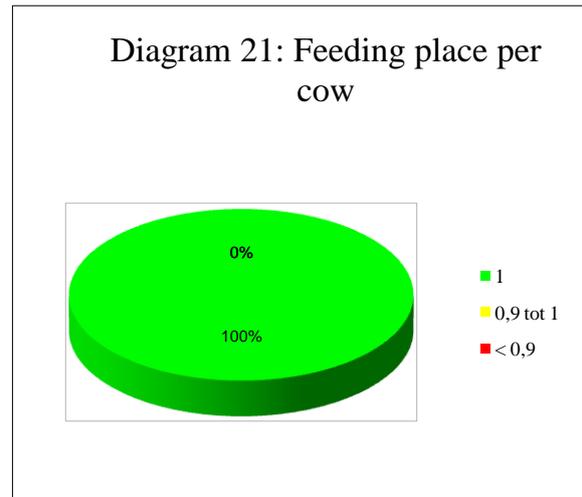
If there is one feeding site (> 65cm) per cow give 3 points.

In case 58,5-65 cm per cow: 1 point.

In case of < 58,5 cm per cow: 0 points.

The number of feeding places per cow were investigated on twenty-seven farms. On every farm the cows had one whole feeding place for themselves. There were no farms with less than one feeding site per cow. See diagram 21.

Because the cows are fed almost everywhere during the milking process, they all have their own feeding place.



Contamination of the feeding site:

The feeding site is supposed to be clean. There may be no undesirable debris that may affect the cow's health and comfort (wires, plastic containers etc.); the troughs must be free of any (in)organic material other than their food and look suitable for cows. A feeding site on the ground has a larger risk to get contaminated than one above the ground.

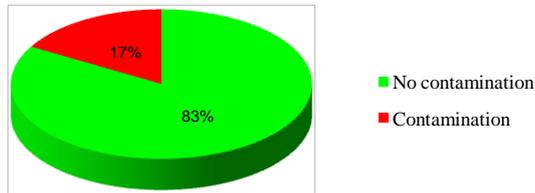
No contamination of the feeding site: 0 points.

Contamination of the feeding site: -3 points.



Figure 8. Examples of contamination of the feeding site: no contamination, contamination.

Diagram 22: Contamination of the feeding site



On twenty-four farms the contamination of the feeding site was investigated. Twenty of the feeding sites were clean. On four farms the feeding site was contaminated. See diagram 22.

The contamination mostly existed of organic material like mud and maggots. Wires etc. were not seen.

Distance from the pasture to the feeding site:

It costs a cow a lot of energy to walk long distances. This affects the welfare and the production.

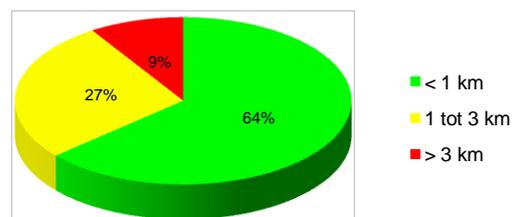
If the distance is <1 km give 3 points.

In case of a distance between 1 and 3 kilometres give 1 point.

Otherwise: 0 points.

On eleven farms the distance from the pasture to the feeding site was scored. In seven cases the cows had to walk less than 1 kilometre. On three farms they had to walk between one and three kilometres. On one farm the cows had to walk further than three kilometre. See diagram 23.

Diagram 23: Distance pasture - feeding site



Quality:

The quality of the food provided for the cows has to be good. Dairy cows need special nutrition because they have to produce milk. Important are the rates of proteins and minerals and vitamins in the food. The mixture should also provide enough energy. Food must be free of undesirable organic materials (for example mould) and look suitable for cows. The food also may not contain any other debris that may affect the cow's health and comfort (wires, strings, plastic containers etc.)

Obtain the results by asking the farmer what and how many the cows were fed; and looking at the food. Use the questionnaire in appendix 6.

5 points: food for dairy cows, without mould and other debris, adjusted to the cows personal needs.

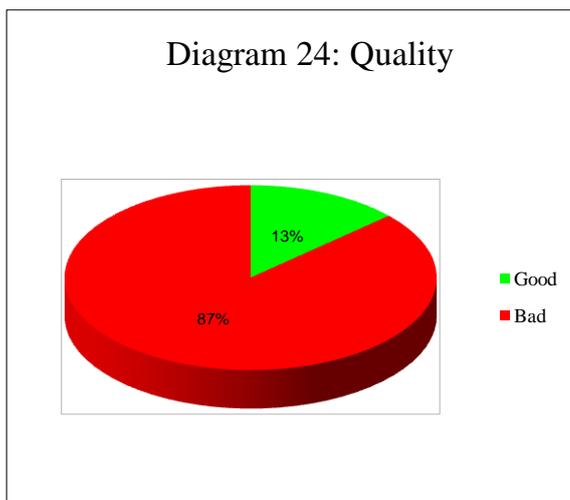
4 points: food for dairy cows, without mould and other debris, adjusted to a group of cows (with the same lactation stadium).

3 points: food for dairy cows, without mould and other debris, all the cows get the same amount.

2 points: food not for dairy cows, without mould and other debris, all the cows get the same amount.

1 point: food for dairy cows, with mould and/or other debris, all the cows get the same amount.

0 points: food not for dairy cows, with mould and/or other debris, all the cows get the same amount.



On fifteen farms the quality of the food was investigated. On only two farms the food given to the cows was good. On thirteen farms the quality was bad. See diagram 24.

Assigning points 1-4 was not possible, because these definitions were included after the research in Uruguay was done.

ENVIRONMENTAL MANAGEMENT

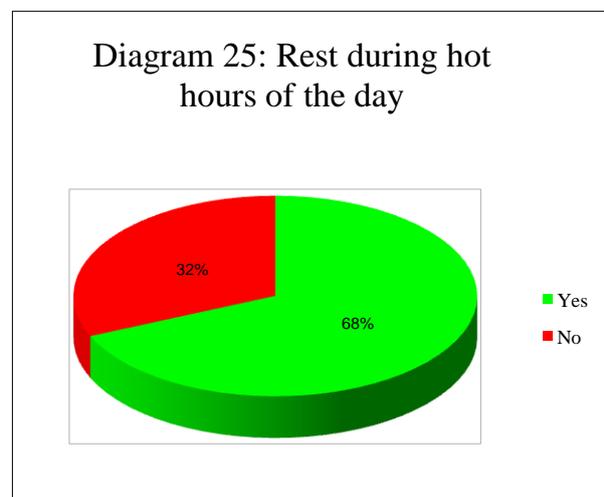
Rest during hot hours of the day:

A cow is supposed to rest during the hot hours of the day to save energy. A farmer can choose to leave the cows in the field where they can rest wherever they like. Or he can bring the cows to the milking parlour, milk them before heat strikes and make sure the outlet is big enough for all the cows to rest, eat grass and lie down in the shade. In the last case the exit of the milking parlour is a sort of pasture.

If the cows have rest during the hot hours of the day give 5 points.

If not give 0 points.

The rest during the hot hours of the day was scored on nineteen farms. On thirteen farms the cows had the chance to rest during the hot hours of the day. On six farms the cows could not rest during the hot hours of the day. See diagram 25.

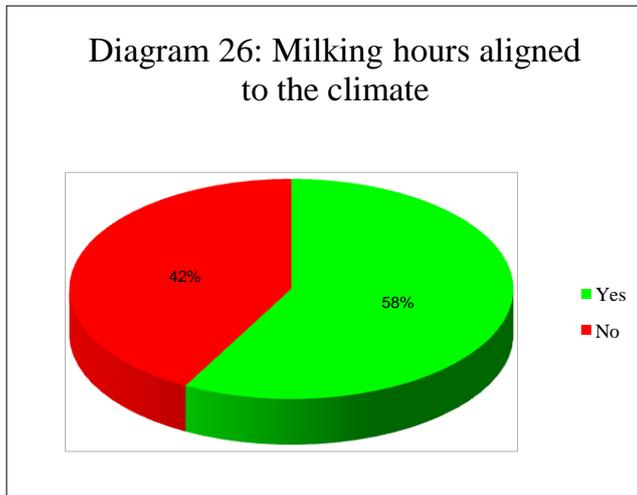


Milking hours aligned to the climate:

It is in the best interest of the cows to milk them during less hot hours of the day. This means that they don't have to walk from the pasture to the milking parlour and that they don't have to wait in the waiting room during the warmest hours of the day.

If the milking hours are in the cows best interest give 5 points.

If not give 0 points.



The milking hours were investigated on nineteen farms. In eleven of the cases the milking hours were aligned to the climate. On eight farms the milking hours were not aligned to the climate. See diagram 26.

Almost one half of the farms does not align their milking hours to the climate. This is a point that can be improved. Although it is difficult for very big farms to take the milking hours into account.

ANIMAL HEALTH

Although certain parasite and pathogen infections have little effect on the host, the welfare of most diseased animals is poor and disease reduction is a most important part of welfare improvement⁴. Because of this animal health gets 200 points assigned on a total of 500.

Hair:

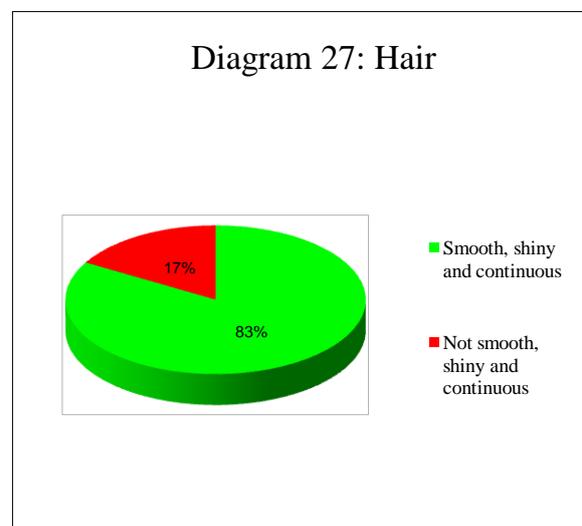
Animals that are acutely ill are normally depressed, lethargic and have no appetite. Body care may be neglected and that is why coats may become rough and dirty².

smooth, shiny and continuous

If so: 2 points.

If not: 0 points.

On eighteen of the farms was investigated if the hair was smooth, shiny and continuous. On fifteen farms the cows had smooth, shiny and continuous hair. On three farms the hair was not how it should be. See diagram 27.

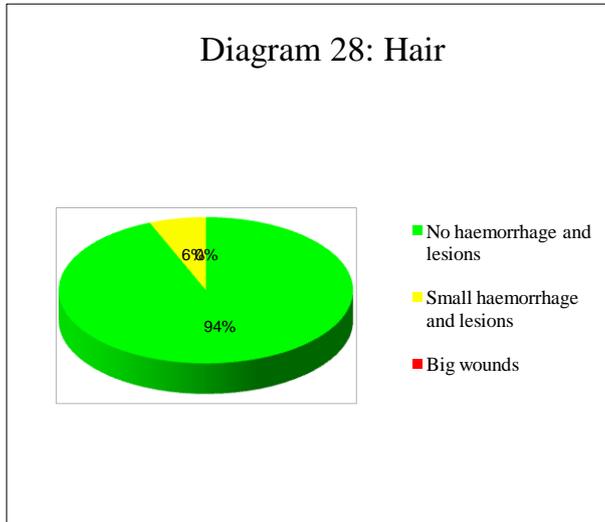


haemorrhage and lesions

If there are no haemorrhages and lesions give 3 points.

In case of small lesions or haemorrhages give -3 points.

In case of big wounds give -10 points.



On sixteen farms the presence of haemorrhage and lesions were investigated. On one farm there were cows with small lesions. On fifteen farms the cows looked good and did not have lesions or haemorrhage. See diagram 28.



Figure 9. Examples of hair: smooth, shiny and continuous and not smooth, shiny and continuous.



Figure 10. Examples of lesions.

Lameness and locomotion:

Lameness in dairy cattle can be due to trauma, infection, nutritional deficiency or metabolic disturbances¹⁶. There are a number of factors affecting the incidence of lameness: the type and maintenance of the farm track, the patience of the stock person in handling the cows and the herd size¹⁷. Because of problems associated with lameness such as pain, reduced food intake and loss of body condition, lameness can be considered as a serious welfare problem for dairy cows¹⁷. The percentage of lameness at one day can be measured on the basis of a locomotion scoring system. There are a lot of different locomotion scoring systems that can be used³². The percentage of lameness per year can only be asked to the farmer or veterinarian in case they hold records. Lameness, as measured on the basis of locomotion, was associated with less time eating and more time spent lying, and consequently lame cows had a lower complete diet intake and a loss of production²². Another recent study also has proven that clinical lameness has a significant impact on milk production¹⁴. A cow should walk with firm steps and put the same weight on every leg also while standing. It's back should be straight. Lame animals often adopt characteristic postures depending on the locations of the lesion or inflammation².

In case the farmer or veterinarian hold records, both scores (locomotion score and % lameness/year) are combined. In case the farmer and veterinarian both don't hold records, only the locomotion score is used. The points raise times five.

% lameness / year

Here cow-cases per year are indicated. Do not count repeated cases twice.

< 10% give 20 points.

10 – 15% give 10 points.

15 – 25% give 0 points.

25 – 40% give -5 points.

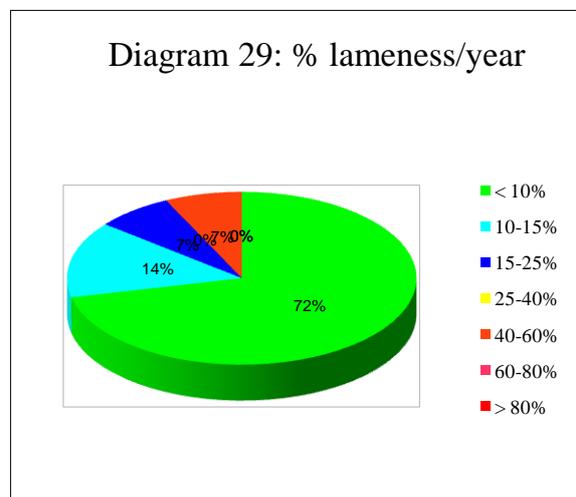
40 – 60% give -10 points.

60 – 80% give -15 points.

> 80% give -20 points.

The percentage of lame cows per year on fourteen farms was investigated. On ten farms the lameness was less than 10%. On two farms they scored between ten and fifteen percent. On one farm there were 15- 25% lame cows a year. There was one farm with a percentage between forty and sixty. See diagram 29.

Lameness is one of the biggest welfare problems at the farms that were visited.



Locomotion score

A locomotion scoring system³ was used for this parameter (appendix 3):

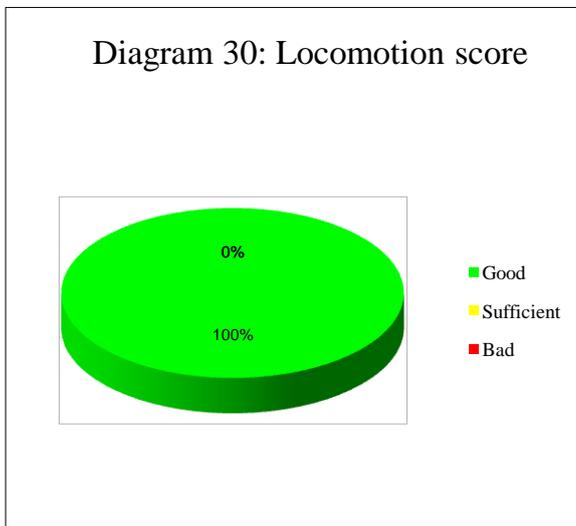
- 1) Normal: stands and walks normally with a level back. Makes long content strides.
- 2) Mildly lame: stands with flat back, but arches when walks. Gait is slightly abnormal.
- 3) Moderately lame: stands and walks with an arched back and short strides with one or more legs. Slight sinking of dew-claws in limb opposite to the affected limb may be evident.
- 4) Lame: Arched back standing and walking. Favouring one or more limbs but can still bear some weight on them. Sinking of the dew-claws is evident in the limb opposite to the affected limb.
- 5) Severely lame: Pronounced arching of back. Reluctant to move, with almost complete weight transfer off the affected limb.

Check the current number of animals and determine the sample size according to the table in appendix 7. Calculate the average score of these cows.

Good, an average between 1 and 2: 5 points.

Sufficient, an average between 2 and 3: 0 points.

Bad, an average between 3 and 5: -5 points.



The locomotion score of the cows was scored on seven farms. At all of this farms cows scored between one and two which is considered as good. See diagram 30.

This outcome is better than the year marks that were asked. Which is strange, because it is expected to be worse than what is said by the farmers. It is possible that by accident only good farms were scored or that not enough cows were looked at through which the farms scored better than they actually were.

Thick hocks:

A hock can be thicker through bone formation. In such cases the cow is not harmed clinically at that moment. The thickness is mostly caused by repeated trauma and an indication for reduced lying comfort. If the farmer or veterinarian holds records use these figures. Otherwise check the current number of animals and determine the sample size according to the table in appendix 7. Calculate the average score of these cows.

< 10% per year give 10 points.
10 – 15% per year give 5 points.
15 – 25% per year give 0 points.
25 – 40% per year give -2 points.
40 – 60% per year give -5 points.
60 – 80% per year give -8 points.
> 80% per year give -10 points.

The hock can also be thicker with soft tissue. If the entire leg is inflamed, count this case as 5 cows.

<5% per year: 10 points.
5-10% per year: 5 points.
10 – 15% per year: 0 points.
15 – 25% per year: -10 points.
25 – 40% per year: -20 points.
40 – 60% per year: -30 points.
60 – 80% per year: -40 points.
> 80% per year: -50 points.

If erosions are visible in >50% of the hocks: -10 points; in 25-50%: -5 points; in <25%: not extra withdrawal of points.

This parameter was not investigated, because it was considered of no importance during the research in Uruguay and deleted from the system. Back in the Netherlands was decided to put the parameter back in the system to keep it comparable with the barn-based system from van Eerdenburg et al ⁶.

Thick carpi:

The carpus can be thicker with soft tissue. If the entire leg is inflamed, count this cow as 5 cows. If the farmer or veterinarian holds records use these figures. Otherwise check the current number of animals and determine the sample size according to the table in appendix 7. Calculate the average score of these cows.

<5% per year: 20 points.
5-10% per year: 10 points.
10 – 15% per year: 0 points.
15 – 25% per year: -10 points.
25 – 40% per year: -20 points.
40 – 60% per year: -30 points.
60 – 80% per year: -40 points.
> 80% per year: -50 points.

If erosions are visible in >50% of the carpi: -10 points; at 25-50%: -5 points; at <25% no extra withdrawal of points.

This parameter was not investigated, because it was considered of no importance during the research in Uruguay and deleted from the system. Back in the Netherlands was decided to put the parameter back in the system to keep it comparable with the barn-based system from van Eerdenburg et al ⁶.

Claws:

The claws have to look good and are judged on form, angle and stand.

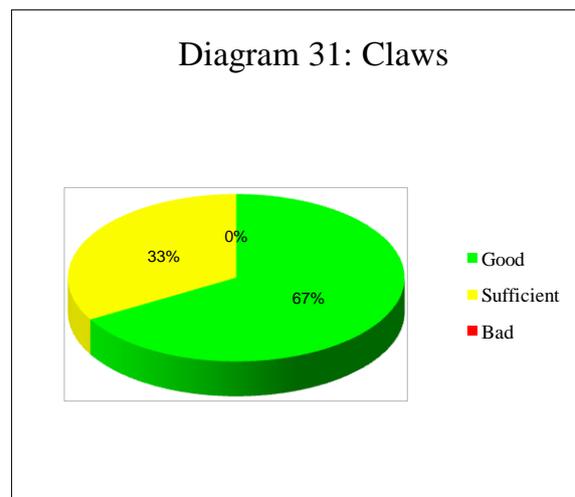
Check the current number of animals and determine the sample size according to the table in appendix 7. Calculate the average score of these cows.

Good claws score 20 points.

Very bad ones 0 points.

If the claws are not good but also not very bad: 10 points.

The claws were investigated on nine farms. On six farms they were considered to be good. On three farms the claws scored sufficient. On none of the farms that were investigated the score of the claws turned out to be bad. See diagram 31.



% mastitis / year:

Take the number of cow-cases per year into account. If a cow is considered healthy and reoccurs after 14 days as a clinical case, than consider this as a new case. Use the questionnaire in appendix 6.

< 5%: 15 points

5 – 10%: 10 points.

10 – 15%: 5 points.

15 – 25%: 0 points.

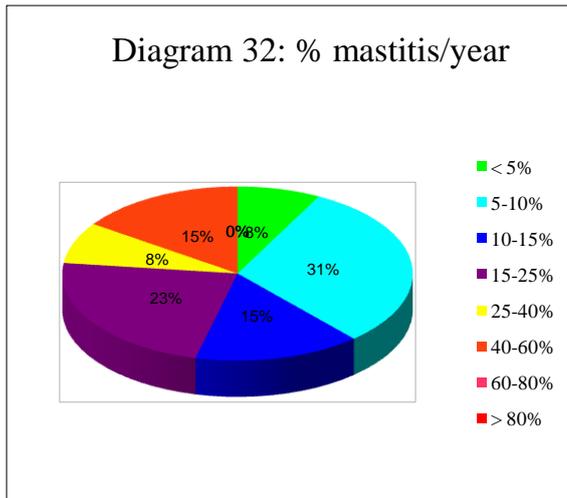
25 – 40%: -3 points.

40 – 60%: -5 points.

60 – 80%: -10 points.

>80%: -15 points.

Diagram 32: % mastitis/year



The percentage of mastitis per year was investigated on thirteen farms. One farm had less than 5% mastitis a year. Four farms had a percentage between 5 and 10 percent. Two farms had ten to fifteen percent of mastitis a year. Three farms scored between fifteen and twenty-five percent. On one farm there was a percentage between 25 and 40 mastitis a year. Two farms had a score between forty and sixty. No farms where the percentage of mastitis was higher than sixty percent were seen. See diagram 32.

Big differences are seen in the percentages of mastitis on the different farms. It is clear that mastitis is a big problem on the farms that were visited. When random farms are visited in the future, the percentages should be lower.

Abomasal dislocations:

Use the questionnaire in appendix 6.

0% per year: 10 points.

0-5% per year: 0 points.

5-10% per year: -5 points.

10-15% per year: -10 points.

>15% per year: -15 points.

This parameter was not investigated, because it was considered of no importance during the research in Uruguay and deleted from the system. Back in the Netherlands was decided to put the parameter back in the system to keep it comparable with the barn-based system from van Eerdenburg et al ⁶.

Filling of the rumen:

What is the general impression of the cows? Sample 10 of these cows: 5 that calved less than 3 months ago and 5 more than 3 months ago. The filling of the rumen is good if it measures up to the average rumen score of cows in that particular lactation stadium.

We used the rumen score ³³ for this parameter (appendix 4):

- 1) A deep hollow left flank. The skin below the transverse processes sinks in. The skin fold from the hipbone nodule runs vertically down. The rumen quarry behind the rib arch is more than one hand deep. From the side it looks like a rectangular area. The cow has eaten little or nothing due to acute illness, poor food availability or no tasty food.

- 2) The skin below the transverse processes sinks in. The skin fold from the hipbone nodule slants forward to the rib arch. The rumen quarry behind the rib arch is one hand deep. From the side it looks triangular. This score is often seen in cows the first week after calving. Later in lactation, it is a signal of inadequate intake or excessive transit time.
- 3) The skin on top of the transverse processes runs one hand vertically down and after that bows to the side. The skin fold from the hipbone nodule is not visible. De rumen quarry behind the rib arch is visible. This is the desired score for lactating cows with adequate food intake and where the food can stay inside the rumen for a sufficient time.
- 4) The skin on top of the transverse processes bows to the side at once. Behind the rib there is no rumen quarry visible. This is the desirable score for cows at the end of lactation and for dry cows.
- 5) The transverse processes are not visible because of the rumen being filled. De skin of the abdomen is round like a barrel and very tense. There is no transition to the ribs visible. This is the desirable score for dry cows.

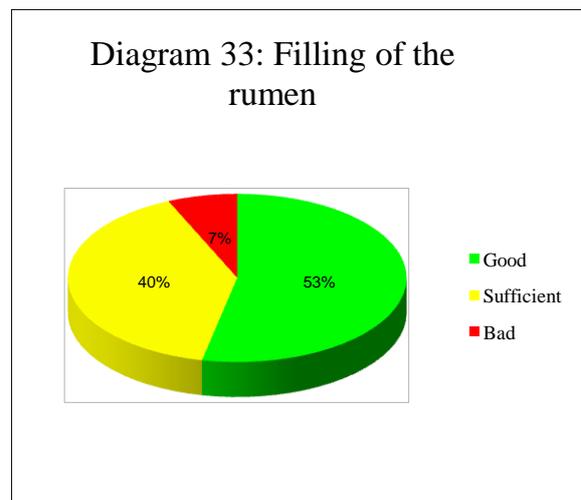
Good: 5 points.

Sufficient: 0 points.

Bad: -10 points.

The filling of the rumen was investigated on fifteen farms. On eight farms the filling of the rumen was good. On six farms it was sufficient and one farm scored bad. See diagram 33.

This figures could have been much worse if it had not rained that much. Overall the filling of the rumen in this study turned out to be good.



% milk fever / year:

Use the questionnaire in appendix 6.

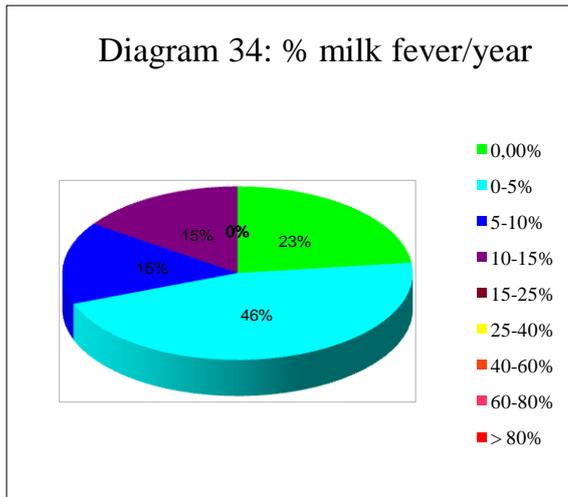
0% give 5 points.

0-5% give 0 points.

5-10% give -2 points.

10-15% give -5 points.

> 15% give -10 points.



The percentage of milk fever was investigated on thirteen farms. On three farms there was no milk fever at all. On six farms there was 0-5% milk fever a year. Two farms had a percentage of 5-10% and two other farms had a percentage between ten and fifteen. There were no farms with a score higher than fifteen percent. See diagram 34.

Acetonaemia:

Use the questionnaire in appendix 6.

0% give 5 points.

0-5% give 0 points.

5-10% give -5 points.

10-15% give -10 points.

> 15% give -15 points.

This parameter was not investigated, because it was considered of no importance during the research in Uruguay and deleted from the system. Back in the Netherlands was decided to put the parameter back in the system to keep it comparable with the barn-based system from van Eerdenburg et al ⁶.

Body Condition Score:

The body condition score of a dairy cow is an assessment of the proportion of body fat that it possesses, and it is recognized by animal scientists and producers as being an important factor in dairy cattle management ²⁶. Body condition scores provide an indication of the energy status of dairy cattle. Thin cows in a negative energy balance are unable to perform at maximum capacity in the herd. Cows that are too fat are more prone to metabolic problems, produce less milk and more easily go off feed ^{19,26}. The BCS will show if the cows are fed well or not. We take a look at the general impression of all the cows. 10 of these cows: 5 that calved less than 3 months ago and 5 that calved more than 3 months ago. The BCS is good if it measures up to the average BCS of cows in that particular lactation stadium. View the animal from behind and from the side in the loin and tail head area and assess the animals' body condition. Animals must not be touched, only observed.

We used the body condition scoring system ⁷ for this parameter (appendix 5), animals are scored as follows:

- 1) Very bad condition (emaciated): spinal crest looks like the teeth of a saw, transverse processes are very prominent $> \frac{1}{2}$ length visible, ischial bones very prominent with a deep V-shaped cavity below the tail.
- 2) Skeleton clearly visible: spinal crest vertebra's individually recognizable, transverse processes are for $\frac{1}{2} - \frac{1}{3}$ visible, ischial bones prominent, U-shaped cavity below the tail.
- 3) Skeleton and covering well balanced: spinal crest forms a sharp edge, transverse processes $\frac{1}{4}$ visible, ischial bones softly curved, shallow cavity below tail
- 4) Almost everything covered: vertebra's of spinal crest are flat and cannot be individually defined, transverse processes are softly curved, ischial bones are surrounded by fat, cavity filled with some fat under the tail.
- 5) Too much fat: spinal crest covered with fat, edge of transverse processes barely visible because of fat, ischial bones covered by fat, cavity filled with fat, folds arise.

When the BCS is determined and the average is equal to the desired score of the lactation stadium give 17 points.

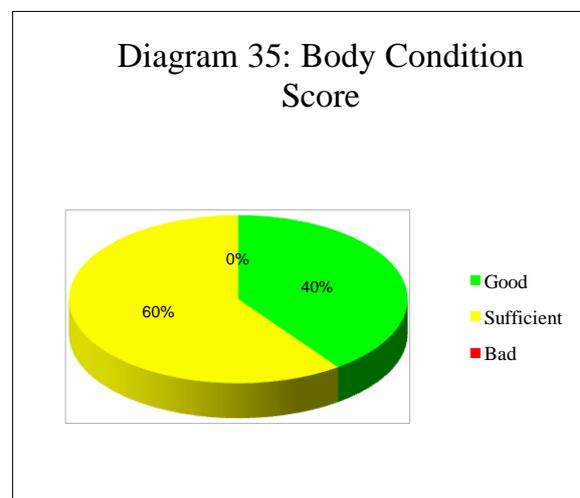
In case of 0.5 points difference with the desired score: 5 points reduction.

If the difference is more than one point give 0 points.

The desired score may vary per country and breed.

The body condition was investigated on fifteen farms. On six farms the condition of the cows was good. On nine farms the body condition was sufficient. There were no farms where the average body score was bad. See diagram 35.

This figures could have been much worse if it had not rained that much. Overall the BCS of the cows was good.



% rumen acidosis / year:

Use the questionnaire in appendix 6.

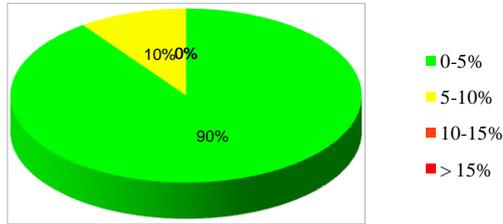
0-5%: 15 points.

5-10%: 10 points.

10-15%: 5 points.

> 15%: 0 points.

Diagram 36: % rumen acidosis/year



The percentage of rumen acidosis was investigated on ten farms. Nine farms had a percentage of zero to five. Only one farm scored higher, between five and ten percent. Diagram 36.

Rumen acidosis apparently is not a big problem in Uruguay.

Fertility:

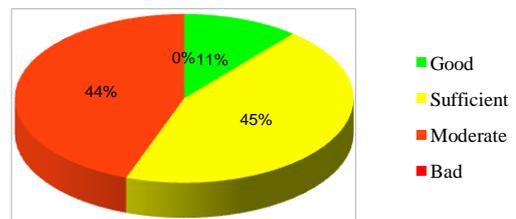
Fertility rates can be judged on the calving interval, the way of fertilization (insemination and/or use of a bull) and the times needed for the fertilization. Use the questionnaire in appendix 6.

- If the fertility rates are good give 25 points.
- If the fertility rates are sufficient give 10 points.
- In case of moderate fertility rates give 0 points.
- If the fertility rates are bad give -10 points.

The fertility of the cows was investigated on nine farms. On one farm the fertility rate was good. Four farms had a sufficient fertility rate. Four other farms scored moderate. Not one farm was considered bad. See diagram 37.

Based on this figures, we can conclude that the fertility rates can be improved. At a lot of farms there is a bull living in the herd with cows.

Diagram 37: Fertility



Calving:

% of cases that needed assistance of the veterinarian. Use the questionnaire in appendix 6.

0-5% per year: 15 points.

5-10% per year: 10 points.

10-15% per year: 5 points.

> 15% per year: 0 points.

This parameter was not investigated during this study, because the decision to put this parameter back in the system was made after the research in Uruguay.

Cow mortality:

% of cases in which a cow dies at the farm. Mortality rates in South-America tend to be much higher than in Europe. Use the questionnaire in appendix 6.

Subtract 5 points per % of mortality. For example, in case of 10% unexplained cow-mortality, give minus 50 points.

This parameter was not investigated during this study, because the decision to put this parameter in the system was made after the research in Uruguay.

COMPARING THE SYSTEMS

The system from van Eerdenburg et al ⁶ differs from the pasture-based system in a few ways.

The main difference is the fact that the header cubicles/free stalls from the barn-based system, is replaced by the header pastures in the pasture-based system. They both have a maximum of 70 points, to keep the systems comparable.

Three headers are (almost) the same in both systems. These are the headers general, milking parlour & waiting area and animal health. For the section general only the sub-headers are slightly different. Number of cows standing idle and cows sleeping in walkways have been deleted and are replaced for broken tails, flies, tail docking and the cleanliness score. These are parameters that have showed to be of significance in Uruguay. In the section animal health ten minus points can be given for lesions under the sub-header hair in the pasture-based system, in the barn-based system this is not possible. Besides that the BCS is worth 2 more points in the pasture-based system than in the barn-based system. This is done because the BCS will show if there is enough food available. It is an extra point of control to see if the cows eat enough. Keeping all the sub-headers the same, leads to the result that there are a few diseases that are of no importance in Uruguay that are still in the pasture-based system. The absence of these diseases gives the farms a positive reward. In this way the systems stay comparable.

The headers waiting area, milking parlour and exit are assigned a total of 41 points. The headers light, ventilation and floor (together 120 points) of the barn-based system are housed under these headers in the pasture-based system but with less points. This is decided because the total time that the cows are staying in these areas is not so long. Although the cows that live at a pasture-based farm are grazing in the pasture most of the time, the waiting area, the milking parlour and the exit are assigned 41 points, which is relatively much. At first this seems to be more than for the barn-based system, but in the barn-based system the barn is the waiting room and exit in one and together with the points of the headers light, ventilation and floor it is assigned much more points. Decided was to give these headers this much points because important parameters like shade, placing of the feeding troughs, space and kicking cows are placed under this sections. It is possible that the cows have to wait in the waiting area for a few hours, time in which they cannot drink, eat or lay down and most of the time have to stand in the burning sun. Furthermore it is important for cows to be comfortable during milking. If they are uncomfortable during milking or have bad experiences they will get an aversion for the milking parlour. This influences the welfare of the cows.

Besides the header cubicles/free stalls, also the header miscellaneous out of the barn-based system is removed. Instead of this header and the points saved at light, ventilation and floor the headers farmer and staff, loading site and environmental management are introduced in the pasture-based system. The new header, farmer and staff, is assigned 68 points. This is almost as much as for the header pastures. This is decided because the way the farmer and staff treat their animals is of major importance for the welfare of the cows ^{9,10,11,27}.

The header water in de pasture-based system is assigned 33 points while it is assigned 25 points in the barn-based system. This is due to an extra sub-header: distance from the pasture with cows to the place to drink and another one, safety of the drinking trough. These sub-headers are included in the system because they influence the welfare of the cows. The first one by taking energy that will go at the expense of the production and welfare, the second by causing possible trauma. Animals that live in a barn almost always have access to water and don't have to walk very far to reach a drinking place. In Uruguay, the cows can be in different

pastures, which not all have drinking places. Therefore cows sometimes have to walk very far to get water.

The section feeding sites of the pasture-based system is worth 27 points, while the feeding fence of the barn-based system is worth 15 points. This is partly due to new sub-headers like: distance from the pasture to the feeding site and additional feeding sites in the pasture. At first this seems to be very illogical, because cows in a barn have to eat all their food at the feeding fence, while a cow on pasture eats in the pasture most time of the day. It is impossible to measure the quality of the food in the pasture, but what can be measured is what and how the cows are fed in and around the milking parlour. And because it is important for the cows to be fed well, especially in times of scarcity and drought, more points than for the barn-based system are assigned.

The negative points that can be assigned in the pasture-based system are more than for the barn-based system. This is mainly due to negative points that can be given under the headers: pastures, farmer and staff and an new sub-header (cow mortality) under the section animal health.

Both systems have a maximum of 500 points in total. This suggests that both cows in a barn and cows that live in a pasture can be equal in happiness. According to a study of Hemsworth et al ¹⁷ though, outdoor farming has a more favourable welfare image largely because of the freedom of the animals to perform a wide range of species-specific behaviours and possibly because of less stress and fewer health problems ¹⁷. As can be seen in the pasture-based scoring system there are more risk factors for cows living on pasture than for cows in a barn. Under optimal conditions cows can be very happy when living on pasture, but their welfare can decrease rapidly due to small things like for example changes in the weather. In the future the happiness of cows held on pasture and in barns can be easily investigated in a study by using the two scoring systems.

VALIDATING THE SYSTEM

The scoring system was validated by assessing nine farms.

Making a comparison between all nine farms was at first not possible, because some parameters were not counted at different farms. When a correction was made for all parameters that were not counted, ranking of all nine farms became possible. Totally excluded from the system are: stretching when rising from the pasture, the percentage of kicking cows, the speed of cows walking, sufficient amount and size of drinking troughs, the way of treating the cows during herding and cow mortality. An excluded parameter with a maximum of 3 points has 1 point deduction in the minimum score which must be achieved. An excluded parameter with a maximum of 5 points has 2 points deduction in the minimum score which must be achieved. An excluded parameter with a maximum of 20 points has 7 points deduction in the minimum score which must be achieved. On a couple of farms the loading sites were not found, these farms were assigned 3 points. For the total scheme of assigned points see appendix 9.

After visiting the nine farms a top nine was made. According to the investigators this top nine should be:

1st place → farm 4

2nd place → farm 1

shared 3rd / 4th place → farm 2 and 3

5th place → farm 7

6th place → farm 9

7th place → farm 5

8th place → farm 6

9th place → farm 8

In table 2 the outcome is shown. Farm four scores best, farm one comes in second place and farm eight comes at last place as predicted. In third place should be farm two and three. But farm two scores 71 points lower and comes in sixth place. According to the validation in appendix 9 this lower score is due to negative points in the section general because there were a lot of flies bothering the cows and a lot of the cows their tails were docked. Also a negative outcome is seen under the header waiting area due to no shade. The high percentage of lameness, mastitis and fertility rates give a low score under the section animal health. All together this is the reason of the lower score than expected. At last, farm seven seems to be out of place. The welfare of the cows looked good at first. It should be at fourth place, but it only comes in second last place. The biggest cause of this bad result can be found in the way the farmer and staff treated the animals. A lot of negative points were scored under this section. Adding the fact that there was a lot of mud (due to rain) and rubbish at the farm, whereby the cows got dirty. This also gave this farm a lot of negative points. Animal health has a good score, and if the farmer and staff change the way they treat their animals this farm would be on fourth place. The rest of the farms were ranked rightly according to the results.

Table 2. Scores of all nine farms.

Date	Farm	Score
17-12-09	1	338
17-12-09	2	203
17-12-09	3	274
18-12-09	4	350
23-12-09	5	228
23-12-09	6	197
23-12-09	7	175
29-12-09	8	123
29-12-09	9	236

When less corrections are made a better comparison can be made between the farms that were visited at the same day. Still totally excluded are stretching when rising from the pasture, sufficient amount and size of drinking troughs & cow mortality. On 17, 18 and 23 December the percentage of kicking cows is excluded. On 23 December also the speed of cows walking and the way of treating the cows during herding were not counted. On a couple of farms the loading sites were not found, these farms were assigned 3 points. For the total scheme of assigned points see appendix 8.

After visiting the first farms a top four was made. Based on what was seen at these four farms the top four should be:

1st place → farm 4

2nd place → farm 1

3rd place → farm 2 and 3

In table 3 the outcome is shown. Farm number four scores the most points and farm one comes at second place. There are 11 points difference. Farm two and three are supposed to have the same amount of points. But as can be seen, the difference between the two is quite big with 70 points. This difference is due to the sections general, pastures and animal health. Because of tail docking and a lot of flies farm two scores a lot of negative points. Very big differences are made due to less shade and a high percentage of lameness at farm two. Farm one and four clearly score better than farm two and three. For ranking these four farms the welfare scoring system seems to work.

Table 3. Scores of the farms visited on 17 and 18 December 2009.

Date	Farm	Score
17-12-09	1	360
17-12-09	2	222
17-12-09	3	292
18-12-09	4	371

The next three farms were visited on 23 December 2009. After visiting these three farms a top three was made. This top three was:

1st place → farm 7

2nd place → farm 5

3rd place → farm 6

As seen in table 4 farm five scored the most points. Farm six scored twenty-nine points less and comes in second place. Farm number seven scored a lot worse than expected, it was supposed to be the farm with the best welfare. The main problem at this farms lays at the farmer and staff. They score -47 points for this header, while the other two farms score +40 points. This is where the difference is made. They treated the cows badly and that costs them a lot of points. So although the welfare at farm seven looked very good, the investigators made a wrong judgment. This is an explanation for the low ranking of farm number seven.

Table 4. Scores of the farms visited on 23 December 2009.

Date	Farm	Score
23-12-09	5	228
23-12-09	6	197
23-12-09	7	175

On 29 December 2009 two farms were visited. After visiting the farms a top two was made.

1st place → farm 9

2nd place → farm 8

In table 5 the outcome of the forms is displayed. Farm nine scores best and farm eight comes second. This result is consistent with the prediction. Farm eight has a very low score in general, the lowest score of all nine farms. The main reason again is the way the farmer and staff treat their animals, besides that there is not enough shade in the pastures and there is a lot of mud and rubbish at the farm. All of these are reasons to assign negative points to the farm, resulting in a low total score. The system seems to work for ranking these two farms.

Table 5. Scores of the farms visited on 29 December 2009.

Date	Farm	Score
29-12-09	8	108
29-12-09	9	225

Discussion

Some critical notes need to be made about the pasture-based welfare scoring system for dairy cows.

There was no welfare scoring system for pasture-based dairy cows yet. Therefore the system in this study was made from scratch. The barn-based scoring system was used as a model for the pasture-based system, because the systems had to be comparable.

In the barn-based system negative scores weigh more than positive ones, which is unique for that system⁶. The pasture-based system is similar to the barn-based system, the negative scores also weigh more than positive ones.

The situation in Uruguay is very different from the situation in the Netherlands. Uruguay is, as a country, not as developed as the Netherlands and some farmers are very poor and not trained. Training on how to work with the cows and development of their knowledge would make a very big difference in the treatment of the animals and thus in the welfare of the cows. This is not an excuse for the bad welfare, but a point where improvement can be made. That the situation is different between these two countries is also visible in the fact that it is very difficult to get a good sight at the animal health in Uruguay, because most of the farmers don't have year marks. They don't document the history of every cow as is done in the Netherlands. Also the veterinarians don't keep track of these numbers. The pasture-based scoring system would be more comparable to the barn-based scoring system, if the history of cows and farms was documented. Now the investigators were depending on the memory of the farmers to get the numbers. This is not an accurate method.

The investigators travelled along with a mastitis expert, therefore, most of the farms that were visited had a mastitis problem. This could have biased the results. It is of importance that in the future, the pasture-based system will be tested on random farms too.

During the study it rained a lot, which was not normal for that period of the year. Pastures were very green and grassy but the walkways and outlets were very muddy. This could have given some of the final results a more positive or negative outcome than was expected.

The investigators could not speak Spanish very well. So there was a language barrier between them and the farmers. Much more information could have been collected if the investigators were well trained in the language.

An attempt was made to keep the scoring system objective. Some influences make it impossible for the system to be entirely objective. Some parameters are divided in several options. The option chosen is the choice of the investigator. He or she has very good guidelines to make an informed choice. However it is possible that in some situations it is not entirely clear which option to choose. Various investigators will not always choose the same option. To avoid this, the scoring was always done by 2 investigators who are provided with a description and pictures of the several options.

A lot of changes were made in the pasture-based system after collecting the data in Uruguay, because the system had to be comparable with the system from van Eerdenburg et al ⁶. For the validation of the system this is not very good, because some parameters were scored only a few times or not at all. The percentages are based on relatively little data and therefore not significant.

Conclusion

Based on the results, the conclusion is that a scoring system for pasture-based dairy cows has been developed. Although the validation showed some positive results, more research needs to be done to improve and fine tune the pasture-based welfare scoring system. Further research will show if the system can also be used on its own to rank groups of pasture-based farms. The impression is made that the pasture-based scoring system is comparable with the barn-based system from van Eerdenburg et al ⁶. However further research is required in order to see if the two systems are really comparable and to find out if a cow is happier when she lives on pasture than when she lives in a barn.

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Appendix 1 – Score sheet

Score sheet for pasture-based dairy cows

GENERAL	
* fear behaviour	curious / not fearful / fearful
* stretching when raising from the pasture	yes / no
* tail is hanging straight and relaxed	> 90% / 80-90% / < 80%
* broken tails	... %
* bellowing	< 2x / 2 x / > 2 x
* environmental noise	quiet / some noise / much noise
* flies	no / a few / many / very many
* tail docking	tails not docked / docked tails
* cleanliness score	1:.....2:.....
	3:.....4:.....
	5:.....

MILKING PARLOUR AND WAITING AREA	
* behaviour	waiting in front / waiting in the back / turning their backs to the milking parlour
* max. time waiting before entering the milking parlour	< 1h / 1-2h / > 2h
waiting area	
* shade	a lot / a bit / no shadow
* presence of a ventilation system	yes / no
* presence of sprinklers	yes / no
* slipperiness floor	sufficient grip / no sufficient grip
* cleanliness floor	clean / a bit dirty / dirty
* flatness floor	flat / small holes or lumps / big holes of lumps

milking parlour	
* placing of feeding troughs	straight in front / oblique in front
* space	enough / not enough
* slipperiness floor	sufficient grip / no sufficient grip
* cleanliness floor	clean / a bit dirty / dirty
* flatness floor	flat / small holes or lumps / big holes of lumps
* stairs and slopes	yes / no
* walking related to placement of the shafts	lofty, good / careful, slow
* light	sufficient / not enough light
* it smells nice	fresh / like gasses / strong smell
* % kicking cows	0-5% / 5-10% / 10-15% / 15-20% / >20%

Exit milking parlour	
* floor	concrete / grass / sand
* mud	no / a little / a lot
* surface	flat / convex / severely convex or holes
* rubbish and obstacles	no / a little / a lot
* slopes	yes / no

ENVIRONMENT	
Water	
* ad libitum water available	yes / pastures and waiting area / no
* type of place to drink	natural / constructed
* cleanliness	clean / a bit dirty / dirty
* temperature	cold / warm / hot
* distance from pasture with cows to the place to drink	< 500 m / 500-1500 m / > 1500 m
* sufficient amount and size of drinking troughs	sufficient / not sufficient
* safety of the drinking trough	safe / dangerous

Feeding sites	
* additional feeding sites in the pasture	yes / no
* surface	concrete / grass / sand
* cleanliness of the surface	clean / small layer mud / big layer mud
* feeding place per cow	< 0,9 / 0,9-1,0 / 1,0
* contamination of the feeding site	no contamination / contamination
* distance from the pasture to the feeding place	< 1 km / 1-3 km / > 3 km
* quality	good / bad

Walkways	
* floor	concrete / grass / sand
* mud	no / a little / a lot
* surface	flat / convex / severely convex or holes
* rubbish and obstacles	no / a little / a lot
* walking distance	< 1 km / 1-3 km / > 3 km
* slopes	yes / no
* speed of cows walking	3 km/h / 3-4 km/h / > 4 km/h

Loading place	
* steepness	steep / very steep
* safety	safe / dangerous
* flatness floor	flat / small holes or lumps / big holes of lumps
* straight end	yes / no

Pastures	
* shade during hot hours of the day	>80% / 60-80% / 40-60% / 20-40% / <20%
* food availability	full of grass / a lot / some / almost no grass
* mud	no / a little / a lot
* rubbish and obstacles	no / a little / a lot
* presence extra pasture	yes / no
* mud extra pasture	no / a little / a lot

Farmer and staff	
* relevant education farmer	relevant education / no relevant education
* relevant education staff	relevant education / no relevant education
* way of herding	by foot / by horse / by motor
* way of treating the cows during herding	quiet / whisteling / yelling / beating / using an object
* way of treating the cows around the milking parlour	quiet / whisteling / yelling / beating / using an object
* use of automatic driving aids	no / yes / with electricity

Environmental management	
* rest during hot hours of the day	yes / no
* milking hours aligned to the climate	yes / no

ANIMAL HEALTH	
* hair	yes / no shiny, smooth, continuous
	no / small / big lesions, haemorrhage
* % lameness / year	< 10% / 10-15% / 15-25% / 25-40%
	40-60% / 60-80% / >80%
* lameness during visit	< 10% / 10-15% / 15-25% / 25-40%
	40-60% / 60-80% / >80%
* locomotion score	1:.....2:.....
	3:.....4:.....
	5:.....
* hocks	bone formation / soft tissue / entire leg
	< 5% / 5-10% / 10-15% / 15-25% / 25-40%
	40-60% / 60-80% / >80%
* carpus	< 5% / 5-10% / 10-15% / 15-25% / 25-40%
	40-60% / 60-80% / >80%
* claws	form good / bad
	angle good / bad
	stand good / bad
* clinical mastitis / year	< 5 % / 5-10% / 10-15% / 15-25%
	25-40% / 40-60% / 60-80% / >80%
* clinical mastitis during visit	< 5 % / 5-10% / 10-15% / 15-25%
	25-40% / 40-60% / 60-80% / >80%
* abomasal dislocation	0% / 0-5 % / 5-10% / 10-15% / >15%
* filling of the rumen (3 cows of each lactation stadium)	1:.....2:.....
	3:.....4:.....
	5:.....
* % milk fever / year	0% / 0-5 % / 5-10% / 10-15% / >15%
* acetonaemia	0% / 0-5 % / 5-10% / 10-15% / >15%
* body condition score	1:.....2:.....
	3:.....4:.....
	5:.....
* % rumen acidosis / year	0-5 % / 5-10% / 10-15% / >15%
* fertility	good / sufficient / moderate / bad
* calving	0-5% / 5-10% / 10-15% / >15%
* cow mortality	... %

Appendix 2 – Cleanliness score

Category Identification		Score				
		1	2	3	4	5
	Tail head Area around tail head in a radius equal to the distance between tail head and base of vulva.					
	Upper rear limb Area from base of vulva to point of hock (both sides of cow).					
	Ventral abdomen Area in front of udder.					
	Udder Includes fore and rear udders, and udder floor and teats.					
	Lower rear limb 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.						

Appendix 3 – Locomotion score

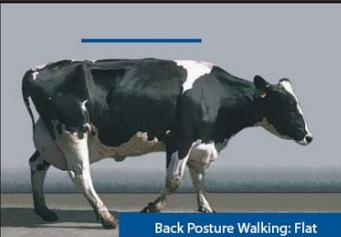
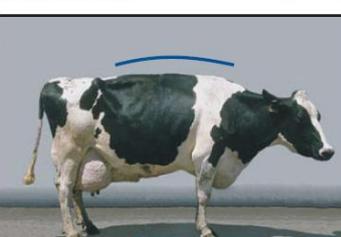
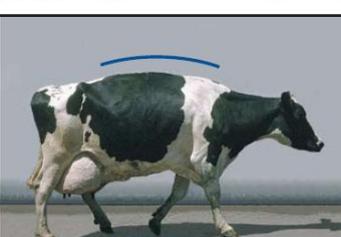
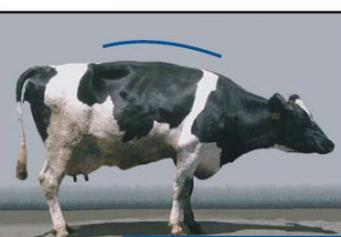
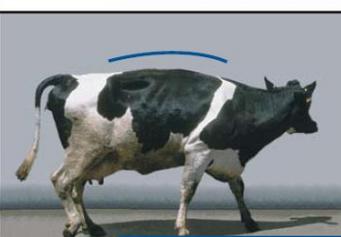
Locomotion Scoring of Dairy Cattle*



PERFORMANCE MINERALS*

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<p>LOCOMOTION SCORE 1</p> <p>Clinical Description: NORMAL</p> <p>Description: Stands and walks normally with a level back. Makes long confident strides.</p>	 <p>Back Posture Standing: Flat</p>	 <p>Back Posture Walking: Flat</p>
<p>LOCOMOTION SCORE 2</p> <p>Clinical Description: MILDLY LAME</p> <p>Description: Stands with flat back, but arches when walks. Gait is slightly abnormal.</p>	 <p>Back Posture Standing: Flat</p>	 <p>Back Posture Walking: Arched</p>
<p>LOCOMOTION SCORE 3</p> <p>Clinical Description: MODERATELY LAME</p> <p>Description: Stands and walks with an arched back and short strides with one or more legs. Slight sinking of dew-claws in limb opposite to the affected limb may be evident.</p>	 <p>Back Posture Standing: Arched</p>	 <p>Back Posture Walking: Arched</p>
<p>LOCOMOTION SCORE 4</p> <p>Clinical Description: LAME</p> <p>Description: Arched back standing and walking. Favouring one or more limbs but can still bear some weight on them. Sinking of the dew-claws is evident in the limb opposite to the affected limb.</p>	 <p>Back Posture Standing: Arched</p>	 <p>Back Posture Walking: Arched</p>
<p>LOCOMOTION SCORE 5</p> <p>Clinical Description: SEVERELY LAME</p> <p>Description: Pronounced arching of back. Reluctant to move, with almost complete weight transfer off the affected limb.</p>	 <p>Back Posture Standing: Arched</p>	 <p>Back Posture Walking: Arched</p>

* Adapted from Sprecher, D.J.; Hostettler, D.E.; Kaneene, J.B. 1997. Theriogenology 47:1178-1187 and contribution from Cook, N.B, University of Wisconsin.

Appendix 4 – Rumen fill score

Het scoren van de pensvulling bij melkvee (staande schuin achter de koe)



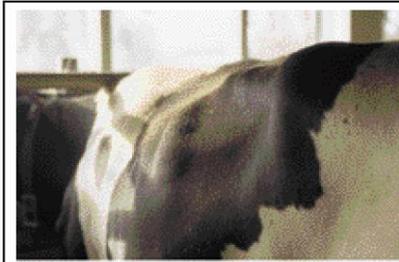
Score 1

Diep ingevallen linkerflank; de huid over de dwarsuitsteeksels van de lendenwervels stulpt naar binnen. De huidplooi vanaf de heupbeensknobbel loopt in verticale richting omlaag. De pensgroeve achter de ribboog is meer dan een hand breed. Van opzij is het beeld van dit flankgedeelte rechthoekig.



Score 2

De huid over de dwarsuitsteeksels van de lendenwervels stulpt naar binnen. De huidplooi vanaf de heupbeensknobbel loopt schuin naar voren, naar de ribboog. De pensgroeve achter de ribboog is een hand breed. Van opzij gezien is het beeld driehoekig.



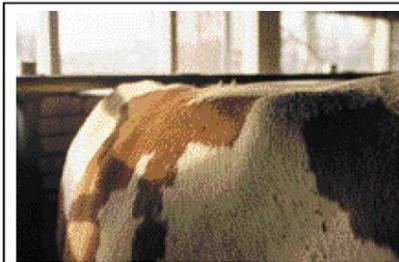
Score 3

De huid over de dwarsuitsteeksels van de lendenwervels gaat eerst verticaal omlaag en buigt daarna naar buiten. De huidplooi vanaf de heupbeensknobbel is niet zichtbaar. De pensgroeve achter de ribboog is zichtbaar.



Score 4

De huid over de dwarsuitsteeksels van de lendenwervels buigt direct naar buiten. Er is achter de ribboog geen pensgroeve zichtbaar.



Score 5

De dwarsuitsteeksels van de lendenwervels zijn niet zichtbaar door de sterk gevulde pens. De buikhuid is tonrond gespannen. Er is geen overgang te zien van flank naar ribben.

D. Zaaijer, W.D.J. Kremer, J.P.T.M. Noordhuizen



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Appendix 5 – Body Condition score

No Matter How You Look At It...

Body Condition Scoring

ELANCO
ANIMAL HEALTH

Is An Important Part of Modern Dairy Management.

In the dairy cow, body condition is an indicator of the amount of stored energy reserves and changes with different stages of lactation. Fresh cows in peak lactation tend to be in a negative energy balance and therefore lose body condition. Late lactation cows, dry cows and low producers are in a positive energy balance and gain condition. There is no one ideal body condition score. There is a range of desirable scores which change for individual cows over the different stages of each lactation.

Dairy farmers should regularly evaluate the body condition of their cows and heifers so they can fine-tune feeding and management practices. Adequate body reserves are necessary to maintain health, production and reproductive efficiency. Underconditioned cows are prone to reduced milk production and poor persistency of lactation. Overly conditioned cows are predisposed to calving difficulties, fatty liver syndrome, impaired reproduction and metabolic disorders.

Body condition scoring of cattle is an essential management tool for the progressive dairy farmer. It can be mastered with a little training and good observation skills, using both sight and touch to evaluate each cow.



BCS = 3



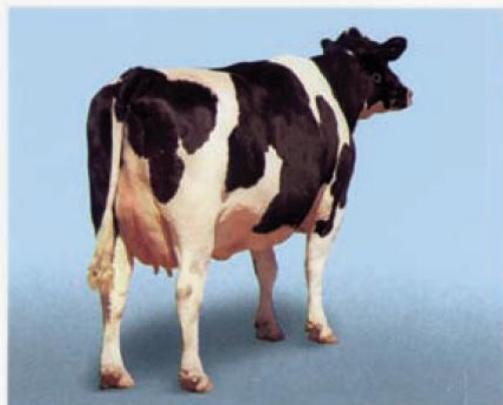
BCS = 1



BCS = 4



BCS = 2



BCS = 5

Photos by Craig Johnson

No Matter How You Look At It...

Body Condition Scoring

...Is An Important Part of Modern Dairy Management.



BCS = 1

Deep cavity around tailhead. Bones of pelvis and short ribs sharp and easily felt. No fatty tissue in pelvic or loin area. Deep depression in loin.



BCS = 2

Shallow cavity around tailhead with some fatty tissue lining it and covering pin bones. Pelvis easily felt. Ends of short ribs feel rounded and upper surfaces can be felt with slight pressure. Depression visible in loin area.



BCS = 3

No cavity around tailhead and fatty tissue easily felt over whole area. Pelvis can be felt with slight pressure. Thick layer of tissue covering top of short ribs which can still be felt with pressure. Slight depression in loin area.



BCS = 4

Folds of fatty tissue are seen around tailhead with patches of fat covering pin bones. Pelvis can be felt with firm pressure. Short ribs can no longer be felt. No depression in loin area.



BCS = 5

Tailhead is buried in thick layer of fatty tissue. Pelvic bones cannot be felt even with firm pressure. Short ribs covered with thick layer of fatty tissue.

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ANIMAL HEALTH

Appendix 6 – Questionnaire

General information / Información general	
Date of visit: <i>Fecha visita:</i>	
Number farm: <i>Matrícula:</i>	
Number of dairy cows: <i>No. de vacas lecheras:</i>	
Race: <i>Raza:</i>	
Average age dairy cows: <i>Edad promedio de las vacas lecheras:</i>	
Size area (ha): <i>Tamaño en ha:</i>	

(Animal)health / Sanidad	
How many cows are crippled at the moment? <i>Cuántas vacas rengas hay hoy?</i>	
What is the percentage cows that were suffering from lameness this year? (Don't count repeated cases twice) <i>Qué porcentaje de las vacas estuvieron rengas durante el año pasado? (no contar vacas repetidoras)</i>	
How many cases (%) of thick hocks did you have this year? <i>Cuántos casos ...?</i>	
How many cases (%) of thick carpi did you have this year? <i>Cuántos casos ...?</i>	
How many cows are you treating today for mastitis? <i>Cuántas vacas reciben tratamiento por mastitis clínica hoy?</i>	
How many cases (%) of mastitis did you have this year? (in case of 14 days healthy and then again mastitis counts as a new case) <i>Cuántos casos de mastitis clínica hubo durante el año pasado? (la definición de un caso nuevo es: luego de 14 días sin problemas)</i>	

<p>Wat is the percentage of cows with abomasal dislocations per year? <i>Cuál es el porcentaje ...?</i></p>	
<p>What is the percentage of cows with milk fever per year? <i>Anualmente, cuál es el porcentaje de hipocalcemia?</i></p>	
<p>What is the percentage of cows with acetonaemia per year? <i>Cuál es el porcentaje ...?</i></p>	
<p>What is the percentage of cows with rumen acidosis at the moment? <i>Qué porcentaje de las vacas ha sufrido acidosis en algún momento?</i></p>	
<p>What is the percentage of cows that is directly pregnant after the first insemination? <i>Cuál es el porcentaje de preñez a la primera inseminación?</i></p>	
<p>What is the average time between calving? <i>Cuál es el intervalo entre partos?</i></p>	
<p>What is the percentage of cows that get pregnant after insemination? <i>Cuál es el porcentaje de preñez final?</i></p>	
<p>How many cases (%) needed assistance of a veterinarian at calving? <i>Cuántas vacas necesitaron asistencia veterinaria durante el parto durante el año pasado?</i></p>	
<p>How many cows (%) died in the last year without an explanation? <i>Cuántas vacas ...?</i></p>	

Miscellaneous / Misceláneo	
<p>How many times per day are the cows fed? <i>Con qué frecuencia se suministra el alimento (1 o 2 veces/día)?</i></p>	
<p>How do you estimate the quality of the nutrition? <i>Cuál es su evaluación de la calidad del alimento? (bien / mal)</i></p>	
<p>Are the cows resting during the hot hours of the day?</p>	

<p><i>Las vacas pueden descansar durante las horas de mayor calor?</i></p>	
<p>Is there ad libitum water available for the cows? <i>Las vacas tienen acceso a agua fresca y limpia todo el día?</i></p>	
<p>What are the milking hours? <i>Cuáles son los horarios de ordeño?</i></p>	
<p>How long are the cows maximal waiting in the waiting area? <i>Cuál es el tiempo que el lote más grande pasa en el corral de espera?</i></p>	

Appendix 7 – Table for sample size

Table 6. Sample size for clinical scoring depending on the herd size. Adapted from welfare quality®³¹.

Herd size	Number of animals to score (suggestion A)	If A is not feasible
< 20	Every animal	Every animal
20	20	20
30	30	30
40	30	30
50	33	30
60	37	32
70	41	35
80	44	37
90	47	39
100	49	40
110	52	42
120	54	43
130	55	45
140	57	46
150	59	47
160	60	48
170	62	48
180	63	49
190	64	50
200	65	51
210	66	51
220	67	52
230	68	52
240	69	53
250	70	53
160	70	54
270	71	54
280	72	54
290	72	55
300	73	55

Appendix 8 – Validation of the scoring system: partially

	Min.	Max.	1	2	3	4	5	6	7	8	9
General	10 (9)	20	-1	-19	-11	-1	7	-23	-13	1	-5
Fear behaviour		5	3	0	3	5	3	0	3	0	3
Stretching when raising from the pasture		3	x	x	x	x	x	x	x	x	x
Tails are hanging straight and relaxed		3	2	0	0	0	0	0	0	3	0
Broken tails		0 (-100)	-3	0	-4	-3	0	-5	0	0	0
Bellowing		4	4	4	4	4	4	2	4	4	4
Environmental noise		0 (-5)	0	0	0	0	0	0	0	0	0
Flies		0 (-5)	-2	-4	-4	-2	-4	-4	-4	-2	-5
Tail docking		0 (-5)	0	-5	0	0	0	0	0	0	0
Cleanliness score		5 (-5)	0	0	0	0	5	0	-5	0	0
Milking parlour and waiting area	2	5	4	-2	4	4	5	0	4	0	3
Behaviour		3 (-3)	3	0	3	3	3	0	3	0	3
Max. time waiting before entering the milking parlour		2	1	0	1	1	2	1	1	1	0
Waiting area	8	17	6	-12	-8	-6	6	-14	8	-16	6
Shade		5 (-5)	5	-5	-5	-5	5	-5	5	-5	5
Presence of a ventilation system		1	0	0	0	0	0	0	0	0	0
Presence of sprinklers		5	0	0	0	0	0	0	0	0	0
Slipperiness floor		2	0	0	2	2	0	0	0	0	0
Cleanliness floor		2	0	1	1	2	2	1	2	1	1
Flatness floor		2	2	2	2	2	0	1	1	0	1
Milking parlour	8 (7)	18	13	9	9	15	3	3	5	6	9
Placing of feeding troughs		3	3	3	3	3	0	3	0	3	3
Space		3	3	3	0	3	0	0	0	0	3

Slipperiness floor		1	0	0	1	1	0	0	0	0	0
Cleanliness floor		1 (-1)	0	0	1	1	1	0	1	1	1
Flatness floor		1 (-1)	1	1	1	1	-1	0	1	0	0
Stairs and slopes		1	1	0	1	1	1	0	0	1	0
Walking related to the placement of the shafts		2	2	2	2	2	2	2	2	2	0
Light		2	2	0	0	2	2	0	2	0	2
It smells nice		1 (-2)	1	0	0	1	0	0	0	0	0
% kicking cows		3 (-3)	x	x	x	x	x	x	x	0	0
Exit milking parlour	3	6	6	3	-1	6	-7	-5	6	-9	-3
Floor		1 (-1)	1	1	1	1	1	1	1	-1	-1
Mud		2 (-2)	2	0	0	2	-2	-2	2	-2	-2
Surface		2	2	2	0	2	0	0	2	1	2
Rubbish and obstacles		0 (-2)	0	0	0	0	-2	-1	0	-1	0
Slopes		1	1	0	0	1	1	1	1	0	1
Water	16 (14)	33	20	12	15	20	15	15	6	14	14
Ad libitum water available		10	5	0	0	5	0	0	0	0	0
Type of place to drink		3	3	3	3	3	3	3	3	3	3
Cleanliness		5	5	3	5	5	5	5	0	3	3
Temperature		5	2	2	2	2	2	2	2	5	5
Distance from the pasture with cows to the place to drink		3	3	3	3	3	3	3	3	1	1
Sufficient amount and size of drinking troughs		5	x	x	x	x	x	x	x	x	x
Safety of the drinking trough		2	2	2	2	2	2	2	2	2	2
Feeding sites	13	27	11	11	11	15	11	11	7	11	7
Additional feeding sites in the pasture		10	0	0	0	0	0	0	0	0	0
Surface		3	3	3	3	3	3	3	3	3	3
Cleanliness of the surface		3	3	3	3	3	3	3	3	3	3
Feeding place per cow		3	3	3	3	3	3	3	3	3	3

Contamination of the feeding site		0 (-3)	0	0	0	0	0	0	0	0	0
Distance from the pasture to the feeding site		3	3	3	3	1	3	3	1	3	1
Quality		5	0	0	0	5	0	0	0	0	0
Walkways	9 (8)	18	16	10	-1	-7	-12	-6	-18	-15	7
Floor		3	1	0	0	0	1	1	0	0	0
Mud		5 (-5)	5	5	0	0	-5	-5	-5	-5	0
Surface		3	3	0	0	0	0	3	0	0	3
Rubbish and obstacles		0 (-5)	0	0	-3	-3	-3	-3	-3	-3	0
Walking distance		3	3	1	3	1	3	3	1	3	1
Slopes		2	2	2	2	2	2	2	2	0	2
Speed of cows walking		2	2	2	2	1	x	x	x	2	2
Loading site	3	6	3	3	4	4	3	4	5	3	4
Steepness		1	x	x	0	0	x	0	0	x	0
Safety		2	x	x	2	2	x	2	2	x	2
Flatness floor		2	x	x	2	2	x	2	2	x	2
Straight end		1	x	x	0	0	x	0	1	x	0
Pastures	35	70	60	40	60	60	5	25	60	5	40
Shade during hot hours of the day		20 (-20)	20	0	20	20	-20	20	20	-20	0
Food availability		20 (-20)	20	20	20	20	20	10	20	20	20
Mud		10 (-10)	10	10	10	10	10	0	10	10	10
Rubbish and obstacles		10 (-10)	10	10	10	10	10	0	10	10	10
Presence extra pasture		5	0	0	0	0	0	0	0	0	0
Mud extra pasture		5	0	0	0	0	0	0	0	0	0
Farmer and staff	34 (27)	68	60	40	50	65	40	40	-47	-44	16
Relevant education farmer		4	0	0	0	4	0	0	0	0	0
Relevant education staff		4	0	0	0	0	0	0	0	0	0
Way of herding		10 (-10)	10	10	10	10	10	10	0	10	0
Way of treating the cows		20 (-15)	20	15	15	20	x	x	x	-5	-5

during herding											
Way of treating the cows around the milking parlour		20 (-15)	20	5	15	20	20	20	-20	-20	20
Use of automatic driving aids		10 (-10)	10	10	10	10	10	10	10	10	10
Environmental management	5	10	10	10	-5	10	10	10	-5	10	-5
Rest during hot hours of the day		5	5	5	0	5	5	5	0	5	0
Milking hours aligned to the climate		5	5	5	0	5	5	5	0	5	0
Animal health	100	202	152	117	165	187	142	137	157	142	132
Hair		5 (-10)	5	5	3	5	5	5	5	5	5
% lameness / year and locomotion		25 (-25)	25	-10	25	25	25	25	15	25	5
Hocks		20 (-60)	20	20	20	20	20	20	20	20	20
Carpus		20 (-60)	20	20	20	20	20	20	20	20	20
Claws		20	20	20	20	20	10	10	20	20	10
% mastitis /year		15 (-15)	-5	0	-5	15	5	5	10	-3	0
Abomasal dislocation		10 (-15)	10	10	10	10	10	10	10	10	10
Filling of the rumen		5 (-10)	0	5	5	0	0	0	5	5	5
% milk fever /year		5(-10)	0	0	5	0	0	-5	5	-2	-5
Acetonaemia		5 (-15)	5	5	5	5	5	5	5	5	5
Body condition score		17	12	12	17	12	12	12	12	12	17
% Rumen acidosis / year		15	15	15	15	15	15	15	15	15	15
Fertility		25 (-10)	10	0	10	25	0	0	0	0	10
Calving		15	15	15	15	15	15	15	15	10	15
Cow mortality		0 (-500)	x	x	x	x	x	x	x	x	x
Total		500	360	222	292	371	228	197	175	108	225

Appendix 9 – Validation of the scoring system: totally

	Min.	Max.	1	2	3	4	5	6	7	8	9
General	10 (9)	20	-1	-19	-11	-1	7	-23	-13	1	-5
Fear behaviour		5	3	0	3	5	3	0	3	0	3
Stretching when raising from the pasture		3	x	x	x	x	x	x	x	x	x
Tails are hanging straight and relaxed		3	2	0	0	0	0	0	0	3	0
Broken tails		0 (-100)	-3	0	-4	-3	0	-5	0	0	0
Bellowing		4	4	4	4	4	4	2	4	4	4
Environmental noise		0 (-5)	0	0	0	0	0	0	0	0	0
Flies		0 (-5)	-2	-4	-4	-2	-4	-4	-4	-2	-5
Tail docking		0 (-5)	0	-5	0	0	0	0	0	0	0
Cleanliness score		5 (-5)	0	0	0	0	5	0	-5	0	0
Milking parlour and waiting area	2	5	4	-2	4	4	5	0	4	0	3
Behaviour		3 (-3)	3	0	3	3	3	0	3	0	3
Max. time waiting before entering the milking parlour		2	1	0	1	1	2	1	1	1	0
Waiting area	8	17	6	-12	-8	-6	6	-14	8	-16	6
Shade		5 (-5)	5	-5	-5	-5	5	-5	5	-5	5
Presence of a ventilation system		1	0	0	0	0	0	0	0	0	0
Presence of sprinklers		5	0	0	0	0	0	0	0	0	0
Slipperiness floor		2	0	0	2	2	0	0	0	0	0
Cleanliness floor		2	0	1	1	2	2	1	2	1	1
Flatness floor		2	2	2	2	2	0	1	1	0	1
Milking parlour	8 (7)	18	13	9	9	15	3	3	5	7	9
Placing of feeding troughs		3	3	3	3	3	0	3	0	3	3
Space		3	3	3	0	3	0	0	0	0	3

Slipperiness floor		1	0	0	1	1	0	0	0	0	0
Cleanliness floor		1 (-1)	0	0	1	1	1	0	1	1	1
Flatness floor		1 (-1)	1	1	1	1	-1	0	1	0	0
Stairs and slopes		1	1	0	1	1	1	0	0	1	0
Walking related to the placement of the shafts		2	2	2	2	2	2	2	2	2	0
Light		2	2	0	0	2	2	0	2	0	2
It smells nice		1 (-2)	1	0	0	1	0	0	0	0	0
% kicking cows		3 (-3)	x	x	x	x	x	x	x	x	x
Exit milking parlour	3	6	6	3	-1	6	-7	-5	6	-9	-3
Floor		1 (-1)	1	1	1	1	1	1	1	-1	-1
Mud		2 (-2)	2	0	0	2	-2	-2	2	-2	-2
Surface		2	2	2	0	2	0	0	2	1	2
Rubbish and obstacles		0 (-2)	0	0	0	0	-2	-1	0	-1	0
Slopes		1	1	0	0	1	1	1	1	0	1
Water	16 (14)	33	20	12	15	20	15	15	6	14	14
Ad libitum water available		10	5	0	0	5	0	0	0	0	0
Type of place to drink		3	3	3	3	3	3	3	3	3	3
Cleanliness		5	5	3	5	5	5	5	0	3	3
Temperature		5	2	2	2	2	2	2	2	5	5
Distance from the pasture with cows to the place to drink		3	3	3	3	3	3	3	3	1	1
Sufficient amount and size of drinking troughs		5	x	x	x	x	x	x	x	x	x
Safety of the drinking trough		2	2	2	2	2	2	2	2	2	2
Feeding sites	13	27	11	11	11	15	11	11	7	11	7
Additional feeding sites in the pasture		10	0	0	0	0	0	0	0	0	0
Surface		3	3	3	3	3	3	3	3	3	3
Cleanliness of the surface		3	3	3	3	3	3	3	3	3	3
Feeding place per cow		3	3	3	3	3	3	3	3	3	3

Contamination of the feeding site		0 (-3)	0	0	0	0	0	0	0	0	0
Distance from the pasture to the feeding site		3	3	3	3	1	3	3	1	3	1
Quality		5	0	0	0	5	0	0	0	0	0
Walkways	9 (8)	18	14	8	-4	-8	-12	-6	-18	-18	4
Floor		3	1	0	0	0	1	1	0	0	0
Mud		5 (-5)	5	5	0	0	-5	-5	-5	-5	0
Surface		3	3	0	0	0	0	3	0	0	3
Rubbish and obstacles		0 (-5)	0	0	-3	-3	-3	-3	-3	-3	0
Walking distance		3	3	1	3	1	3	3	1	3	1
Slopes		2	2	2	2	2	2	2	2	0	2
Speed of cows walking		2	x	x	x	x	x	x	x	x	x
Loading site	3	6	3	3	4	4	3	4	5	3	4
Steepness		1	x	x	0	0	x	0	0	x	0
Safety		2	x	x	2	2	x	2	2	x	2
Flatness floor		2	x	x	2	2	x	2	2	x	2
Straight end		1	x	x	0	0	x	0	1	x	0
Pastures	35	70	60	40	60	60	5	25	60	5	40
Shade during hot hours of the day		20 (-20)	20	0	20	20	-20	20	20	-20	0
Food availability		20 (-20)	20	20	20	20	20	10	20	20	20
Mud		10 (-10)	10	10	10	10	10	0	10	10	10
Rubbish and obstacles		10 (-10)	10	10	10	10	10	0	10	10	10
Presence extra pasture		5	0	0	0	0	0	0	0	0	0
Mud extra pasture		5	0	0	0	0	0	0	0	0	0
Farmer and staff	34 (27)	68	40	23	35	44	40	40	-47	-27	30
Relevant education farmer		4	0	0	0	4	0	0	0	0	0
Relevant education staff		4	0	0	0	0	0	0	0	0	0
Way of herding		10 (-10)	10	10	10	10	10	10	0	10	0
Way of treating the cows		20 (-15)	x	x	x	x	x	x	x	x	x

during herding											
Way of treating the cows around the milking parlour		20 (-15)	20	5	15	20	20	20	-20	-20	20
Use of automatic driving aids		10 (-10)	10	10	10	10	10	10	10	10	10
Environmental management	5	10	10	10	-5	10	10	10	-5	10	-5
Rest during hot hours of the day		5	5	5	0	5	5	5	0	5	0
Milking hours aligned to the climate		5	5	5	0	5	5	5	0	5	0
Animal health	100	202	152	117	165	187	142	137	157	142	132
Hair		5 (-10)	5	5	3	5	5	5	5	5	5
% lameness / year and locomotion		25 (-25)	25	-10	25	25	25	25	15	25	5
Hocks		20 (-60)	20	20	20	20	20	20	20	20	20
Carpus		20 (-60)	20	20	20	20	20	20	20	20	20
Claws		20	20	20	20	20	10	10	20	20	10
% mastitis /year		15 (-15)	-5	0	-5	15	5	5	10	-3	0
Abomasal dislocation		10 (-15)	10	10	10	10	10	10	10	10	10
Filling of the rumen		5 (-10)	0	5	5	0	0	0	5	5	5
% milk fever /year		5(-10)	0	0	5	0	0	-5	5	-2	-5
Acetonaemia		5 (-15)	5	5	5	5	5	5	5	5	5
Body condition score		17	12	12	17	12	12	12	12	12	17
% Rumen acidosis / year		15	15	15	15	15	15	15	15	15	15
Fertility		25 (-10)	10	0	10	25	0	0	0	0	10
Calving		15	15	15	15	15	15	15	15	10	15
Cow mortality		0 (-500)	x	x	x	x	x	x	x	x	x
Total		500	338	203	274	350	228	197	175	123	236