



Welfare Quality[®] Assessment protocol for cattle

*Please notice that this protocol does not include
the veal calves!
A protocol including veal calves will be published
at the home page during the fall.*

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Foreword

The European Welfare Quality[®] project developed standardized ways of assessing animal welfare and a standardized way of integrating this information to enable farms and slaughterhouses to be assigned to one of four categories (from poor, to good animal welfare).

One of the innovations of the Welfare Quality[®] animal welfare assessment system is that it focuses more on animal-based measures (e.g. directly related to animal body condition, health aspects, injuries, behaviour, etc.). Existing approaches largely concentrate on design or management-based characteristics (e.g. size of cage or pen, flooring specifications etc.). Of course, this does not mean that resource-based or management-based factors are ignored in Welfare Quality[®]; and many of these are important features of the system. A particular attraction of using animal-based measures is that they show the 'outcome' of the interaction between the animal and its environment (housing design and management) and this combined outcome is assessed by the Welfare Quality[®] assessment system.

This protocol provides a description of the Welfare Quality[®] assessment procedure for cattle.

Within the Welfare Quality[®] project, these assessment protocols have been developed through the collaboration of a large number of research groups and institutes. A list of the contributors to Welfare Quality[®] can be found in Annex C. Special thanks are due to Xavier Boivin, Raphaëlle Botreau, Nina Brörkens, Elisabetta Canali, Sue Haslam, Ute Knierim, Simone Laister, Katharine Anne Leach, Joop Lensink, Helene Leruste, Susanna Lolli, Finn Milard, Michela Minero, Fabio Napolitano, Regina Quast, Anna-Maria Regner, Giuseppe de Rosa, Viveca Sandström, Claudia Schmied, Heike Schulze Westerath, Susanne Waiblinger, Francoise Wemelsfelder, Rebecka Westin, Helen Rebecca Whay, Ines Windschnurer, Karin Zenger, Daniela Zucca for their work in the development of the final protocols.

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The Welfare Quality[®] protocols reflect the present scientific status of the Welfare Quality[®] project, but will undergo an ongoing process of updating and revision since these protocols are considered 'living documents'.

Prof Dr Harry J. Blokhuis (Coordinator Welfare Quality[®])
Uppsala, October 2009

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Introduction

Animal welfare is an important attribute of an overall 'food quality concept' and consumers expect their animal-related products, especially food, to be produced with respect for the welfare of the animals. Recent surveys carried out by the European Commission¹ as well as studies within the Welfare Quality[®] project², confirm that animal welfare is an issue of considerable significance for European consumers and that European citizens show a strong commitment to animal welfare. In order to accommodate societal concerns about the welfare quality of animal food products as well as related market demands, e.g. welfare as a constituent aspect of product quality, there is a pressing need for reliable science based systems for assessing the animals' welfare status³.

In January 2006 the European Commission adopted a Community Action Plan on the Protection and Welfare of Animals⁴. The Action Plan outlines the Commission's planned initiatives and measures to improve the protection and welfare of animals for the period 2006-2010. The Action Plan aims to ensure that animal welfare is addressed in the most effective manner possible, in all EU sectors and through EU relations with Third Countries. Among other things the Action Plan foresees a classification system for animal welfare practices, to differentiate between where minimum standards are applied and cases where even higher standards are used. It also foresees setting up standardised indicators whereby production systems which apply higher animal welfare standards than the minimum standards get due recognition. The option of an EU label for animal welfare is also put forward, to promote products obtained in line with certain animal welfare standards.

Consumers' concern and the apparent demand for information on animal welfare was the starting point of Welfare Quality[®], funded from the European Commission within the 6th EU programme. The project started in 2004 and became the largest piece of integrated research work yet carried out in animal welfare in Europe. The Welfare Quality[®] project is a partnership of 40 institutions in Europe and, since 2006, four in Latin America. The partners are based in 13 European and four Latin American countries.

The Welfare Quality[®] project set out to develop scientifically based tools to assess animal welfare. The acquired data provides feedback to animal unit managers about the welfare status of their animals, and is translated into accessible and understandable information on the welfare status of food producing animals for consumers and others. Welfare Quality[®] also generates knowledge on practical strategies to improve animal welfare on farm and at slaughter.

In a truly integrated effort Welfare Quality[®] combined analyses of consumer perceptions and attitudes with existing knowledge from animal welfare science and thereby identified 12 criteria that should be adequately covered in the assessment systems. To address these areas of concern, it was decided to concentrate on so-called animal-based measures that address aspects of the actual welfare state of the animals in terms of, for instance, their behaviour, fearfulness, health or physical condition. Such animal-based measures include the effects of variations in the way the farming system is managed (role of the farmer) as well as specific system-animal interactions. However, it is clear that resource and management-based measures can contribute to a welfare assessment if they are closely correlated to animal-based measures. Moreover, resource and management-based measures can also be used to identify risks to animal welfare and identify causes of poor welfare so that improvement strategies can be implemented.

¹ European Commission (2005). Attitudes of consumers towards the welfare of farmed animals. Eurobarometer, Brussels. 138 pp.

European Commission (2006). Communication from the Commission to the European Parliament and the Council on a Community Action Plan on the Protection and Welfare of Animals 2006-2010, COM (2006) 13 final, Brussels.

European Commission (2007). Attitudes of EU citizens towards Animal Welfare. Eurobarometer, Brussels. 82 pp.

² Kjaernes, U., Roe, E. & Bock, B. (2007). Societal concerns on farm animal welfare. In: I. Veissier, B. Forkman and B. Jones (Eds), Assuring animal welfare: from societal concerns to implementation (pp. 13-18). Second Welfare Quality stakeholder conference, 3-4 May 2007, Berlin, Germany.

³ Blokhuis, H.J., Jones, R.B., Geers, R., Miele, M. & Veissier, I. (2003). Measuring and monitoring animal welfare: transparency in the food product quality chain. *Animal Welfare*, 12, 445-455.

⁴ European Commission. (2006). Communication from the commission to the European Parliament and the Council on a community action plan on the protection and welfare of animals 2006e2010, COM (2006) 13 final, Brussels.

Following a common approach across animal species an integrated, standardized and, wherever possible, animal-based methodology for assessment of animal welfare was then developed. The chosen animal species, based on their economic and numeric importance, are pigs, poultry and cattle. In addition, the focus has been on the production period of the animals' life (i.e. on farm/transport/slaughter).

The present protocol describes the procedures and requirements for the assessment of welfare in cattle and is restricted to the key production animals, which are fattening cattle, dairy cows and veal calves.

This document presents the collection of data for fattening cattle measured on farm, followed by the procedures for calculating the scores. The collection of data at the slaughterhouse to assess welfare of fattening cattle at slaughter is presented in the following section. Subsequently, the procedure for the collection of data for dairy cows on farm and calculation of scores for the overall assessment of welfare on the farm is described. After this, the protocols for the collection of veal calves data measured on farm are provided. Additionally, the collection of data measured at the slaughterhouse but which reflect on farm welfare are also described. These two sections complement each other and are used together in the calculation of welfare scores for veal calves on farm.

Glossary

ACBSS	Australian Carcass Bruise Scoring System
cm	Centimetre(s)
(c)m ²	Square (centi-) metre
e.g.	exempli gratia: for example
h	Hour(s)
i.e.	id est: that is
L	Liter(s)
Min	Minute(s)
No.	Number
OLA	Outdoor loafing area
QBA	Qualitative behaviour assessment
RS	Recording sheet
s	Second(s)
VAS	Visual analogue scale

1 Scope

This cattle protocol deals with measures related to welfare assessment made during the production period on farm for the following categories: fattening cattle, dairy cows and veal calves. The descriptions are kept as short as is possible, and for training purposes more detailed descriptions of the measures are recommended. In addition to the on-farm assessment, the quality of the slaughterhouse from a welfare perspective is assessed for fattening cattle at the time of slaughter.

At least three major periods can be distinguished: the rearing period, the production period (meat and milk) and the end of life of the animal, where it will be transported and slaughtered.

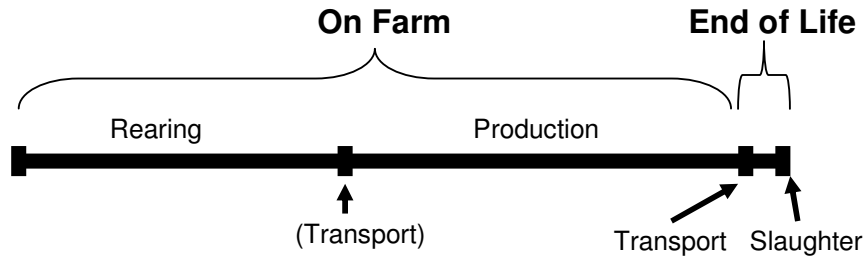


Figure 1 Schematic reproduction of the different periods in the life of production animals. These are not necessarily all covered in the protocol.

Some specific periods are not yet included in the protocols for some categories of animals:

- For veal calves the rearing period is essentially the production period and thus no distinction between the two is made;
- In this protocol we do not consider the rearing period for fattening cattle and dairy (cows). No data will be collected during the time the animals are transported to slaughter, although some measures taken at the slaughterhouse indirectly allow assessment of the welfare of animals during transport;
- Transport between farms, for example as sometimes occurs between rearing and production periods is not considered;
- The protocol is not applicable to other ruminant species such as sheep and goats.

This is also shown in Table 1.

	Rearing	Producing	End of life
Fattening cattle			
Dairy cows			
Veal calves			

Included in cattle protocol Not included in protocol

Table 1 Periods in the life of animals which are considered in the Welfare Quality® Protocols.

The protocols described in this section only apply to fattening cattle, dairy cows and veal calves. The protocols for cattle have been developed for intensive housing systems.

When visiting a farm for professional assessment purposes, it may be appropriate to collect additional information. Such information may be useful for management support or to provide advice for the farmer. This advisory support role must be separated from the inspection role as, in general, assessors must not involve themselves in giving prescriptive advice to clients. If additional information is collected, this may contribute to improved efficiency in the long term, by reducing the total number of visits to particular farms. However, since this document deals with the assessment system, only

questions necessary for the assessment process are included. It is proposed that any additional questions aimed at advisory support are best developed independently by the advisory or management support services present in each country.

2 Legal aspects

The Welfare Quality[®] protocols should only be applied to farming systems which operate within the applicable legal framework of the country. The Welfare Quality[®] protocols do not replace or supersede any existing farm assurance or legal standards. They provide an additional tool for the assessment of animal welfare using predominantly animal-based measures and as such can add valuable additional information to existing inspection programs.

The individual animal unit manager has responsibility to operate within legal requirements. It is not considered feasible or desirable to list all legal statutes relevant to animal and farm operation in Europe within this document. For these reasons, a list of current normative legal texts is not provided for within the Welfare Quality[®] protocols.

However, the current key legislative framework can be found at the webpage of EUR-lex, where the relevant treaties, legislation, case-law and legislative proposals can be consulted⁵. If the application or interpretation of any element of this standard conflicts with legislation, current acting legislation always has priority.

⁵ <http://eur-lex.europa.eu>

3 Terms and definitions

Advisor

Person who uses the outcome of the Welfare Quality® protocols and other information to advise the animal unit manager on how to improve welfare

NOTE This is distinct from the assessor

Animal unit

Section of a farm, a transport unit or a slaughter plant that deals with a certain type of animal

NOTE An animal unit can, for example, be the section of a farm where all adult animals are kept or the section of a slaughter plant where all animals are handled and slaughtered

Animal unit manager

Person responsible for an animal unit

NOTE This can be the farmer or the slaughter plant manager (or person responsible for animal care)

Animal-based measure

Measure that is taken directly from the animal

NOTE Animal-based measures can include, for instance, behavioural and clinical observations

Assessment protocol

An assessment protocol is a description of the procedures and requirements for the overall assessment of welfare

Assessor

Person in charge of collecting data using the Welfare Quality® protocols on an animal unit in order that the welfare of animals is assessed

Dairy cows (*Bos taurus*)

Female cattle after calving, that are kept for the purpose of milk production

Fattening cattle (*Bos taurus*)

Bulls, steers or heifers above 200 kilograms live weight, which are raised with the purpose of red meat production. This does not include the cows and replacement stock in cow-calf herds. Although beef production can also be based on pasture systems, this is not covered in this protocol.

Heifer (*Bos taurus*)

Female cow that has not yet calved

Management-based measure

Measures which refer to what the animal unit manager does on the animal unit and what management processes are used

NOTE Management-based measures contain, for instance, the procedures used to protect animals from disease, including for example use of anaesthetics and the duration of fattening

Overall assessment of welfare

Synthesis of welfare information, which will then be used to allocate an animal unit to a welfare category. The overall assessment of welfare reflects the overall welfare state of the animals

Resource-based measure

Measure that is taken regarding the environment in which the animals are kept

NOTE Resource-based measures include for instance the number of drinkers

Transport unit

The transportation truck, lorry, module etc, which is considered as part of an animal unit for assessment purposes

Veal calf (*Bos taurus*)

Calf raised up to an age of 8 months with the purpose of white meat production

Welfare category

Final categorization obtained by an animal unit that indicates the overall welfare of animals

NOTE This is expressed on a 4 level scale: not classified, acceptable, enhanced, and excellent

Welfare criterion

Represents a specific area of welfare, which indicates an area of welfare concern

NOTE An example of a welfare criterion is "absence of injuries"

Welfare measure

Measure taken on an animal unit that is used to assess a welfare criterion

NOTE A measure can be animal-based, resource-based or management-based

Welfare principle

Collection of criteria associated with one of the following four areas: feeding, housing, health and behaviour

Welfare Quality[®] protocol

Description of the measures that will be used to calculate the overall assessment of welfare

NOTE The protocols also specify how the data will be collected

Welfare score

Score that indicates how well an animal unit fulfils a criterion or principle

4 Background Welfare Quality® protocols

This chapter outlines the principles and overall structure of the Welfare Quality® protocols and how they are to be used in the overall assessment of animal welfare.

4.1 Overall structure of the project

Welfare Quality® has developed a system to enable overall assessment of welfare and the standardised conversion of welfare measures into summary information.

The welfare assessment related to a specific animal unit is based on the calculation of welfare scores from the information collected on that unit. An advisor can use the welfare assessment to highlight points requiring the animal unit manager's attention. The information can also be used to inform consumers about the welfare status of animal products or the welfare quality of the supply chain.

The species protocols contain all the measures relevant for the species and an explanation of what data should be collected, and in what way.

The species protocols address animals at different stages of their lives and/or in various housing systems. It can cover the rearing, the production, or the end of life of the animal, which includes transport and slaughter (Figure 2). At the moment there are no measures that are carried out during the actual transport process, but the effects of transport on welfare can be determined by examining the animals on arrival at the slaughterhouse. Transport measures may be added in the future.

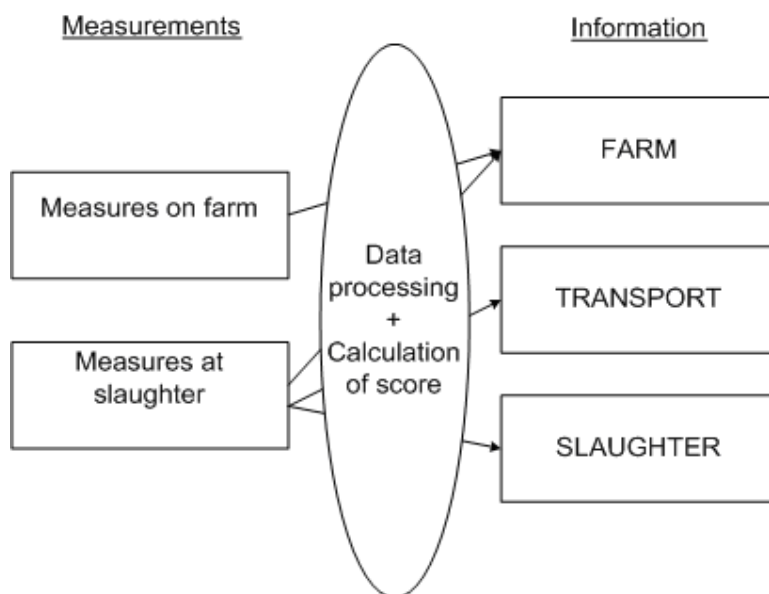


Figure 2 The different sources of information in Welfare Quality®. It is outside the scope of this document, but potential use of the output generated includes information provided to consumers, advisors and retailers.

4.2 Basic principles

4.2.1 Introduction

Welfare is a multidimensional concept. It comprises both physical and mental health and includes several aspects such as physical comfort, absence of hunger and disease, possibilities to perform motivated behaviour, etc. The importance attributed to different aspects of animal welfare may vary between different people.

The different measurable aspects of welfare to be covered are turned into welfare criteria. The criteria reflect what is meaningful to animals as understood by animal welfare science. They also have to be agreed by stakeholders in order to ensure that wider ethical and societal issues have been dealt with, and furthermore to maximize the likelihood of successful translation into practice. In the case of Welfare Quality[®] these have been systematically discussed with members of the general public and farmers, as well as with representatives of these and other stakeholder groups.

A top-down approach was used - four main welfare principles were identified and then split into twelve independent welfare criteria. Finally measures were selected to assess these welfare criteria. In general, the principles and criteria which have been chosen are relevant for different species and throughout an animal's entire lifespan. A bottom-up approach, i.e. stepwise integration of measures, leads ultimately to the overall assessment of welfare (see Figure 3).

Animals differ in their genetics, early experience and temperament and therefore may experience the same environment in different ways. Even apparently similar environments may be managed differently by the stockperson, further affecting animals' experience of a particular situation. Because welfare is a characteristic of the individual animal, Welfare Quality[®] has based its welfare assessment essentially on animal-based measures (e.g. health and behaviour). Since resource-based measures (e.g. type of housing and stocking density) or management-based measures (e.g. breeding strategies and health plans) are a poor direct guarantee of good animal welfare in a particular situation, these measures are avoided within the protocols. However, when no animal-based measure is available to check a criterion, or when such a measure is not sensitive or reliable enough, measures of the resources or the management are used to check as much as possible that a given welfare criterion is met.

There is no gold standard measure of overall animal welfare and no available information on the relative importance animals attribute to the various welfare aspects. Welfare Quality[®] scientists are aware that the production of an overall assessment of animal welfare is by nature bound to ethical decisions, e.g. on whether we should consider the average state of animals vs. the worst ones, whether we should consider each welfare criterion separately vs. together in a more holistic approach, or whether a balance between societal aspirations for high welfare levels and the realistic achievements of such levels in practice should be achieved. Welfare Quality[®] scientists did not decide upon these ethical issues themselves. They consulted experts, including animal scientists, social scientists, and stakeholders, and the methodology for overall assessment was then adjusted according to their opinions; that is that all of the parameters used in the scoring model were optimised so as to best match expert opinions.

4.2.2 Defining welfare principles and criteria

Each welfare principle is phrased in such a way that it communicates a key welfare question. Four main principles are identified: good feeding, good housing, good health, appropriate behaviour. They correspond to the questions:

- Are the animals properly fed and supplied with water?
- Are the animals properly housed?
- Are the animals healthy?
- Does the behaviour of the animals reflect optimized emotional states?

Each principle comprises two to four criteria. Criteria are independent of each other and form an exhaustive but minimal list. Welfare principles and criteria are summarized in Table 2.

Welfare principles	Welfare criteria	
Good feeding	1	Absence of prolonged hunger
	2	Absence of prolonged thirst
Good housing	3	Comfort around resting
	4	Thermal comfort
	5	Ease of movement
Good health	6	Absence of injuries
	7	Absence of disease
	8	Absence of pain induced by management procedures
Appropriate behaviour	9	Expression of social behaviours
	10	Expression of other behaviours
	11	Good human-animal relationship
	12	Positive emotional state

Table 2 The principles and criteria that are the basis for the Welfare Quality[®] assessment protocols

More detailed definitions of welfare criteria are described below.

1. Animals should not suffer from prolonged hunger, i.e. they should have a suitable and appropriate diet.
2. Animals should not suffer from prolonged thirst, i.e. they should have a sufficient and accessible water supply.
3. Animals should have comfort when they are resting.
4. Animals should have thermal comfort, i.e. they should neither be too hot nor too cold.
5. Animals should have enough space to be able to move around freely.
6. Animals should be free of injuries, e.g. skin damage and locomotory disorders.
7. Animals should be free from disease, i.e. animal unit managers should maintain high standards of hygiene and care.
8. Animals should not suffer pain induced by inappropriate management, handling, slaughter, or surgical procedures (e.g. castration, dehorning).
9. Animals should be able to express normal, non-harmful, social behaviours (e.g. grooming).
10. Animals should be able to express other normal behaviours, i.e. it should be possible to express species-specific natural behaviours such as foraging.
11. Animals should be handled well in all situations, i.e. handlers should promote good human-animal relationships.
12. Negative emotions such as fear, distress, frustration or apathy should be avoided whereas positive emotions such as security or contentment should be promoted.

4.2.3 Measures developed to check criteria

Whenever possible, the final Welfare Quality[®] assessment measures have been evaluated with respect to their validity (does the measure reflect some aspect of the actual welfare of animals), reliability (acceptable inter or intra observer repeatability and robustness to external factors e.g. time of day or weather conditions) and their feasibility. A further important aspect of this data collection is that value judgements are minimized, i.e. the assessor counts or classifies animals according to a simple series of categories illustrated by pictures or video clips. Hence measures in the protocols do not require veterinary diagnostic expertise or specialist animal behaviour knowledge to be accurately recorded. Some measures which were initially proposed did not meet these conditions and were dropped from the scheme early in the evaluation process, whereas other measures have been accepted in anticipation of further improvements and refinements. This latter concession is because at least one measure per criterion is needed to assess overall animal welfare. For some criteria, it has been necessary to include resource- and/or management-based measures because no animal-based measure was sufficiently sensitive or satisfying in terms of validity, reliability, or feasibility.

NOTE It is important to remember that research is continuing to identify new and better measures and that Welfare Quality[®] protocols will be updated in the light of new knowledge.

4.2.4 Calculation of scores

Once all the measures have been performed on an animal unit, a bottom-up approach is followed to produce an overall assessment of animal welfare on that particular unit: first the data collected (i.e.

values obtained for the different measures on the animal unit) are combined to calculate criterion-scores; then criterion-scores are combined to calculate principle-scores; and finally the animal unit is assigned to one welfare category according to the principle-scores it attained (Figure 3). A mathematical model has been designed to produce the overall assessment.

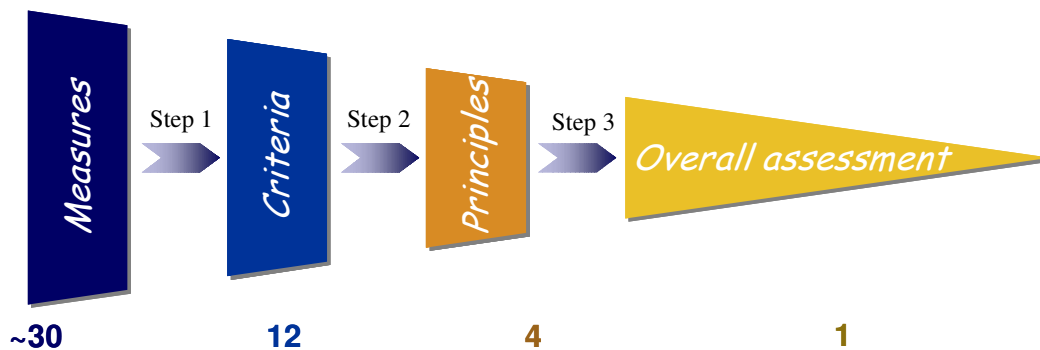


Figure 3 Bottom-up approach for integrating the data on the different measures to an overall assessment of the animal unit.

Calculation of criterion-scores

Although this is not generally the case, some measures may be related to several criteria (e.g. low body condition score can originate from hunger or disease, or both). In order to avoid double counting, measures have been allocated to only one criterion, except in very few cases where we could distinguish the way they were interpreted (e.g. access of cattle to pasture is used to check the Ease of movement criterion, especially for animals which are tethered in winter, and the expression of other behaviour).

The data produced by the measures relevant to a given criterion are interpreted and synthesized to produce a criterion-score that reflects the compliance of the animal unit to this criterion. This compliance is expressed on a 0 to 100 value scale, in which:

- '0' corresponds to the worst situation one can find on an animal unit (i.e. the situation below which it is considered there cannot be further decrements in welfare)
- '50' corresponds to a neutral situation (i.e. level of welfare is not bad but not good)
- '100' corresponds to the best situation one can find on a farm (i.e. the situation in which it is considered there cannot be further improvements in welfare).

Because the total number of measures, the scale on which they are expressed, and the relative importance of measures varies between and within criteria and also between animal types, the calculation of scores varies accordingly. In general there are three main types of calculation:

- When all measures used to check a criterion are taken at farm level and are expressed in a limited number of categories, a decision tree is produced. An example is provided in Explanation box 1.
- When a criterion is checked by only one measure taken at individual level, this scale generally represents the severity of a problem and the proportion of animals observed can be calculated (e.g. percentage animals walking normally, percentage moderately lame animals, percentage severely lame animals). In that case a weighted sum is calculated, with weights increasing with severity. An example is provided in Explanation box 2.
- When the measures used to check a criterion lead to data expressed on different scales (e.g. percentage animals lying outside the lying area, or average latency to lie down expressed in seconds), data are compared to an alarm threshold that represents the limit between what is considered abnormal and that considered to be normal. Then the number of alarms is used as the measure value. An example is provided in Explanation box 3.
- When the measures to check a criterion are taken at group level, the score attributed to the animal unit is equal to the worst score obtained at group level as long as at least 15% of the observed animals are in groups that obtain this score or a lower one.

Experts from animal sciences were consulted to interpret the raw data in terms of welfare. When necessary, alarm thresholds were defined by consultation with them. Then experts were asked to

score virtual farms. In the situations where weighted sums were to be calculated, this consultation was used to define weights that produce the same ranking of farms as the one given by experts.

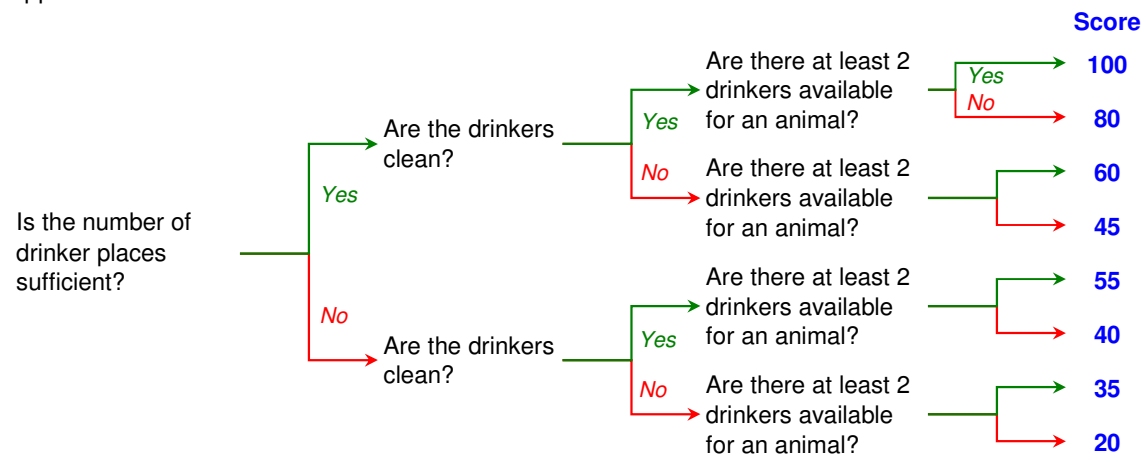
This exercise showed that experts do not in general follow a linear reasoning, e.g. for a given disorder a 10 % increase does not yield the same decrement in expert scores at the bottom of the [0,100] scale (where most animals get this disorder) than at the top of the scale (when most animals are normal). It is therefore necessary to resort to non-linear functions to produce criterion-scores, in this case I-spline functions. Briefly, I-spline functions allow calculation of portions of curves so as to obtain a smooth representative curve.

They are expressed in the form of cubic functions (Explanation box 2).

When a criterion was composed of very different measures which experts found difficult to consider together, blocks of measures were aggregated using Choquet integrals (Explanation box 4).

Explanation box 1: Decision tree as applied to absence of prolonged thirst in fattening pigs

Thirst is not assessed directly on animals because signs of dehydration can be detected only in extreme cases. Rather, the number of drinking places, their functioning and their cleanliness are assessed. The recommended number of pigs is calculated (10 pigs per functioning drinking place and 5 for a drinking place of reduced capacity). If there are more pigs in the pen than recommended then the number of drinking places is considered insufficient. Thereafter, cleanliness of drinkers and whether pigs have access to two drinkers in the same pen is considered. The following decision tree is applied:



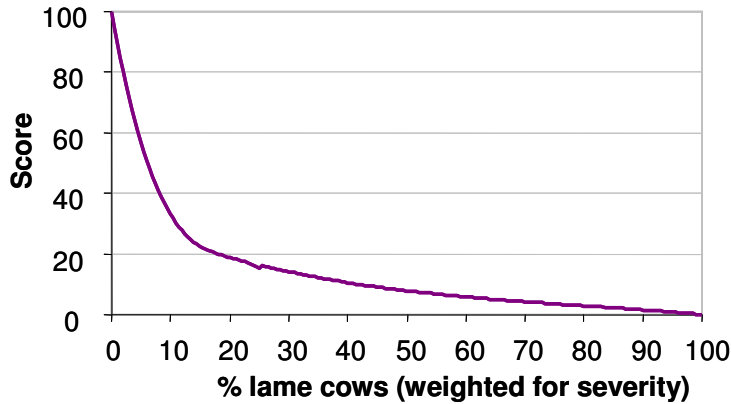
Explanation box 2: Weighted sum and I-spline functions as applied to lameness in dairy cows

The % of animals moderately lame and the % of animals severely lame are combined in a weighted sum, with a weight of 2 for moderate lameness and 7 for severe lameness. This sum is then transformed into an index that varies from 0 to 100:

$$\text{Index for lameness } I = \left(100 - \frac{2(\% \text{moderate}) + 7(\% \text{severe})}{7} \right)$$

This index is computed into a score using I-spline functions:

$$\begin{aligned} \text{When } I \leq 65 & \text{ then Score} = (0.0988 \times I) - (0.000955 \times I^2) - (5.34 \times 10^{-5} \times I^3) \\ \text{When } I \geq 65 & \text{ then Score} = 29.9 - (0.944 \times I) - (0.0145 \times I^2) + (1.92 \times 10^{-5} \times I^3) \end{aligned}$$



Explanation box 3: Use of alarm thresholds applied to absence of diseases in broilers

In broiler chicken the following disorders are checked on the farm or at slaughter: ascites, dehydration, septicaemia, hepatitis, pericarditis, subcutaneous abscesses. The incidence of each disorder is compared to an alarm threshold, defined as the incidence above which a health plan is required at the farm level.

Disorder	Alarm Threshold (%)
Ascites	1
Dehydration	1
Scepticaemia	1.5
Hepatitis	1.5
Pericarditis	1.5
Subcutaneous abscess	1

When the incidence observed on a farm reaches half the alarm threshold, a warning is attributed. The number of alarms and warnings detected on a farm are calculated. They are used to calculate a weighted sum finally transformed into a score using I-spline functions (as in the example shown in Explanation box 2).

Calculation of principle-scores from criterion-scores

Criterion-scores are synthesized to calculate principle-scores. For instance, the scores obtained by an animal unit for absence of injuries, absence of disease, and absence of pain due to management procedures are combined to reflect compliance of this unit with the principle 'good health'. Animal and social scientists were consulted, and considered some criteria to be more important than others (e.g. in most animal types, 'Absence of disease' is considered to be more important than 'Absence of injuries' which in turn is more important than 'Absence of pain induced by management procedures'). Nevertheless, synthesis does not allow compensation between scores (e.g. absence of disease does not compensate for injuries and vice versa). A specific mathematical operator (Choquet integral) was used to take into account these two lines of reasoning. In short, the Choquet integral calculates the difference between the minimum score and the next minimum score and attributes a weight (called 'capacity') to that difference. This process is repeated until the highest score is reached. In the

species-specific sections, only the ‘capacities’ are given (μ_x for the capacity of a criterion x, μ_{xy} for the capacity of a group made of 2 criteria x and y, etc.). An example of the calculation of principle-scores is provided in Explanation box 4.

Explanation box 4: Use of a Choquet integral to calculate the principle-scores for ‘Good health’.

‘Good health’ integrates 3 criteria; ‘Absence of injuries’, ‘Absence of disease’, and ‘Absence of pain induced by management procedures’. First the scores obtained by a farm for the 3 criteria are sorted in increasing order. The first criterion-score is considered, and then the difference between that score and the next criterion-score is multiplied by the ‘capacity’ (see explanation below) of the group made of all criteria except the one that brings the lowest score. Following this, the difference between the last but one score and the next score is multiplied by the ‘capacity’ of the group made by the combined criteria except those that bring the two lowest scores. This can be written as follows:

$$\text{Principle-score} = \begin{cases} S_6 + (S_7 - S_6)\mu_{78} + (S_8 - S_7)\mu_8 & \text{if } S_6 \leq S_7 \leq S_8 \\ S_6 + (S_8 - S_6)\mu_{78} + (S_7 - S_8)\mu_7 & \text{if } S_6 \leq S_8 \leq S_7 \\ S_7 + (S_6 - S_7)\mu_{68} + (S_8 - S_6)\mu_8 & \text{if } S_7 \leq S_6 \leq S_8 \\ S_7 + (S_8 - S_7)\mu_{68} + (S_6 - S_8)\mu_6 & \text{if } S_7 \leq S_8 \leq S_6 \\ S_8 + (S_6 - S_8)\mu_{67} + (S_7 - S_6)\mu_7 & \text{if } S_8 \leq S_6 \leq S_7 \\ S_8 + (S_7 - S_8)\mu_{67} + (S_6 - S_7)\mu_6 & \text{if } S_8 \leq S_7 \leq S_6 \end{cases}$$

Where S_6 , S_7 , and S_8 are the scores obtained by a given farm for Criterion 6 (Absence of injuries), 7 (Absence of disease), and 8 (Absence of pain induced by management procedures)

μ_6 μ_7 μ_8 are the capacities of Criterion 6, 7 and 8

μ_{67} is the capacity of the group made of criteria 6 and 7, etc.

Assignment of animal units to the welfare categories

The scores obtained by an animal unit on all of the welfare principles are used to assign that farm to a welfare category. At this stage, both animal scientists, social scientists and stakeholders, were consulted. The stakeholders were members of the Advisory committee of Welfare Quality®.

Four welfare categories were distinguished to meet stakeholders’ requirements:

Excellent: the welfare of the animals is of the highest level.

Enhanced: the welfare of animals is good.

Acceptable: the welfare of animals is above or meets minimal requirements.

Not classified: the welfare of animals is low and considered unacceptable.

‘Aspiration values’ are defined for each category. They represent the goal that the farm should try to achieve to be assigned to a given category. The excellence threshold is set at 80, the one for enhanced at 55 and that for acceptability at 20. But, just as criteria do not compensate each other within a principle (see above), high scores in one principle do not offset low scores in another, so categories cannot be based on average scores. At the same time, it is important that the final classification reflects not only the theoretical acknowledgement of what can be considered excellent, enhanced etc. but also what can realistically be achieved in practice. Therefore, a farm is considered ‘excellent’ if it scores more than 55 on all principles and more than 80 on two of them while it is considered ‘enhanced’ if it scores more than 20 on all principles and more than 55 on two of them. Farms with ‘acceptable’ levels of animal welfare score more than 10 on all principles and more than 20 on three of them. Farms that do not reach these minimum standards are not classified (Figure 4). An indifference threshold equal to 5 is applied: For instance, 50 is not considered significantly lower than 55.

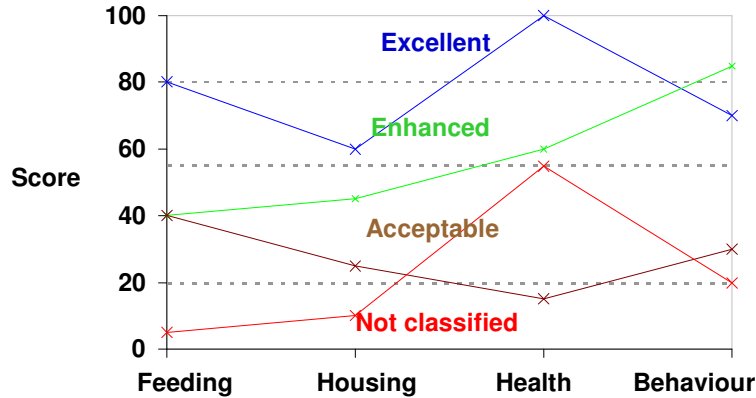


Figure 4 Examples of farms in the four welfare categories.

Software has been developed to calculate welfare scores and to produce the overall assessment of animal units. For more information, contact the Welfare Quality® consortium, represented by its coordinator (contact: Anke.delorm@wur.nl).

Final comments

The following sections are specific to the animal species covered in this document. They are structured to present firstly the measures collected on farms, secondly the measures collected at slaughter that apply to welfare assessment on-farm, thirdly the calculation of scores needed for overall assessment, and finally the measures collected at slaughter that apply to assessment of the welfare of the animals during transport and slaughter.

It should be emphasised that scientific research will continue to refine measures and that the Welfare Quality® protocols will be updated in the light of new knowledge. **Training and validation** in the methods and protocols **is essential** and no individual or organisation can be considered capable of applying these methods in a robust, repeatable, and valid way without attending harmonised training approved by the Welfare Quality® consortium.

5 Welfare Quality[®] applied to fattening cattle

The assessment of welfare should be a multi-disciplinary process since the assessment of a variety of different parameters can provide the most comprehensive assessment of an animal's welfare in any given system. To this end, the Welfare Quality[®] project utilizes physiological, health and behavioural aspects to assess the welfare of fattening cattle on farm and at the slaughterhouse.

In this chapter, a description of each measure for fattening cattle is given, followed by additional information about the sample size requirements and the order in which the different measures should be carried out.

Before commencing farm visits, assessors will have been fully trained in all the measures that are to be assessed by using photographs, video clips and practical 'on farm' training. For some of the health measures, this training will involve recognition of symptoms of certain conditions/diseases; however it is imperative that this document is not used as a diagnostic tool to identify individual health conditions, but rather as a tool to highlight the presence of health problems affecting the welfare of animals. The assessor should not enter into discussions with the animal unit manager on the prevalence or severity of different diseases on their farm; this is a matter for the animal unit manager and the herd veterinarian. Additionally, in general, the role of the assessor is to assess, and not to advise directly.

Trained assessors will use animal-based, management-based or resource-based measures to achieve a representative assessment of fattening cattle welfare of each farm. Many different measures are assessed, and most are scored according to a three-point scale ranging from 0 – 2. The assessment scales have been selected so that a score 0 is awarded where welfare is good, a score 1 is awarded (where applicable) where there has been some compromise on welfare, and a score 2 is awarded where welfare is poor or unacceptable. In some cases a binary (0/2 or Yes/No) or a cardinal scale (e.g. cm or m²) is used.

The assessor should prepare and start the visit according to the description provided for in Annex A ('Guidelines for visit to animal unit'). For most measures data can be recorded with the aid of Annex B ('Recording Sheets').

5.1 Collection of data for fattening cattle on farm

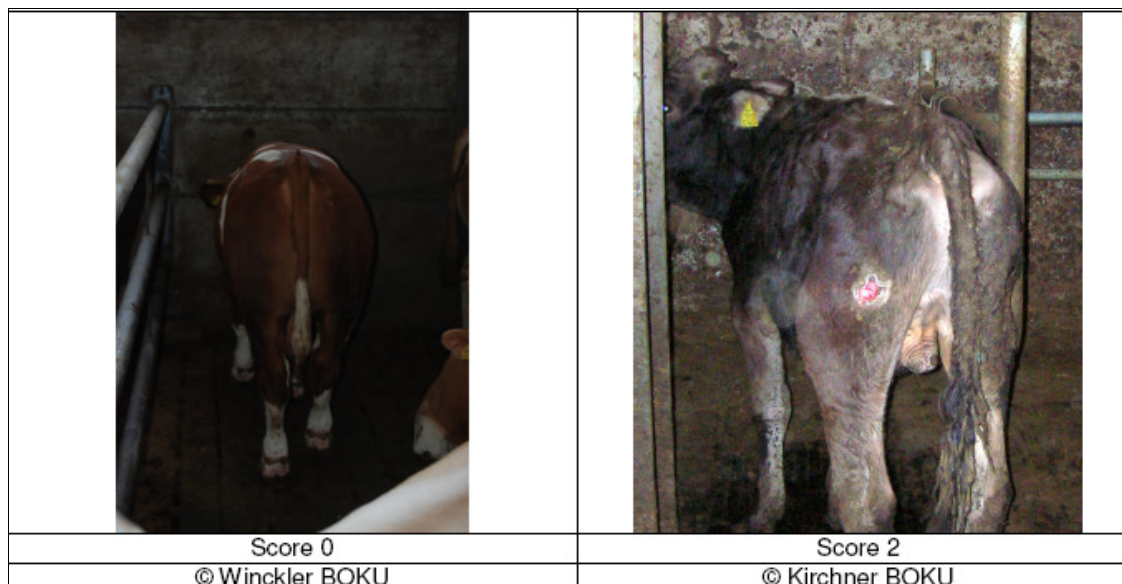
	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	Body condition score
	2	Absence of prolonged thirst	Water provision, cleanliness of water points, number of animals using the water points
Good housing	3	Comfort around resting	Time needed to lie down, cleanliness of the animals
	4	Thermal comfort	<i>As yet, no measure is developed</i>
	5	Ease of movement	Pen features according to live weight, access to outdoor loafing area or pasture
Good health	6	Absence of injuries	Lameness, integument alterations
	7	Absence of disease	Coughing, nasal discharge, ocular discharge, hampered respiration, diarrhoea, bloated rumen, mortality
	8	Absence of pain induced by management procedures	Disbudding/dehorning, tail docking, castration
Appropriate behaviour	9	Expression of social behaviours	Agonistic behaviours, cohesive behaviours
	10	Expression of other behaviours	Access to pasture

	11	Good human-animal relationship	Avoidance distance
	12	Positive emotional state	Qualitative behaviour assessment

5.1.1 Good feeding

5.1.1.1 Absence of prolonged hunger






<i>Title</i>	Body condition score										
<i>Scope</i>	Animal-based measure: Fattening cattle										
<i>Sample size</i>	Sample size according to § 5.1.5										
<i>Method description</i>	<p>View the animal from behind and from the side in the loin, tail head and vertebrae. Animals must not be touched but only watched.</p> <p>Animals are scored with regard to four criteria as follows (see photographic illustration):</p> <table border="1"> <thead> <tr> <th>Body region</th> <th>Very lean</th> </tr> </thead> <tbody> <tr> <td>Tail head</td> <td>• Cavity around tail head</td> </tr> <tr> <td>Loin</td> <td>• Visible depression between backbone and hip bones (tuber coxae)</td> </tr> <tr> <td>Vertebrae</td> <td>• Ends of transverse processes distinguishable</td> </tr> <tr> <td>General</td> <td>• Tail head, hip bones (tuber coxae), spine and ribs visible</td> </tr> </tbody> </table> <p>Individual level: 0 – Satisfactory body condition: at most two body regions classified as too thin 2 – Very lean: indicators for ‘too thin’ present in at least three body regions</p>	Body region	Very lean	Tail head	• Cavity around tail head	Loin	• Visible depression between backbone and hip bones (tuber coxae)	Vertebrae	• Ends of transverse processes distinguishable	General	• Tail head, hip bones (tuber coxae), spine and ribs visible
Body region	Very lean										
Tail head	• Cavity around tail head										
Loin	• Visible depression between backbone and hip bones (tuber coxae)										
Vertebrae	• Ends of transverse processes distinguishable										
General	• Tail head, hip bones (tuber coxae), spine and ribs visible										
<i>Classification</i>	<p>Herd level: Percentage of very lean animals (score 2)</p>										



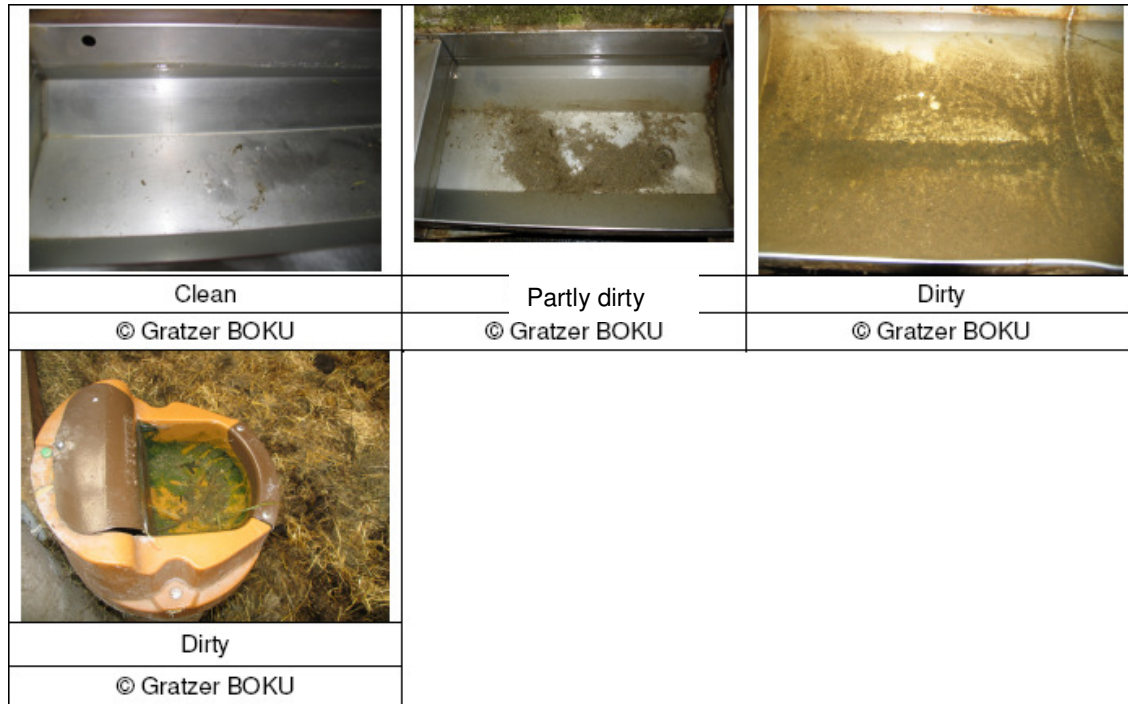
5.1.1.2 Absence of prolonged thirst

<i>Title</i>	Water provision
<i>Scope</i>	Resource-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5

<i>Method description</i>	<p>All water points in question are assessed within the area of the animal unit where behavioural observations have been made (see 5.1.2.1, 5.1.4.1)</p> <p>Check for the type of the water points (see photographic illustration). In the case of open and tip-over troughs, measure the length of the trough. In case of bowls with reservoirs, bowls, nipple drinkers or drinkers with balls/antifrost devices, count the number of water points.</p> <p>If a water point from an adjacent pen is accessible, count it as 'half' (both for number and length in case of a trough).</p>
<i>Classification</i>	<p>Group level: Number of each type of water points. and Length in cm for troughs including tip-over troughs.</p>

		
Trough © BOKU	Tip-over trough © Brinkmann BOKU	Anti-frost with balls © Brinkmann BOKU
		
Bowl © Kirchner BOKU	Bowl with reservoir © Gratzner BOKU	Nipple drinker © Winckler BOKU

<i>Title</i>	Cleanliness of water points
<i>Scope</i>	Resource-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>All water points in question are assessed within the area of the animal unit where behavioural observations have been made (see 5.1.2.1, 5.1.4.1)</p> <p>Check the cleanliness of the water points with regard to presence of old or fresh dirt on the inner side of the bowl or trough as well as staining of the water (see photographic illustration). Water points are considered as clean when there is no evidence of crusts of dirt (e.g. faeces, mould) and/or decayed food residues. Note that some amount of fresh food is acceptable.</p>
<i>Classification</i>	<p>Group level: 0 – Clean: drinkers and water clean at the moment of inspection 1 – Partly dirty: drinkers dirty but water fresh and clean at moment of inspection 2 – Dirty: drinkers and water dirty at moment of inspection</p>



<i>Title</i>	Number of animals using the water points
<i>Scope</i>	Resource-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	All water points in question are assessed within the area of the animal unit where behavioural measures have been made (see 5.1.2.1, 5.1.4.1) Count the number of animals per pen that have access to the water points.
<i>Classification</i>	Group level: Number of animals in the pen having access to the water points



5.1.2 Good housing

5.1.2.1 Comfort around resting

<i>Title</i>	Time needed to lie down
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	This measure applies to fattening cattle of more than 350 kg live weight, and applies to all observable 'lying down' movements (minimum sample size of 8 is required). Time needed to lie down is recorded continuously according to the following method: time recording of a lying down sequence starts when one carpal joint of the animal is bent and lowered (before touching the ground). The whole lying down movement ends when the hind quarter of the animal has fallen down (touched the ground) and the animal has pulled the front leg out from underneath the body. Record the time needed to lie down. Observations take place in pens or, in the case of very large pen sizes, in segments of pens. Per segment not more than 25 animals should be assessed on average. Total net (overall) observation time is a maximum of 120 minutes depending on the weight class distribution in the farm (together with social behaviour).

	Minimum duration of observation per pen/segment is 10 minutes. Individual level: Duration of lying down movement in seconds
<i>Classification</i>	Herd level: Mean duration of lying down movement in seconds

<i>Title</i>	Cleanliness of the animals
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>From a distance not exceeding 2 m, one side of the focal animal is examined including as much of the underbelly as is visible but excluding head, neck and legs below the carpal joint and hock (tarsal joint), respectively.</p> <p>The criterion for cleanliness is the degree of dirt on the body parts considered (see photographic illustration):</p> <ul style="list-style-type: none"> • covering with liquid dirt • plaques: three-dimensional layers of dirt <p>Random selection of the side of the animal observed (left or right) has to be ensured. To prevent biased results, the side selection has to be done before the examination. In most cases, the side which is seen first when approaching the animal can be chosen.</p> <p>Individual level: 0 – Less than 25% of the area in question covered with plaques, or less than 50% of the area covered with liquid dirt 2 – 25% of the area in question or more covered with plaques, or more than 50% of the area covered with liquid dirt</p>
<i>Classification</i>	Herd level: Percentage of dirty animals (score 2)

	
Score 0 © Winckler BOKU	Score 2 © Gratzner BOKU

5.1.2.2 Thermal comfort
As yet, no measure is developed

5.1.2.3 Ease of movement

<i>Title</i>	Pen features according to live weight
<i>Scope</i>	Resource-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	The length and width of the pens is measured. The number of animals in each pen is counted. The average weight of the fattening cattle is estimated in each pen in categories of 100 kg (e.g. 200, 300, 400... kg).

<i>Classification</i>	Group level: Length/width in m and Number of animals and Estimated weight of the animals in kg (per 100 kg)
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<i>Title</i>	Access to outdoor loafing area or pasture
<i>Scope</i>	Resource-based measure: Fattening cattle
<i>Sample size</i>	Animal unit
<i>Method description</i>	Check the availability of an outdoor loafing area and/or access to pasture and the respective conditions. The animal unit manager is asked about pasture management (days per year, average time spent in outdoor loafing area/pasture per day).
<i>Classification</i>	Herd level: <u>Availability of outdoor loafing area (OLA):</u> 0 – Yes 2 – No and Number of days with access to OLA per year Number of hours with access to OLA per day and <u>Availability of pasture</u> 0 – Yes 2 – No and Number of days on pasture per year Number of hours on pasture per day
<i>Optional additional information</i>	Note that hours per day at pasture is also assessed within behaviour principle as expression of other behaviour (e.g. grazing). If there is permanent access to OLAs given and/or there are functional areas (such as drinkers, feeding or lying areas accessible only via the OLAs) the surface of the OLA for the particular group should be included in the length/width measured in pen features.

5.1.3 Good health

5.1.3.1 Absence of injuries

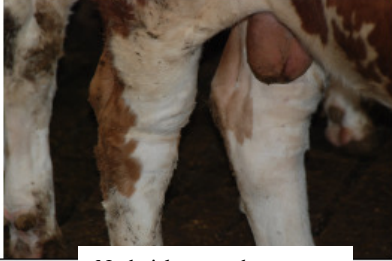
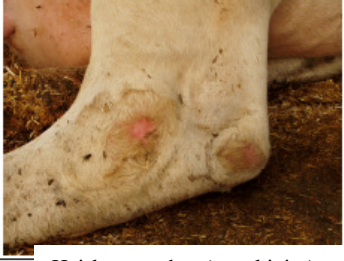

<i>Title</i>	Lameness
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	Lameness describes an abnormality of movement and is most evident when the animal (and so the legs) is in motion. It is caused by reduced ability to use one or more limbs in a normal manner. Lameness can vary in severity from reduced mobility to inability to bear weight. Assess the animal for presence of one of the indicators mentioned below, according to the description for either standing or moving animals. Indicators in moving animals: <ul style="list-style-type: none"> ▪ Reluctance to bear weight on a foot ▪ Uneven temporal rhythm between hoof beats, weight not borne for equal time on each of the four feet Indicators in standing animals: <ul style="list-style-type: none"> ▪ Resting a foot (bearing less/no weight on one foot). ▪ Frequent weight shifting between feet (“stepping”), or repeated movements of the same foot ▪ Standing on the edge of a step

	<p>Individual level: 0 – No evidence of lameness: animals showing none of the indicators listed above 2– Evidence of lameness: animals showing one indicator in the case of either moving or standing animals</p>
<i>Classification</i>	<p>Herd level: Percentage of lame animals</p>

<i>Title</i>	Integument alterations (hairless patches and lesions/swellings)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>Integument alterations are defined as hairless patches and lesions/swellings. Assess one side of the animal for integument alterations.</p> <p>Hairless patches and lesions/swellings are counted in accordance with the criteria provided below: Only skin alterations of a minimum diameter of 2 cm at the largest extent are counted.</p> <p>Hairless patch (see photographic illustration 'a')</p> <ul style="list-style-type: none"> • area with hair loss • skin not damaged • extensive thinning of the coat due to parasites • hyperkeratosis possible <p>Lesion/swelling (see photographic illustrations 'b' and 'c')</p> <ul style="list-style-type: none"> • damaged skin either in form of a scab or a wound • dermatitis due to ectoparasites • ear lesions due to torn off ear tags <p>From a distance not exceeding 2 m, three body regions on one side of the assessed animal have to be examined with regard to the criteria listed above.</p> <div data-bbox="451 1150 1263 1648" data-label="Image"> <p>The diagram shows a side view of a cow. A horizontal line is drawn across the middle of the cow's body, labeled 'Body'. Two vertical lines are drawn from the top of the cow's legs down to the ground, labeled 'Hind leg' on the left and 'Front leg' on the right. The entire cow is shaded in light green.</p> </div> <p>These body regions are scanned from the rear to the front, excluding the bottom side of the belly and the inner side of the legs, but including the inner side of the opposite hind leg.</p> <p>Random side selection (left or right) has to be ensured. To prevent biased results, the side selection has to be done before the examination. In most cases, the side which is seen first when approaching the animal can be chosen.</p> <p>In the case of more than 20 alterations per category only ">20" is noted.</p>

	<p>The maximum (“>20”) is also given if the area affected is at least as large as the size of a hand.</p> <p>If there are different categories of alterations at the same location (e.g. swelling and lesion at one leg joint) or adjacent to each other (e.g. a round hairless patch with a lesion in its centre) all these alterations are counted.</p> <p>Individual level: Number of hairless patches Number of lesions/swellings</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with no integument alteration (no hairless patch, no lesion/swelling) Percentage of animals with mild integument alterations (at least one hairless patch, no lesion/swelling) Percentage of animals with severe integument alterations (at least one lesion/swelling)</p>
<i>Optional additional information</i>	<p>For the calculation of scores, this measure is taken into account as the total number of counts from all body regions. However, for advisory purposes more detailed information may be necessary.</p>



a) hairless spots

		
No hairless patches © Winckler BOKU	Hairless patches (tarsal joint) © Brinkmann BOKU	Hairless patches (carpal joint) © Brinkmann BOKU

b) lesions

	
No lesion	Lesion (tarsal joint)
© Winckler BOKU	© Brinkmann BOKU

c) swellings

	
No swelling	Swelling (tarsal joint)
© Dippel BOKU	© Gratzer BOKU

5.1.3.2 Absence of disease

<i>Title</i>	Coughing
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	Coughing is defined as a sudden and noisy expulsion of air from the lungs. The number of coughs is counted using continuous observations in pens or, in the case of very large pen sizes, in segments of the pens. Per segment not more than 25 animals should be assessed on average. Total net observation time is 120 minutes. Recording of coughs is carried out together with social behaviour and resting behaviour observations (5.1.2.1, 5.1.4.1).
<i>Classification</i>	Herd level: Mean number of coughs per animal and 15 min.

<i>Title</i>	Nasal discharge
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	Nasal discharge is defined as clearly visible flow/discharge from the nostrils; it can be transparent to yellow/green and often is of thick consistency.

	<p>The animal is observed but must not be touched. Animals are scored with regard to the nasal discharge criteria (see photographic illustration).</p> <p>Individual level: 0 – No evidence of nasal discharge 2 – Evidence of nasal discharge</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with nasal discharge (score 2)</p>



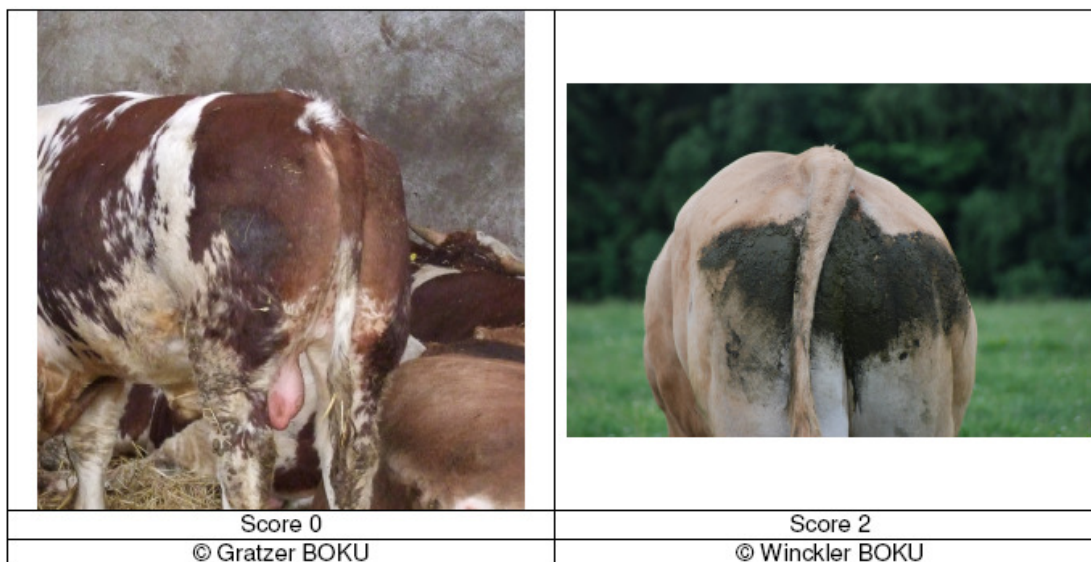
<i>Title</i>	Ocular discharge
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>Ocular discharge is defined as clearly visible flow/discharge (wet or dry) from the eye, at least 3 cm long.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the ocular discharge criteria (see photographic illustration).</p> <p>Individual level: 0 – No evidence of ocular discharge 2 – Evidence of ocular discharge</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with ocular discharge (score 2)</p>



<i>Title</i>	Hampered respiration
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method</i>	Hampered respiration rate is defined as deep and overtly difficult or

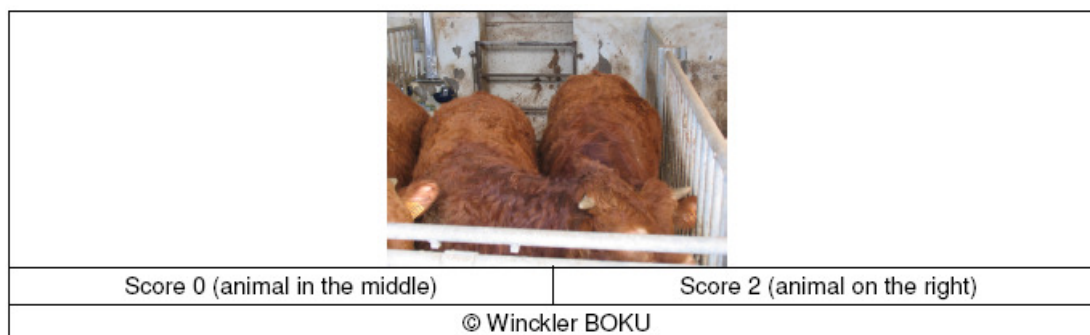
<i>description</i>	<p>laboured breathing. Expiration is visibly supported by the muscles of the trunk, often accompanied by a pronounced sound. Breathing rate may only be slightly increased.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the criteria for hampered respiration.</p> <p>Individual level: 0 – No evidence of hampered respiration 2 – Evidence of hampered respiration</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with hampered respiration (score 2)</p>

<i>Title</i>	Diarrhoea
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>Diarrhoea is defined as loose watery manure below the tail head on both sides of the tail, with the area affected at least the size of a hand.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the criteria of diarrhoea (see photographic illustration).</p> <p>Individual level: 0 – No evidence of diarrhoea 2 – Evidence of diarrhoea</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with diarrhoea (score 2)</p>



<i>Title</i>	Bloated rumen
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>Bloated rumen is defined as a characteristic “bulge” between the hip bone and the ribs on the left side of the animal.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the criteria of bloated rumen (see photographic illustration).</p>

	Individual level: 0 – No evidence of bloated rumen 2 – Evidence of bloated rumen
<i>Classification</i>	Herd level: Percentage of animals with bloated rumen (score 2)



<i>Title</i>	Mortality
<i>Scope</i>	Management-based measure: Fattening cattle
<i>Sample size</i>	Animal unit
<i>Method description</i>	<p>Mortality is defined as the 'uncontrolled' death of animals as well as cases of euthanasia and emergency slaughter.</p> <p>The animal unit manager is asked about the number of animals which died on the farm, were euthanized due to disease or accidents, or were emergency slaughtered during the last 12 months. Additionally the average number of animals with a weight of more than 200 kg live weight in the animal unit is asked. Farm records may also be used.</p>
<i>Classification</i>	Herd level Percentage of animals dead, euthanized and emergency slaughtered on the farm during the last 12 months

5.1.3.3 Absence of pain induced by management procedures

<i>Title</i>	Disbudding/dehorning
<i>Scope</i>	Management-based measure: Fattening cattle
<i>Sample size</i>	Animal unit
<i>Method description</i>	<p>The animal unit manager is asked about the disbudding/dehorning practices on the farm with regard to the following:</p> <ul style="list-style-type: none"> • Procedures for disbudding calves or dehorning fattening cattle • Use of anaesthetics • Use of analgesics
<i>Classification</i>	<p>Herd level: 0 – No dehorning or disbudding 1 – Disbudding of calves using thermocautery 2 – Disbudding of calves using caustic paste 3 – Dehorning of fattening cattle and 0 – Use of anaesthetics 2 – No use of anaesthetics and 0 – Use of post-surgery analgesics 2 – No use of analgesics</p>

<i>Title</i>	Tail docking
<i>Scope</i>	Management-based measure: Fattening cattle
<i>Sample size</i>	Animal unit
<i>Method description</i>	The animal unit manager is asked about tail docking practices on the farm with regard to the following: <ul style="list-style-type: none"> • Procedures for tail docking • Use of anaesthetics • Use of analgesics
<i>Classification</i>	Herd level: 0 – No tail docking 1 – Tail docking using rubber rings 2 – Tail docking using surgery, and 0 – Use of anaesthetics 2 – No use of anaesthetics and 0 – Use of analgesics 2 – No use of analgesics

<i>Title</i>	Castration
<i>Scope</i>	Management-based measure: Fattening cattle
<i>Sample size</i>	Animal unit
<i>Method description</i>	The animal unit manager is asked about castration practices on the farm with regard to the following: <ul style="list-style-type: none"> • Procedures for castration • Use of anaesthetics • Use of analgesics
<i>Classification</i>	Herd level: 0 – No castration 1 – Castration using rubber rings 2 – Castration using Burdizzo 3 – Castration using surgery and 0 – Use of anaesthetics 2 – No use of anaesthetics and 0 – Use of analgesics 2 – No use of analgesics

5.1.4 Appropriate behaviour

5.1.4.1 Expression of social behaviours

<i>Title</i>	Agonistic behaviours
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	Agonistic behaviour is defined as social behaviour related to social hierarchy and includes aggressive as well as submissive behaviours. Here, only aggressive interactions are taken into account. Assess the occurrence of the behaviours listed below. Observations take place in pens or segments of pens. On farms with more than 12 pens in question (live weight >200 kg), the maximum number of 12 pens is observed for 10 min net observation time each. Pens with more than 25 animals are divided into 2 or more segments, which will also be observed for 10 min per segment and this thus reduces the total number of pens observed. Pens containing animals with a weight between 200 and 350 kg and animals with more than 350 kg live weight are observed proportionally to their presence within the

observation time. Pens observed should always be approximately randomly distributed across the barn(s) and also within the weight categories.

Total net (overall) observation time is 120 minutes. Minimum duration of observation per segment is 10 minutes.

Agonistic behaviours are recorded using continuous behaviour sampling always taking the animal carrying out the action (actor) into account. Interactions between animals in different segments are recorded if the head of the animal carrying out the action (actor) is located in the focus segment.

Parameter	Description
Head butt	<ul style="list-style-type: none"> Interaction involving physical contact where the actor is butting, hitting, thrusting, striking or pushing the receiver with forehead, horns or horn base with a forceful movement; the receiver does not give up its present position (no displacement, see definition below).
Displacement	<ul style="list-style-type: none"> Interaction involving physical contact where the actor is butting, hitting, thrusting, striking, pushing or penetrating the receiver with forehead, horns, horn base or any other part of the body with a forceful movement and as a result the receiver gives up its position (walking away for at least half an animal-length or stepping aside for at least one animal-width). Penetrating is defined as an animal forcing itself between two other animals or between an animal and barn equipment (e.g. at feeding rack, at water trough). If after a displacement neighbouring animals also leave their feeding places but physical contact as described above is not involved, this reaction is not recorded as displacement.
Chasing	<ul style="list-style-type: none"> The actor makes an animal flee by following fast or running behind it, sometimes also using threats like jerky head movements. Chasing is only recorded if it follows an interaction with physical contact. If, however, chasing occurs in the context of fighting then it is not counted separately.
Fighting	<ul style="list-style-type: none"> Two contestants vigorously pushing their heads (foreheads, horn bases and/or horns) against each other while planting their feet on the ground in 'sawbuck' position and both exerting force against each other. Pushing movements from the side are not recorded as head butt as long as they are part of the fighting sequence. A new bout starts if the same animals restart fighting after more than 10 seconds or if the fighting partner changes.
Chasing-up	<ul style="list-style-type: none"> The actor uses forceful physical contact (e.g. butting, pushing, and shoving) against a lying animal which makes the receiver rise.

Before starting and after finishing the behaviour observation in a pen/segment the number of animals present in the pen/segment has to

	<p>be counted. In the case of multiple segments within a pen, animals which are found lying, standing or feeding across the boundaries of segments are counted in the section where the main part of their body is situated.</p> <p>Note that agonistic and cohesive behaviours are recorded at the same time and therefore the number of animals at the start and the end of each observation period is only recorded once.</p> <p>Group level: Number of animals in the pen/segment at the start and the end of each observation period. Number of aggressive behaviours per pen/segment and observation period. Duration of observations</p>
<i>Classification</i>	<p>Herd level: Mean number of aggressive behaviours per animal and hour</p>

<i>Title</i>	Cohesive behaviours				
<i>Scope</i>	Animal-based measure: Fattening cattle				
<i>Sample size</i>	Sample size according to § 5.1.5				
<i>Method description</i>	<p>Cohesive behaviour is defined as behaviour promoting group cohesion. Assess the occurrence of the behaviours listed below.</p> <p>Observations take place in pens or segments of pens. On farms with more than 12 pens in question (in weight >200 kg), the maximum number of 12 pens is observed for 10 min net observation time each. Pens with more than 25 animals are divided into 2 or more segments, which will also be observed for 10 min per segment and thus this reduce the total number of pens observed. Pens containing animals with a weight between 200-350 kg and animals with more than 350 kg live weight are observed proportionally to their presence. Pens observed should always be approximately randomly distributed across the barn(s) and also within the weight categories.</p> <p>Total net (overall) observation time is 120 minutes. Minimum duration of observation per pen/segment is 10 minutes.</p> <p>Cohesive behaviours are recorded using continuous behaviour sampling always taking the actor into account. Interactions between animals in different segments are recorded if the actor's head is located in the focus segment.</p> <p>Before starting and after finishing the behaviour observation in a pen/segment the number of animals present in the pen/segment has to be counted. In the case of multiple segments within a pen, animals which are found lying, standing or feeding across the boundaries of segments are counted in the section where the main part of their body is situated.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="border: none;">Parameter</th> <th style="border: none;">Description</th> </tr> </thead> <tbody> <tr> <td style="border: none;">Social Licking</td> <td style="border: none;"> <ul style="list-style-type: none"> The actor touches with its tongue any part of the body (head, neck, torso, legs, and tail) of another group mate except for the anal region or the prepuce. If the actor stops licking for more than 10 s and then starts licking the same receiver again, this is recorded as a new bout. It is also taken as a new bout, if the actor starts licking another receiver or if there is a role reversal between actor and receiver. </td> </tr> </tbody> </table>	Parameter	Description	Social Licking	<ul style="list-style-type: none"> The actor touches with its tongue any part of the body (head, neck, torso, legs, and tail) of another group mate except for the anal region or the prepuce. If the actor stops licking for more than 10 s and then starts licking the same receiver again, this is recorded as a new bout. It is also taken as a new bout, if the actor starts licking another receiver or if there is a role reversal between actor and receiver.
Parameter	Description				
Social Licking	<ul style="list-style-type: none"> The actor touches with its tongue any part of the body (head, neck, torso, legs, and tail) of another group mate except for the anal region or the prepuce. If the actor stops licking for more than 10 s and then starts licking the same receiver again, this is recorded as a new bout. It is also taken as a new bout, if the actor starts licking another receiver or if there is a role reversal between actor and receiver. 				

	<p>Horning</p> <ul style="list-style-type: none"> • Head play with physical contact of two animals: The animals rub foreheads, horn bases or horns against the head or neck of one another without obvious agonistic intention. Neither of the opponents takes advantage of the situation in order to become a victor. It is taken as a new bout if the same animals start horning after 10 seconds or more or if the horning partner changes. <p>Note that agonistic and cohesive behaviours are recorded at the same time and therefore the number of animals at the start and the end of each observation period is only recorded once.</p> <p>Group level: Number of animals in the pen/segment at the start and the end of each observation period. Number of cohesive behaviours per pen/segment and observation period. Duration of observations</p>
<i>Classification</i>	<p>Herd level: Mean number of cohesive behaviours per animal and hour</p>

5.1.4.2 Expression of other behaviours

<i>Title</i>	Access to pasture
<i>Scope</i>	Management-based measure: Fattening cattle
<i>Sample size</i>	Animal unit
<i>Method description</i>	<p>Check the availability of access to pasture.</p> <p>If pasture is available, the animal unit manager is asked about pasture management (days per year, average time spent on pasture per day).</p>
<i>Classification</i>	<p>Herd level: Number of days with access to pasture per year and Number of hours per day on pasture</p>

5.1.4.3 Good human–animal relationship

<i>Title</i>	Avoidance distance
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>Test at least half of the animals in a pen In the case of herd sizes ≥ 100, where sample size is less than 50 % of the animals, randomly select the number of pens necessary to reach the sample size; however proportions of weight classes should still be considered; the pens selected for the behavioural observations should be included.</p> <p>Place yourself on the feed bunk at a distance of 3 meters (if possible) in front of the animal to be tested. The head of the animal has to be completely past the feeding rack / neck rail over the feed. If you do not have 3 meters in front of the animals in which to approach them, then choose an angle of up to 45 degrees with the feeding rack, and start at a distance of 3.5 meters. If a distance of 3.5 meters is not possible, continue with the assessment but note down the maximum distance possible on the recording sheet.</p> <p>Make sure that the animal is attentive or is taking notice of your presence. If an animal is not obviously attentive, but also not clearly distracted, it can be tested. A way to attract the animals' attention is to make some movements in front of them (at the starting position).</p>

	<p>Approach the animal at a speed of one step per second and a step length of approximately 60 cm with the arm held overhead at an angle of approximately 45° from the body. When approaching, always direct the back of the hand toward the animal. Do not look into the animal's eyes but look at the muzzle. Continue to walk towards the animal until signs of withdrawal occur, or until you can touch the nose/muzzle.</p> <p>Withdrawal movement is defined as the following behaviours: the animal moves back, turns the head to the side, or pulls back the head trying to get out of the feeding rack; head shaking can also be found.</p> <p>In the case of withdrawal the avoidance distance is estimated (= distance between the hand and the muzzle at the moment of withdrawal) with a resolution of 10 cm (300 cm to 10 cm possible). If withdrawal takes place at a distance lower than 10 cm, the test result is still 10 cm. If you can touch the nose/muzzle, an avoidance distance of zero cm is recorded.</p> <p>Make sure that the hand is always closest to the animal during the approach (not the knee or the feet). Especially when getting close to animals that are feeding or have their heads in a low position, bend a little in order to try to touch them.</p> <p>Note that neighbouring animals react to an animal being tested and so should be tested later on. In order to reduce the risk of influencing the neighbour's test result, every second animal can be chosen.</p> <p>Retest animals at a later time if the reaction was unclear.</p> <p>Individual level: 0 – The assessor can touch the animal 1 – The assessor can approach closer than 50 cm but cannot touch the animal 2 – The assessor can approach within 100 to 50 cm 3 – The assessor cannot approach as close as 100 cm</p>
<i>Classification</i>	<p>Herd level: Percentage of animals that can be touched Percentage of animals that can be approached closer than 50 cm but not touched Percentage of animals that can be approached as closely as 100 to 50 cm Percentage of animals that cannot be approached as closely as 100 cm</p>

5.1.4.4 Positive emotional state

<i>Title</i>	Qualitative behaviour assessment
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Animal unit (depending on number of observation points, see method description)
<i>Method description</i>	<p>Qualitative Behaviour Assessment (QBA) considers the expressive quality of how animals behave and interact with each other and the environment, i.e. their 'body language'.</p> <p>Select between one and eight observation points (depending on the size and structure of the farm) that together cover the different areas of the farm. Decide the order to visit these observation points, wait a few minutes to allow the animals to return to undisturbed behaviour. Watch the animals that can be seen well from that point and observe the expressive quality of their activity at group level. It is likely that the animals will initially be disturbed, but their response to this can be included in the assessment. Total observation time should not exceed 20 minutes, and so the time taken at each observation point depends on the number of points selected for a farm:</p>

	<p>Number of observation points</p> <p>Duration of observation per observation point in minutes</p>	<p>1 2 3 4 5 6 7 8</p> <p>10 10 6.5 5 4 3.5 3 2.5</p>
	<p>When observation at all selected points has been completed, find a quiet spot and score the 20 descriptors using the visual analogue scale (VAS, see Annex B1). Please note that scoring is not done during observation, and that only one integrative assessment is made per farm.</p> <p>Each VAS is defined by its left 'minimum' and right 'maximum' point. 'Minimum' means that at this point, the expressive quality indicated by the term is entirely absent in any of the animals you have seen. 'Maximum' means that at this point this expressive quality is dominant across all observed animals. Note that it is possible to give more than one term a maximum score; animals could for example be both entirely calm and entirely content.</p> <p>To score each term, draw a line across the 125 mm scale at the appropriate point. The measure for that term is the distance in millimetres from the minimum point to the point where the line crosses the scale. Do not skip any term.</p> <p>Please be aware when scoring terms that start with a negative pre-fix, such as unsure or uncomfortable, as the score gets higher, the meaning of the score gets more negative, not more positive.</p> <p>The terms used for QBA in fattening cattle are:</p> <ul style="list-style-type: none"> • Active • Relaxed • Uncomfortable • Calm • Content • Tense • Enjoying • Indifferent • Frustrated • Friendly • Bored • Positively occupied • Inquisitive • Irritable • Nervous • Boisterous • Uneasy • Sociable • Happy • Distressed 	
<i>Classification</i>	<p>Herd level: Continuous scales for all body language parameters from minimum to maximum.</p>	

5.1.5 Sampling and practical information

Only farms with fattening cattle with a live weight > 200 kg are assessed. If not stated otherwise only fattening cattle over 200 kg and pens containing such animals are taken into account. The assessor should first become familiar with the facilities (pens/houses, potential observation points, etc.). Any disturbance of the animals should be avoided as far as is possible at this time. There is a logical order in which the different measures have to be carried out, and also which measures can be carried out simultaneously. For some of the measures, input from the animal unit manager is required. An appointment with animal unit manager has to be planned taking into account the timing of the animal-based measures.

Table 3 Order in which the (groups of) measures will be assessed during the on-farm visit, sample size and approximate time needed at each step.

	Parameter	Sample size	Time needed approximately

1	Avoidance distance	Sample size depending on herd size according to Table 4	0.6 min/animal
2	Qualitative behaviour assessment	Up to 8 observation points (total net observation time 20 min)	25 min
3	Behavioural observations <ul style="list-style-type: none"> • Time needed to lie down • Agonistic behaviours • Cohesive behaviours 	Up to 12 pens	145 min
4	Clinical scoring <ul style="list-style-type: none"> • Body condition score • Cleanliness of the animals • Lameness • Integument alternations • Nasal discharge, ocular discharge, hampered respiration • Diarrhoea, bloated rumen 	Sample size depending on herd size according to Table 4. All measures are recorded in the same sample of animals; pens used for no. 3 should in any case be considered	1.6 min/animal
5	Resources checklist <ul style="list-style-type: none"> • Water provision • Cleanliness of water points • Number of animals using the water points • Pen features 	Up to 12 pens (same pens as for no. 3)	20 min
6	Management questionnaire <ul style="list-style-type: none"> • Access to outdoor loafing area or pasture • Disbudding/dehorning • Tail docking • Castration • Mortality 	Animal unit (interview with animal unit manager)	10 min
		TOTAL for different farm sizes	50 animals: 4.5 h 100 animals: 5.1 h 200 animals: 5.7 h 300 animals: 6.0 h

Section 3: Pens of two weight classes (200-350 kg, > 350 kg) are observed proportionally to their presence within the observation time. Pens observed should always be approximately randomly distributed across the barn(s) and also within the weight categories.

Section 4: Focal animals (animals assessed) have to be considered proportionally to their weight class (200-350 kg, >350 kg); in general half of the animals in a given pen are assessed (e.g. choose only odd or even ear tag numbers in a given pen and alternate the choice between pens); in case of “herd sizes” of up to 100 animals, where more than 50% of the animals have to be sampled, additionally to assessing 50% of the animals in each pen, in randomly selected pens all animals are assessed until the sample size is reached. With herd sizes of more than 100 animals, the number of ‘focal’ pens is reduced until the sample size is reached (select a random sample of pens taking the proportion of weight classes as well as the hospital pens into account).

Selecting animals/pens for assessment

For some of the measures, random sampling of animals/pens is required. Check the current number of animals and determine the sample size according to Table 4.

Table 4 Sample size for clinical scoring and avoidance distance recording depending on the herd size.

Herd size	Number of animals to score (suggestion A)	If suggestion A is not feasible
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
260	70	54
270	71	54
280	72	54
290	72	55
300	73	55

The measures 'time needed to lie down', 'coughing' as well as 'agonistic behaviours' and 'cohesive behaviours' are recorded at the same time.

All water supply measures, the measures 'time needed to lie down' and both social behaviour categories (agonistic and cohesive behaviours) are assessed within the same group of animals/pens. Note that the maximum number of pens assessed is 12 pens as described in the short forms. This number is not only dependent on the number of animals on the farm but also on the number of animals per pen (i.e. less pens with larger numbers of animals per pen due to segmentation for observations). The measures which require random sampling ('clinical scoring': 'body condition score', 'cleanliness of the animals', 'lameness', 'integument alteration', 'nasal discharge', 'ocular discharge', 'hampered respiration', 'diarrhoea' and 'bloated rumen') can be assessed in the same sample, 'Cleanliness of the animals' is assessed on a randomly chosen side of each animal.

5.2 Calculation of scores for fattening cattle on farm

5.2.1 Criterion scores

5.2.1.1 Absence of prolonged hunger

The % of very lean animals is turned into a score using an I-spline function (Figure 5):

Let $I = 100 - \% \text{ very lean animals}$

When $l \leq 85$ then Score = $(-1.5332 \times 10^{-12} \times l) + (6.1469 \times 10^{-13} \times l^2) + (1.103 \times 10^{-05} \times l^3)$
 When $l \geq 85$ then Score = $-16189.1908 + (571.383219 \times l) - (6.722215565 \times l^2) + (0.02637243 \times l^3)$

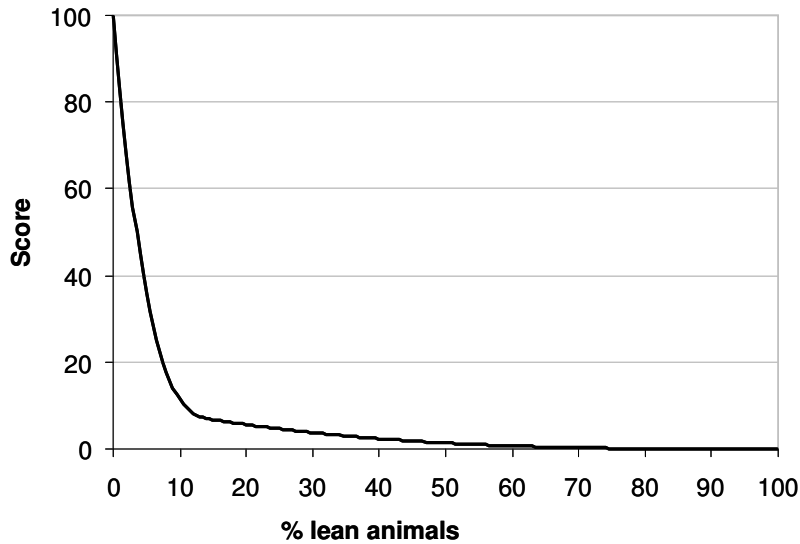


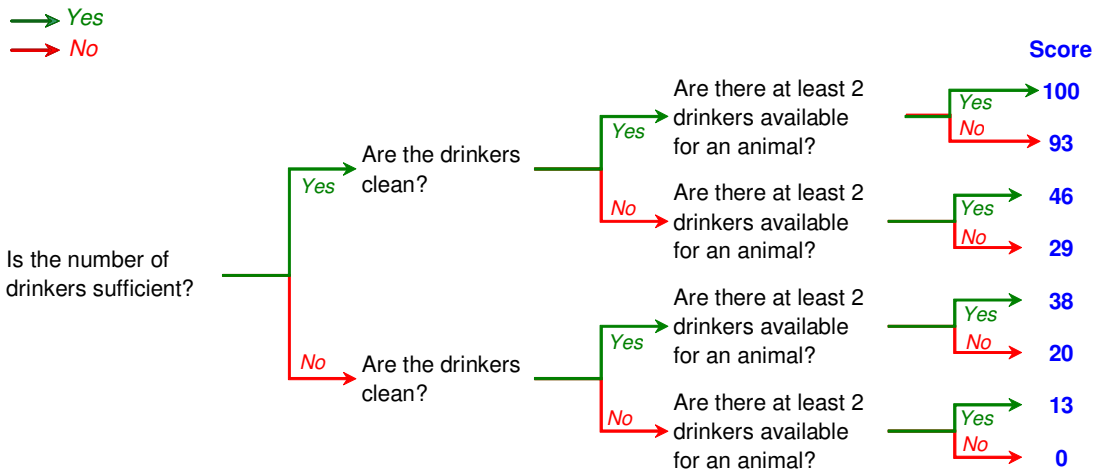
Figure 5 Calculation of scores for absence of hunger according to %very lean animals.

5.2.1.2 Absence of prolonged thirst

For each group of animals three aspects are considered:

- Is the number of drinkers sufficient?
- Are the drinkers clean?
- Are there at least 2 drinkers available for an animal?

To be sufficient, there must be at least 1 water bowl for 13 animals and/or 6 cm of trough per bull. The score for absence of prolonged thirst is attributed according to the answers to these three questions:



Then the score attributed to the whole animal unit is equal to the worst score obtained at group level as long as at least 15% of the observed animals are in groups that obtain this score or a lower one.

5.2.1.3 Comfort around resting

Two partial scores are calculated, one for the ease of lying down, and one for cleanliness of the animals, before being combined into a criterion score.

Partial score for ease of lying down

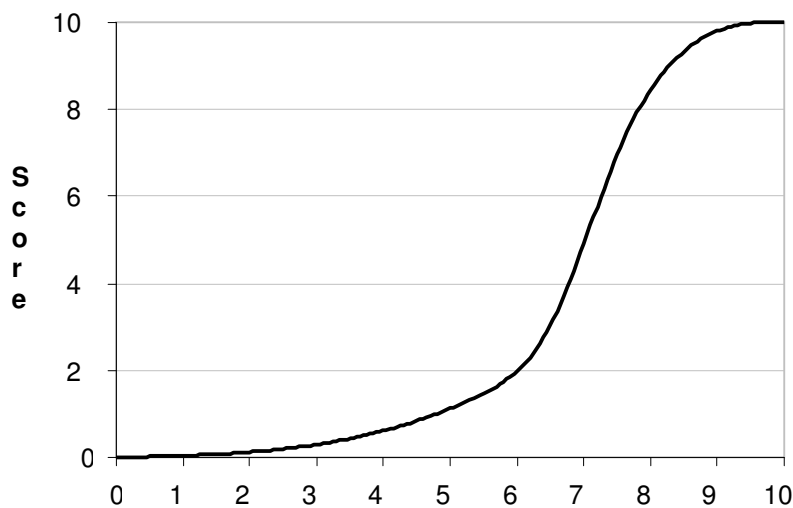
Let t be the average time to lie down in seconds and I_t the index for ease of lying down:

$$\text{Index for ease of lying down } I_t = 100 \left(1 - \frac{t-1}{21-1} \right)$$

(where 1 and 21 are considered minimum and maximum respectively of time taken to lie down (in seconds))

This is computed into a score using I-spline functions (Figure 6):

When $I_t \leq 55$	then Score= $(0.04095718 \times I_t) - (74.468 \times 10^{-5} \times I_t^2) + (8.8803 \times 10^{-5} \times I_t^3)$
When $55 \leq I_t \leq 65$	then Score= $-1074.36077 + (58.6424512 \times I_t) - (1.06622635 \times I_t^2) + (0.00654627 \times I_t^3)$
When $65 \leq I_t \leq 75$	then Score= $3984.96907 - (174.865114 \times I_t) + (2.52619822 \times I_t^2) - (0.01187642 \times I_t^3)$
When $75 \leq I_t$	then Score= $-1846.63817 + (58.3991449 \times I_t) - (0.58399145 \times I_t^2) + (0.00194664 \times I_t^3)$



Index derived from average time to lie down or lying intentions

Figure 6 Calculation of scores for ease of lying down in fattening cattle according to average time needed to lie down and average number of lying intentions (index calculated as explained in text).

Partial score for cleanliness of animals:

Let $I_c = 100 - \% \text{ dirty animals}$

I_c is computed into a score using I-spline functions (Figure 7):

When $I_c \leq 50$	then Score= $-(1.4247E-13 \times I_c) + (0.00129402 \times I_c^2) + (6.0057E-05 \times I_c^3)$
When $I_c \geq 50$	then Score= $-27.003019 + (1.62018114 \times I_c) - (0.0311096 \times I_c^2) + (0.00027608 \times I_c^3)$

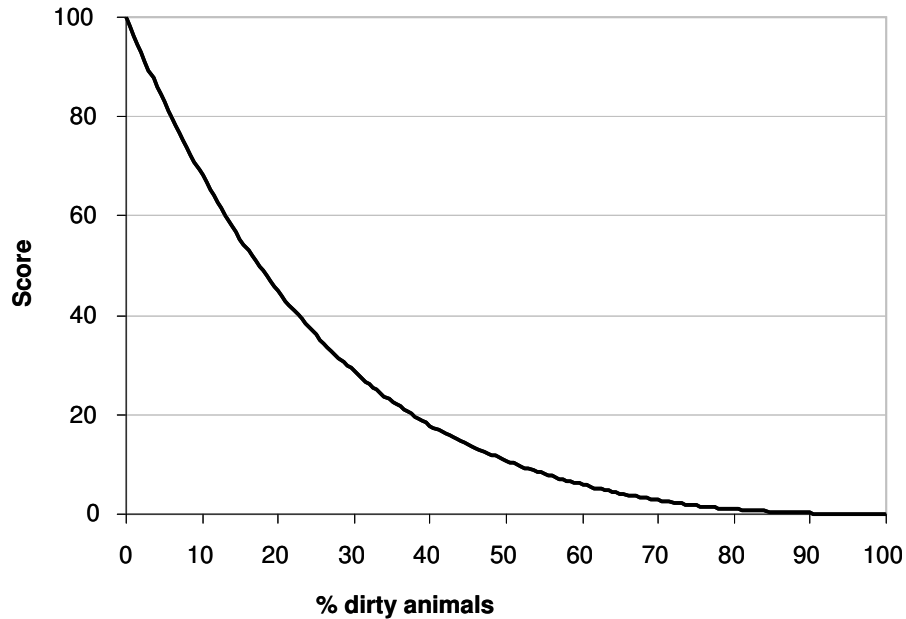


Figure 7 Calculation of scores for cleanliness according to the % of dirty animals.

Score for comfort around resting

The two partial scores I_t and I_c are combined using a Choquet integral. The parameters of the Choquet integral are: $\mu_t=0.44$ and $\mu_c=0.31$

5.2.1.4 Thermal comfort

As yet this criterion is not assessed for fattening cattle.

5.2.1.5 Ease of movement

STEP 1: First calculations are carried out at group level:
We first check whether animals have access to an outdoor run

The total time spent per day in an outdoor loafing area or at pasture is calculated (**T**).
The % days in a year on which animals have access to an outdoor loafing area or to pasture for at least 1 h is calculated (**D**).

Then:

- if $T < 1$ h or $D < 50\%$ then it is considered that animals do not have access to an outdoor run
- otherwise it is considered that animals have access to an outdoor run

Then, for each group of animals, the space allowance is expressed as $m^2/700$ kg animals:

$$\text{Space allowance} = (\text{pen length} \times \text{pen width}) / [(\text{number of animals} \times \text{estimated bull weight}) / 700]$$

The following index is calculated:

$I = (100 \times (\text{space allowance} - 2)) / (9 - 2) = (100 \times (\text{space_allowance} - 2)) / 7$ where space allowance is expressed in $m^2/700$ kg; 2 $m^2/700$ kg animals is considered as the minimum space allowance and 9 $m^2/700$ kg animals is considered the maximum.

Finally **I** is computed into a score according to I-spline functions (Figures 8 & 9):

If animals do not have access to an outdoor run then

$$\text{When } I \leq 40 \quad \text{then Score} = (0.261344814086679 \times I) + (0.0437246404434019 \times I^2) - (0.00046756184410103 \times I^3)$$

When $I \geq 40$ then $\text{Score} = -30.8684320775023 + (2.57647721987413 \times I) - (0.0141536697008547 \times I^2) + (0.00001475740709866 \times I^3)$

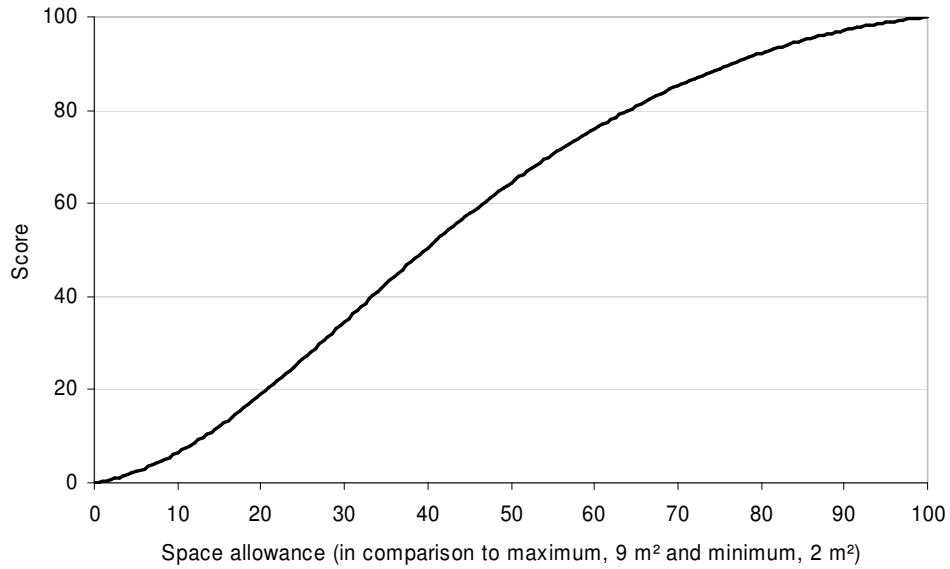


Figure 8 Calculation of scores for ease of movement according to space allowance, when animals do not have access to an outdoor run.

If animals have access to an outdoor run then

When $I \leq 40$ then $\text{Score} = (1.41476362965055 \times I) + (0.0136098671341753 \times I^2) - (0.000243428610378907 \times I^3)$

When $I \geq 40$ then $\text{Score} = -19.5121706903097 + (2.87817643135746 \times I) - (0.0229754529074143 \times I^2) + (0.0000614490566287734 \times I^3)$

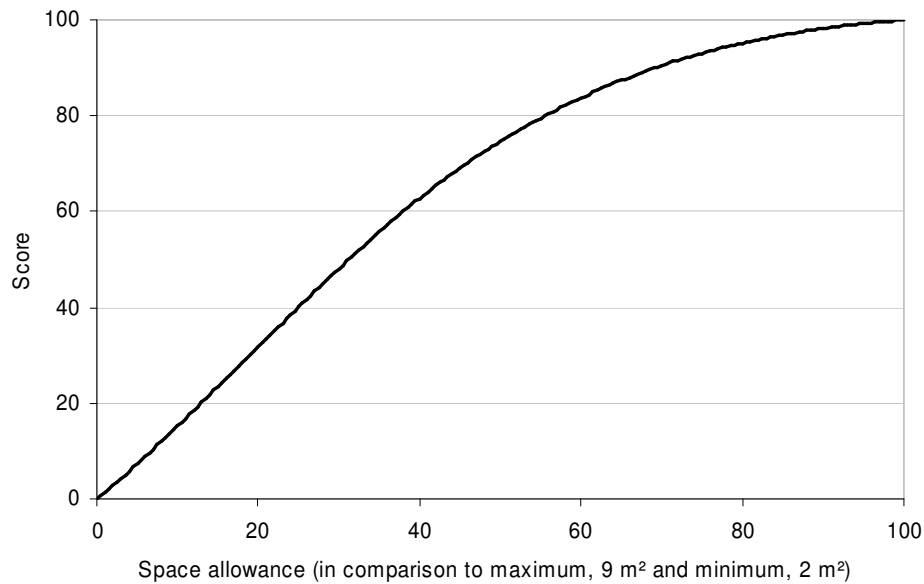


Figure 9 Calculation of scores for ease of movement according to space allowance, when animals have access to an outdoor run.

STEP 2: Then the score attributed to the whole animal unit is equal to the worst score obtained at group level as long as at least 15% of the observed animals are in groups that obtain this score of a lower one.

5.2.1.6 Absence of injuries

Two partial scores are calculated, one for integument alterations, and one for lameness, before being combined into a criterion score.

Partial score for integument alterations

The % of animals affected by one or several mild alterations and no severe one and the % animals affected by one or more severe alterations are combined in a weighted sum, with a weight of 1 for mild alterations and 5 for severe ones. This sum is then transformed into an index that varies from 0 to 100:

$$\text{Index for integument alterations } I_i = \left(100 - \frac{(\% \text{mild}) + 5(\% \text{severe})}{5} \right)$$

This index is computed into a score according to I-spline functions (Figure 10):

$$\text{When } I_i \leq 65 \quad \text{then Score} = (0.43168 \times I_i) - (0.0065044 \times I_i^2) + (0.00012589 \times I_i^3)$$

$$\text{When } I_i \geq 65 \quad \text{then Score} = 29.9 - (0.944 \times I_i) + (0.0145 \times I_i^2) + (1.92E^{-05} \times I_i^3)$$

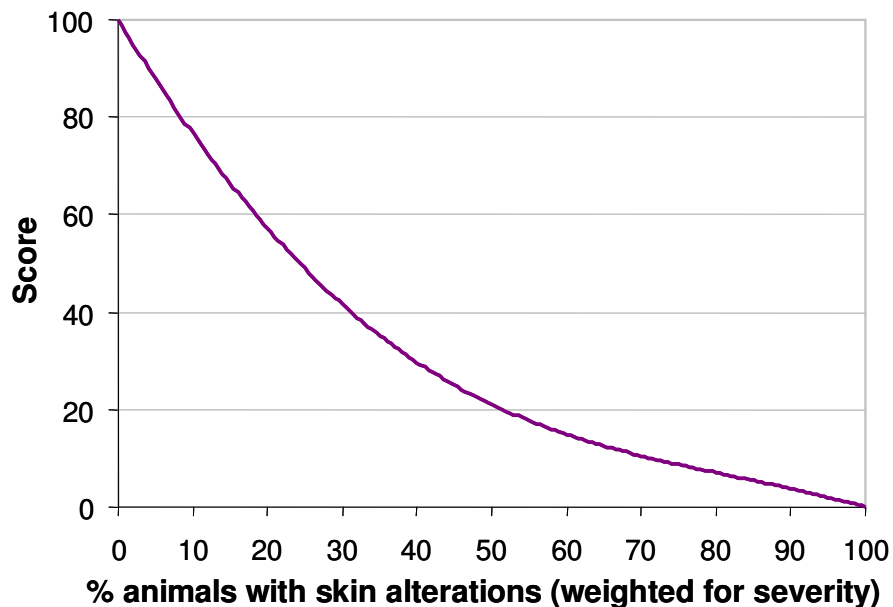


Figure 10 Calculation of the partial score for integument alterations according to the % animals affected by mild alterations and % animals affected by severe ones (weights: 0.2 for mild and 1 for severe alterations).

Partial score for lameness

The % of lame animals is used to calculate an index for lameness: $I_l = 100 - (\% \text{lame})$

This index is computed into a score using I-spline functions (Figure 11):

$$\text{When } I_l \leq 78 \quad \text{then Score} = (0.0988 \times I_l) - (0.000955 \times I_l^2) + (5.34E^{-05} \times I_l^3)$$

$$\text{When } I_l \geq 78 \quad \text{then Score} = -2060 + (79.3 \times I_l) - (1.02 \times I_l^2) + (0.00439 \times I_l^3)$$

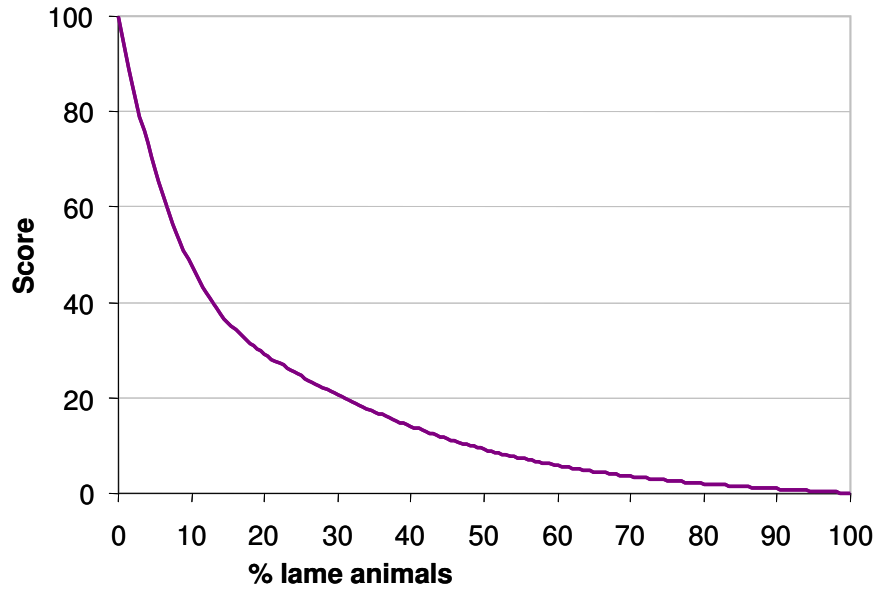


Figure 11 Calculation of the partial score for lameness according to the % lame animals.

Score for absence of injuries

The two partial scores are combined using a Choquet integral. The parameters of the Choquet integral are: $\mu_s=0.56$ and $\mu_l=0.31$

An example of data produced is presented in Table 5 below.

Table 5 Example of scores for absence of injuries calculated from partial scores for integument alterations and lameness.

	Integument alteration score	Lameness score	Score for absence of injuries
Farm 1	40	60	51
Farm 2	50	50	50
Farm 3	60	40	46

5.2.1.7 Absence of disease

The frequency of symptoms is compared to warning and alarm thresholds:

Measure	Description of the measure	Warning threshold	Alarm threshold
Nasal discharge	% of animals with nasal discharge	5%	10%
Ocular discharge	% of animals with ocular discharge	3%	6%
Coughing	$\frac{\text{nb of coughs (during 15 min)}}{\text{nb of animals in the herd}}$	4%	8%
Hampered respiration	% of animals with hampered respiration	5%	10%
Bloated rumen	% of animals with bloated rumen	5%	10%
Diarrhoea	% of animals with diarrhoea	3%	6%
Mortality	$\frac{\text{nb of dead animals * during a year}}{\text{nb of animals in the herd}}$	2%	4%

Symptoms are grouped by areas

- nasal and ocular discharge
- coughing and hampered respiration
- diarrhoea and bloated rumen
- mortality constitutes 1 area

total number of area = 4

The severity of problems is estimated per area:

- if in an area, the frequency of at least one symptom is above the warning threshold and the others are below the alarm threshold, then a warning is attributed to the area
- if in an area, the frequency of one symptom is above the alarm threshold, then an alarm is attributed to the area
- else no problem is recorded

An index is calculated as:

$$I = \left(\frac{100}{4} \times \left(4 - \frac{(\text{warnings}) + 3(\text{alarms})}{3} \right) \right)$$

where 4 is the number of areas.

Then the index is transformed into a score according to I-spline functions (Figure 12):

When $I \leq 70$ then Score = $(0.39094656 \times I) + (0.00217984 \times I^2) + (3.0794 \times 10^{-5} \times I^3)$

When $I \geq 70$ then Score = $-105.607674 + (4.91698974 \times I) - (-0.06247792 \times I^2) + (0.00033869 \times I^3)$

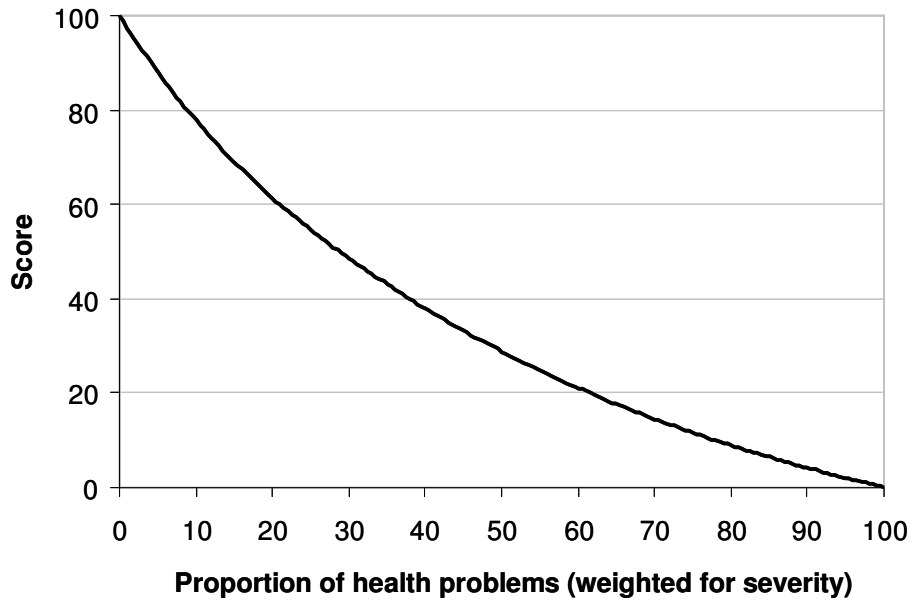
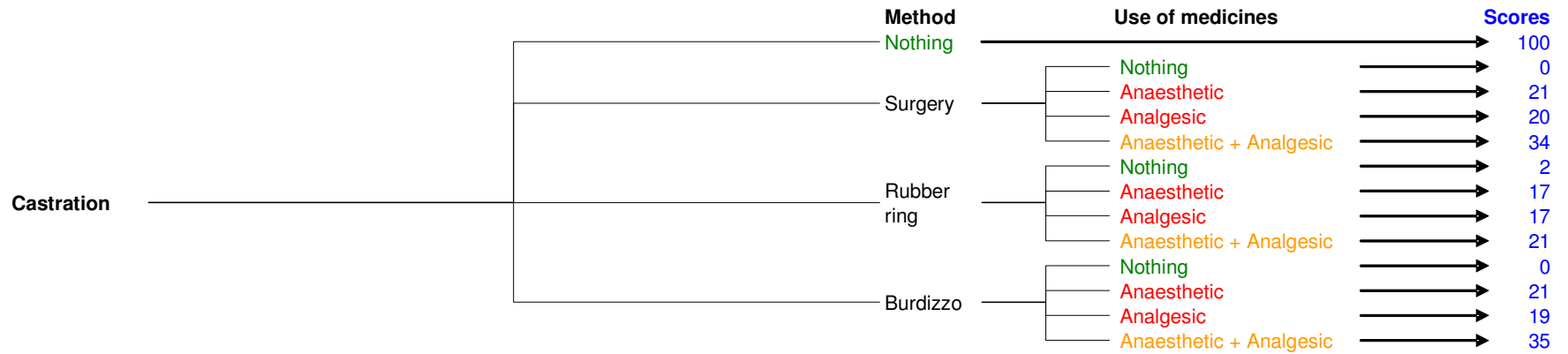
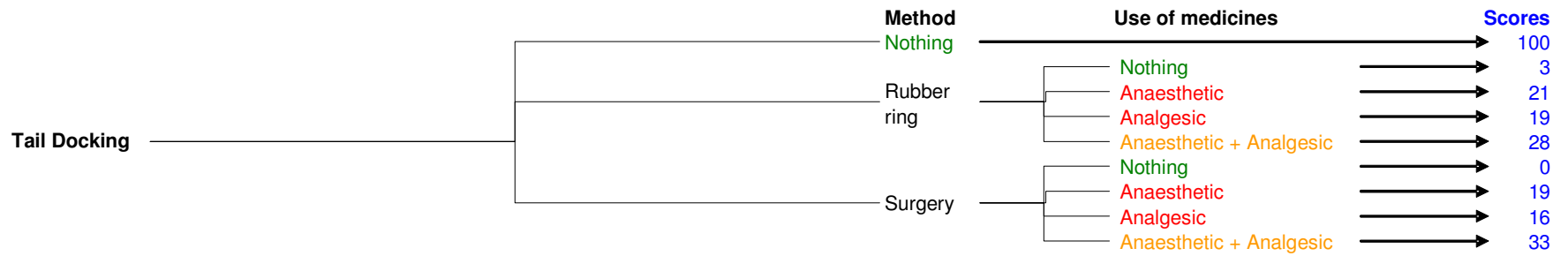
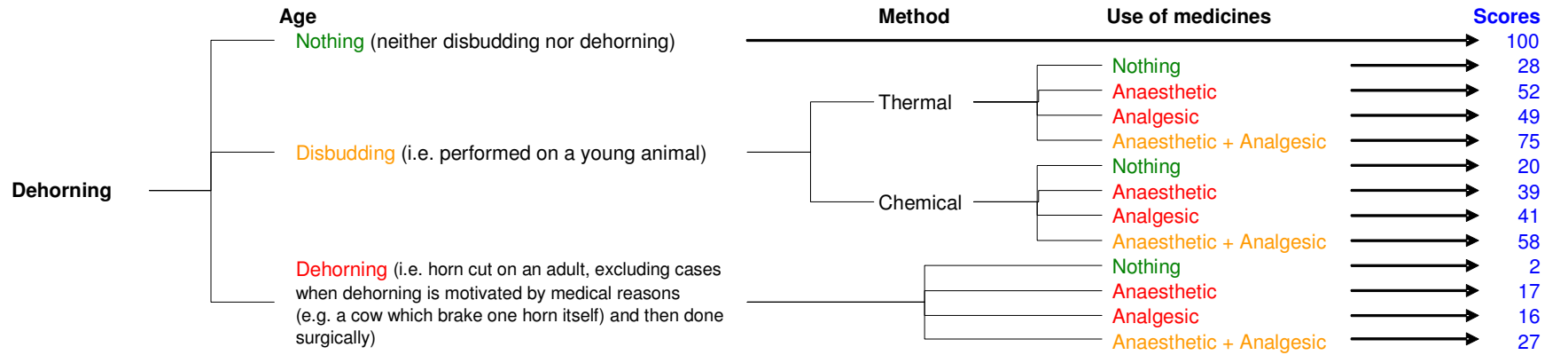


Figure 12 Calculation of scores for absence of diseases according to the proportion of areas for which symptoms are above the warning or the alarm threshold (weights: 0.33 for warnings and 1 for alarms).

5.2.1.8 Absence of pain induced by management procedures

The score for absence of pain due to management procedures is attributed according to whether and how animals are dehorned, tail docked or castrated. Decision trees are used to attribute scores. At farm level the three subscores are combined with a Choquet integral with the following parameters:

$V_h = 0.14$	$V_{ht} = 0.34$
$V_t = 0.17$	$V_{hc} = 0.35$
$V_c = 0.14$	$V_{tc} = 0.35$



5.2.1.9 Expression of social behaviours

The frequency of agonistic behaviour (y_1) expressed per animal and per hour is calculated by adding the frequency of head butts, displacements, chasing, fighting, and chasing up. The frequency of cohesive social behaviour (y_2) expressed per animal and per hour is calculated by adding the frequency of social licking and social horning.

Index I is derived from the proportion of agonistic behaviour out of total social behaviour (agonistic or cohesive):

If $(y_1 + y_2) = 0$ then $I = 78$

Else:

$$I = \left(100 \left(1 - \frac{y_1}{y_1 + y_2} \right) \right)$$

Then I is transformed into a score using I-spline functions (Figure 13). The parameters of the functions depend on the value of y_1 :

- If $y_1 \leq 0.5$

When $I \leq 85$ then Score = $57.9999745363695 + (0.388083494115609 \times I) + (0.0043823226865423 \times I^2) - (4.70122820048543 \times 10^{-5} \times I^3)$

When $I \geq 85$ then Score = $-1103.05408986355 + (41.3664545487207 \times I) - (0.477716075811182 \times I^2) + (0.00184356936389565 \times I^3)$

- If $0.5 < y_1 \leq 1.5$

When $I \leq 85$ then Score = $33.9999521188202 + (0.682099060722142 \times I) - (0.00195952922169403 \times I^2) - (1.25327903803408 \times 10^{-5} \times I^3)$

When $I \geq 85$ then Score = $-5409.99869694617 + (192.823191797772 \times I) - (2.26244257697619 \times I^2) + (0.00885210516370731 \times I^3)$

- If $1.5 < y_1 \leq 3$

When $I \leq 85$ then Score = $23.9999360534004 + (0.555539107885598 \times I) - (-0.00316998938699416 \times I^2) + (0.121211485198511 \times 10^{-5} \times I^3)$

When $I \geq 85$ then Score = $-9244.0877565184 + (327.664455108955 \times I) - (3.85150950305552 \times I^2) + (0.0150927371526195 \times I^3)$

- If $3 < y_1 \leq 8$

When $I \leq 85$ then Score = $7.99996220862464 + (0.479014947625655 \times I) - (0.00377860309080861 \times I^2) + (0.862849506660717 \times 10^{-5} \times I^3)$

When $I \geq 85$ then Score = $-13321.8892279187 + (470.945604038117 \times I) - (5.53867868184848 \times I^2) + (0.0217141154552035 \times I^3)$

- If $8 < y_1$

When $I \leq 85$ then Score = $1.84771270333218E^{-05} + (0.195437882151419 \times I) - (0.00229926920215343 \times I^2) + (0.901674197170915 \times 10^{-5} \times I^3)$

When $I \geq 85$ then Score = $-17183.1466985407 + (606.659326014577 \times I) - (7.13716729244669 \times I^2) + (0.0279888867759231 \times I^3)$

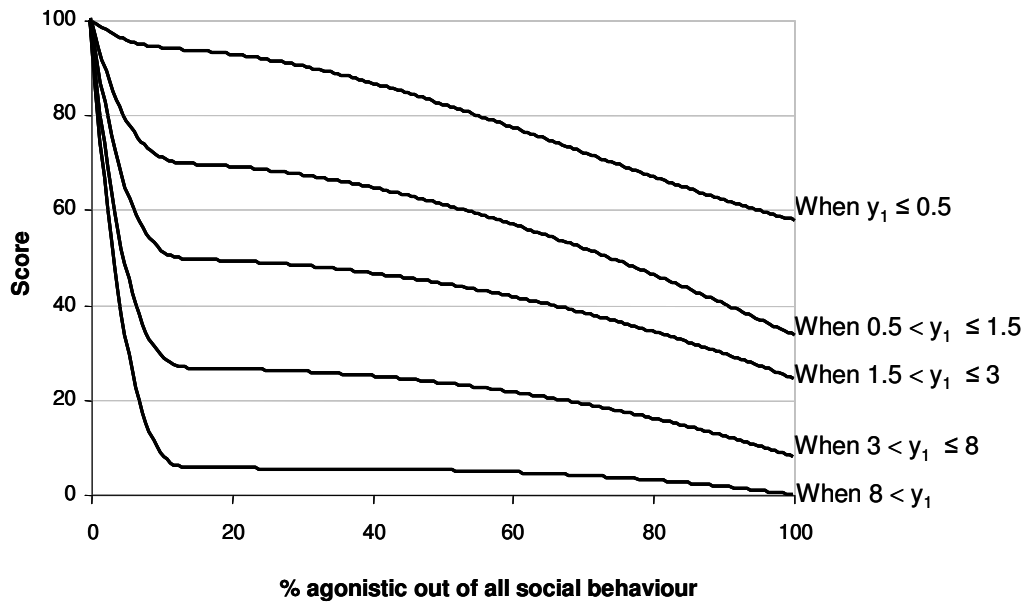


Figure 13 Calculation of scores for the expression of social behaviour according to the frequency of agonistic behaviours (y_1) and their proportion out of all social behaviours.

5.2.1.10 Expression of other behaviours

We consider two cases:

- animals had access to pasture before the beginning of fattening (3 months or more)
- animals did not have access to pasture before fattening (less than 3 months)

During fattening, the % days with at least 6 h at pasture is considered.

$I = 100 * n / 365$ with n = number of days at pasture during fattening

I is transformed into a score thanks to I-spline functions:

- If animals did not have access to pasture before fattening (Figure 14)

When $I \leq 10$ then Score = $(4.00250024295338 \times I) - (0.281116234502185 \times I^2) + (0.00929758464676235 \times I^3)$

When $I \geq 10$ then Score = $9.30956423315741 + (1.20963097300155 \times I) - (0.00182930750631154 \times I^2) - (1.19795864701957 \times 10^{-5} \times I^3)$

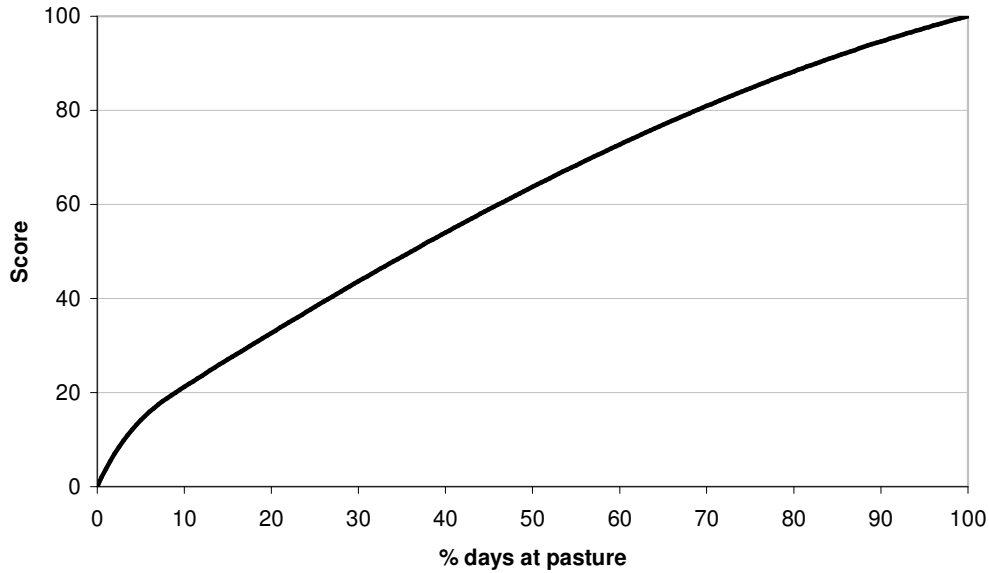


Figure 14 Calculation of scores for the expression of other behaviours according to the proportion of days per year when animals are at pasture, when they did not have access to pasture before fattening.

- If animals had access to pasture before fattening (Figure 15):

When $I \leq 10$ then Score = $(3.98753415594048 \times I) - (0.221386509408506 \times I^2) + (0.00688220633057168 \times I^3)$

When $I \geq 10$ then Score = $6.81357291075789 + (1.94346228270356 \times I) - (0.0169793220833334 \times I^2) + (0.0000686334196522238 \times I^3)$

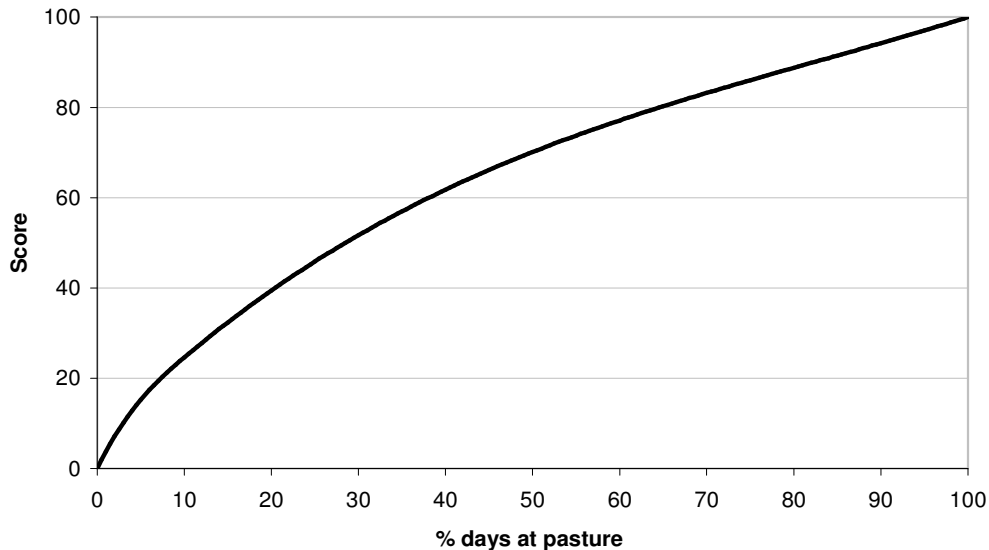


Figure 15 Calculation of scores for the expression of other behaviours according to the proportion of days per year when animals are at pasture, when they had access to pasture before fattening.

5.2.1.11 Good human-animal relationship

The following percentages of animals are taken into account:

- p_0 : animals that can be touched
- p_1 : animals that can be approached closer than 50 cm but not be touched
- p_2 : animals that can be approached as closely as 100 to 50 cm

- p_3 : animals that cannot be approached as closely as 100 cm

They are used to calculate index I : $I = 100 - \frac{p_1 + 3p_2 + 5p_3}{5}$

I is computed into a score according to I-spline functions (Figure 16):

When $I \leq 65$ then Score = $(1.44732957 \times I) - (0.02226661 \times I^2) + (0.00019627 \times I^3)$

When $I \geq 65$ then Score = $117.471056 - (3.97441147 \times I) + (0.06114479 \times I^2) - (0.00023148 \times I^3)$

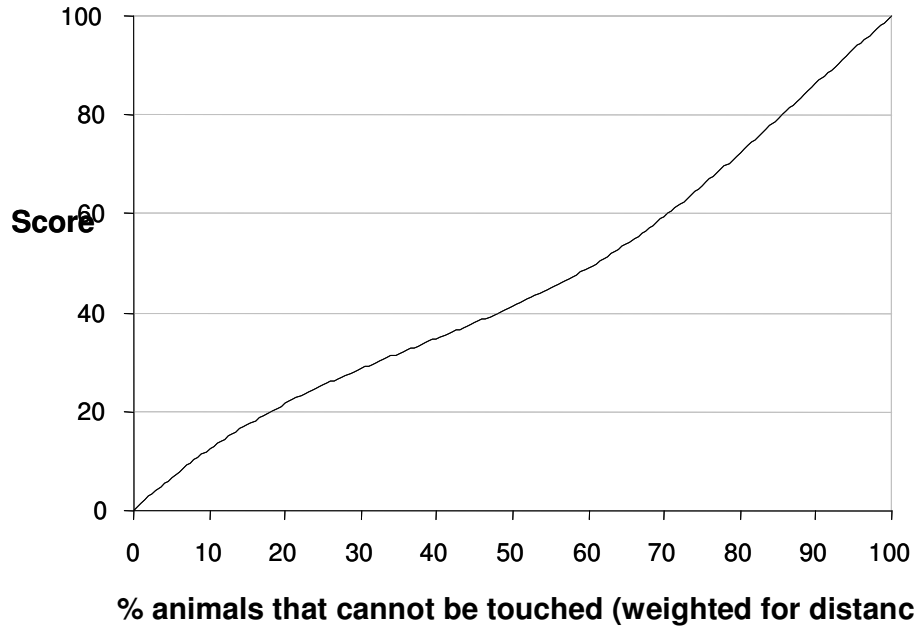


Figure 16 Calculation of scores for good human-animal relationship according to the proportion of animals that cannot be touched (weight: 0.2, 0.6 and 1 for animals being approached by less than 0.5 m, less than 1 m, or more than 1 m)

5.2.1.12 Positive emotional state

The values (between 0 and 125) obtained by a farm for the 20 terms of the Qualitative Behaviour Assessment are turned into an index using a weighted sum:

$$I = -2.0906 + \sum_{k=1}^{20} w_k N_k$$

with N_k , the value obtained by a farm for a given term k
 w_k , the weight attributed to a given term k

The weights w_k of the various terms are:

Terms	Weights
active	0.00434
relaxed	0.00784
uncomfortable	-0.00933
calm	0.00120
content	0.01015
tense	-0.00371
enjoying	0.01040
indifferent	-0.00912
frustrated	-0.01050
friendly	0.00976
bored	-0.00895
positively occupied	0.00979
inquisitive	0.00560
irritable	-0.00223
nervous	-0.00141
boisterous	0.00403
uneasy	-0.00516
sociable	0.00838
happy	0.01062
distressed	-0.00873

This index is then transformed into a score according to I-spline functions (Figure 17):

$$\text{When } I \leq 0 \quad \text{then} \quad \text{Score} = 50 + (8.75 \times I) + (0.3125 \times I^2)$$

$$\text{When } I \geq 0 \quad \text{then} \quad \text{Score} = 50 + (11.6667 \times I) - (0.55556 \times I^2)$$

In addition the score can vary between 0 and 100 only, hence

- if a calculation brings a value below 0 then Score = 0
- if a calculation brings a value above 100 then Score = 100

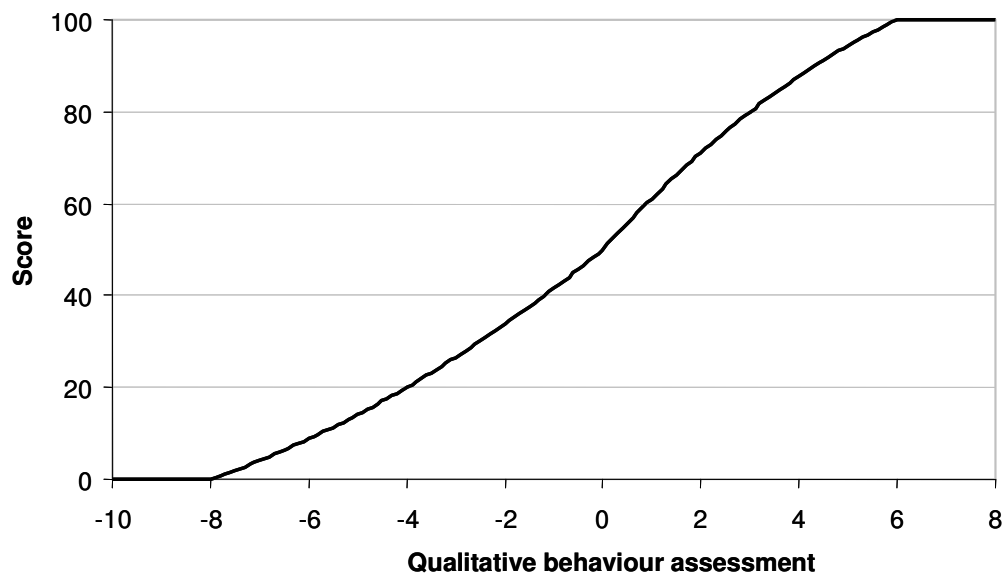


Figure 17 Calculation of scores for positive emotional state according to the values the farm obtained for the various terms used in qualitative Behaviour Assessment (combined in a weighted sum).

5.2.2 Principle scores

Criterion-scores are combined to form principle-scores using Choquet integrals. The parameters of the integrals are given below for each principle.

Principle Good feeding

μ_1	μ_2
0.08	0.26

with 1, Absence of prolonged hunger and 2, Absence of prolonged thirst

Principle Good housing

μ_3	μ_4	μ_5
0.22	0.18	0.18
μ_{34}	μ_{35}	μ_{45}
0.26	0.36	0.30

with 3, Comfort around resting; 4, Thermal comfort; 5, Ease of movement

Thermal comfort is not assessed in fattening cattle. The missing criterion-score is replaced by the best score among Comfort around resting and Ease of movement.

Principle Good health

μ_6	μ_7	μ_8
0.09	0.23	0.13
μ_{67}	μ_{68}	μ_{78}
0.43	0.24	0.23

with 6, Absence of injuries; 7, Absence of disease; 8, Absence of pain induced by management procedures

Principle Appropriate behaviour

μ_9	μ_{10}	μ_{11}	μ_{12}
0.06	0.03	0.09	0.15
μ_{910}	μ_{911}	μ_{912}	
0.09	0.09	0.17	
μ_{1011}	μ_{1012}	μ_{1112}	
0.14	0.18	0.27	
μ_{91011}	μ_{91012}	μ_{91112}	μ_{101112}
0.41	0.52	0.55	0.51

with 9, Expression of social behaviours; 10, Expression of other behaviours; 11, Good human-animal relationship; 12, Positive emotional state.

Due to the positive values of the interactions between criterion-scores, the principle-scores are always intermediate between the lowest and the highest values obtained at criterion level, and always closer to the minimum value.

Within each principle, some criteria are considered more important than others (and will contribute to a large extent to the principle-score):

- Within principle “Good feeding”, Criterion “Absence of prolonged thirst” is considered more important than Criterion “Absence of prolonged hunger”.

- Within principle “Good housing”, Criterion “Ease of movement” and Criterion “Comfort around resting” are considered more important than Criterion “Thermal comfort”.
- Within principle “Good health”, Criterion “Absence of disease” is considered more important than Criterion “Absence of injuries” which in turn is considered more important than Criterion “Absence of pain induced by management procedures”.
- Within principle “Appropriate behaviour”, the order of importance of criteria is: “Positive emotional state” (most important), “Good human-animal relationship”, “Expression of social behaviours” and “Expression of other behaviours” (least important).

Examples of principle-scores resulting from criterion-scores are provided in Tables 6 to 9 below.

Table 6 Examples of scores for “Good feeding” according to combinations of Criterion-scores for “Absence of prolonged hunger” and “Absence of prolonged thirst”.

Criteria		Principle
Absence of hunger	Absence of thirst	Good Feeding
25	75	38
40	60	45
50	50	50
60	40	42
75	25	29

Table 7 Examples of scores for “Good housing” according to combinations of Criterion-scores for “Comfort around resting”, “Thermal comfort”, and “Ease of movement”.

Comfort around resting	Criteria		Principle
	Thermal comfort	Ease of movement	Good housing
25	50	75	37
25	75	50	37
50	25	75	39
75	25	50	40
40	50	60	45
40	60	50	45
50	40	60	45
50	50	50	50
50	75	25	36
75	50	25	37
50	60	40	44
60	40	50	46
60	50	40	45

Table 8 Examples of scores for “Good health” according to combinations of Criterion-scores for “Absence of injuries” Absence of disease”, and “Absence of pain induced by management procedures”.

Absence of injuries	Criteria		Principle
	Absence of disease	Absence of pain induced by management procedures	Good health
25	50	75	34
25	75	50	37
50	25	75	34
75	25	50	33
40	50	60	44
40	60	50	45
50	40	60	44

50	50	50	50
50	75	25	42
75	50	25	38
50	60	40	47
60	40	50	43
60	50	40	45

Table 9 Examples of scores for “Appropriate behaviour” according to combinations of Criterion-scores for “Expression of social behaviours”, “Expression of other behaviours”, “Good human-animal relationship”, and “Positive emotional state”.

Criteria				Principle
Expression of social behaviours	Expression of other behaviours	Good human-animal relationship	Positive emotional state	Appropriate behaviour
35	35	65	65	43
35	50	50	65	45
35	50	65	50	44
35	65	35	65	41
35	65	50	50	43
35	65	65	35	39
50	35	50	65	45
50	35	65	50	45
50	50	35	65	45
50	50	50	50	50
50	50	65	35	42
50	65	35	50	43
50	65	50	35	42
65	35	35	65	40
65	35	50	50	44
65	35	65	35	38
65	50	35	50	44
65	50	50	35	42
65	65	35	35	38

5.2.3 Overall assessment

The synthesis of the four principle-scores into an overall assessment is carried out in a similar way for all animal types. The overall assessment is explained in Chapter 4.

5.3 Collection of data for fattening cattle at slaughterhouse

	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	Food supply
	2	Absence of prolonged thirst	Water supply
Good housing	3	Comfort around resting	Flooring, bedding
	4	Thermal comfort	<i>This criterion is not applied in this situation</i>

	5	Ease of movement	Slipping, falling, freezing, trying to turn, turning around, moving backwards
Good health	6	Absence of injuries	Lameness, bruises
	7	Absence of disease	<i>This criterion is not applied in this situation</i>
	8	Absence of pain induced by management procedures	Stunning effectiveness
Appropriate behaviour	9	Expression of social behaviours	<i>This criterion is not applied in this situation</i>
	10	Expression of other behaviours	<i>This criterion is not applied in this situation</i>
	11	Good human–animal relationship	Vocalizations, coercion
	12	Positive emotional state	Struggling, kicking, jumping in stun box, freezing, trying to turn, turning around, moving backwards

5.3.1 Good feeding

5.3.1.1 Absence of prolonged hunger

<i>Title</i>	Food supply (at lairage)
<i>Scope</i>	Management-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	At the start of a visit, monitor the feed provision in all overnight lairage pens, interview staff on when feed is provided and at what quantities (to assure that sufficient is fed, e.g. <2000g insufficient). The animal unit manager is asked about feeding management at slaughter. This can be corroborated by the assessor during the course of the visit when assessing resource–based measures, by monitoring all overnight lairage pens to assess food supply in the lairage and score according to the scoring scale.
<i>Classification</i>	0 – No evidence of feed provision 1 – Some evidence of feed provision 2 – Clear evidence of feed provision

5.3.1.2 Absence of prolonged thirst

<i>Title</i>	Water supply (at lairage)
<i>Scope</i>	Resource-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	At start of visit the assessor should monitor the water provisions in all pens. Assess the water supply in lairage in percentage of pens with functioning water bowls
<i>Classification</i>	Percentage of pens with functioning water bowls

5.3.2 Good housing

5.3.2.1 Comfort around resting

<i>Title</i>	Flooring (during lairage)
<i>Scope</i>	Resource-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	To assess the suitability of flooring during lairage, monitor all lairage pens in the slaughterhouse. Suitable flooring is rubber, which is preferred over concrete (which is too hard).

	Score in table what flooring material is used and what percentage of the total consists of rubber.
<i>Classification</i>	Percentage of pens with suitable flooring (rubber)

<i>Title</i>	Bedding (during lairage)
<i>Scope</i>	Management-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	To assess the suitability of the bedding during lairage, monitor all lairage pens in the slaughterhouse, in which straw (>10cm) is the best, short straw is second best, wood shavings is another appropriate option. Sawdust is the least preferable. Score in table what material is used for bedding.
<i>Classification</i>	Percentage of pens with bedding

5.3.2.2 Thermal comfort

This criterion is not applied in this situation.

5.3.2.3 Ease of movement

<i>Title</i>	Slipping (during unloading and driving into the lairage)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	Slipping is defined as a loss of balance in which the animal loses its foothold or the hooves slide on the floor surface. No other body parts except hooves and/or legs are in contact with the floor surface. Slipping is noticed as a lowering of an animals' body due to the gliding or folding of leg/legs, possibly in combination with an interruption of movement. Assess the number of slipping events per animal. At all times the assessor should stand directly in front of animals which are being moved towards him/her. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm in height should be used.
<i>Classification</i>	Individual level: Number of slipping movements per animal observed

<i>Title</i>	Falling (during unloading and driving into lairage)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	Falling is defined as the loss of balance in which parts of the body other than feet and legs are in contact with floor surface. Assess the number of falling events per animal. At all times the assessor should stand directly in front of animals that are being moved towards him/her. A raised position preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.
<i>Classification</i>	Individual level: Number of falling movements per animal observed

<i>Title</i>	Freezing (at unloading and driving into lairage)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Freezing is defined as when the route is free in front or behind the animal but the animal refuses to move forwards or backwards within 4 seconds from being touched/coerced by the handler. If the animal takes more than one step and stops again, or moves backwards, a 'freeze' is recorded again when a new driving attempt is made. An animal that stops but continues to walk when the handler drives it forwards is not frozen.</p> <p>Assess the number of freezing events per animal.</p> <p>At all times the assessor should stand directly in front of animals that are being moved towards him/her. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.</p>
<i>Classification</i>	Individual level: Number of freezing events per animal observed

<i>Title</i>	Trying to turn (at unloading and at driving into lairage)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>'Trying to turn around' is defined as an animal that makes an unsuccessful attempt to turn, by itself or as a reaction to the handling regime. An animal that is simply turning its head in an investigative way should not be regarded as trying to turn.</p> <p>Assess the number of turning attempts per animal. At all times the assessor should stand directly in front of animals that are being moved towards him/her. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.</p>
<i>Classification</i>	Individual level: Number of turning around attempts per animal observed

<i>Title</i>	Turning around (at unloading and at driving into lairage)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Turning around is defined as when the animal turns around, by itself or as a reaction to the handling regime. When/if the animal turns back again to the former direction, the behaviour should not be recorded again.</p> <p>Assess the number of turning attempts per animal. At all times it should of course be avoided to stand directly in front of animals that are being moved towards the assessor. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.</p>
<i>Classification</i>	Individual level: Number of turning around movements per animal observed

<i>Title</i>	Moving backwards (at unloading and at driving into lairage)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Moving backwards is defined as when the animal moves backwards, by itself or as a reaction to handling. When an animal takes a few steps backwards to achieve balance or changes position in relation to other animals when crowding it is not considered as moving backwards.</p> <p>Assess the number of moves backwards per animal. At all times the assessor should stand directly in front of animals that are being moved towards him/her. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.</p>
<i>Classification</i>	<p>Individual level: Number of backwards movements per animal observed</p>

5.3.3 Good health

5.3.3.1 Absence of injuries

<i>Title</i>	Lameness (when moved to lairage)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Lameness describes an abnormality of movement and is most evident when the animal (and so the legs) is in motion. It is caused by reduced ability to use one or more limbs in a normal manner. Lameness can vary in severity from reduced mobility to inability to bear weight.</p> <p>Indicators of lameness are:</p> <ul style="list-style-type: none"> • irregular foot fall • uneven temporal rhythm between hoof beats • weight not borne for equal time on each of the four feet <p>The following gait attributes are taken into account:</p> <ul style="list-style-type: none"> • timing of steps • temporal rhythm • weight-bearing on feet. <p>Assess the gait of the animals. At all times the assessor should stand directly in front of animals that are being moved towards him/her. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.</p> <p>Individual level: 0 – Not lame: timing of steps and weight-bearing equal on all four feet. 1 – Lame: imperfect temporal rhythm in stride creating a limp 2 – Severely lame: strong reluctance to bear weight on one limb, or more than one limb affected</p>
<i>Classification</i>	<p>Herd level: Percentage of not lame animals (i.e. scored 0) Percentage of moderately lame animals (i.e. scored 1) Percentage of severely lame animals (i.e. scored 2)</p>

<i>Title</i>	Bruises
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Scoring must be done between the points where the skin is taken off the carcasses and where trimming occurs. Note that bruise scoring according to the ACBSS* does not, in a direct way, take into account the age of the carcass damage. Bruising can occur at the slaughterhouse, but it can also be caused by incidents on farm or during loading and transport. Therefore, it is important to emphasize that problems with heavy bruising detected at slaughterhouse inspection must undergo further investigation to examine the causal factors.</p> <p>The only suitable position for inspectors to perform bruise scoring would be at the station for meat and hygiene control, provided that such a station exists or close to where the trimming is carried out. The assessor needs to be able to study the whole of the carcass closely according to the ACBSS and should also evaluate the depth of the bruise by cutting tissue. In order to do this the assessor will need an “elevated platform” to reach the middle and upper parts of the carcass.</p> <p>Assess the bruising of the animals according to two characteristics of the bruise: Assess the spread of the bruise</p> <ul style="list-style-type: none"> • Slight (<i>S</i>) – from 2 to 8 cm in diameter • Medium (<i>M</i>) – from 8 to 16 cm in diameter • Heavy (<i>H</i>) – greater than 16 cm in diameter <p>Bruises below 2 cm in diameter, fire bruises (superficial bleedings in the subcutaneous fat) and bruises caused by shackling are not recorded. In addition to the spread of the bruise, the depth is assessed. If the bleedings involve any tissue other than surface muscle tissue the bruise is considered to be deep (<i>d</i>). All concluded this makes a total of six categories:</p> <ul style="list-style-type: none"> • S, Slight (<i>S</i>) = 2-8cm • Sd, Slight-deep (<i>Sd</i>) • M, Medium (<i>M</i>) = 8-16cm • Md, Medium-deep (<i>Md</i>) • H, Heavy (<i>H</i>) = >16cm) and depth • Hd. Heavy-deep (<i>Hd</i>)*
<i>Classification</i>	<p>Individual level: Number of bruises per animal observed according to the severity of the bruise (spread and depth).</p>
<i>Optional additional information</i>	<ul style="list-style-type: none"> • See also Annex 7 in “Proposal of monitoring system for the assessment of cattle welfare in abattoirs” Sandström et al, 2008 WQ Report Dec 15 and pictures in Assessment of ultimate pH and bruising in cattle. EU Food-CT-2004-506508. <i>Report: Welfare Quality Project, Deliverable 2, subtask 2.2.2</i> • * See further WQ report Algers 2006: “Assessment of Ultimate pH and Bruising in Cattle” and Anderson, B. & Horder, J.C., 1979. The Australian carcass bruise scoring system. Queensland Agricultural Journal 105:281-287.

5.3.3.2 Absence of disease

This criterion is not applied in this situation.

5.3.3.3 Absence of pain induced by management procedures

<i>Title</i>	Stunning effectiveness
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method</i>	It is normally only possible to look at one eye as it is often impossible to

<p><i>description</i></p>	<p>evaluate the eye on the side facing the floor when animals lie on the shackle table. Also when animals are hanging on the shackle rail it can be very hard to get a good look at both eyes.</p> <p>Assess the animal for one or more of the seven reflexes. These are:</p> <ol style="list-style-type: none"> 1. Corneal reflex Corneal reflex is defined as the response to light touching of the eyeball 2. Spontaneous blinking Spontaneous blinking is defined as when the animal blinks spontaneously without physical stimulation 3. Eye ball rotation Eye ball rotation is defined as when one or both eye balls rotate so that the pupil/pupils are partly or completely hidden. 4. Rhythmic breathing Rhythmic breathing is defined as the presence of rhythmic breathing (repeated inhaling/exhaling in a rhythmic fashion). NOTE! Air filling the lungs at the moment of stunning is often expired right after the animal is stunned which can be misinterpreted as breathing. This expire of air is never followed by any inspiration of new air and hence not regarded as “rhythmic breathing”. Respiratory gasps can also occur, with or without vocalisation, which are of spinal origin and therefore do not indicate recovery. Rhythmic breathing is best detected by observing the chest and abdomen for movements and by putting the hand in front of the nostrils to feel the air blow. The animal can start breathing immediately after stunning or after some time when shackled on rail. 5. Righting reflex Righting reflex is defined as the arched back righting reflex with the head bent straight back. The symptom can be shown while an animal is lying in horizontal position or while hanging on the shackle rail. NOTE! This is not to be confused with spinal reflexes such as kicking with the legs which naturally occur when the inhibiting function of the brain on the spinal nerves is lost due to stunning. Remember that spinal reflexes never involve the head. If the head is “loose and floppy” the animal is stunned properly and shows no righting reflex. If the animal tries to lift its head, the brain is partly functioning 6. Excessive kicking and delay of shackling or sticking Excessive kicking and subsequent delay of shackling or sticking procedure is defined as considerable or severe physical movement of the limbs that produces a delay to the operation and a potential danger to operator safety. 7. Re-stunning Re-stunning is defined as the incident of more than one stunning attempt to the same individual animal. <p>Assess the effectiveness of stunning according to indicators and qualify according to scales below. The data should be divided into categories “Bulls” and “other cattle”.</p> <p>Individual level:</p> <p>a – Good stunning: The animal shows no signs of eye movements and has dilated pupils, fixed in a staring gaze and no corneal reflex.</p> <p>b – Poor stunning: The animal shows one or several of the following symptoms: corneal reflex, spontaneous blinking, righting reflex and rhythmic breathing.</p> <p>c – Undefined stunning: The animal shows eyeball rotation up to</p>
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	sticking, nystagmus, gasping/groaning or excessive kicking in combination with eyeball rotation, nystagmus or gasping/groaning.
<i>Classification</i>	Herd level: Percentage of animals with score 'a' and 'b'
<i>Optional additional information</i>	NOTE that if electrical stunning is used, some of the above used parameters need to be evaluated differently. See also "Proposal of monitoring system for the assessment of cattle welfare in abattoirs" Sandström et al, 2008 WQ Report Dec 15, chapters 1.11 and 2.6.

5.3.4 Appropriate behaviour

5.3.4.1 Expression of social behaviours

This criterion is not applied in this situation.

5.3.4.2 Expression of other behaviours

This criterion is not applied in this situation.

5.3.4.3 Good human-animal relationship

<i>Title</i>	Vocalization (when moved to stunning)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	Vocalizations are defined as an animals' vocalizing response to fear- or pain-related events, such as falling, physical means of coercion, restraining and strikes by gates. Vocalizations that occur without involvement of any obvious fear- or injury related event should not be recorded. Repeated bellowing is recorded as one vocalization. Assess the number of vocalizations per animal observed. At all times the assessor should stand directly in front of animals that are being moved towards him/her. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.
<i>Classification</i>	Individual level: Number of vocalizations per animal observed

<i>Title</i>	Coercion
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	Coercion is defined as the use of any of the following items when handling live animals: electric goad, stick, flapper, rattle (EG) or other items (OI). "Other" means any item except the ones listed above and use of the drivers own body. If "other" means of coercion is recorded, the assessor should remark on the type of item used. Incidents involving these items shall only be recorded as coercion if the items are used by physically touching the animal. The number of times coercion is used and also where on the animal's body it is used should also be recorded by using the options "front, middle, rear", meaning on the animals head region, the middle or back part of the body, or the rear end. Assess the prevalence of coercion observations in use of electric goads (EG) or other items (OI) on front (f), middle(m) or rear (r) of animal: <ul style="list-style-type: none"> • % EGf • % EGm • % EGr • % OIf • % OIm

	<ul style="list-style-type: none"> • % OI_r <p>Assess the number of coercions per animal observed. At all times the assessor should stand directly in front of animals that are being moved towards the assessor. A raised position is preferred in order to perform inspection, despite the fact that this can cause greater disturbance to animals compared to monitoring from ground level. Depending on the height of walls at different plants, a simple footstool adjustable to at least 70 cm height should be used.</p>
<i>Classification</i>	Individual level: Number of coercions per animal observed

5.3.4.4 Absence of fearfulness

<i>Title</i>	Struggling (in the stun box)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Heavy struggling is defined as continuous struggling/panicking movements of escape, as general slipping, forward and backward movements and body trembling, lasting for more than 3 seconds, with no breaks of calm behaviour.</p> <p>When the box gate is closed behind an animal, the assessor appears, preferably looking into the box from the side, behind the animal.</p> <p>Record struggling behaviour.</p>
<i>Classification</i>	Individual level: Number of struggling movements per animal observed

<i>Title</i>	Kicking (in the stun box)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Kicking is defined as the hind leg kicking, often as a reaction to touch/pain (e.g. gate push or touch by handler).</p> <p>When the box gate is closed behind an animal, the assessor appears, preferably looking into the box from the side, behind the animal.</p> <p>Record kicking behaviour.</p>
<i>Classification</i>	Individual level: Number of kicking movements per animal observed

<i>Title</i>	Jumping (in the stun box)
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.3.5
<i>Method description</i>	<p>Jumping is defined as a sudden startle flight reaction.</p> <p>When the box gate is closed behind an animal, the assessor appears, preferably looking into the box from the side, behind the animal.</p> <p>Record jumping behaviour.</p>
<i>Classification</i>	Individual level: Number of jumping movements per animal observed

5.3.5 Sampling and practical information

There is a logic to the order in which the different measures should be carried out and which measures can be carried out at the same time, this is presented in Table 10.

Table 10 Indication of time required based on experience for different areas of monitoring (relevant to slaughterhouses with approx. line speed of 25-45/hour).

Monitoring area	Time required
Interview animal unit manager on conditions (General)	15-30 minutes
Monitor provisions of resources (Lairage area)	5 minutes
Unloading of animals from one vehicle (at unloading ramp)	2-30 minutes
Driving into lairage (at driving chute into lairage)	1-3 minutes/group and up to 25-30 minutes to monitor animals from one vehicle
Individual animals entering the stun box (at stun box)	0.5-3 minutes
Group monitoring of driving into stun box until all animals are stunned (at driving chute into stun box)	2-10 minutes
Behaviour in stun box (at stun box)	According to line speed, or rather the speed of entrance into the box. Time to monitor a group of animals until all have been stunned is estimated to 2-11 min
Stunning effectiveness	<ul style="list-style-type: none"> • According to line speed • Half of line speed or less
<ul style="list-style-type: none"> • with line speed of 30-35/h or less • with line speed above 30-35/h (at bleeding table) 	<p>According to line speed, although detection of damages could need more thorough investigation, which would reduce the no. of carcasses scored/time unit</p>
Bruise scoring (at meat classification site)	

Monitoring of behaviour in stun box and stunning effectiveness should involve studies towards the end of working shifts. Therefore, monitoring of this section could preferably be performed for example one hour prior to lunch break and for one hour at the end of the day shift.

Selecting fattening cattle for assessment

For the measures slipping, falling, freezing, trying to turn, turning around, moving backwards, lameness, vocalizations and coercion the observation should be conducted between pre-determined lines that indicate the starting and stopping point of monitoring (e.g. representing a "monitoring section"). For each monitoring section observation points should be set up in advance at a preparatory visit. One observation point is often satisfactory in order to observe unloading and animal movement through the unloading area, although in some plants additional observation points may be necessary. This is the case, for example, when the unloading area has a sharp bend behind which animals disappear out of sight if you are observing from a point in line with or slightly behind the vehicle ramp. In this particular case, it would be optimal to have an additional observation point covering the section after the bend.

Sample sizes for monitoring of unloading and driving into lairage

Taking into account the number of observation points needed to cover important areas, monitoring of animals from trucks coming in should be evenly distributed between unloading and driving into the lairage. This means that the assessor needs to be informed how many trucks are expected during the day.

In Table 11 three scenarios are illustrated, to give an idea of the number of vehicles and groups of animals that could possibly be monitored given some general presumptions.

Presumptions:

- The examples concern monitoring of Unloading and Driving into lairage

- Two assessors are monitoring together (or one assessor and an assistant from the plant or factory)
- To cover Unloading, 1-2 observation points are normally needed
- To cover Driving into lairage 2-3 observation points are normally needed.
- If animals need to be monitored further into the lairage system, additional observation points would be needed, the number depending very much on interior plant design. As an estimation, the need for observation points in this area is set to 2.
- Approximately 4-8 vehicles, each containing 2-7 groups and each group having 2-10 animals, are arriving at the plant during one work day, which could be considered normal at medium throughput plants.

Table 11 Illustration of three scenarios and their effect on the number of trucks/groups monitored.

Scenario	Monitoring of Unloading	Monitoring of Driving into lairage, part 1	Monitoring of Driving into lairage, part 2
“At best”			
<ul style="list-style-type: none"> • Minimum of observation points • Maximum no. of trucks/day • Max no. of groups in each truck • Max no. of animals/group 	2 trucks Up to 14 groups and 140 animals	4 trucks Up to 28 groups and 280 animals	2 truck Up to 14 groups and 140 animals
“Worst case scenario”			
<ul style="list-style-type: none"> • Max observation points • Min no. of trucks/day • Min no. of groups in each truck • Min no. of animals/group 	2 trucks 2 groups and 4 animals	3 trucks	To cover all observation points, 7 trucks would be needed and this would mean observation of as little as 2 groups and 4 animals per observation point
“Realistic example”			
<ul style="list-style-type: none"> • Four observation points in total • 6 trucks/day • 5 groups in each truck • 5 animals/group 	2 trucks 10 groups and 50 animals	1 truck 5 groups and 25 animals	2 trucks 10 groups and 50 animals

Sample sizes for monitoring of lairage, stunning area and slaughter line

Sample size in these cases should be at least 140 animals. This would apply to all measurements.

5.4 Calculation of scores for fattening cattle at slaughterhouse

Not included in the protocol at the moment.

6 Welfare Quality[®] applied to dairy cows

The assessment of welfare should be a multi-disciplinary process since the assessment on a variety of different parameters can provide a more comprehensive assessment of an animal's welfare in any given system. To this end, the Welfare Quality[®] project utilizes physiological, health and behavioural characteristics to assess the welfare of dairy cows on farm.

In this chapter, a description of each measure for dairy cows is given, followed by information about the sample size and the order in which the different measures have to be carried out.

Before commencing farm visits, assessors will have been fully trained in all the measures that are to be assessed using photographs, video clips and practical 'on farm' training. For some of the health measures, this training will involve recognition of symptoms of certain conditions/diseases; however it is imperative that this document is not used as a diagnostic tool to identify individual health conditions, but rather as a tool to highlight the presence of health problems affecting the welfare of animals. The assessor should not enter into discussions with the animal unit manager on the prevalence or severity of different diseases on their farm; this is a matter for the animal unit manager and the herd veterinarian. Additionally, in general, the role of the assessor is to assess, and not to advise directly.

Trained assessors will use either animal-based, management-based, and resource-based measures to achieve a representative welfare assessment for each farm. Many different measures are assessed, and most are scored according to a three-point scale ranging from 0 – 2. The assessment scales have been selected so that a score 0 is awarded where welfare is good, a score 1 is awarded (where applicable) where there has been some compromise on welfare, and a score 2 is awarded where welfare is poor and unacceptable. In some cases a binary (0/2 or Yes/No) or a cardinal scale (e.g. m²) scale is used.

The assessor should prepare and start the visit according to the description provided for in Annex A ('guideline for visit of animal unit'). For most measures data can be recorded with aid of Annex B ('Recording Sheets').

6.1 Collection of data for dairy cows on farm

	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	Body condition score
	2	Absence of prolonged thirst	Water provision, cleanliness of water points, water flow, functioning of water points
Good housing	3	Comfort around resting	Time needed to lie down, animals colliding with housing equipment during lying down, animals lying partly or completely outside the lying area, cleanliness of udders, cleanliness of flank/upper legs, cleanliness of lower legs
	4	Thermal comfort	<i>As yet, no measure is developed</i>
	5	Ease of movement	Presence of tethering, access to outdoor loafing area or pasture
Good health	6	Absence of injuries	Lameness (loose housed animals), lameness (tied animals), integument alternations

	7	Absence of disease	Coughing, nasal discharge, ocular discharge, hampered respiration, diarrhoea, vulvar discharge, milk somatic cell count, mortality, dystocia, downer cows
	8	Absence of pain induced by management procedures	Disbudding/dehorning, tail docking
Appropriate behaviour	9	Expression of social behaviours	Agonistic behaviours
	10	Expression of other behaviours	Access to pasture
	11	Good human-animal relationship	Avoidance distance
	12	Positive emotional state	Qualitative behaviour assessment

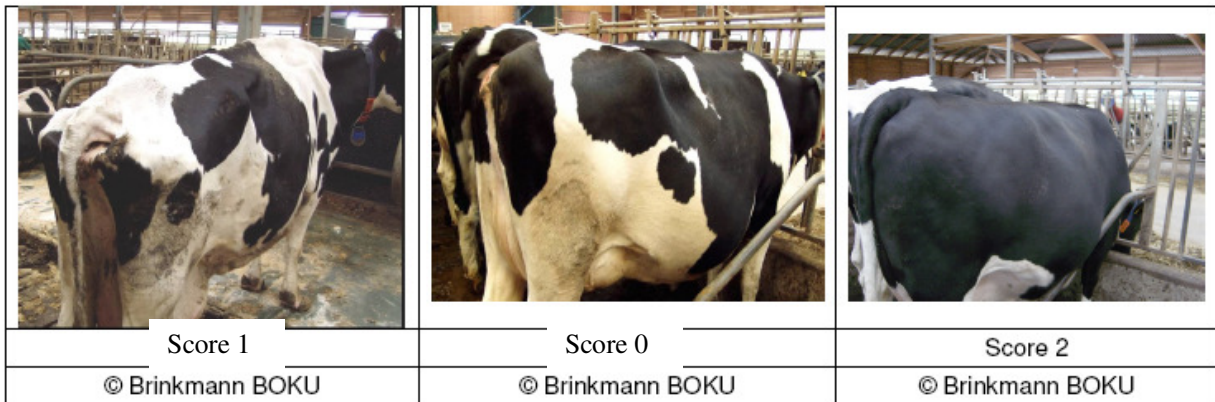
6.1.1 Good feeding

6.1.1.1 Absence of prolonged hunger




<i>Title</i>	Body condition score																										
<i>Scope</i>	Animal-based measure: Dairy cows																										
<i>Sample size</i>	Sample size according § 6.1.5																										
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers if they are kept together with dairy cows.</p> <p>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 but only observed. Animals are scored as follows, with regard to 4 criteria and according to breed (see photographic illustration):</p> <p>Descriptors for indicators in dairy breeds:</p> <table border="1"> <thead> <tr> <th><i>Body Region</i></th> <th><i>Very lean</i></th> <th><i>Very fat</i></th> </tr> </thead> <tbody> <tr> <td>Cavity around tail head</td> <td> <ul style="list-style-type: none"> Deep cavity around tail head </td> <td> <ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present </td> </tr> <tr> <td>Loin</td> <td> <ul style="list-style-type: none"> Deep depression between backbone and hipbones (tuber coxae) </td> <td> <ul style="list-style-type: none"> Convex between backbone and hipbones (tuber coxae) </td> </tr> <tr> <td>Vertebrae</td> <td> <ul style="list-style-type: none"> Ends of transverse processes sharp </td> <td> <ul style="list-style-type: none"> Transverse processes not discernible </td> </tr> <tr> <td>Tail head, hipbones, spine and ribs</td> <td> <ul style="list-style-type: none"> Tail head, hipbones (tuber coxae), spine and ribs prominent </td> <td> <ul style="list-style-type: none"> Outlines of fat patches visible under skin </td> </tr> </tbody> </table> <p>Descriptors for indicators in dual purpose breeds:</p> <table border="1"> <thead> <tr> <th><i>Body Region</i></th> <th><i>Very lean</i></th> <th><i>Very fat</i></th> </tr> </thead> <tbody> <tr> <td>Cavity around tail head</td> <td> <ul style="list-style-type: none"> Cavity around tail head </td> <td> <ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present </td> </tr> <tr> <td>Loin</td> <td> <ul style="list-style-type: none"> Visible depression between </td> <td> <ul style="list-style-type: none"> Convex between backbone and </td> </tr> </tbody> </table>			<i>Body Region</i>	<i>Very lean</i>	<i>Very fat</i>	Cavity around tail head	<ul style="list-style-type: none"> Deep cavity around tail head 	<ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present 	Loin	<ul style="list-style-type: none"> Deep depression between backbone and hipbones (tuber coxae) 	<ul style="list-style-type: none"> Convex between backbone and hipbones (tuber coxae) 	Vertebrae	<ul style="list-style-type: none"> Ends of transverse processes sharp 	<ul style="list-style-type: none"> Transverse processes not discernible 	Tail head, hipbones, spine and ribs	<ul style="list-style-type: none"> Tail head, hipbones (tuber coxae), spine and ribs prominent 	<ul style="list-style-type: none"> Outlines of fat patches visible under skin 	<i>Body Region</i>	<i>Very lean</i>	<i>Very fat</i>	Cavity around tail head	<ul style="list-style-type: none"> Cavity around tail head 	<ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present 	Loin	<ul style="list-style-type: none"> Visible depression between 	<ul style="list-style-type: none"> Convex between backbone and
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Loin	<ul style="list-style-type: none"> Deep depression between backbone and hipbones (tuber coxae) 	<ul style="list-style-type: none"> Convex between backbone and hipbones (tuber coxae) 																									
Vertebrae	<ul style="list-style-type: none"> Ends of transverse processes sharp 	<ul style="list-style-type: none"> Transverse processes not discernible 																									
Tail head, hipbones, spine and ribs	<ul style="list-style-type: none"> Tail head, hipbones (tuber coxae), spine and ribs prominent 	<ul style="list-style-type: none"> Outlines of fat patches visible under skin 																									
<i>Body Region</i>	<i>Very lean</i>	<i>Very fat</i>																									
Cavity around tail head	<ul style="list-style-type: none"> Cavity around tail head 	<ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present 																									
Loin	<ul style="list-style-type: none"> Visible depression between 	<ul style="list-style-type: none"> Convex between backbone and 																									

	<p>Vertebrae</p> <p>Tail head, hipbones, spine and ribs</p> <p>Individual level: 0 – Regular body condition 1 – Very lean: indicators for ‘very lean’ present in at least three body regions 2 – Very fat: indicators for ‘very fat’ present in at least three body regions</p>	<p>backbone and hipbones (tuber coxae)</p> <ul style="list-style-type: none"> • Ends of transverse processes distinguishable • Tail head, hipbones (tuber coxae), spine and ribs visible 	<p>hipbones (tuber coxae)</p> <ul style="list-style-type: none"> • Transverse processes not discernible • Outlines of fat patches visible under skin
<i>Classification</i>	<p>Herd level: Percentage of very lean cows (i.e. score 1)</p>		
<i>Optional additional information</i>	<p>As yet, for the calculation of scores, only very lean animals are taken into account. However, for advisory purposes information on very fat animals (risk for metabolic disorders and calving difficulties etc.) may be useful.</p>		

Body condition - Dairy breeds

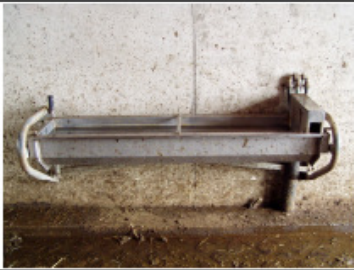



Body condition - Dual purpose breeds

		
Score 1	Score 0	Score 2
© BOKU	© Winckler BOKU	© Dippel BOKU





6.1.1.2 Absence of prolonged thirst

<i>Title</i>	Water provision
<i>Scope</i>	Resource-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	All water points in question are assessed within the area of the animal unit where lactating animals are kept. Check the type of the water points per pen (see photographic illustration), and count the number of animals per pen. In the case of open troughs, measure the length of the trough. In the case of bowls with reservoirs, bowls, nipple drinkers or drinkers with balls/antifrost devices, count the number of water points.
<i>Classification</i>	Group level: Number of animals and Number of each type of water points. Length of troughs in cm .

		
Trough	Tip-over trough	Anti-frost with balls
© BOKU	© Brinkmann BOKU	© Brinkmann BOKU

		
Bowl	Bowl with reservoir	Nipple drinker
© Kirchner BOKU	© Gratzer BOKU	© Winckler BOKU

Title	Cleanliness of water points
Scope	Resource-based measure: Dairy cows
Sample size	Sample size according to § 6.1.5
Method description	<p>All water points in question are assessed within the area of the animal unit where lactating animals are kept.</p> <p>Check the cleanliness of the water points with regard to the presence of old or fresh dirt on the inner side of the bowl or trough as well as staining of the water (see photographic illustration). Water points are considered as clean when there is no evidence of crusts of dirt (e.g. faeces, mould) and/or decayed food residues. Note that some amount of fresh food is acceptable.</p>
Classification	<p>Group level:</p> <p>0 – Clean: drinkers and water clean at the moment of inspection</p> <p>1 – Partly dirty: drinkers dirty, but water fresh and clean at moment of inspection or only part of several drinkers clean and containing clean water</p> <p>2 – Dirty: drinkers and water dirty at moment of inspection</p>

		
clean	Partly dirty	Dirty
© Gratzer BOKU	© Gratzer BOKU	© Gratzer BOKU
		
Dirty		
© Gratzer BOKU		

<i>Title</i>	Water flow
<i>Scope</i>	Resource-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>All water points in question are assessed within the area of the animal unit where lactating animals are kept.</p> <p>Check the amount of water coming out of the drinker per minute, e.g. by filling it up to the brim and then collecting the overflow for 1 minute using a bucket. To be sufficient the water flow must be at least 10 L/min in case of a bowl and 20 L/min in case of a trough. In the case of troughs with a large reservoir, this test does not have to be carried out. Water flow is then set to 20L/min.</p> <p>Point level: Amount of water in L/min per water point.</p>
<i>Classification</i>	<p>Group level: Number of water bowls with sufficient water flow Length of trough with sufficient water flow</p>

<i>Title</i>	Functioning of water points
<i>Scope</i>	Resource-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>All water points in question are assessed within the area of the animal unit where lactating animals are kept.</p> <p>Check if water drinkers are working correctly, e.g. if levers are movable and that water flows if they are moved.</p>
<i>Classification</i>	<p>Group level: 0 – The drinkers are working correctly 2 – The drinkers are malfunctioning</p>

6.1.2 Good housing

6.1.2.1 Comfort around resting

<i>Title</i>	Time needed to lie down
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according § 6.1.5
<i>Method description</i>	<p>This measure applies to lactating cows as well as to dry cows and pregnant heifers if they are kept with lactating animals. It considers all observable lying down movements (minimum sample size of 6 is required).</p> <p>Time recording of a lying down sequence starts when one carpal joint of the animal is bent and lowered (before touching the ground). The whole lying down movement ends when the hind quarter of the animal has fallen down and the animal has pulled the front leg out from underneath the body.</p> <p>Time needed to lie down is recorded in seconds, continuously in the focus segment. The duration of a lying down movement is only taken when undisturbed by other animals or human interaction and – in case of cubicles and littered systems – if it takes place on the supposed lying area. Observations take place in segments of the barn (→ 6.1.4.1).</p> <p>Individual level: Time in seconds</p>
<i>Classification</i>	<p>Herd level: Mean time to lie down (in seconds)</p>


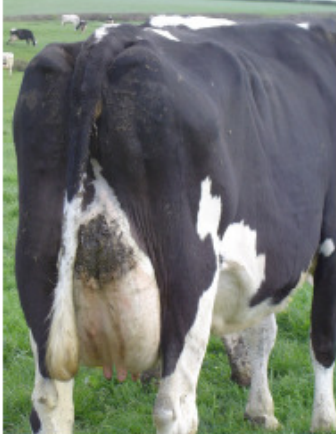
<i>Title</i>	Animals colliding with housing equipment during lying down
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according § 6.1.5
<i>Method description</i>	<p>This measure applies to lactating cows as well as to dry cows and pregnant heifers if kept with lactating animals. It considers all lying down movements for which time needed to lie down has been recorded (minimum sample size of 6 is required).</p> <p>A collision is defined as occurring when, during lying down, the cow collides with or contacts housing equipment with any part of the body (usually hind quarter or side). The collision is obviously seen or heard.</p> <p>Collisions with housing equipment are recorded continuously in the focus segment. The duration of a lying down movement is only taken when undisturbed by other animals or human interaction and – in case of cubicles and littered systems – if it takes place on the supposed lying area. Observations take place in segments of the barn (→ 6.1.4.1).</p> <p>Individual level: 0 – No collision 2 – Collision</p>
<i>Classification</i>	<p>Herd level: Percentage of animals colliding with housing equipment (i.e. score 2)</p>

<i>Title</i>	Animals lying partly or completely outside the lying area
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to lactating cows as well as to dry cows and pregnant heifers if they are kept with lactating animals.</p> <p>Assess the number of animals which are lying and how many of them are lying with their hind quarter on the edge of the cubicle or the deep littered area (edge markedly pressing into the hind leg of the animal), lying with hind quarter (both hind legs) or completely outside the supposed lying area (cubicles, deep littered area).</p> <p>Observations take place in segments of the barn. Animals lying partly/completely outside the lying area are recorded at the start and at the end of each segment observation (see 6.1.4.1).</p> <p>Group level: Number of animals lying Number of animals lying partly/completely outside lying area</p>
<i>Classification</i>	<p>Herd level: Percentage of animals lying partly/completely outside lying area out of all lying animals</p>

<i>Title</i>	Cleanliness of udder, flank/upper legs and lower legs
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according § 6.1.5

<p><i>Method description</i></p>	<p>This measure applies to lactation cows as well as to dry cows and pregnant heifers if kept with lactating animals, and groups of dry cows which are kept separately.</p> <p>Cleanliness of the applicable body parts is defined as the degree of dirt on the body parts considered (see photographic illustration):</p> <ul style="list-style-type: none"> • splashing (e.g. faeces, mud) • plaques: three-dimensional layers of dirt amounting to the size of the palm of a hand or if more than half of the area under consideration is covered <p>Assess one side of the body (random side selection, especially in tie stalls) and from behind. The following areas are scored:</p> <ul style="list-style-type: none"> • the lower hind legs (including the hock), • hind quarters - upper hind leg, flank and rear view including tail (excluding udder) • the udder <p>Individual level: <i>Lower hind legs:</i> 0 – No dirt or minor splashing 2 – Separate or continuous plaques of dirt above the coronary band <i>Hind quarters:</i> 0 – No dirt or minor splashing 2 – Separate or continuous plaques of dirt <i>Udder:</i> 0 – No dirt or minor splashing, other than on teats 2 – Distinct plaques of dirt on udder or any dirt on and around the teats</p>
<p><i>Classification</i></p>	<p>Herd level: Lower hind legs: Percentage of animals with clean lower hind legs (i.e. score 0) Percentage of animals with dirty lower hind legs (i.e. score 2) Hind quarters: Percentage of animals with clean hindquarters(i.e. score 0) Percentage of animals with dirty hindquarters(i.e. score 2) Udder: Percentage of animals with a clean udder (i.e. score 0) Percentage of animals with dirty udder (i.e. score 2)</p>



Cleanliness of udder

	
<p>Score 0</p>	<p>Score 2</p>
<p>© March BOKU</p>	<p>© Leach UNIVBristol</p>

Cleanliness of hindquarter

	
Score 0 © Brinkmann BOKU	Score 2 © March BOKU

Cleanliness of lower hindleg

	
Score 0 © Leach UNIVBristol	Score 2 © UNIVBristol

6.1.2.2 Thermal comfort
As yet, no measure is developed.

6.1.2.3 Ease of movement

Title	Presence of tethering
Scope	Resource-based measure: Dairy cows
Sample size	Animal unit
Method description	The resources provided on the animal unit are checked with regard to lactating cows. The assessor checks whether the farm has a tie stall system or a loose housing system.
Classification	Herd level: 0 – Loose housing system 2 – Tie stall system

Title	Access to outdoor loafing area or pasture
Scope	Management-based measure: Dairy cows
Sample size	Animal unit

<i>Method description</i>	<p>This measure applies to lactating cows as well as to dry cows if kept with lactating animals.</p> <p>The animal unit manager is asked about the loafing area and pasture management on the farm with regard to the availability of an outdoor loafing area and/or access to pasture, and also the respective conditions in terms of days per year and average time spent in the outdoor loafing area/pasture per day.</p>
<i>Classification</i>	<p>Herd level: Availability of outdoor loafing area (OLA) (herd level): 0 – Yes 2 – No and Number of days with access to OLA per year Number of hours with access to OLA per day</p> <p>Availability of pasture (herd level): 0 – Yes 2 – No and Number of days on pasture per year Number of hours on pasture per day</p>

6.1.3 Good health

6.1.3.1 Absence of injuries

<i>Title</i>	Lameness (loose housed animals)
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to lactating cows, dry cows and pregnant heifers if kept with lactating animals as well as all dry cows if kept separately, able to move freely and individually controlled, i.e. loose housed animals as well as animals which are kept in tie stalls but are released at least twice a week.</p> <p>Lameness describes an abnormality of movement and is most evident when the legs are in motion. It is caused by reduced ability to use one or more limbs in a normal manner. Lameness can vary in severity from reduced ability to inability to bear weight.</p> <p>Indicators of lameness are:</p> <ul style="list-style-type: none"> • irregular foot fall • uneven temporal rhythm between hoof beats • weight not borne for equal time on each of the four feet <p>The following gait attributes are taken into account:</p> <ul style="list-style-type: none"> • timing of steps • temporal rhythm • weight-bearing on feet. <p>Assess the gait score of the animal. All animals should be walked in a straight line on a hard, level, non-slippery surface on which they would normally walk. The assessor should view them from the side and/or behind. Animals must not be assessed when they are turning.</p> <p>Individual level: 0 – Not lame: timing of steps and weight-bearing equal on all four feet. 1 – Lame: imperfect temporal rhythm in stride creating a limp 2 – Severely lame: strong reluctance to bear weight on one limb, or more than one limb affected</p>

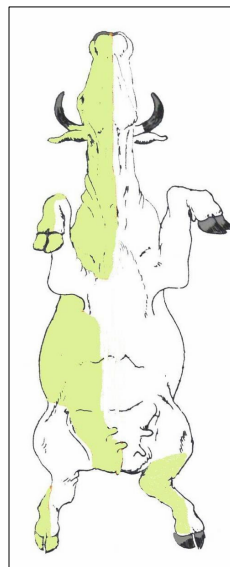
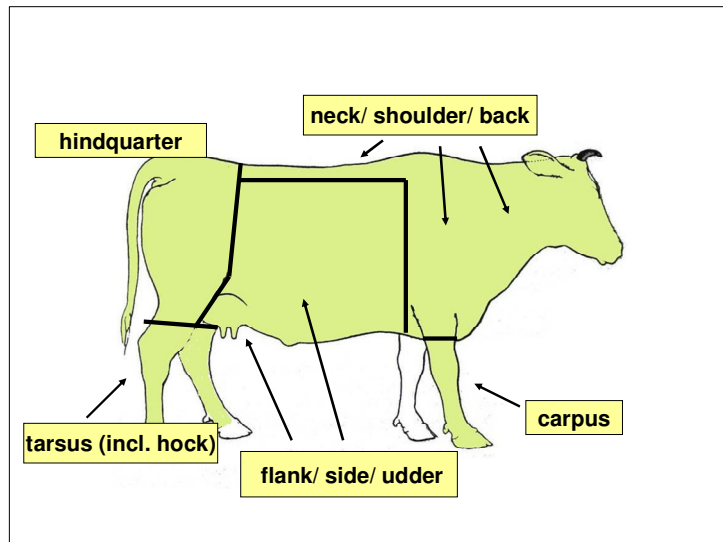
<i>Classification</i>	Herd level: Percentage of not lame animals (score 0) Percentage of moderately lame animals (score 1) Percentage of severely lame animals (score 2)
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<i>Title</i>	Lameness (tied animals)
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all lactating cows, dry cows and pregnant heifers if kept with the lactating animals kept in tie stalls and which are not released at least twice a week.</p> <p>Lameness describes an abnormality of movement and is most evident when the legs are in motion. It is caused by reduced ability to use one or more limbs in a normal manner. However, in some tie stall systems it will not be practical to release the cows to carry out gait scoring. A method for detecting lame cows in tie stalls has been developed and validated against gait scoring. The 'stall lameness score' is based upon the following indicators:</p> <ul style="list-style-type: none"> • Resting: Resting a foot (one more than another). • Standing: Standing on the edge of a step (to avoid bearing weight on one foot/part of foot). • Stepping: Frequent weight shifting between feet ("stepping"), or repeated movements of the same foot (this could also be due to nervousness, flies, or anticipation of feeding.) • Reluctance: Reluctance to bear weight on a foot when moving. <p>Assess the score of the animal. Firstly observe how the cow stands when undisturbed. Then move the cow to the left and to the right, observing how she shifts weight from foot to foot. Then observe the position the cow returns to after movement. If the cow has been lying down, get it up and wait 3 - 4 minutes before assessing.</p> <p>Individual level: 0 – Not lame: cow showing none of the indicators listed above 2 – Lame: cow showing at least one of the four indicators listed above</p>
<i>Classification</i>	Herd level: Percentage of not lame animals (i.e. score 0) Percentage of severely lame animals (i.e. score 2)

<i>Title</i>	Integument alterations (hairless patches and lesions/swellings)
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers if kept together with dairy cows.</p> <p>Integument alterations are defined as hairless patches and lesions/swellings. Only skin alterations of a minimum diameter of 2 cm at the largest extent are counted. Additionally, skin alterations in terms of hairless patches and lesions/swellings are counted in accordance with criteria below:</p> <p>Hairless patch (see photographic illustration):</p> <ul style="list-style-type: none"> • area with hair loss • skin not damaged

- extensive thinning of the coat due to parasites
 - hyperkeratosis possible
- Lesion/swelling (see photographic illustration):
- damaged skin either in form of a scab or a wound
 - dermatitis due to ectoparasites
 - completely or partly missing teats
 - ear lesions due to torn off ear tags

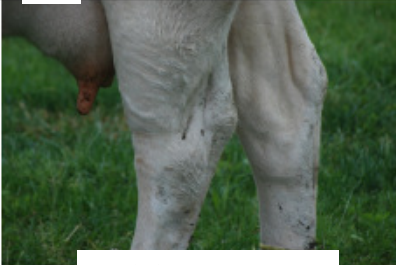


From a distance not exceeding 2 m, five body regions on one side of the focal animal have to be examined with regard to the criteria listed above.



These body regions are scanned from the rear to the front, excluding the bottom side of the belly and the inner side of the legs, but including the inner side of the opposite hind leg as well as the udder with teats. A random side selection (left or right) has to be ensured, especially in tie-stalls. To prevent biased results, the side selection should be carried out before the examination. In most cases, the side which is seen first when approaching the animal can be chosen.

	<p>In the case of more than 20 alterations per category only ">20" is noted. The maximum (">20") is also given if the area affected is at least as large as the size of a hand.</p> <p>If there are different categories of alterations at the same location (e.g. swelling and lesion at one leg joint) or adjacent to each other (e.g. a round hairless patch with a lesion in its centre) all these alterations are counted.</p> <p>Individual level: Number of hairless patches Number of lesions/swellings</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with no integument alteration (no hairless patch, no lesion/swelling) Percentage of animals with mild integument alterations (at least one hairless patch, no lesion/swelling) Percentage of animals with severe integument alterations (at least one lesion/swelling)</p>
<i>Optional additional information</i>	<p>For the calculation of scores, this measure is taken into account as the total count from all body regions. However, for advisory purposes more detailed information may be necessary.</p>

a) hairless spots

		
No hairless patch	Hairless patch (tarsal joint)	Hairless patch (carpel joint)
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b) lesions



c) swellings



6.1.3.2 Absence of disease

Title	Coughing
Scope	Animal-based measure: Dairy cows
Sample size	Sample size according to § 6.1.5
Method description	This measure applies to lactating cows as well as to dry cows and pregnant heifers, if kept with lactating animals. Coughing is defined as a sudden and noisy expulsion of air from the lungs. It is recorded using continuous behavioural sampling. Observations take place in segments of the barn. Per segment not more than 25 cows should be assessed on average. Total net observation time is 120 minutes. Minimum duration of observation per segment is 10 minutes. If possible with regard to herd size and housing design, the area in question should be divided into not more than 6 segments in order to allow for a repetition of the observations in the second hour. In larger herds up to 12 segments may be observed without repetition. In very large herds (approximately > 250 cows), representative segments covering all areas of the housing system should be chosen.
Classification	Herd level: Mean number of coughs per animal and per 15 min.

Title	Nasal discharge
Scope	Animal-based measure: Dairy cows

<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers, if kept together with dairy cows.</p> <p>Nasal discharge is defined as clearly visible flow/discharge from the nostrils; transparent to yellow/green and often of thick consistency.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the nasal discharge criteria (see photographic illustration).</p> <p>Individual level: 0 – No evidence of nasal discharge 2 – Evidence of nasal discharge</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with nasal discharge</p>



<i>Title</i>	Ocular discharge
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers, if kept together with dairy cows.</p> <p>Ocular discharge is defined as clearly visible flow/discharge (wet or dry) from the eye, at least 3 cm long.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the ocular discharge criteria (see photographic illustration).</p> <p>Individual level: 0 – No evidence of ocular discharge 2 – Evidence of ocular discharge</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with ocular discharge</p>

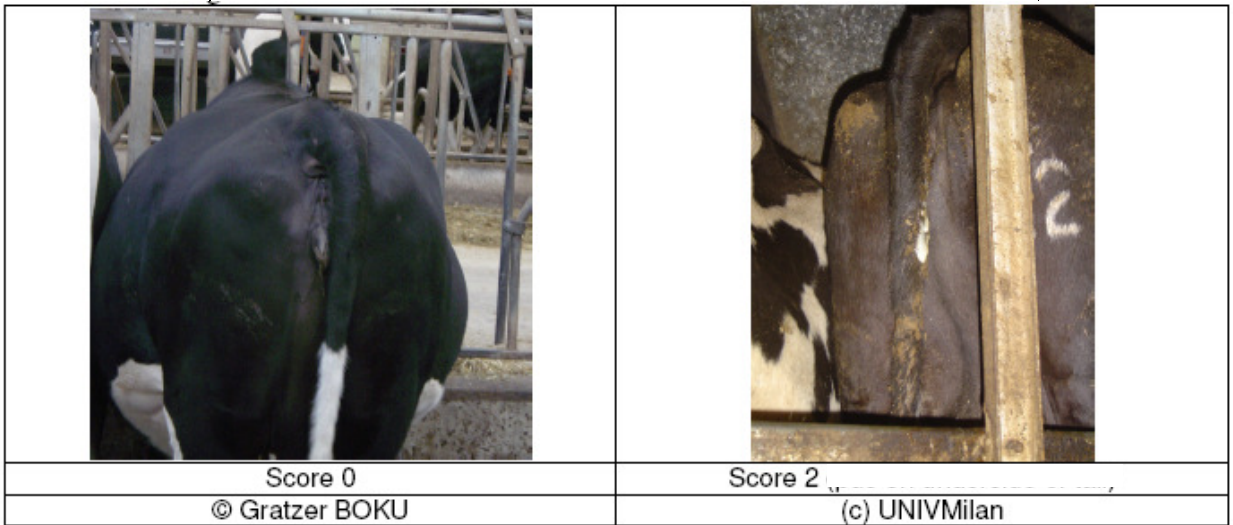
	
Score 0 © BOKU	Score 2 © Leach UNIVBristol

<i>Title</i>	Hampered respiration
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers, if kept together with dairy cows.</p> <p>Hampered respiration rate is defined as deep and laboured or overtly difficult breathing. Expiration is supported by the muscles of the trunk, mostly accompanied by pronounced sound. Breathing rate may only slightly be increased.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the hampered respiration criteria.</p> <p>Individual level: 0 – No evidence of hampered respiration 2 – Evidence of hampered respiration</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with hampered respiration</p>

<i>Title</i>	Diarrhoea
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers, if kept together with dairy cows.</p> <p>Diarrhoea is defined as loose watery manure below the tail head on both sides of the tail, area affected at least the size of a hand.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the diarrhoea criteria (see photographic illustration).</p> <p>Individual level: 0 – No evidence of diarrhoea 2 – Evidence of diarrhoea</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with diarrhoea</p>



<i>Title</i>	Vulvar discharge
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers, if kept together with dairy cows.</p> <p>Vulvar discharge is defined as purulent effluent from the vulva or plaques of pus on the bottom side of the tail (CAVE: viscous mucus in animals in late pregnancy).</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the vulvar discharge criteria (see photographic illustration).</p> <p>Individual level: 0 – No evidence of vulvar discharge 2 – Evidence of vulvar discharge</p>
<i>Classification</i>	<p>Herd level: Percentage of animals with vulvar discharge</p>



<i>Title</i>	Milk somatic cell count
<i>Scope</i>	Animal-based measure: Dairy cows

<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows, and requires input from animal unit manager.</p> <p>Milk somatic cell count data can be obtained from milk records. They are collected at individual cow level from a period of three months prior to the farm visit. Such data can also be collected in advance of the farm visit.</p> <p>Somatic cell counts greater than 400,000 are considered to indicate subclinical inflammation.</p> <p>Individual level: 0 – Somatic cell count below 400,000 within 3 months 2 – Somatic cell count of 400,000 or above within 3 months</p>
<i>Classification</i>	<p>Herd level: Percentage cows with somatic cell count of 400,000 or above (i.e.; score 2)</p>

<i>Title</i>	Mortality
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Animal unit
<i>Method description</i>	<p>Mortality is defined as the ‘uncontrolled’ death of animals as well as cases of euthanasia and emergency slaughter.</p> <p>The animal unit manager is asked about the number of dairy cows which died on the farm, were euthanized due to disease or accidents or were emergency slaughtered during the last 12 months. Additionally the average number of dairy cows in the animal unit is asked. Farm records may also be used.</p>
<i>Classification</i>	<p>Herd level: Percentage of animals dead, euthanized and emergency slaughtered on the farm during the last 12 months</p>

<i>Title</i>	Dystocia
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>Dystocia incidence is defined as the number of calvings where major assistance was required during the last 12 months.</p> <p>Data is collected from herd records, or the animal unit manager is asked about the number of dystocia cases on the farm during the last 12 months (animal unit manager estimates). The average number of calvings (on a yearly basis) is also recorded.</p>
<i>Classification</i>	<p>Herd level: Percentage of dystocia</p>

<i>Title</i>	Downer cows
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>Incidence of downer cows is defined as the number of cases of non-ambulatory cows during the last 12 months.</p> <p>Data is collected from herd records, or the animal unit manager is asked about the number of downer cows on the farm during the last 12 months (animal unit manager estimates). The average number of dairy cows (on a yearly basis) is also recorded.</p>

<i>Classification</i>	Herd level: Percentage of downer cows
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6.1.3.3 Absence of pain induced by management procedures

<i>Title</i>	Disbudding/dehorning
<i>Scope</i>	Management-based measure: Dairy cows
<i>Sample size</i>	Animal unit
<i>Method description</i>	The animal unit manager is asked about the disbudding/dehorning practices on the farm with regard to the following items: <ul style="list-style-type: none"> • Procedures used for disbudding of calves/dehorning of cattle • Use of anaesthetics • Use of analgesics
<i>Classification</i>	Herd level: 0 – No dehorning or disbudding 1 – Disbudding of calves using thermocautery 2 – Disbudding of calves using caustic paste 3 – Dehorning of cattle and 0 – Use of anaesthetics 2 – No use of anaesthetics and 0 – Use of analgesics 2 – No use of analgesics

<i>Title</i>	Tail docking
<i>Scope</i>	Management-based measure: Dairy cows
<i>Sample size</i>	Animal unit
<i>Method description</i>	This measure applies to dairy cows as well as dairy heifers The animal unit manager is asked about mutilation management on the farm with regard to the following items: <ul style="list-style-type: none"> • Procedures for tail docking • Use of anaesthetics • Use of analgesics
<i>Classification</i>	Herd level: 0 – No tail docking 1 – Tail docking using rubber rings 2 – Tail docking using surgery and 0 – Use of anaesthetics 2 – No use of anaesthetics and 0 – Use of analgesics 2 – No use of analgesics

6.1.4 Appropriate behaviour

6.1.4.1 Expression of social behaviours

<i>Title</i>	Agonistic behaviour
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	This measure applies to lactating cows as well as to dry cows and pregnant heifers if kept with lactating animals. Agonistic behaviour is defined as social behaviour related to fighting and includes aggressive as well as submissive behaviours. Here, only aggressive interactions are taken into account. Assess the occurrence

of the behaviours listed below.

Observations take place in segments of the barn. Per segment not more than 25 cows should be assessed on average. Total net (overall) observation time is 120 minutes. Minimum duration of observation per segment is 10 minutes. If possible with regard to herd size and housing design, the area in question should be divided in not more than 6 segments in order to allow for a repetition of the observations in the second hour. In larger herds up to 12 segments may be observed without repetition. In very large herds (approximately > 250 cows), representative segments covering all areas of the housing system have to be chosen.

Agonistic behaviours are recorded using continuous behaviour sampling always taking the actor into account. Interactions between animals in different segments are recorded if the actor's head is located in the focus segment.

Parameter	Description
Head butt	<ul style="list-style-type: none"> Interaction involving physical contact where the actor is butting, hitting, thrusting, striking or pushing the receiver with forehead, horns or horn base with a forceful movement; the receiver does not give up its present position (no displacement, see definition below).
Displacement	<ul style="list-style-type: none"> Interaction involving physical contact where the actor is butting, hitting, thrusting, striking, pushing or penetrating the receiver with forehead, horns, horn base or any other part of the body with a forceful movement and as a result the receiver gives up its position (walking away for at least half an animal-length or stepping aside for at least one animal-width). Penetrating is defined as an animal shoving itself between two other animals or between an animal and barn equipment (e.g. at feeding rack, at water trough). If after a displacement neighbouring animals also leave their feeding places but physical contact as described above is not involved, this reaction is not recorded as displacement.
Chasing	<ul style="list-style-type: none"> The actor makes an animal flee by following fast or running behind it, sometimes also using threats like jerky head movements. Chasing is only recorded if it follows an interaction with physical contact. If, however, chasing occurs in the context of fighting then it is not counted separately.
Fighting	<ul style="list-style-type: none"> Chasing is not applicable in tie stalls. Two contestants vigorously pushing their heads (foreheads, horn bases and/or horns) against each other while planting their feet on the ground in 'sawbuck position' and both exerting force against each other. Pushing movements from the side are not recorded as head butt as long as they are part of the fighting sequence. A new bout starts if the same animals restart fighting after more than 10 seconds or if the

	<p>fighting partner changes.</p> <ul style="list-style-type: none"> Fighting is not applied in tie stalls. <p>Chasing-up</p> <ul style="list-style-type: none"> The actor uses forceful physical contact (e.g. butting, pushing and shoving) against a lying animal which makes the receiver rise. 																																								
	<p>Before starting and after finishing the behaviour observation in a segment the number of animals present in the segment and the number of animals lying has to be counted. Animals which are found lying, standing or feeding across the boundaries of segments are counted in the section where the main part of their body is situated.</p> <p>Note that agonistic and cohesive behaviours are recorded at the same time and therefore the number of animals at the start and the end of each observation period/number of animals lying is only recorded once.</p> <p>Group level: Number of animals in pen or segment and Number of head butts per observation period Number of displacements (agonistic behaviours except head butts) per observation period and Duration of observations</p>																																								
<i>Classification</i>	<p>Herd level: Mean number of head butts per animal and hour Mean number of displacements (agonistic behaviours except head butts) per animal and hour</p>																																								
<i>Optional additional information</i>	<p>Number of observation points and duration of observations per segment:</p> <table border="1"> <thead> <tr> <th>Number of segments</th> <th>Duration of observations (min)</th> <th>Repeated observations</th> <th>Total net duration</th> </tr> </thead> <tbody> <tr><td>1</td><td>120</td><td>No</td><td>120</td></tr> <tr><td>2</td><td>30</td><td>Yes</td><td>120</td></tr> <tr><td>3</td><td>20</td><td>Yes</td><td>120</td></tr> <tr><td>4</td><td>15</td><td>Yes</td><td>120</td></tr> <tr><td>5</td><td>12</td><td>Yes</td><td>120</td></tr> <tr><td>6</td><td>10</td><td>Yes</td><td>120</td></tr> <tr><td>8</td><td>15</td><td>No</td><td>120</td></tr> <tr><td>10</td><td>12</td><td>No</td><td>120</td></tr> <tr><td>12</td><td>10</td><td>No</td><td>120</td></tr> </tbody> </table>	Number of segments	Duration of observations (min)	Repeated observations	Total net duration	1	120	No	120	2	30	Yes	120	3	20	Yes	120	4	15	Yes	120	5	12	Yes	120	6	10	Yes	120	8	15	No	120	10	12	No	120	12	10	No	120
Number of segments	Duration of observations (min)	Repeated observations	Total net duration																																						
1	120	No	120																																						
2	30	Yes	120																																						
3	20	Yes	120																																						
4	15	Yes	120																																						
5	12	Yes	120																																						
6	10	Yes	120																																						
8	15	No	120																																						
10	12	No	120																																						
12	10	No	120																																						

6.1.4.2 Expression of other behaviours

<i>Title</i>	Access to pasture
<i>Scope</i>	Resource-based measure: Dairy cows
<i>Sample size</i>	Animal unit
<i>Method description</i>	<p>This measure applies to lactating cows, as well as dry cows and pregnant heifers if kept together with lactating animals.</p> <p>Check the availability of access to pasture.</p> <p>The animal unit manager is asked about pasture management (days per</p>

	year, average time spent on pasture per day).
<i>Classification</i>	Herd level: Number of days with access to pasture per year and Number of hours per day on pasture

6.1.4.3 Good human–animal relationship

<i>Title</i>	Avoidance distance
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers if kept with lactating animals.</p> <p>The test can start, when at least 75 % of the cows are back in the barn after milking.</p> <p>Place yourself on the feed bunk at a distance of 2 m (if possible) in front of the animal to be tested. The head of the animal has to be completely past the feeding rack / neck rail over the feed. Make sure that the animal is attentive or taking notice of your presence. If an animal is not obviously attentive, but also not clearly distracted, it can be tested. A way to attract the animals' attention is to make some movements in front of them (at the starting position). If you do not have 2 m in front of the animals for approaching them, then choose an angle of up to 45° with the feeding rack, and start at a distance of 2.5 m. If a distance of 2.5 meters is not possible, still carry out the assessment but note down the maximum distance possible on the recording sheet.</p> <p>Approach the animal at a speed of one step per second and a step length of approximately 60 cm with the arm held overhand in an angle of approximately 45° from the body. When approaching, direct the back of the hand toward the animal. Do not look into the animal's eyes but look at the muzzle. Continue to walk towards the animal until signs of withdrawal or until touching the nose/muzzle.</p> <p>Definition of withdrawal is when the animal moves back, turns the head to the side, or pulls back the head trying to get out of the feeding rack; head shaking can also be found.</p> <p>In the case of withdrawal the avoidance distance is estimated (= distance between the hand and the muzzle at the moment of withdrawal) with a resolution of 10 cm (200 cm to 10 cm possible).</p> <p>If withdrawal takes place at a distance lower than 10 cm, the test result is still 10 cm. If you can touch the nose muzzle, an avoidance distance of 0 cm is recorded.</p> <p>Make sure that the hand is always closest to the animal during the approach (not the knee or the feet). Especially when getting close to animals that are feeding or have their heads in a low position, bend a little in order to try to touch them.</p> <p>Neighbouring animals that react to an animal being tested should be tested later on. In order to reduce the risk of influencing the neighbour's test result, every second animal can be chosen.</p> <p>Retest animals at a later time if the reaction was unclear.</p> <p>Individual level: Distance in cm (200-0 cm, with a resolution of 10 cm)</p>
<i>Classification</i>	Herd level: Percentage of animals that can be touched Percentage of animals that can be approached closer than 50 cm but not be touched

	Percentage of animals that can be approached as closely as 100 to 50 cm
	Percentage of animals that cannot be approached as closely as 100 cm

6.1.4.4 Positive emotional state

<i>Title</i>	Qualitative behaviour assessment																		
<i>Scope</i>	Animal-based measure: Dairy cows																		
<i>Sample size</i>	Animal unit (depending on number of observation points, see method description)																		
<i>Method description</i>	<p>Qualitative Behaviour Assessment (QBA) considers the expressive quality of how animals behave and interact with each other and the environment i.e. their 'body language'.</p> <p>Select between one and eight observation points (depending on the size and structure of the farm) that together cover the different areas of the farm. Decide the order to visit these observation points, wait a few minutes to allow the animals to return to undisturbed behaviour. Watch the animals that can be seen well from that point and observe the expressive quality of their activity at group level. It is likely that the animals will initially be disturbed, but their response to this can be included in the assessment. Total observation time should not exceed 20 minutes, and so the time taken at each observation point depends on the number of points selected for a farm:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: left;"><i>Number of observation points</i></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: left;"><i>Duration of observation per observation point in minutes</i></td> <td style="text-align: center;">10</td> <td style="text-align: center;">10</td> <td style="text-align: center;">6.5</td> <td style="text-align: center;">5</td> <td style="text-align: center;">4</td> <td style="text-align: center;">3.5</td> <td style="text-align: center;">3</td> <td style="text-align: center;">2.5</td> </tr> </table> <p>When observation at all selected points has been completed, find a quiet spot and score the 20 descriptors using the visual analogue scale (VAS, see Annex B3). Please note that scoring is not done during observation, and that only one integrative assessment is made per farm.</p> <p>Each VAS is defined by its left 'minimum' and right 'maximum' point. 'Minimum' means that at this point, the expressive quality indicated by the term is entirely absent in any of the animals you have seen. 'Maximum' means that at this point this expressive quality is dominant across all observed animals. Note that it is possible to give more than one term a maximum score; animals could for example be both entirely calm and content.</p> <p>To score each term, draw a line across the 125 mm scale at the appropriate point. The measure for that term is the distance in millimetres from the minimum point to the point where the line crosses the scale. Do not skip any term.</p> <p>Please be aware when scoring terms that start with a negative pre-fix, such as unsure or uncomfortable. As the score gets higher, the meaning of the score gets more negative, not more positive.</p> <p>The terms used for dairy cow QBA assessment are:</p> <ul style="list-style-type: none"> • Active • Relaxed • Fearful • Agitated • Calm • Frustrated • Friendly • Bored • Playful • Positively occupied • Irritable • Uneasy • Sociable • Apathetic • Happy 	<i>Number of observation points</i>	1	2	3	4	5	6	7	8	<i>Duration of observation per observation point in minutes</i>	10	10	6.5	5	4	3.5	3	2.5
<i>Number of observation points</i>	1	2	3	4	5	6	7	8											
<i>Duration of observation per observation point in minutes</i>	10	10	6.5	5	4	3.5	3	2.5											

	<ul style="list-style-type: none"> • Content • Indifferent • Lively • Inquisitive • Distressed
<i>Classification</i>	Herd level: Continuous scales for all body language parameters from minimum to maximum.

6.1.5 Sampling and practical information

The assessor should first become familiar with the facilities (pens/houses, potential observation points, etc.). Any disturbance of the animals should be avoided as far as possible at this time.

There is a logical order in which the different measures should be carried out and which measures can be carried out at the same time. For some of the measures, input from the animal unit manager is required (see Table 12). An appointment with the animal unit manager should be planned taking into account the timing of the animal-based measures.

Table 12 Order in which the (groups of) measures will be assessed during the on-farm visit and approximate time needed at each step.

	Parameter	Sample size	Time needed approximately
1	Avoidance distance	Sample size depending on herd size according to Table 13	1 min/animal
2	Qualitative behaviour assessment	Up to 8 observation points (total net observation time 20 min)	25 min
3	Behavioural observations <ul style="list-style-type: none"> • Time needed to lie down, animals colliding with housing equipment during lying down • Animals lying partly or completely outside the lying area • Agonistic behaviours • Coughing 	Up to 12 segments	150 min
4	Clinical scoring <ul style="list-style-type: none"> • Body condition score • Cleanliness of udder, flank/upper legs and lower legs • Lameness • Integument alternations • Nasal discharge, ocular discharge, hampered respiration • Diarrhoea • Vulvar discharge 	Sample size depending on herd size according to Table 13 All measures are recorded in the same sample of animals. If animals are kept in different groups, proportionate sampling according to group size has to be carried out.	3 min/animal

5	Resources checklist <ul style="list-style-type: none"> • Water provision • Cleanliness of water points • Water flow • Functioning of water points • Presence of tethering 	All pens where lactating cows are kept	15 min
6	Management questionnaire <ul style="list-style-type: none"> • Access to outdoor loafing area or pasture • Disbudding/dehorning • Tail docking • Milk somatic cell count • Mortality • Dystocia • Downer cows 	Animal unit (interview with animal unit manager)	15 min
		TOTAL	25 cows: 4.4 h 60 cows: 5.6 h 100 cows: 6.6 h 200 cows: 7.7 h

Selecting dairy cows for assessment

For some of the measures, random sampling is required. This is indicated in the description of the measures. Check the current number of animals and determine the sample size according to Table 13.

Table 13 Sample size for clinical scoring depending on the herd size.

Herd size	Number of animals to score (suggestion A)	If A is not feasible
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
260	70	54

270	71	54
280	72	54
290	72	55
300	73	55

- A random sample can be obtained by selecting every nth animal in the milking parlour. These animals are marked, to enable re-identification afterwards for data-collection.
- If animals can be locked in a feeding rack, they can be selected by choosing every nth animal in the row(s). Data collection can be carried out immediately.
- In the least preferable method, animals in all areas of the pen including standing, feeding and lying animals are considered together.
- To simplify the assessment, animals can be marked with a stock marking device after assessing them.
- The same animals can be assessed for the scoring of all measures, where random sampling is required.
- If animals are kept in different groups, proportionate sampling according to group size should be carried out.
- For all the measures that assess the quality of water provision the assessed pens are those in which the lactating animals are kept.
- For the measures time needed to lie down, animals colliding with housing equipment and animals lying partly or completely outside the lying area, observations take place in segments of the barn. Per segment not more than 25 cows should be assessed on average. Total net (overall) observation time is 120 minutes. Minimum duration of observation per segment is 10 minutes. If possible with regard to herd size and housing design, the area in question should be divided in not more than 6 segments in order to allow for a repetition of the observations in the second hour.
- Cleanliness of the body and integument alterations are assessed on the same side of each animal.

6.2 Calculation of scores for dairy cows on farm

6.2.1 Criterion-scores

6.2.1.1 Absence of prolonged hunger

The score of a farm in regard to absence of hunger is calculated from the % of very lean cows (that is with a body condition score of 1). This % is turned into a score using an I-spline function (Figure 18) as follows:

Let I = 100 - % of very lean cows,

A spline function is used to compute the index into a score, with the general formula:

$$\text{Score} = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	80
a when I < knot	0
a when I > knot	-2961.3146422677
b when I < knot	0.2216596254
b when I > knot	111.2709595652
c when I < knot	-0.0027707453
c when I > knot	-1.3908870043
d when I < knot	0.0000592709
d when I > knot	0.0058430887

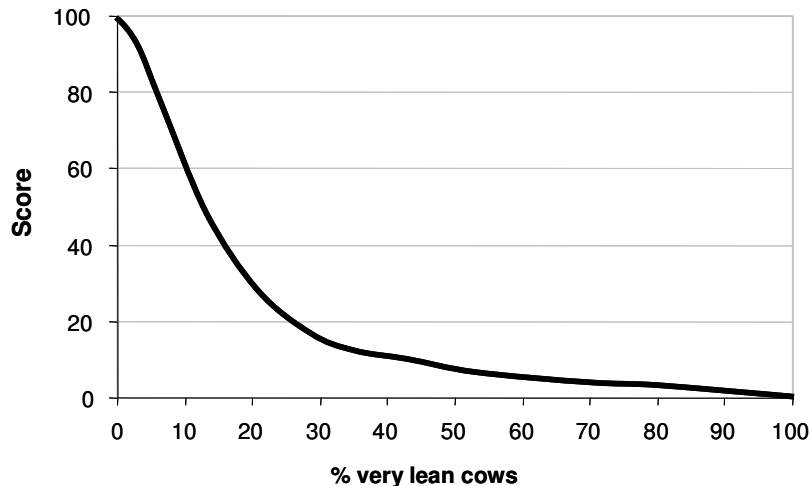


Figure 18 Calculation of the score for absence of prolonged hunger according to the percentage of very lean cows in the herd.

6.2.1.2 Absence of prolonged thirst

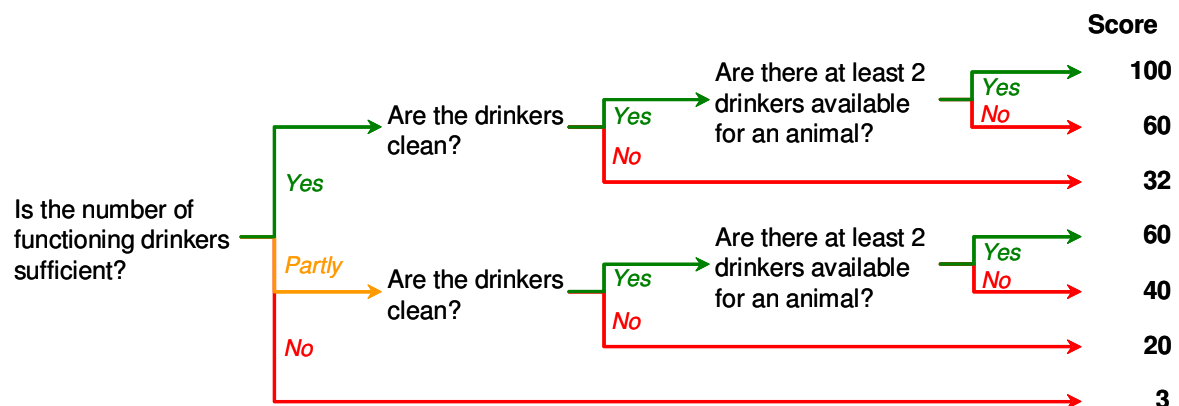
For each group of animals three aspects are considered:

- Is the number of functioning drinkers sufficient?
- Are the drinkers clean?
- Are there at least 2 drinkers available for an animal?

To be sufficient, there must be at least 1 water bowl for 10 cows and/or 6 cm of trough per cow. To be considered as partly sufficient, there must be at least 1 water bowl for 15 cows and/or 4 cm of trough per cow. A drinker that does not function properly counts for half.

If a drinker is not functioning properly or the water flow is insufficient (i.e. lower than 20L/min for a trough or lower than 10 L/min for a bowl) then the recommended number of animals is divided by two (i.e. 1 bowl for 5 animals and 12 cm of trough per animal to be sufficient, and 1 bowl for 7.5 animals and 8 cm of trough per animal to be partly sufficient).

The score for absence of prolonged thirst is attributed to the group of cows according to the answers of these three questions as follows:



Then the score attributed to the whole animal unit is equal to the worst score obtained at group level as long as at least 15% of the observed animals are in groups that obtain this score of a lower one.

6.2.1.3 Comfort around resting

For each measure, we consider 3 levels from a welfare point of view: normal (no problem), moderate problem, serious problem. The limits between the categories are defined for each measure (Table 14).

Table 14 Limits between welfare categories on each measure.

	Normal	Moderate problem	Serious problem
Time needed to lie down	≤ 5.20 s	5.20 s $< \leq 6.30$ s	> 6.30 s
Percentage of animals lying partly or completely outside the supposed lying area	$\leq 3\%$	$3\% < \leq 5\%$	$> 5\%$
Percentage of collisions with housing equipment during lying down	$\leq 20\%$	$20\% < \leq 30\%$	$> 30\%$
Cleanliness: % of animals with dirty lower legs	$\leq 20\%$	$20\% < \leq 50\%$	$> 50\%$
Cleanliness: % of animals with dirty udder	$\leq 10\%$	$10\% < \leq 19\%$	$> 19\%$
Cleanliness: % of animals with dirty hindquarters	$\leq 10\%$	$10\% < \leq 19\%$	$> 19\%$

The total number of moderate problems and serious problems on a farm is calculated.

For instance, Farm A with 10% cows lying outside the resting area, 25% collisions against equipment during lying down, and 25% cows with dirty udder has 1 serious and 1 moderate behavioural problem and 1 serious problem regarding cleanliness.

Overall importance of 3 for resting behaviour and 1 for cleanliness are attributed because cleanliness is considered less important than behaviour.

Therefore, Farm A is estimated to have 3 moderate problems (1x3) and 4 serious problems (3x1 + 1).

We calculate a weighted sum of moderate and serious problems. In this sum, the weights are set at 4 for moderate problems and 9 for serious problems.

For Farm A this sum gives $3 \times 4 + 4 \times 9 = 48$

The theoretical maximum of this sum is $9 \times 12 = 108$. To obtain an index between 0 and 100 (with 0—worst; 100—best), the sum is then divided by the theoretical maximum (108) and multiplied by 100 and the difference to 100 is calculated:

Let I be the index for the comfort around resting:

$$I = 100 - [4 \times (\text{no. moderate problems}) + 9 \times (\text{no. serious problems})] / 108$$

For farm A, this brings $100 - 100 \times (48/108) = 55.6$

Finally this index is computed into a score using I-spline functions (Figure 19), with the general formula:

$$\text{Score} = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	62
a when l < knot	0
a when l > knot	-152.5694102955
b when l < knot	0.5647086656
b when l > knot	7.9470994784
c when l < knot	0.0046442175
c when l > knot	-0.1144266019
d when l < knot	-0.0000380402
d when l > knot	0.0006021255

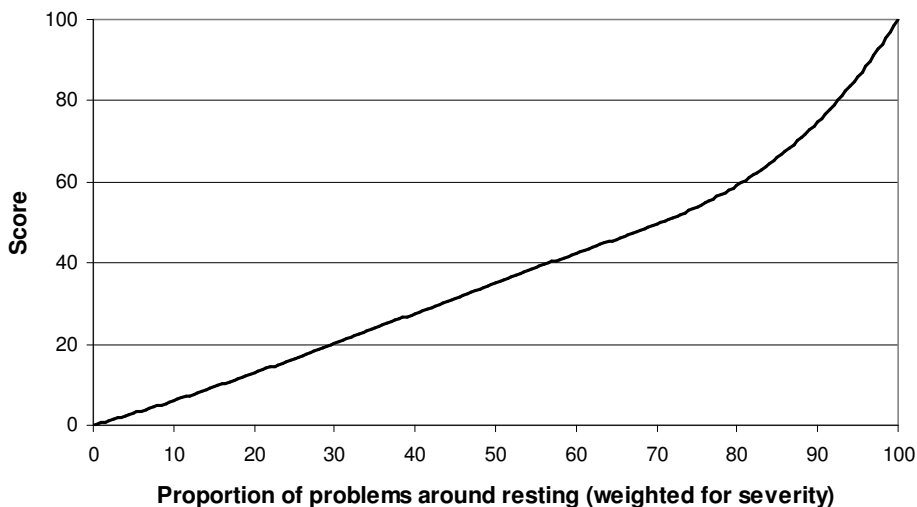


Figure 19 Calculation of the score for comfort around resting according to the number of moderate and serious problems on behaviour around resting and cleanliness of the cows (weights: 0.44 for moderate problems and 1 for serious problems..)

6.2.1.4.1 Thermal comfort

As yet this criterion is not assessed for dairy cows.

6.2.1.5 Ease of movement

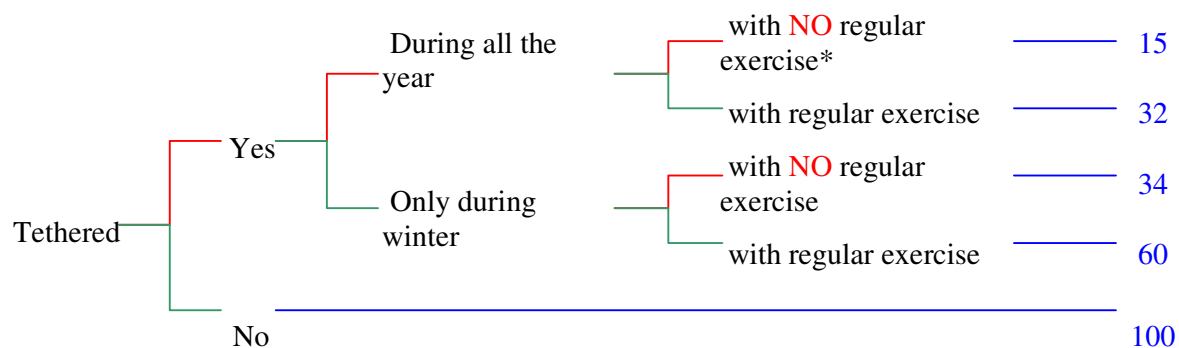
The score for ease of movement is attributed according to the number of days per year and hours per day cows are able to move freely (i.e. not tethered).

A cow is considered tethered on a given day if it spends at least 18 hours tethered.

At year level a cow is considered:

- tethered all year round if it is tethered (as defined above) for at least 265 days per year,
- tethered only in winter if it is tethered for at least 15 days but less than 265 days per year,
- not tethered if it is tethered for less than 15 days per year.
- when a cow is tethered, it is considered to have regular exercise when it is released for at least 1 hour per day on at least 2 days per week.

The following scores are attributed to each of these possibilities:



6.2.1.6 Absence of injuries

Two partial scores are calculated, one for integument alterations, and one for lameness, before being combined into a criterion score.

Partial score for integument alterations

The % of animals affected by one or several mild alterations and no severe one and the % animals affected by one or more severe alterations are combined in a weighted sum, with a weight of 1 for mild alterations and 5 for severe ones. This sum is then transformed into an index that varies from 0 to 100 as follows:

$$\text{Index for integument alterations } I_s = \left(100 - \frac{(\%mild) + 5(\%severe)}{5} \right) =$$

A spline function is used to compute the index into a score (Figure 20), with the general formula:

$$\text{Score} = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	65
a when I < knot	0
a when I > knot	29.8965836056
b when I < knot	0.4353924567
b when I > knot	-0.9444498651
c when I < knot	-0.0066983455
c when I > knot	0.0145299979
d when I < knot	0.0001281117
d when I > knot	0.0000192484

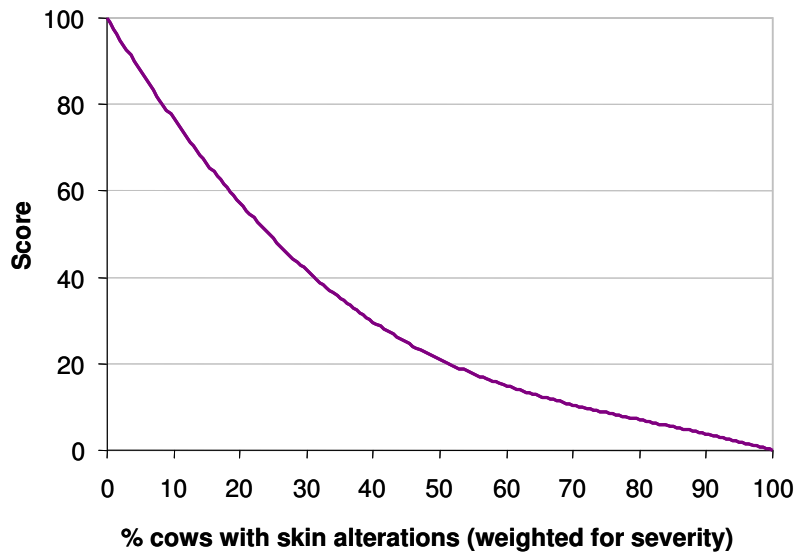


Figure 20 Calculation of the partial score for integument alterations according to the % animals affected by mild alterations and % animals affected by severe ones (weights: 0.2 for mild and 1 for severe alterations).

Partial score for lameness

The % of animals moderately lame and the % of animals severely lame are combined in a weighted sum, with a weight of 2 for moderate lameness and 7 for severe lameness (note that for tied cows only the proportion of severely lame animals is used). This sum is then transformed into an index that varies from 0 to 100 as follows:

$$\text{Index for lameness } I_l = \left(100 - \frac{2(\% \text{ moderate}) + 7(\% \text{ severe})}{7} \right)$$

A spline function is used to compute the index into a score (Figure 21), with the general formula:

$$\text{Score} = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	78
a when I < knot	0
a when I > knot	-2129.5217776808
b when I < knot	0.0750111002
b when I > knot	81.9796965434
c when I < knot	-0.0000242066
c when I > knot	-1.0500842958
d when I < knot	0.0000449587
d when I > knot	0.0045323951

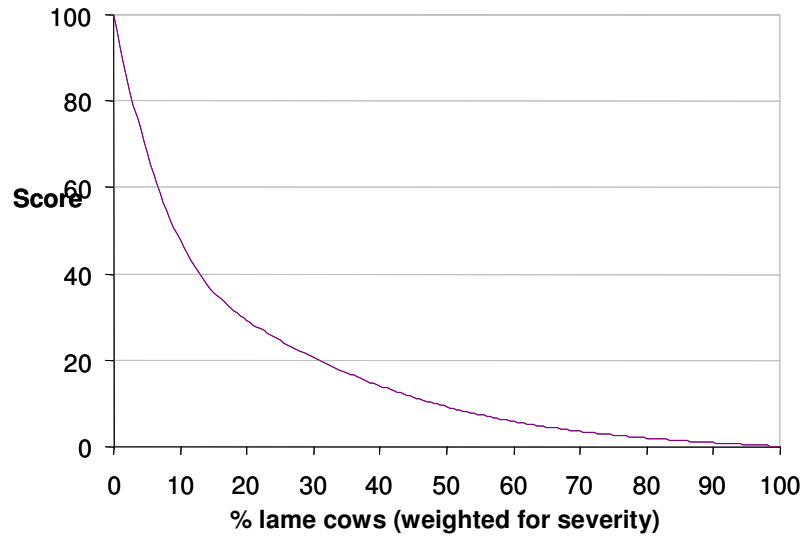


Figure 21 Calculation of the partial score for lameness according to the % animals moderately lame and the % animals severely lame (weights: 0.29 for moderate and 1 for severe lameness).

Score for absence of injuries

The two partial scores are combined using a Choquet integral. The parameters of the Choquet integral are:

$$\mu_s=0.56 \quad \text{and} \quad \mu_l=0.31$$

An example of data produced is presented in Table 15 below.

Table 15 Example of scores for absence of injuries calculated from partial scores for integument alteration and lameness.

	Integument alteration score	Lameness score	Score for absence of injuries
Farm 1	40	60	51
Farm 2	50	50	50
Farm 3	60	40	46

6.2.1.7 Absence of disease

Some diseases affect few animals in a herd while some other can spread very easily between animals. The incidence of symptoms of disease is compared to warning and alarm thresholds. The alarm threshold is the minimum value for a decision to put in place a health plan at the farm level. The warning threshold is half of the alarm threshold. The values chosen for alarm thresholds appear in Table 16.

The number of warnings and alarms obtained by a farm is calculated. At that stage, nasal and ocular discharges are considered together (ORL area) and coughing and hampered respiration are considered together (respiratory problems). If an alarm exists for one of the two symptoms of the same area then an alarm is attributed to this area. If a warning exists and no alarm, a warning is attributed to the area. Then the maximum of alarms and warnings is 8, equal to the number of distinct areas (ORL, respiratory problems, diarrhoea, mastitis, vulva discharge, dystocia, downer cows, mortality).

Table 16 Warning and alarm thresholds for each symptom.

Symptom	Warning threshold	Alarm threshold
%cows with nasal discharge	5	10
%cows with ocular discharge	3	6
average frequency of coughing per cow per 15 min	3	6
% cows with hampered respiration	3.25	6.5
% cows with diarrhoea	3.25	6.5
% Mastitis (milk somatic cell count > 400,000)	8.75	17.5
%cows with vulva discharge	2.25	4.5
% Dystocia	2.75	5.5
% Downer cows	2.75	5.5
% Mortality	2.25	4.5

We calculate a weighted sum of warnings and alarms, with 1 the weight of warnings and 3 the weight of alarms.

For instance a Farm A with 2 warnings and 1 alarm obtains $1 \times 2 + 3 \times 1 = 5$

The theoretical maximum of this sum is $3 \times 8 = 24$. To obtain an index between 0 and 100 (with 0—worst; 100—best), the sum is divided by the theoretical maximum and multiplied by 100 and the difference to 100 is calculated.

For farm A, this gives $100 - 100 \times (5/24) = 79$

A spline function is used to compute the index into a score (Figure 22), with the general formula:

$$\text{Score} = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	65
a when I < knot	0
a when I > knot	-154.2417024020
b when I < knot	0.5280510652
b when I > knot	7.6468988725
c when I < knot	-0.0036474543
c when I > knot	-0.1131681899
d when I < knot	0.0000595889
d when I > knot	0.0006212337

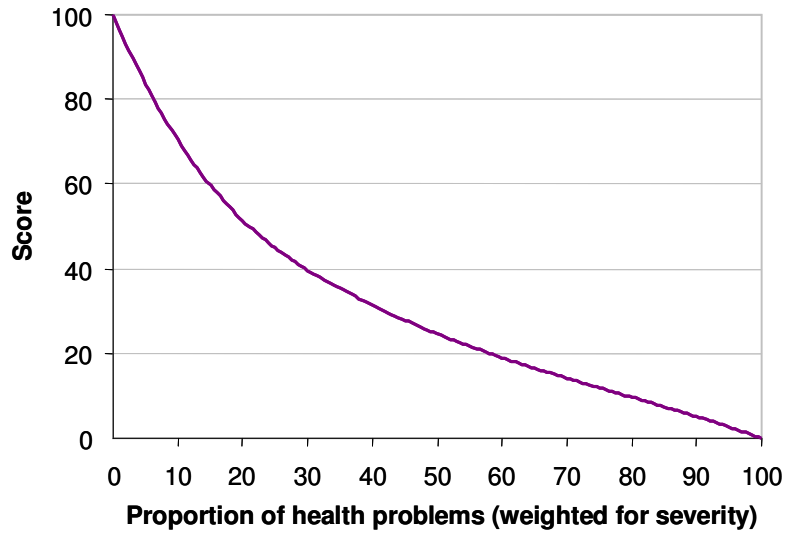


Figure 22 Calculation of scores for absence of diseases according to the proportion of symptoms for which incidence is above warning or alarm thresholds (weights: 0.33 for warning and 1 for alarm).

6.2.1.8 Absence of pain induced by management procedures

One score is attributed to dehorning and one to tail docking. These partial scores are attributed according to decision trees (Figure 23 and 24).

Then at criterion level, the worst score among the two partial scores (one for dehorning and one for tail docking) is retained.

A farm is considered as practicing dehorning or disbudding when at least 15% of the animals present on the farm are dehorned or disbudded. The same principle is applied to tail docking.

		Method	Use of medicines	Scores	
Dehorning	[Nothing (neither disbudding nor dehorning)		100	
		Disbudding (i.e. performed on a young animal)	Thermal	Nothing →	28
				Anaesthetic →	52
				Analgesic →	49
				Anaesthetic + Analgesic →	75
		Dehorning (i.e. horn cut on an adult, not considering cases when dehorning is motivated by medical reasons (e.g. a cow which broke one horn itself) and then done surgically)	Chemical	Nothing →	20
				Anaesthetic →	39
				Analgesic →	41
				Anaesthetic + Analgesic →	58
		Dehorning (i.e. horn cut on an adult, not considering cases when dehorning is motivated by medical reasons (e.g. a cow which broke one horn itself) and then done surgically)	Surgery	Nothing →	2
				Anaesthetic →	14
				Analgesic →	13
Anaesthetic + Analgesic →	22				

Figure 23 Scores attributed to combinations of answers to questions on dehorning.

		Method	Use of medicines	Scores
Tail Docking	[Nothing		100
		Rubber ring	Nothing →	3
			Anaesthetic →	21
			Analgesic →	19
			Anaesthetic + Analgesic →	28
		Surgery	Nothing →	0
			Anaesthetic →	19
			Analgesic →	16
Anaesthetic + Analgesic →	33			

Figure 24 Scores attributed to combinations of answers to questions on tail docking.

6.2.1.9 Expression of social behaviours

According to experimental studies, the absolute maximum expected is an average of 5 agonistic encounters per cow per hour, including 3.4 displacements and 1.6 head butts. A weighted sum is calculated, with 4 the weight of head butts and 11 that of displacements. The theoretical maximum of this sum is 43.8 (4x1.6 head butts + 11 x 3.4 displacements). To obtain an index between 0 and 100 (with 0-worst and 100-best), the sum is transformed into an index as follows:

$$\text{Index for social behaviour } I = 100 \times [(43.8) - (4(\text{head butts}) + 11(\text{displacements}))]/43.8$$

A spline function is used to compute the index into a score (Figure 25), with the general formula:

$$\text{Score} = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	70
a when I < knot	0
a when I > knot	92.1225251801
b when I < knot	0.3919305016
b when I > knot	-3.5561777144
c when I < knot	-0.0055990072
c when I > knot	0.0508025387
d when I < knot	0.0001240486
d when I > knot	-0.0001445301

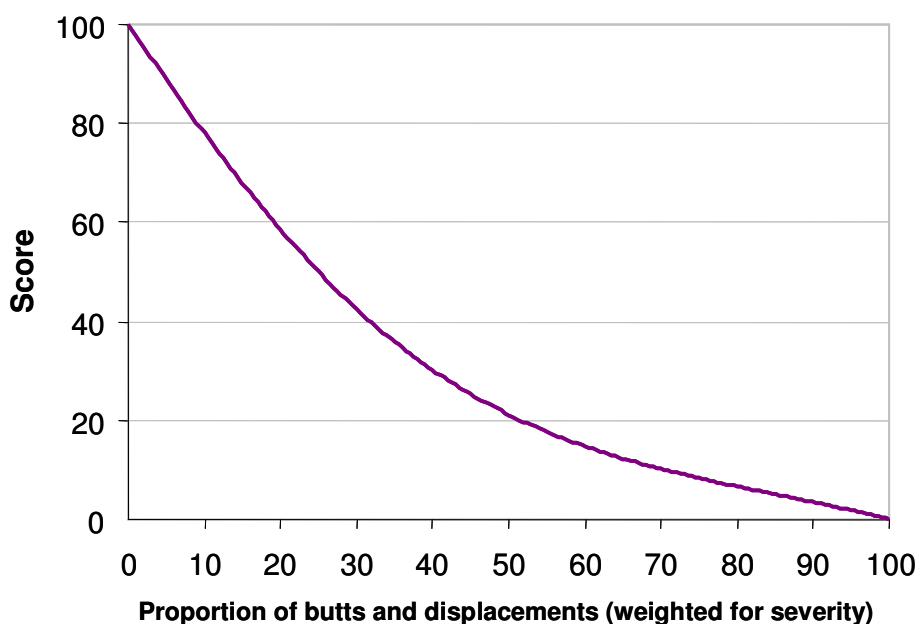


Figure 25 Calculation of scores for the expression of social behaviour according to the frequency of head butts and displacements (weight: 0.36 for butts and 1 for displacements) and in comparison to an extreme situation with 1.6 butts and 3.4 displacements.

6.2.1.10 Expression of other behaviours

The % days per year with at least 6 h at pasture is considered.

A spline function is used to compute the index into a score (Figure 26), with the general formula:

$$\text{Score} = a + b \times l + c \times l^2 + d \times l^3$$

with a, b, c, d differing when l is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	50
a when l < knot	0
a when l > knot	-37.3194755012
b when l < knot	1.7752743048
b when l > knot	4.0144428355
c when l < knot	-0.0009243370
c when l > knot	-0.0457077076
d when l < knot	-0.0001056035
d when l > knot	0.0001929523

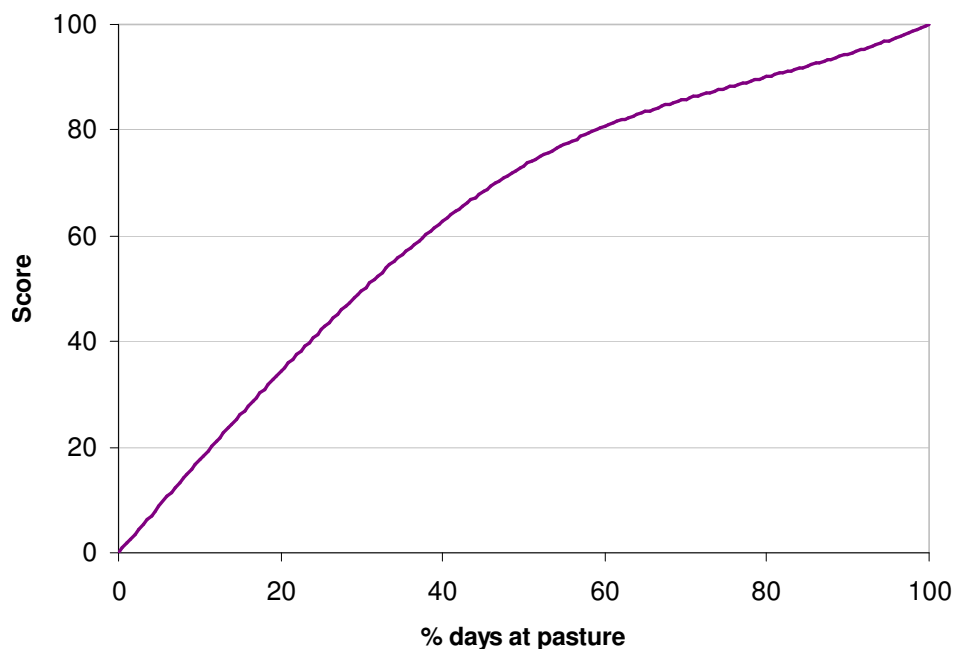


Figure 26 Calculation of scores for the expression of other behaviours according to the proportion of days per year spent at pasture.

6.2.1.11 Good human-animal relationship

Four categories of animals are distinguished and the % of animals in each of them are combined in a weighted sum, with the following weights:

- 0 for animals that can be touched (Avoidance Distance (AD) = 0),
- 3 for animals that can be approached closer than 50 cm but not touched ($0 < AD \leq 50$),
- 11 for animals that can be approached as closely as 100 cm to 50 cm ($50 < AD \leq 100$),

- 26 for animals that cannot be approached as closely as 100 cm (AD > 100). This sum is computed into an index that varies from 0 (worst situation) to 100 (best situation):

$$\text{Index for good human-animal relationship } I = \left(100 - \frac{3(\%cat2) + 11(\%cat3) + 26(\%cat4)}{26} \right)$$

A spline function is used to compute the index into a score (Figure 27), with the general formula:

$$\text{Score} = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	70
a when I < knot	0
a when I > knot	-247.7002454443
b when I < knot	0.7221171736
b when I > knot	11.3378420026
c when I < knot	-0.0103159596
c when I > knot	-0.1619691718
d when I < knot	0.0001114496
d when I > knot	0.0008336078

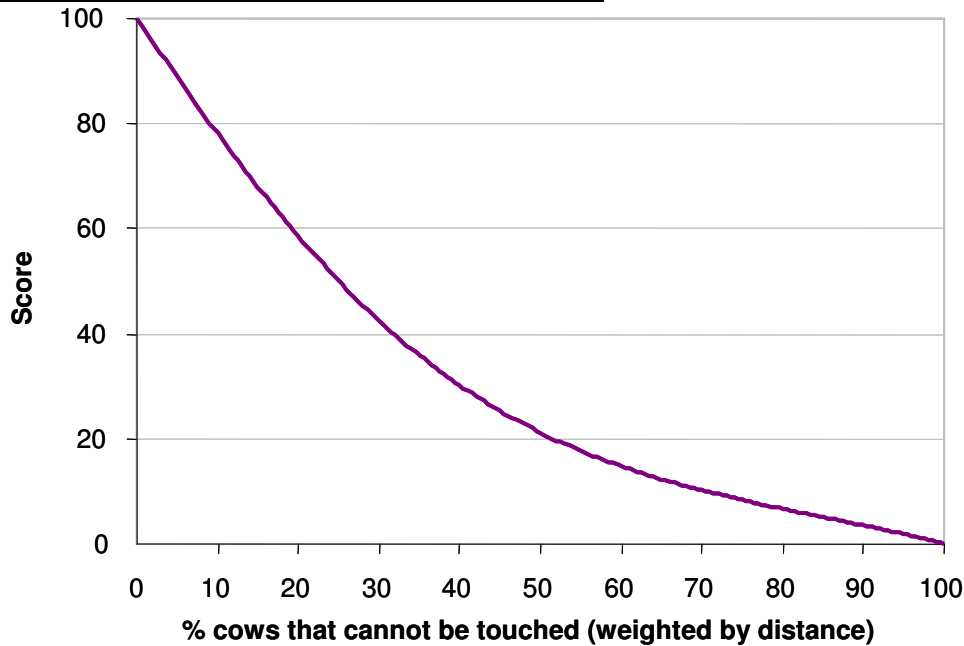


Figure 27 Calculation of scores for good human-animal relationship according to the proportion of animals that cannot be touched (weight: 0.12, 0.42 and 1 for animals with approach distances less than 50 cm, less than 100 cm, or more than 100 cm)

6.2.1.12 Positive emotional state

The values (between 0 and 125) obtained by a farm for the 20 terms of the Qualitative Behaviour Assessment are turned into an index using a weighted sum:

$$Index = -3.40496 + \sum_{k=1}^{20} w_k N_k$$

with N_k , the value obtained by a farm for a given term k
 w_k , the weight attributed to a given term k

The weights of the various terms in this sum are:

Terms	Weights
active	0.00768
relaxed	0.01004
fearful	-0.01286
agitated	-0.01620
calm	0.00881
content	0.01213
indifferent	-0.01116
frustrated	-0.01609
friendly	0.01172
bored	-0.01087
playful	0.00109
positively occupied	0.01183
lively	0.00028
inquisitive	0.00048
irritable	-0.02182
uneasy	-0.01032
sociable	0.00527
apathetic	-0.01562
happy	0.01468
distressed	-0.02027

A spline function is used to compute the index into a score (Figure 28), with the general formula:

$$Score = a + b \times I + c \times I^2 + d \times I^3$$

with a, b, c, d differing when I is lower or equal to a specific value (called knot) vs. equal or higher than this value.

The values for a, b, c, d and the knot are:

knot	0
a when I < knot	50
a when I > knot	50
b when I < knot	8.75
b when I > knot	11.6667
c when I < knot	0.3125
c when I > knot	-0.55556
d when I < knot	0
d when I > knot	0

In addition the score can vary only between 0 and 100. Therefore:

if a calculation brings a value below 0 then Score = 0

if a calculation brings a value above 100 then Score = 100

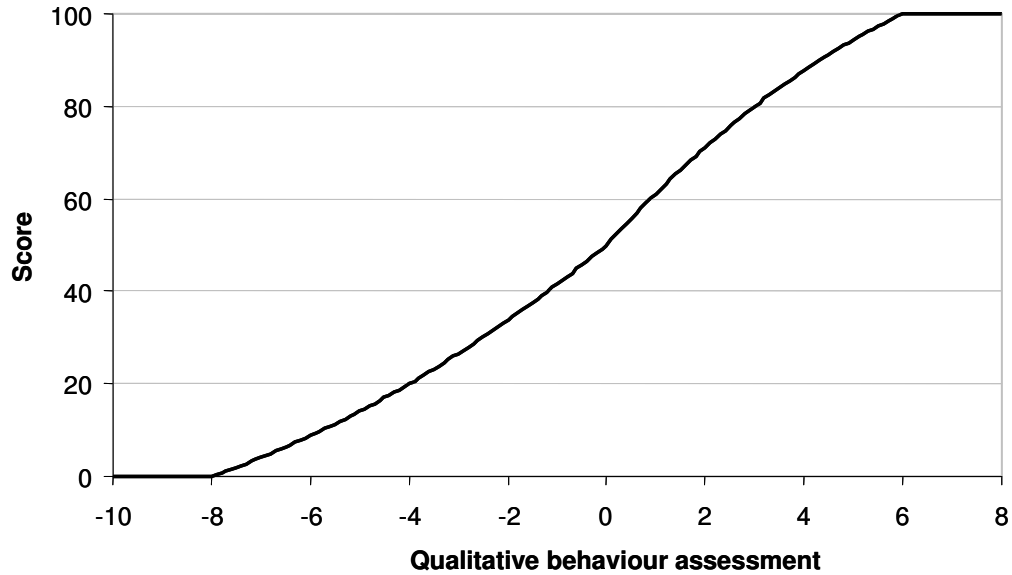


Figure 28 Calculation of scores for positive emotional state according to the values the farm obtained for the various terms used in qualitative Behaviour Assessment (combined in a weighted sum).

6.2.2 Principle scores

Criterion-scores are combined to form principle-scores thanks to Choquet integrals. The parameters of the integrals are given below for each principle.

Principle Good feeding

μ_1	μ_2
0.12	0.27

with 1, Absence of prolonged hunger and 2, Absence of prolonged thirst

Principle Good housing

μ_3	μ_4	μ_5
0.15	0.11	0.12

μ_{34}	μ_{35}	μ_{45}
0.34	0.43	0.37

with 3, Comfort around resting; 4, Thermal comfort; 5, Ease of movement

Thermal comfort is not assessed in dairy cows. The missing criterion-score is replaced by the best score among Comfort around resting and Ease of movement.

Principle Good health

μ_6	μ_7	μ_8
0.11	0.24	0.13

μ_{67}	μ_{68}	μ_{78}
0.42	0.24	0.24

with 6, Absence of injuries; 7, Absence of disease; 8, Absence of pain induced by management procedures

Principle Appropriate behaviour

μ_9	μ_{10}	μ_{11}	μ_{12}
0.10	0.07	0.12	0.17
μ_{910}	μ_{911}	μ_{912}	
0.12	0.12	0.18	
μ_{1011}	μ_{1012}	μ_{1112}	
0.15	0.19	0.27	
μ_{91011}	μ_{91012}	μ_{91112}	μ_{101112}
0.42	0.49	0.52	0.48

with 9, Expression of social behaviours; 10, Expression of other behaviours; 11, Good human-animal relationship; 12, Positive emotional state.

- Due to the positive values of the interactions between criterion-scores, the principle-scores are always intermediate between the lowest and the highest values obtained at criterion level, and always closer to the minimum value.
- Within each principle, some criteria are considered more important than others (and will contribute to a large extent to the principle-score):
- Within principle “Good feeding”, Criterion “Absence of prolonged thirst” is considered more important than Criterion “Absence of prolonged hunger”.
- Within principle “Good housing”, Criterion “Ease of movement” and Criterion “Comfort around resting” are considered more important than Criterion “Thermal comfort”.
- Within principle “Good health”, Criterion “Absence of disease” is considered more important than Criterion “Absence of injuries” which in turn is considered more important than Criterion “Absence of pain induced by management procedures”.
- Within principle “Appropriate behaviour”, the order of importance of criteria is: “Positive emotional state” (most important), “Good human-animal relationship”, “Expression of social behaviours”, “Expression of other behaviours” (least important).

Examples of principle-scores resulting from criterion-scores are provided in Tables 17 to 20 below.

Table 17 Examples of scores for “Good feeding” according to combinations of Criterion-scores for “Absence of prolonged hunger” and “Absence of prolonged thirst”.

CRITERIA		PRINCIPLE
ABSENCE OF HUNGER	ABSENCE OF THIRST	GOOD FEEDING
25	75	39
40	60	45
50	50	50
60	40	42
75	25	31

Table 18 Examples of scores for “Good housing” according to combinations of Criterion-scores for “Comfort around resting”, “Thermal comfort”, and “Ease of movement”.

Criteria			Principle
Comfort around resting	Thermal comfort	Ease of movement	Good housing
25	50	75	37
25	75	50	37
50	25	75	39
75	25	50	40
40	50	60	45
40	60	50	45
50	40	60	46
50	50	50	50
50	75	25	36
75	50	25	37
50	60	40	45
60	40	50	46
60	50	40	45

Table 19 Examples of scores for “Good health” according to combinations of criterion-scores for “Absence of injuries” “Absence of disease”, and “Absence of pain induced by management procedures”.

Criteria			Principle
Absence of injuries	Absence of disease	Absence of pain induced by management procedures	Good health
25	50	75	34
25	75	50	37
50	25	75	34
75	25	50	34
40	50	60	44
40	60	50	45
50	40	60	44
50	50	50	50
50	75	25	42
75	50	25	38
50	60	40	47
60	40	50	44
60	50	40	45

Table 20 Examples of scores for “Appropriate behaviour” according to combinations of Criterion-scores for “Expression of social behaviours”, “Expression of other behaviours”, “Good human-animal relationship”, and “Positive emotional state”.

Criteria	Expression of social behaviours	Expression of other behaviours	Good human-animal relationship	Positive emotional state	Principle Appropriate behaviour
35	35	65	65	43	
35	50	50	65	45	
35	50	65	50	44	
35	65	35	65	41	
35	65	50	50	43	
35	65	65	35	40	
50	35	50	65	45	
50	35	65	50	45	
50	50	35	65	45	
50	50	50	50	50	
50	50	65	35	43	
50	65	35	50	43	
50	65	50	35	42	
65	35	35	65	40	
65	35	50	50	44	
65	35	65	35	39	
65	50	35	50	44	
65	50	50	35	43	
65	65	35	35	39	

6.2.3 Overall assessment

The synthesis of the four principle-scores into an overall assessment is carried out in a similar way for all animal types. The overall assessment is explained in Chapter 4.

6.3 Collection of data for dairy cows at slaughterhouse

As yet, this is not included in the protocol.

6.4 Calculation of scores for dairy cows at slaughterhouse

As yet, this is not included in the protocol.

Annex A: Guidelines for visit to the animal unit

Fattening cattle

Since data recording starts after the morning feeding, it is important to know the farm routines and to know the timing of the farm routines. This is further explained in paragraph 5.1.5. The following basic information needed in advance for the planning of the farm visit.

- Routine times for morning feeding
- Presence and use of headlocks/locking feed barrier
- Access to an outdoor run
- Any possible interfering activities planned for the day of your farm visit (e. g. regrouping of animals, visit of the vet)
- Availability of the animal unit manager during the visit
- Layout of the barn

When arriving at the farm, the assessor should first become familiar with the facilities (pens/houses, potential observation points, etc). Any disturbance of the animals should be avoided as far as possible at this time. For some of the measures, input from the animal unit manager is required. An appointment with animal unit manager should be planned taking into account the timing of the animal-based measures.

Dairy

Since data recording starts after the morning milking, it is important to know the farm routines and to know the timing of the farm routines. It may be necessary to choose a random sample of cows during the milking. This is further explained in paragraph 6.1.5. Some basic information is needed in advance for the planning of the farm visit:

- Number of groups of lactating cows and dry cows present at the farm and respective number of cows per group
- Presence of dry cows and pregnant heifers with lactating animals
- Presence of a bull, running with the herd and possibilities to separate it from the herd
- Routine times for feeding and milking and daily morning routines
- Presence and use of headlocks/locking feed barrier
- Access to pasture
- Date of last claw trimming. There should be a period of at least 4 weeks between the last routine claw trimming and the farm visit.
- Any possibly interfering activities planned for the day of your farm visit (e. g. regrouping of animals, visit of a breeding adviser)
- Availability of the animal unit manager during visit
- If possible, information on somatic cell count
- Layout of the barn

Calves

is the following basic information is needed in advance for the planning of the farm visit.

- Number of calves, number of calves per pen
- Date of arrival of the calves (to plan the observation days)

- Routine times for feeding (observations have to be performed between the morning and the afternoon feeding)
- Layout of the barn, location of the sickbay, numbering of pens (give numbers to pens)
- Any possible interfering activities planned for the day of your farm visit (e. g. regrouping of animals, visit of a vet)

Annex B: Recording sheets (RS)

B1. Recording Sheets for fattening cattle on farm

Audit Protocol Instruction: Fattening cattle on farm

Name	
Date	
Farm name	
Number of fattening cattle with live weight 200-350 kg on site (at the time of the visit)	
Number of pens with animals 200-350 kg	
Number of fattening cattle with live weight >350 kg on site (at the time of the visit)	
Number of pens with animals >350 kg	
Most prevalent breed	

1) Avoidance distance at the feeding place

Avoidance distance at the feeding place

group /pen	collar no.	ear tag no.	test 1	test 2 (retest)	remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Farm: _____
 Assessor: _____
 Date: _____
 Page: _____

13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

2) Qualitative Behaviour Assessment

Visual Analogue Scale VAS for Qualitative Behaviour Assessment in Fattening cattle

NAME: _____

Date: _____

Time of day: _____

Farm: _____

Housing unit: _____

No. of animals in unit: _____

Breed: _____

Brief description of system and unit (e.g. indoor/outdoor areas, bedding, enrichment, lighting, feeding system, etc.). Please be sure that the lines of the QBA measures are 125 mm.

Please observe the animals in the unit for 10-20 minutes, and then assess their behavioural expression ('body language') by scoring the following terms:

Active Min. _____ Max.

Relaxed Min. _____ Max.

Fearful Min. _____ Max.

Agitated Min. _____ Max.

Calm Min. _____ Max.

Content Min. _____ Max.

Indifferent Min. _____ Max.

Frustrated Min. _____ Max.

Friendly Min. _____ Max.

Bored Min. _____ Max.

Playful Min. _____ Max.

Page:

Assessor:

Date:

Farm:

Page: _____

Assessor: _____

Date: _____

Farm: _____

Positively occupied Min. _____ Max. _____

Lively Min. _____ Max. _____

Inquisitive Min. _____ Max. _____

Irritable Min. _____ Max. _____

Calmless/
Uneasy Min. _____ Max. _____

Sociable Min. _____ Max. _____

Apathetic Min. _____ Max. _____

Happy Min. _____ Max. _____

Distressed Min. _____ Max. _____

General comments or observations:

3) Behavioural observations

Time needed for lying down

FARMER: _____ DATE: _____ OBSERVER: _____ PAG _____
E

	duration sec
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Observation of social behaviour (agonistic/cohesive)/coughing

Farm: _____ Date: _____ Assessor: _____ Page: _____

Observation of social behaviour (agonistic/cohesive)/coughing

Segment									
Weight Class									
Start-End									
Duration (min.)									
Total numbers of animals									
Social behaviour	Headbutt								
	Displacement								
	Fighting								
	Chasing								
	Chasing Up								
	Social Licking								
Horning									
Health	Coughing								
	Remarks								

4) Clinical scoring

Farm:																					
Pen no.	Total no. of animals in pen																				
ID animal																					
FL=front leg, RL=rear leg, B=body	FL	RL	B	FL	RL	B	FL	RL	B	FL	RL	B	FL	RL	B	FL	RL	B	FL	RL	B
No. hairless spots																					
No. lesions/swellings																					
Dirty																					
Very lean																					
Nasal discharge																					
Ocular discharge																					
Hampered respiration																					
Diarrhoea																					
Bloated rumen																					
Lameness ¹			n			n			n			n			n			n			n

1: n = not visible

Farm: _____ Assessor: _____ Date: _____ Page: _____

5) Resources checklist

Farm-ID: Date: Assessor:

Pen no.:		
Number of animals		
Size of pen		
Length m	
Width m	
Water points		
Number of animals using water points	
Water point 1 Type	<input type="checkbox"/> trough <input type="checkbox"/> tip-over trough <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers	length cm length cm
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes	
Water point 2 Type	<input type="checkbox"/> trough <input type="checkbox"/> tip-over trough <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers	length cm length cm
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes	
Water point 3 Type	<input type="checkbox"/> trough <input type="checkbox"/> tip-over trough <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers	length cm length cm
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes	
Water point 4 Type	<input type="checkbox"/> trough <input type="checkbox"/> tip-over trough <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers	length cm length cm
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes	
Water point 5 Type	<input type="checkbox"/> trough <input type="checkbox"/> tip-over trough <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers	length cm length cm
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes	

6) Management questionnaire

Farm: _____

Date: _____ Assessor: _____

Management questionnaire – fattening cattle

Tick NA if question not appropriate to housing system

1	<p>Access to pasture</p> <p>How long do the animals have access to pasture on average? days / year (0-365); hours / day</p> <p>Did the animals have access to pasture for at least 3 months before fattening? <input type="checkbox"/>yes <input type="checkbox"/>no</p>
2	<p>Access to an outdoor run</p> <p>How long do the animals have access to an outside run on average? days / year (0-365); hours / day</p>
3	<p>Disbudding/dehorning</p> <p>What percentage animals is disbudded/dehorned?%</p> <p>Are the animals disbudded/dehorned on the farm? <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> NA</p> <p><i>If yes:</i></p> <p>Disbudding:</p> <p>Age: weeks</p> <p>Method: <input type="checkbox"/> thermocautery <input type="checkbox"/> caustic paste</p> <p>Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>Dehorning:</p> <p>Age: weeks/months</p> <p>Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If animals are not dehorned/disbudded on farm: Do you know how they are disbudded/dehorned?</i> <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If yes:</i></p> <p>Disbudding:</p> <p>Age: weeks</p> <p>Method: <input type="checkbox"/> thermocautery <input type="checkbox"/> caustic paste</p> <p>Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>Dehorning:</p> <p>Age: weeks/months</p> <p>Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p>

5	<p>Tail docking</p> <p>How many animals are tail-docked?%</p> <p>Are the animals tail-docked on the farm? <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If yes:</i></p> <p> Age: weeks/months</p> <p> Method: <input type="checkbox"/> rubber ring <input type="checkbox"/> surgery</p> <p> Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If animals are not tail-docked on farm:</i></p> <p>Do you know how they are tail-docked? <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If yes:</i></p> <p> Age: weeks/months</p> <p> Method: <input type="checkbox"/> rubber ring <input type="checkbox"/> surgery</p> <p> Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p>
6	<p>Castration</p> <p>How many animals are castrated? %</p> <p>Are the animals castrated on the farm? <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> NA</p> <p><i>If yes:</i></p> <p> Age: weeks/ months</p> <p> Method: <input type="checkbox"/> surgery <input type="checkbox"/> rubber rings <input type="checkbox"/> Burdizzo</p> <p> Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If animals are not castrated on farm:</i></p> <p>Do you know how they are castrated? <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If yes:</i></p> <p> Age: weeks/ months</p> <p> Method: <input type="checkbox"/> surgery <input type="checkbox"/> rubber rings <input type="checkbox"/> Burdizzo</p> <p> Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p>
7	<p>Mortality rate</p> <p>How many animals died on the farm or were euthanized due to disease or accidents during the last 12 months? animals</p> <p>What is the average number of animals with a weight of more than 200 kg live weight in the animal unit? animals</p>

B2. Recording Sheets for fattening cattle at slaughter

Not included within the protocol at the moment.

B3. Recording Sheets for dairy cattle on farm

Audit Protocol Instruction: Dairy cattle on farm

Name	
Date	
Farm name	
Number of dairy cows and heifers kept with dairy cows on site (at the time of the visit, including dry cows)	
Number of dry cows (at the time of the visit)	
Breed	

1) Avoidance distance at the feeding place

Avoidance distance at the feeding place

group/pen	collar no.	ear tag no.	test 1	test 2 (retest)	remarks
1					
2					
3					
4					
5					
6					
7					
8					
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10					
11					
12					
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28					
29					
30					

Page: _____

Observer: _____

Date: _____

Farm: _____

2) Qualitative Behaviour Assessment

Visual Analogue Scale VAS for Qualitative Behaviour Assessment in Dairy cattle

Page:

NAME: _____

Date: _____

Time of day: _____

Farm: _____

Housing unit: _____

No. of animals in unit: _____

Breed: _____

Brief description of system and unit (e.g. indoor/outdoor areas, bedding, enrichment, lighting, feeding system, etc.). Please be sure that the lines of the QBA measures are 125 mm.

Please observe the animals in the unit for 10-20 minutes, and then assess their behavioural expression ('body language') by scoring the following terms:

Active Min. _____ Max.

Relaxed Min. _____ Max.

Fearful Min. _____ Max.

Agitated Min. _____ Max.

Calm Min. _____ Max.

Content Min. _____ Max.

Indifferent Min. _____ Max.

Frustrated Min. _____ Max.

Friendly Min. _____ Max.

Bored Min. _____ Max.

Playful Min. _____ Max.

Assessor:

Date:

Farm:

Positively occupied	Min.	Max.
Lively	Min.	Max.
Inquisitive	Min.	Max.
Irritable	Min.	Max.
Calmless/ Uneasy	Min.	Max.
Sociable	Min.	Max.
Apathetic	Min.	Max.
Happy	Min.	Max.
Distressed	Min.	Max.

General comments or observations:

3) Behaviour observations

**Time needed for lying down and collisions
with housing equipment**

	Duration sec	collision with housing equipment		
		yes	no	not observed/ heard
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

PAGE

OBSERVER:

DATE:

FARMER:

Observation of social behaviour and coughing (loose housed dairy cattle)

FARMER: _____ DATE: _____ OBSERVER: _____ PAGE --

Segment	Pen	START -- END	Duration (min)	Segment scan						AGONISTIC					HEALTH				
				STANDING	FEEDING or DRINKING	LYING	SUM	LYOUT	LYOUT no statement	HEADBUTT	DISPLACEMENT	FIGHTING	CHASING	CHASING UP	COUGHING	remarks			

¹ Lying outside = lying partly or completely outside the lying area

Observation of social behaviour and coughing (dairy cattle in tie stalls)

FARMER: _____ DATE: _____ OBSERVER: _____ PAGE --

Segment	Pen	START -- END	Duration (min)	Segment scan					AGONISTIC			HEALTH							
				NOT LYING	LYING	SUM	LYOUT	LYOUT no statement	HEADBUTT	DISPLACEMENT	CHASING UP	COUGHING	remarks						

¹ Lying outside = lying partly or completely outside the lying area

4) Clinical scoring

Loose housed dairy cattle

Farm: _____ Date: _____ Observer: _____ Page: _____

Transponder no.			
Eartag no.			
Breed	dairy	dual purpose	
Body condition score	0	1	2
Cleanliness			
Legs	0	2	
Flank	0	2	
Udder	0	1	2
Integument	Hairless	Lesion	Swelling
Tarsus			
Hindquarter			
Neck/shoulder/back			
Carpus			
Flank/side/udder			
Other			
Clinical signs			
Nasal discharge	0	2	
Ocular discharge	0	2	
Hampered respiration	0	2	
Diarrhoea	0	2	
Vulvar discharge	0	2	
Lameness	0	1	2

Dairy cattle in tie stalls

Farm: _____ Date: _____ Observer: _____ Page: _____

Transponder no.			
Eartag no.			
Breed	dairy	dual purpose	
Body condition score	0	1	2
Cleanliness			
Legs	0	2	
Flank	0	2	
Udder	0	1	2
Lameness	Resting a foot	0	1
0	Standing on edge	0	1
2	Stepping	0	1
	Reluctance	1	1
Integument	Hairless	Lesion	Swelling
Tarsus			
Hindquarter			
Neck/shoulder/back			
Carpus			
Flank/side/udder			
Other			
Clinical signs			
Nasal discharge	0	2	
Ocular discharge	0	2	
Hampered respiration	0	2	
Diarrhoea	0	2	
Vulvar discharge	0	2	

5) Resources checklist

Loose housed dairy cattle

Farm-ID: Date: Assessor:

Pen no.:	
Number of animals	
Number of water points per pen	
Number of animals using water points	
Water point 1 Type	<input type="checkbox"/> trough length cm <input type="checkbox"/> tip-over trough length cm <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes
Are water points functioning?	<input type="checkbox"/> no <input type="checkbox"/> yes
Water flow	<input type="checkbox"/> <18l/min <input type="checkbox"/> >18l/min <input type="checkbox"/> trough/tip-over-tr.
Water point 2 Type	<input type="checkbox"/> trough length cm <input type="checkbox"/> tip-over trough length cm <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes
Are water points functioning?	<input type="checkbox"/> no <input type="checkbox"/> yes
Water flow	<input type="checkbox"/> <18l/min <input type="checkbox"/> >18l/min <input type="checkbox"/> trough/tip-over-tr.
Water point 3 Type	<input type="checkbox"/> trough length cm <input type="checkbox"/> tip-over trough length cm <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes
Are water points functioning?	<input type="checkbox"/> no <input type="checkbox"/> yes
Water flow	<input type="checkbox"/> <18l/min <input type="checkbox"/> >18l/min <input type="checkbox"/> trough/tip-over-tr.
Water point 4 Type	<input type="checkbox"/> trough length cm <input type="checkbox"/> tip-over trough length cm <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes
Are water points functioning?	<input type="checkbox"/> no <input type="checkbox"/> yes
Water flow	<input type="checkbox"/> <18l/min <input type="checkbox"/> >18l/min <input type="checkbox"/> trough/tip-over-tr.

Water point 5 Type	<input type="checkbox"/> trough <input type="checkbox"/> tip-over trough <input type="checkbox"/> bowl <input type="checkbox"/> bowl with reservoir <input type="checkbox"/> trough with balls/anti-frost <input type="checkbox"/> nipple drinkers	length cm length cm
Cleanliness	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes	
Are water points functioning?	<input type="checkbox"/> no <input type="checkbox"/> yes	
Water flow	<input type="checkbox"/> <18l/min <input type="checkbox"/> >18l/min <input type="checkbox"/> trough/tip-over-tr.	

Dairy cattle in tie stalls:

Farm-ID: Date: Assessor:

Number of animals	
Average number of animals using one water point
Type of water points	<input type="checkbox"/> bowl: diameter cm <input type="checkbox"/> bowl with reservoir: diameter cm
Are water points clean?	<input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/> yes
Are water points functioning?	<input type="checkbox"/> no <input type="checkbox"/> yes
Water flow	<input type="checkbox"/> <18l/min <input type="checkbox"/> >18l/min <input type="checkbox"/> trough/ tip-over-tr.

6) Management questionnaire

Farm: _____ Date: _____ Assessor: _____

Management questionnaire – dairy cattle

Tick NA if question not appropriate to housing system

3	<p>Number of animals</p> <p>What is the annual average number of dairy cows and heifers kept with dairy cows in the animal unit?</p> <p style="text-align: center;">..... Animals</p>
1	<p>Access to pasture</p> <p>How long do the animals have access to pasture on average?</p> <p style="text-align: center;">..... days / year (0-365); hours / day</p>
2	<p>Access to an outdoor run</p> <p>How long do the animals have access to an outside run on average?</p> <p style="text-align: center;">..... days / year (0-365); hours / day</p>
3	<p>Dystocia (if no herd records available)</p> <p>How many dairy cows or heifers kept with dairy cows suffered from dystocia during the last 12 months?</p> <p style="text-align: center;">..... animals</p>
4	<p>Downer cows (if no herd records available)</p> <p>How many dairy cows or heifers kept with dairy cows have been diagnosed as downer cows during the last 12 months?</p> <p style="text-align: center;">..... animals</p>
5	<p>Mortality rate (if no herds record available)</p> <p>How many dairy cows or heifers kept with dairy cows died on the farm or were euthanized due to disease or accidents during the last 12 months?</p> <p style="text-align: center;">..... animals</p>
6	<p>Disbudding/dehorning</p> <p>How many animals are disbudded/dehorned?%</p> <p>Are the animals disbudded/dehorned on the farm? <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> NA</p> <p><i>If yes:</i></p> <p>Disbudding:</p> <p>Age: weeks</p> <p>Method: <input type="checkbox"/> thermocautery <input type="checkbox"/> caustic paste</p> <p>Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>Dehorning:</p> <p>Age: weeks/months</p> <p>Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p>

	<p><i>If animals are not dehorned/disbudded on farm:</i></p> <p>Do you know how they are dehorned/disbudded? <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If yes:</i></p> <p>Disbudding: Age: weeks Method: <input type="checkbox"/> thermocautery <input type="checkbox"/> caustic paste Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>Dehorning: Age: weeks/months Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p>
7	<p>Tail docking</p> <p>How many animals are tail-docked? %</p> <p>Are the animals tail-docked on the farm? <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If yes:</i></p> <p>Age: weeks/months Method: <input type="checkbox"/> rubber ring <input type="checkbox"/> surgery Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If animals are not tail-docked on farm:</i></p> <p>Do you know how they are tail-docked? <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p><i>If yes:</i></p> <p>Age: weeks/months Method: <input type="checkbox"/> rubber ring <input type="checkbox"/> surgery Analgesics: <input type="checkbox"/> yes <input type="checkbox"/> no</p>

B4. Recording Sheet for dairy cattle at slaughter

Not included within the protocol at the moment

B5. Recording Sheets for veal calves on farm

Not included within the protocol at the moment

B6. Recording Sheets for veal calves at slaughter

Post mortem observation: Abomasum

Page: _____
 Assessor: _____
 Date: _____
 Farm: _____

No.	Pyloric area			Torus pylorus
	lesion present ¹	Lesion size		lesion present ¹
		1*	2*	3*
1				
2				
3				
4				
5				
6				
7				
8				
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27				
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29				
30				

No.	Pyloric area			Torus pylorus
	lesion present ¹	Lesion size		lesion present ¹
		1*	2*	3*
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
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56				
57				
58				
59				
60				

¹: indicate presence (1) or absence (0)
 *: indicate the number of lesions as 0, 1, 2, 3 or 4 (=4 and more)

Post mortem observation: Lungs

No. calf	No.	pneumonia ²			pleuritis present ¹
		none 0	minimum 1	mild 2	
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
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	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				

		pneumonia ²				pleuritis
No. calf	No.	none 0	minimum 1	mild 2	severe 3	present ¹
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
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	57					
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	59					
	60					
	61					
	62					
	63					
	64					
	65					
	66					

No. calf	No.	pneumonia ²				pleuritis
		none 0	minimum 1	mild 2	severe 3	present ¹
	67					
	68					
	69					
	70					
	71					
	72					
	73					
	74					
	75					
	76					
	77					
	78					
	79					
	80					
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	91					
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	93					
	94					
	95					
	96					
	97					
	98					
	99					
	100					

¹: indicate presence (1) or absence (0)

²: tick the corresponding box

Annex C: Contributors to Welfare Quality®

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NEN (Netherlands Standardization Institute)**The Netherlands**

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Colophon

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