Welfare Quality
Assessment protocol for veal calves

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Version 2.0	Date: 2016/10	Contributor of the version: E Mainau Brunso; X Manteca; M Brscic; M Kirchner	Reviewed by: Welfare Quality Network
	Modification form the previous version: Typos were corrected Calves protocol was removed. It will be added again when amended.		
Version 3.0	Date: 2023/11	Contributor of the version: R Lardy, H Leruste, I Veissier	Reviewed by: M Brscic and Welfare Quality Network
	Modification form the previous version: The protocol for cattle is now split in three protocols (fattening cattle; dairy cows; veal calves) In Section 'Background to the Welfare Quality protocols': - Change of explanation Box 4, 5, and 6 A new version of the protocol for calves is released with changes in the way several criteria are assessed. The changes are based on the work performed by WUR, ISA-Lille and Padova univ. (K. Van Reenen, J. Lensink, H. Leruste, M. Brscic, G. Cozzi). The scoring model was adapted by INRAE and Univ. Padova (R. Botreau, I. Veissier, R. Lardy, M. Brscic) to the new set of measures. - Comfort around resting: The measure 'calves with no keg stretched' is removed. The measures 'bursae' is added - Absence of injuries: The measure 'Combined lesions (hard skin, claw lesions, joint lesions, bursae, bitten tail/ear) is removed, the measure 'bitten tail/ear' is added - Absence of disease: The measure 'ocular discharge' is removed, the measure 'haemoglobin' is added - Expression of social behaviour: The measure 'locomotor play' is removed, the measure 'urine drinking signs' is added - Good human-animal relationship: during the avoidance distance/calf escape test, only the proportion of calves that can be touched is considered - The calculation of calf mortality is now detailed.		

	- The parameters for all spline functions are now given with more precision (more than 20 decimals) to allow exact calculations.		
Version 3.1	Date: 2023/11	Contributor of the version: R Lardy	Reviewed by: L. Aubé and Welfare Quality Network
	Correction of the equation for 5.3.1.9 Expression of social behaviours When I≤80 then Score = (0.172610241562739 x I) + (-0.00971074033269292 x I2) + (0.000188827826822316 x I3) Correction of the associated figure		

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The text represents the authors' views and does not necessarily represent a position of the Commission who will not be liable for the use made of such information".

Disclaimer
Restrictions on use of the integrated Welfare Quality system

This document presents the practical assessment protocols required to carry out a Welfare Quality assessment. The practical application and integrity of this system depends upon the following;

- **Training and validation** in the methods and protocols is **essential**. It is recommended to consult the website for finding training opportunities http://www.welfarequalitynetwork.net

- Ownership or possession of these assessment documents alone does not indicate capability to carry out assessment without adequate approved training.

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This document presents version 3 of the assessment protocol for cattle.

September, 2023

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, injuries, behaviour, etc.). Other approaches existing at that time largely concentrated on design or management-based characteristics (e.g. size of cage or pen, flooring specifications, handling, 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 describes 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.

This report has been initially edited by Christoph Winckler (Universität für Bodenkultur Wien), Bo Algers (Sveriges Lantbruksuniversitet), Kees van Reenen (Wageningen Universiteit) and Hélène Leruste (Groupe ISA) for the species specific parts. Furthermore Isabelle Veissier (Institut National de la Recherche Agronomique) and Linda Keeling (Sveriges Lantbruksuniversitet) edited the introductory parts of the document, and the English edit was carried out by Andy Butterworth (University of Bristol). Isabelle Veissier also contributed to the development of the calculation systems. Gwen van Overbeke and Vere Bedaux (NEN, Netherlands Standardization Institute) supported the writing and editing of the protocol. The version 2 has been edited by Marlene K. Kirchner (Copenhagen University), Eva Mainau Brunso (IRTA, Girona), Xavier Manteca (University Barcelona), Marta Brscic (University Padova). The current version (3.0) has been edited by Romain Lardy, and Isabelle Veissier for INRAE.

This version of the Welfare Quality protocols for cattle reflects the present scientific status of the Welfare Quality Network, but will be subjected to an on-going process of updating and revision since all protocols are considered 'living documents'.

Dr Antoni Dalmau (Coordinator Welfare Quality Network)
Girona, September 2023

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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. Surveys carried out by the European Commission[1] as well as studies within the Welfare Quality project[2], 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 status[3].

In January 2006 the European Commission adopted a Community Action Plan on the Protection and Welfare of Animals[4]. The Action Plan outlined the Commission's planned initiatives and measures to improve the protection and welfare of animals for the period 2006-2010. The Action Plan aimed to ensure that animal welfare was addressed in the most effective manner possible, in all EU sectors and through EU relations with Third Countries. Among other things the Action Plan foresaw 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 foresaw 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 was 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 was a partnership of 40 institutions in Europe and, since 2006, four in Latin America. The partners were based in 13 European and four Latin American countries.

The Welfare Quality Network is a collaborative effort of a large group of former partners of the Welfare Quality project (see http://www.welfarequalitynetwork.net/). The Welfare Quality Network focuses on scientific exchange and activities to contribute to the further development of the Welfare Quality animal welfare assessment systems. The Welfare Quality Network also aims to provide relevant knowledge and services to support actors in animal production chains who would like to implement or use the Welfare Quality animal welfare assessment systems.
The activities focus on the following main areas:

- Management of the system and support instruments (including training in their use by Network partners)
- Maintenance of the system
- Upgrading the system
- Promoting stakeholder involvement
- Prioritizing and facilitating research

The Welfare Quality Network relies on funding from the partner institutes for its existence.

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 was translated into accessible and understandable information on the welfare status of food producing animals for consumers and others. Welfare Quality also generated 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

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[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.

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 also 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.

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 were kept as short as possible, and though for training purposes more detailed descriptions of the measures will be required. 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.

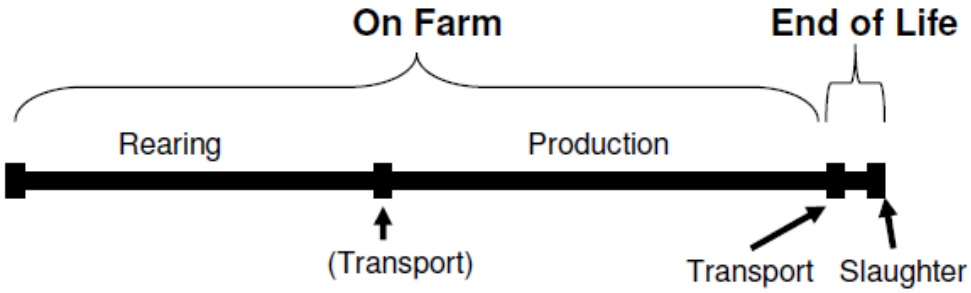


Figure 1 *Schematic reproduction of the different periods in the life of production animals. These are not necessarily all covered in the protocols.*

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 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.

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

	Rearing	Producing	End of life
Fattening cattle			
Dairy cows			
Veal calves			

Included in cattle protocol Not included in protocol

The protocols described in this section only apply to fattening cattle, dairy cows and veal calves. The protocols for cattle was developed for intensive housing systems. The applicability of the protocol in fully extensive systems can be limited. The protocol is not applicable to other ruminant species such as sheep, goat, or buffalo.

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 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 consulted[5]. 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 to the 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 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 and other stakeholders 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.

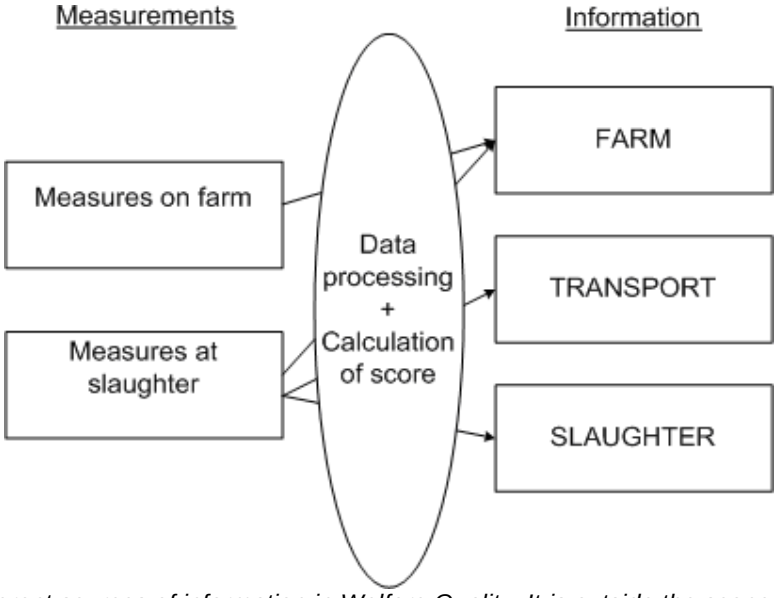


Figure 2 *The different sources of information in Welfare Quality. It is outside the scope of this document, but potential use of the output generated includes information provided to consumers, advisors and retailers.*

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 translated 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 generally 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; e.g. 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.

Table 2 *The principles and criteria that are the basis for the Welfare Quality assessment protocols.*

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

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 was made 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 continue to 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.

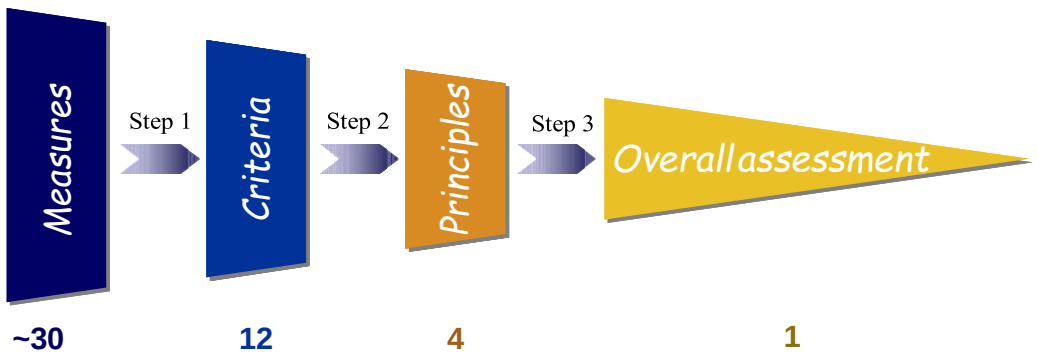


Figure 3 *Bottom-up approach for integrating the data on the different measures to an overall assessment of the animal unit.*

Calculation of criterion-scores

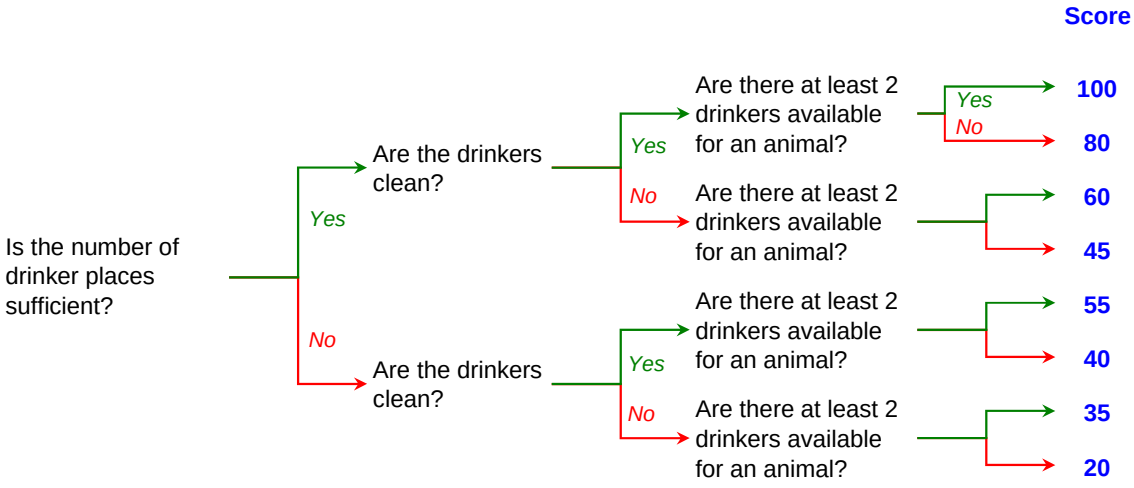
Although this is not generally the case, some measures may be related to several criteria (e.g. low body condition score can originate from hunger or disease, or both). In order to avoid double counting, measures have been allocated to only one criterion, except in very few cases where we could distinguish 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 vary 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.

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:



- 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.

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

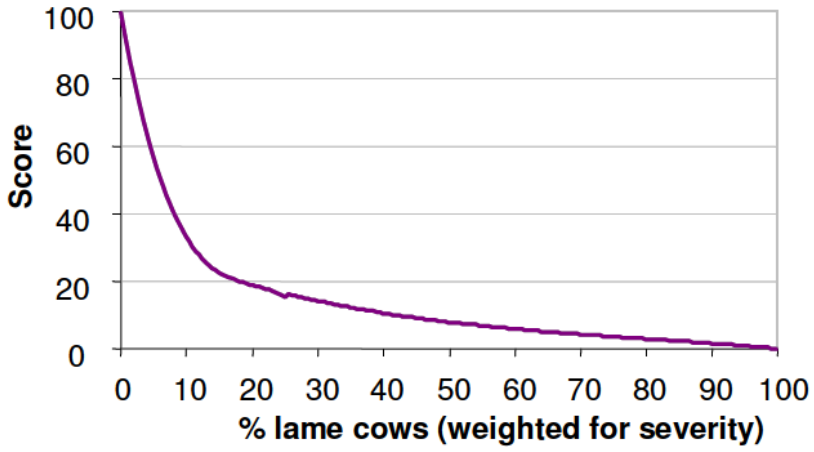
The % of animals moderately lame and the % of animals severely lame are combined in a weighted sum, with a weight of 2 for moderate lameness and 7 for severe lameness. This sum is then transformed into an index that varies from 0 to 100:

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

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

When **I** ≤ 65 then Score = (0.0988 x **I**) - (0.000955 x **I**^{2})- (5.34 x 10-5 x **I**^{3})

When **I** ≥ 65 then Score = 29.9 - (0.944 x **I**) - (0.0145 x **I**^{2}) + (1.92 x 10-5 x **I**^{3})



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).

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 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 4: Use of a Choquet integral to calculate the principle-scores for 'Good feeding'.
'Good feeding integrates 2 criteria; 'Absence of prolonged hunger' and 'Absence of prolonged thirst'. First the scores obtained by a farm for the 2 criteria are sorted in increasing order. The first criterion-score is considered, and then the difference between that score and the second criterion-score is multiplied by the 'capacity' of the second criterion. This can be written as follows:

$$\begin{cases} S_1 + (S_2 - S_1)\mu_2 & if \;\; S_1 \leq S_2 \\ S_2 + (S_1 - S_2)\mu_1 & if \;\; S_2 \leq S_1 \end{cases}$$

Where S_1 and S_2 are the scores obtained by a given farm for Criterion 1 (Absence of prolonged hunger) and 2 (Absence of prolonged thirst)
μ_1 μ_2 are the capacities of Criterion 1 and 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') in general. However, most weight for the principle-score is contributed by the lowest corresponding criterion-score. Nevertheless, synthesis does not allow full compensation between criterion-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, 5 and 6, for respectively 2, 3 and 4 criteria.

Explanation box 5: 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:

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

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.

Explanation box 6: Use of a Choquet integral to calculate the principle-scores for 'Appropriate behaviour'.

'Appropriate behaviour' integrates 4 criteria; 'Expression of social behaviours', 'Expression of other behaviours', 'good human-animal relationship' and 'Positive emotional state'. First the scores obtained by a farm for the 4 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. difference between the second and the third score is multiplied by the 'capacity' of the group made by the combined criteria except those that bring the two lowest scores. Finally the difference between the third and the last score is multiplied by the 'capacity' of last score. This can be written as follows:

$$
\begin{cases}
S_9 + (S_{10} - S_9)\mu_{10,11,12} + (S_{11} - S_{10})\mu_{11,12} + (S_{12} - S_{11})\mu_{12} & if \quad S_9 \le S_{10} \le S_{11} \le S_{12} \\
S_9 + (S_{10} - S_9)\mu_{10,11,12} + (S_{12} - S_{10})\mu_{11,12} + (S_{11} - S_{12})\mu_{11} & if \quad S_9 \le S_{10} \le S_{12} \le S_{11} \\
S_9 + (S_{11} - S_9)\mu_{10,11,12} + (S_{10} - S_{11})\mu_{10,12} + (S_{12} - S_{10})\mu_{12} & if \quad S_9 \le S_{11} \le S_{10} \le S_{12} \\
S_9 + (S_{11} - S_9)\mu_{10,11,12} + (S_{12} - S_{11})\mu_{10,12} + (S_{10} - S_{12})\mu_{10} & if \quad S_9 \le S_{11} \le S_{12} \le S_{10} \\
S_9 + (S_{12} - S_9)\mu_{10,11,12} + (S_{10} - S_{12})\mu_{10,11} + (S_{11} - S_{10})\mu_{11} & if \quad S_9 \le S_{12} \le S_{10} \le S_{11} \\
S_9 + (S_{12} - S_9)\mu_{10,11,12} + (S_{11} - S_{12})\mu_{10,11} + (S_{10} - S_{11})\mu_{10} & if \quad S_9 \le S_{12} \le S_{11} \le S_{10} \\
S_{10} + (S_9 - S_{10})\mu_{9,11,12} + (S_{11} - S_9)\mu_{11,12} + (S_{12} - S_{11})\mu_{12} & if \quad S_{10} \le S_9 \le S_{11} \le S_{12} \\
S_{10} + (S_9 - S_{10})\mu_{9,11,12} + (S_{12} - S_9)\mu_{11,12} + (S_{11} - S_{12})\mu_{11} & if \quad S_{10} \le S_9 \le S_{12} \le S_{11} \\
S_{10} + (S_{11} - S_{10})\mu_{9,11,12} + (S_9 - S_{11})\mu_{9,12} + (S_{12} - S_9)\mu_{12} & if \quad S_{10} \le S_{11} \le S_9 \le S_{12} \\
S_{10} + (S_{11} - S_{10})\mu_{9,11,12} + (S_{12} - S_{11})\mu_{9,12} + (S_9 - S_{12})\mu_9 & if \quad S_{10} \le S_{11} \le S_{12} \le S_9 \\
S_{10} + (S_{12} - S_{10})\mu_{9,11,12} + (S_9 - S_{12})\mu_{9,11} + (S_{11} - S_9)\mu_{11} & if \quad S_{10} \le S_{12} \le S_9 \le S_{11} \\
S_{10} + (S_{12} - S_{10})\mu_{9,11,12} + (S_{11} - S_{12})\mu_{9,11} + (S_9 - S_{11})\mu_9 & if \quad S_{10} \le S_{12} \le S_{11} \le S_9 \\
S_{11} + (S_{10} - S_{11})\mu_{9,10,12} + (S_9 - S_{10})\mu_{9,12} + (S_{12} - S_9)\mu_{12} & if \quad S_{11} \le S_{10} \le S_9 \le S_{12} \\
S_{11} + (S_{10} - S_{11})\mu_{9,10,12} + (S_{12} - S_{10})\mu_{9,12} + (S_9 - S_{12})\mu_9 & if \quad S_{11} \le S_{10} \le S_{12} \le S_9 \\
S_{11} + (S_9 - S_{11})\mu_{9,10,12} + (S_{10} - S_9)\mu_{10,12} + (S_{12} - S_{10})\mu_{12} & if \quad S_{11} \le S_9 \le S_{10} \le S_{12} \\
S_{11} + (S_9 - S_{11})\mu_{9,10,12} + (S_{12} - S_9)\mu_{10,12} + (S_{10} - S_{12})\mu_{10} & if \quad S_{11} \le S_9 \le S_{12} \le S_{10} \\
S_{11} + (S_{12} - S_{11})\mu_{9,10,12} + (S_{10} - S_{12})\mu_{10,9} + (S_9 - S_{10})\mu_9 & if \quad S_{11} \le S_{12} \le S_{10} \le S_9 \\
S_{11} + (S_{12} - S_{11})\mu_{9,10,12} + (S_9 - S_{12})\mu_{10,9} + (S_{10} - S_9)\mu_{10} & if \quad S_{11} \le S_{12} \le S_9 \le S_{10} \\
S_{12} + (S_{10} - S_{12})\mu_{9,10,11} + (S_{11} - S_{10})\mu_{11,9} + (S_9 - S_{11})\mu_9 & if \quad S_{12} \le S_{10} \le S_{11} \le S_9 \\
S_{12} + (S_{10} - S_{12})\mu_{9,10,11} + (S_9 - S_{10})\mu_{11,9} + (S_{11} - S_9)\mu_{11} & if \quad S_{12} \le S_{10} \le S_9 \le S_{11} \\
S_{12} + (S_{11} - S_{12})\mu_{9,10,11} + (S_{10} - S_{11})\mu_{9,10} + (S_9 - S_{10})\mu_9 & if \quad S_{12} \le S_{11} \le S_{10} \le S_9 \\
S_{12} + (S_{11} - S_{12})\mu_{9,10,11} + (S_9 - S_{11})\mu_{9,10} + (S_{10} - S_9)\mu_{10} & if \quad S_{12} \le S_{11} \le S_9 \le S_{10} \\
S_{12} + (S_9 - S_{12})\mu_{9,10,11} + (S_{1.} - S_9)\mu_{10,11} + (S_{11} - S_{10})\mu_{11} & if \quad S_{12} \le S_9 \le S_{10} \le S_{11} \\
S_{12} + (S_9 - S_{12})\mu_{9,10,11} + (S_{11} - S_9)\mu_{10,11} + (S_{10} - S_{11})\mu_{10} & if \quad S_{12} \le S_9 \le S_{11} \le S_{10}
\end{cases}
$$

Where S_9, S_{10}, S_{11} and S_{12} are the scores obtained by a given farm for Criterion 9 (Expression of social behaviours), 10 (Expression of other behaviours), 11 (good human-animal relationship) and 12 (Positive emotional state).
μ_9 μ_{10} μ_{11} μ_{12} are the capacities of Criterion 9, 10, 11 and 12
$\mu_{9,10}$ is the capacity of the group made of criteria 9 and 10, 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, 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.

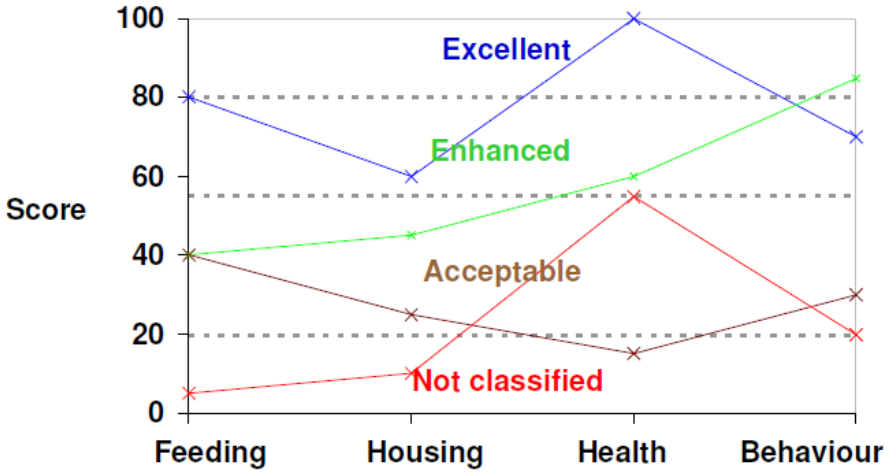


Figure 4 *Examples of farms in the four welfare categories.*

Software has been developed to calculate welfare scores and to produce the overall assessment of animal units. For more information, visit the WAFA website (https://www1.clermont.inrae.fr/wq/).

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. For calculation of the scores, full dataset without missing values are needed.

It should be emphasised again 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 Network.

5 Welfare Quality applied to veal calves

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 aspects to assess the welfare of veal calves on farm.

In this chapter, a description of each measure for veal calves is given, followed by additional 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 animal–based, management-based, and resource–based measures to achieve a representative welfare assessment for each farm. Many different measures are assessed; however 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. m^2) scale is used.

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

5.1 Collection of data for veal calves on farm (measured on farm)

	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	% very lean animals
	2	Absence of prolonged thirst	Provision of water
Good housing	3	Comfort around resting	Bursae, cleanliness of calves
	4	Thermal comfort	Wet calves
	5	Ease of movement	Quality of the floor
Good health	6	Absence of injuries	Bitten tail/ear, lameness
	7	Absence of disease	Coughing, abnormal breathing, pleuritic, nasal discharge, liquid manure, bloated rumen, dull calves, haemoglobin status, obviously sick calves, mortality
	8	Absence of pain induced by management procedures	Tail docking
Appropriate behaviour	9	Expression of social behaviours	Social behaviours
	10	Expression of other behaviours	Abnormal oral behaviours, urine drinking signs
	11	Good human-animal relationship	Calves touched during approach test
	12	Positive emotional state	Qualitative behaviour assessment

5.1.1 Good feeding

5.1.1.1 Absence of prolonged hunger

Title	**Very lean animals**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	The following criteria are taken into account: - Calves should be assessed on the basis of the quantity of muscle, the estimated weight, and physical appearance characteristics including: (i) visibility of the ribs, (ii) the extent to which the backbone protrudes, and (iii) the size of the belly. - Calves are compared with the mean level of the batch - Calves are compared within the breed/type level within the batch Calves are compared to the mean estimated weight and condition of the rest of the batch within their breed. Animals are scored according to the following indicators (see photographic illustration): - Normal: the calf is of the same weight and condition as the average of the batch - Severe lower condition: the calf is 30% below the average weight or condition of the batch **Individual level:** **0** – Normal condition **2** – Severe lower condition (approx. 30% less than average)
Classification	**Farm level:** **Percentage** of very lean animals (i.e. score 2)

Score 0
Normal condition

Score 1 - Lower condition
(approx. 15-30% less than average)

Score 2 - Severe lower condition
(approx. 30% less than average)

5.1.1.2 Absence of prolonged thirst

Title	**Provision of water**
Scope	Resource-based measure: Veal calves
Sample size	Animal unit
Method description	At farm level the availability of water and timing of water supply to calves are assessed. 10 pens are randomly selected in the barn to judge the provision of water. Provision of water is assessed through several indicators: - Water supply (assess whether water is provided, a drinker inadequate for calves (e.g. too low, too high, nipple drinker) is not considered as supplying water) - Duration when water is available during the day (h) - Cleanliness (a water point with manure on it is considered dirty) - Number of water points per animal

Classification	**Group level:** Water **supply** **0** – Water supplied **2** – Water not available for animals Timing of water **availability** **0** – Ad libitum access (i.e. more than 12 h a day) **1** – Intermediate access (i.e. water is available for 6 to 12 h a day) **2** – Restricted access (i.e. water is available for less than 6 h a day) **Cleanliness** of water points **0** – Clean **1** – Dirty **Number** of water points

Clean

Partly Dirty

Dirty

Dirty

5.1.2 Good housing

5.1.2.1 Comfort around resting

Title	**Bursae**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	A bursae is defined as a swelling of the carpal joint (see photographic illustration). **Individual level:** **0** – No evidence of bursae **2** – Evidence of bursae
Classification	**Farm level:** This measure is combined with all lesions (claw lesions, joint lesions, bursae, spots of hard skin, bitten tail/ear)

No bursa

Bursa

Title	**Cleanliness of calves**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Individual observation of calves. Calves are assessed for cleanliness of the coat. The coat of calves is observed and scored as clean, moderately dirty or dirty.

	Individual level: **0** – Clean: no manure **1** – Moderately dirty: less then 25% of the surface is covered by manure **2** – Dirty: more than 25% of the surface is covered by manure
Classification	**Herd level:** **Percentage** of dirty calves (i.e. score 2)

5.1.2.2 Thermal comfort

Title	**Wet calves**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	A calf is considered wet when its coat is wet all along its back (see photographic illustration). **Individual level:** 0 – Calf not wet 2 – Wet calf
Classification	**Farm level:** **Percentage** of wet calves (i.e. score 2)

No wet

Wet

5.1.2.3 Ease of movement

Title	**Quality of the floor**
Scope	Resource-based measure: Veal calves
Sample size	Animal unit
Method description	Assess 10 pens randomly selected in the barn, in which each pen is given a score based on the assessment of the floor properties by the observer: slightly slippery, moderately slippery, slippery, very slippery, or dangerous. These scores are defined as follows: - Not at all slippery. Calves never slip, this can be obtained with a thick layer of straw (i.e. 40 cm), a floor covered with sand or outside at pasture. - Slightly slippery: Slipperiness is limited to a large extent, observed with e.g. dry concrete (slatted) floors, floors covered with a reasonable (e.g. 10 cm) layer of straw - Moderately slippery: e.g. dry hard wooden slats with flat surfaces and with (aluminium) antiskid features; wet concrete (slatted) floors - Slippery: e.g. hard wooden slats with flat surfaces wet due to urine and faeces and with or without (aluminium) antiskid features - Very slippery: It is difficult to stand on the floor, calves cannot move easily and safely. This is observed e.g. on old hard wooden slats with a round surface instead of a flat one, which are wet due to urine and faeces, and with or without antiskid features - Dangerous: floors with openings in the floor that are big enough that a leg of calf can fall through, e.g. missing slats

Classification	**Group level:** **0** – Floor is not slippery **1** - Floor is slightly slippery **2** – Floor is moderately slippery **3** – Floor is slippery **4** – Floor is very slippery **5** – Floor is dangerous

5.1.3 Good health

5.1.3.1 Absence of injuries

Title	**Bitten tail/ear**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Bitten tail and/or ear is defined as damaged tail/ear with/without presence of fresh blood or scab (see photographic illustration). **Individual level:** **0** – No evidence of bitten tail and/or ear **1** – Evidence of bitten tail/ear without blood and scab **2** – Evidence of bitten tail/ear with blood or scab
Classification	**Farm level:** This measure is combined with all lesions (claw lesions, joint lesions, bursae, spots of hard skin, bitten tail/ear)

No bitten tail

Bitten tail

Title	**Lameness**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	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. 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: - 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: - 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 **Individual level:** **0** – No evidence of lameness **2** – Evidence of lameness

Classification	**Farm level:** **Percentage** of animals with lameness (i.e. score 2)

5.1.3.2 Absence of disease

Title	**Coughing**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	A coughing calf is defined as a calf making audible expulsion of air from the mouth. **Individual level:** **0** – No evidence of coughing **2** – Evidence of coughing
Classification	**Farm level:** **Percentage** of animals coughing (i.e. score 2)

Title	**Abnormal breathing**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Abnormal breathing rate is defined as a calf performing belly movements, respiratory frequency > 40/min, pumping, excessive nasal movements, and an overall generalised 'sick' appearance. An increased breathing rate under heat stress is not considered here. **Individual level:** **0** – No evidence of abnormal breathing **2** – Evidence of abnormal breathing
Classification	**Farm level:** **Percentage** of animals with abnormal breathing (i.e. score 2)

Title	**Nasal discharge**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Nasal discharge is defined as obvious visible drops from the nostrils; transparent to yellow/green and often with a thick consistency; obvious because the calf does not lick its muzzle (see photographic illustration). **Individual level:** **0** – No evidence of nasal discharge **2** – Evidence of nasal discharge
Classification	**Farm level:** **Percentage** of animals with nasal discharge (i.e. score 2)

No nasal discharge

Nasal discharge

Title	**Haemoglobin**
Scope	Management-based measure: Veal calves
Sample size	Farm level

Method description	On-farm haemoglobin check data at 3 month of age (as close as possible to 13 weeks of age)
Classification	**Farm level:** **Percentage** of animals with haemoglobin below 4.5 mmol/L

Title	**Liquid manure (diarrhoea)**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	In small groups, manure is not observed directly on the calves but on the floor, the absence/presence of abnormal manure is recorded pen by pen. In small pens the % of calves affected by liquid manure is assumed to be half of the % pens affected (e.g. if liquid manure is observed in 10% of pens with equal numbers of animals in each pen then the % calves affected is determined to be 5%). In large groups, the presence of liquid manure is observed on all individual calves (see photographic illustration). **Individual level or group level:** **0** – No evidence of liquid manure **2** – Evidence of liquid manure
Classification	**Farm level:** **Percentage** of animals with liquid manure (i.e. score 2)

Normal manure

Liquid manure

Title	**Bloated rumen**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Bloated rumen is defined as a calf with an obviously tensed belly (top/below/left/right/both); obviously more convex than the shape of the ribs (see photographic illustrations). **Individual level:** **0** – No evidence of bloated rumen **2** – Evidence of bloated rumen
Classification	**Farm level:** **Percentage** of animals with bloated rumen (i.e. score 2)

normal

bloated rumen

Title	**Dull calf**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	A dull calf is defined as a calf with the entire coat being dull, not shiny or glossy, sometimes with the coat additionally appearing as dry and/or long (see photographic illustration). **Individual level:** **0** – Calf not dull **2** – Dull calf
Classification	**Farm level:** **Percentage** of dull calves (i.e. score 2)

Normal coat

Dull coat

Title	**Obviously sick calf**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Assess for presence of obviously sick calves. An obviously sick calf is defined as an apathetic calf and/or an animal showing hanging ears and/or a body position indicating pain (e.g. rounded back) (see photographic illustration). **Individual level:** **0** – Calf not obviously sick **2** – Obviously sick calf
Classification	**Farm level:** **Percentage** of obviously sick calves (i.e. score 2)

Not Obviously sick

Obviously sick

Title	**Mortality**
Scope	Management-based measure: Veal calves
Sample size	Animal unit
Method description	Mortality is defined as the 'uncontrolled' death of animals as well as cases of euthanasia and emergency slaughter. The animal unit manager is asked about the number of calves present on the farms for the last 12 months and the number of calves which died on the farm, were euthanized due to disease or accidents or were emergency slaughtered during the last 12 months. Calves dying during the first 10 days after arrival at a veal unit are excluded from the calculations because their death are likely to result from previous living conditions.
Classification	**Percentage** of animals dead on the farm during the last 12 months
Optional additional information	(beginning or end of fattening period)

5.1.3.3 Absence of pain induced by management procedures

Title	**Tail docking**
Scope	Management-based measure: Veal calves
Sample size	Animal unit
Method description	The animal unit manager is asked about tail docking practices on the farm with regard to the following items: - Procedures for tail docking - Use of anaesthetics - Use of analgesics
Classification	**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

5.1.4 Appropriate behaviour

5.1.4.1 Expression of social behaviours

Title	**Social behaviours**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Assess the veal calves for presence of the social behaviour mentioned below: - Social licking is defined as licking, nibbling and sniffing a pen mate at the part of the body where the hair is long: head, shoulders, flanks, back and tail but not the lower parts (legs, under the belly). Observations are performed from the corridor, in bouts of 10 minutes per pen at 3 times of the day (in the morning, at noon and in the afternoon). The observation method used is instantaneous scan sampling with a sample interval of 2min (5 scans per 10min). For information on the method of observation see § 7.1A.5. **Group level:**

	Number of scans[5] when social licking is observed **Total number** of scans made
Classification	**Farm level:** **Percentage** of scans when social licking is observed out of the total number of scans made

5.1.4.2 Expression of other behaviours

Title	**Abnormal oral behaviours**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Assess the veal calves for the occurrence of the following abnormal behaviours: **Behaviour** / **Description** Tongue rolling: Calf makes repeated movements with its tongue in or outside its mouth Manipulating substrates: Calf licks, sucks or bites at the fence, wall, bucket, trough, floor or any other non-food and inanimate object. Observations are performed from the corridor. 3 bouts of 10 minutes per pen of observations are performed at 3 times of the day (in the morning, at noon and in the afternoon). The observation method used is instantaneous scan sampling with a sample interval of 2min (5 scans per 10 min). For information on the method of observation see § 7.1A.5. **Group level:** **Number** of scans[6] when abnormal oral behaviour is observed. **Number** of scans when abnormal oral behaviour is observed. **Total number** of scans made
Classification	**Farm level:** **Percentage** of scans where abnormal oral behaviour was observed out of scans where calves were not lying

Title	**Urine drinking signs**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1A.5
Method description	Prevalence of calves with signs of urine drinking (suckers and victims): - Urine sucker = calf with wet and/or yellow snout. - Urine suckers' victim = calf with swollen, hairless prepuce with red skin, wet belly button. Prevalence of calves with signs of urine drinking (suckers and victims) is assessed during the clinical/health visit. There is no behavioural measure since it would assess only suckers and therefore underestimate the problem.
Classification	**Farm level:** **Percentage** of calves showing signs of urine drinking/cross-sucking.

[5] A scan refers to the observation of an individual calf at any given time point. The total number of scans during the behavioural observations is equal to the total number of time points multiplied by the total number of calves observed.

[6] A scan refers to the observation of an individual calf at any given time point.

5.1.4.3 Good human–animal relationship

<table>
<tr><td>Title</td><td>Avoidance distance/calf escape test</td></tr>
<tr><td>Scope</td><td>Animal-based measure: Veal calves</td></tr>
<tr><td>Sample size</td><td>Sample size according to § 7.1A.5</td></tr>
<tr><td>Method description</td><td>The assessor enters the pen, or stays in the pen if the calves have to be woken up, and waits 1 minute to let the calves get used to the presence of the assessor.
The assessor chooses a calf (in small groups: any calf / in large groups: one of the calves on the list) which stands in front of the assessor at a distance of about two steps. The assessor tries to make eye contact.
The assessor slowly (1 step per second) takes 1 step toward the calf (i.e. with a stretched arm) and stands still with two feet next to each other for 1 second. He/she notes whether the calf is standing still or not (i.e. forelegs moved or not). The assessor takes the second step (again 1 step per second) and stands still with two feet next to each other for 1 second. Again the assessor notes whether the calf stands still or not. If the calf stands still the assessor tries to touch the calf on the muzzle (or the calf approaches the assessor and makes contact). The maximum time to try this is 5 s. The assessor notes if contact was successful or not.
Parameters:
- Note the ear tag number calf
- Give a score to the calf using the following grid:
<table><tr><th>Score</th><th>Description</th></tr><tr><td>a</td><td>no eye contact</td></tr><tr><td>b</td><td>eye contact succeeded, step 1 results in a withdrawal</td></tr><tr><td>c</td><td>step 1 succeeded, step 2 results in a withdrawal</td></tr><tr><td>d</td><td>step 2 succeeded, calf can’t be touched</td></tr><tr><td>e</td><td>calf can be touched</td></tr></table>
Up to 3 attempts are made per calf to make eye contact successfully. If the assessor did not achieve eye contact (active avoiding by the calf) after these 3 chances, this will be noted. In large groups, if it is not possible to approach the calf (the calf remains in the opposite part of the pen, hides behind other calves) the calf will be recorded as ‘no eye contact’ (a).
Although a 5-point scale is used to observe calves, calculations are made only on % calves scored e.

<u>Ethogram</u>:
Standing still is defined as the calf remaining oriented toward the human after the human has made one step or has touched the calf (i.e. it did not move its forelegs).
Escape behaviour is defined as when the calf makes a move to move away from the human by moving backward or turning around (i.e. no longer oriented towards the human).
In small groups all calves in a pen are tested, in large groups a random selection of the calves in a pen is tested, depending on the number of pens at a farm.</td></tr>
<tr><td>Classification</td><td>Farm level:
Percentage of calves which allow to be touched calves scored e out of all calves tested.</td></tr>
</table>

5.1.4.4 Positive emotional state

Title	**Qualitative Behaviour Assessment**
Scope	Animal-based measure: Veal calves
Sample size	Animal unit (depending on number of observation points, see *method description*)
Method	Qualitative Behaviour Assessment (QBA) considers the expressive

<table>
<tr><td>description</td><td>quality of how animals behave and interact with each other and the environment i.e. their ‘body language’.

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:

<table>
<tr><td>Number of observation points</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>Duration of observation per observation point in minutes</td><td>10</td><td>10</td><td>6.5</td><td>5</td><td>4</td><td>3.5</td><td>3</td><td>2.5</td></tr>
</table>

When observation at all selected points has been completed, find a quiet spot and score the 20 descriptors using the visual analogue scale (VAS). Please note that scoring is not done during observation, and that only one integrative assessment is made per farm.

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 all 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.

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.

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.

The terms used for veal calves QBA assessment are:
<table>
<tr><td>Active</td><td>Indifferent</td><td>Boisterous</td><td>Tense</td><td>Inquisitive</td></tr>
<tr><td>Relaxed</td><td>Frustrated</td><td>Uneasy</td><td>Lively</td><td>Distressed</td></tr>
<tr><td>Fearful</td><td>Friendly</td><td>Sociable</td><td>Playful</td><td>Happy</td></tr>
<tr><td>Agitated</td><td>Bored</td><td>Apathetic</td><td>Depressed</td><td>Calm</td></tr>
</table>
</td></tr>
<tr><td>Classification</td><td>Herd level:
Continuous scales for all body language parameters from minimum to maximum.</td></tr>
</table>

5.1.5 Sampling and practical information

Organization of the visit

The visit takes place at 13-16 weeks after arrival of the calves in the veal unit.

The assessor arrives in the veal unit, takes 5 minutes to become familiar with the barn and checks with the animal unit manager the number of calves in the sickbay or separated from the batch.

The assessor takes then 5 minutes to become familiar with the mean weight and condition of calves

of the batch (for the body condition score). He/she then performs the different observations on clinical health and behaviour of the calves (see Table 20).

At the end of the observation, the assessor fills in a short questionnaire with the animal unit manager asking about on-going collective treatments, the health status of the batch on arrival, the appetite of the animals on arrival and on the week of the visit, the mortality since the last visit and the causes of mortality.

Table 20 *Order for carrying out measures, sample size and time required for veal calves on farm.*

	Parameter	**Sample size**	**Time needed approximately**
1	Qualitative behaviour assessment (QBA)	All calves in the batch	20 - 30 min
2	Resource checklist - Number of calves in the pen - Provision of water - Slipperiness of floor	All pens 10 pens 10 pens	30 min
3	Clinical measures - Abnormal breathing - Nasal discharge - Liquid manure - Bloated rumen - Dull calf - Wet calves - Bursae - Bitten tail/ear - Body condition score - Coughing calf - Obviously sick calf - Cleanliness of calves	200 to 300 animals: If size of the batch <200: all animals If size of the batch >300: 300 animals	120 min
4	Scan sampling - Social behaviour - Other behaviour - Abnormal oral behaviour	In large groups: 3 x 1-3 pens In small groups: 3 x 12 pens	3 x 30 min
5	Calf escape test	100 animals selected randomly	60 min
6	Management questionnaire - Tail docking - Mortality - Haemoglobin	Animal unit (interview with animal unit manager)	15 min
	TOTAL		**335 – 345 min 5.5 – 5.75 hours**

Selecting veal calves for clinical assessment

Sampling method

Visual observation of each individual calf takes place in the corridor (for calves housed in small groups) or in the home pen (for calves housed in large groups) for the measures body condition score, wet calves, claw lesions, joint lesions, bursae, lameness, spots of hard skin, bitten tail/ear, all respiratory disorders, all enteric disorders, dull calves and obviously sick calves and dirty calves.

Furthermore, for all clinical health measures sample sizes are defined as follows:
In small groups:

- When size of the batch ≤ = 200 calves, all calves are observed (all pens are observed)
- When size of the batch is > 200 calves a maximum of 300 calves are observed. Up to 60 pens (depending on number of animals per pen) are randomly chosen using their numbers in a list).

Remark: the size limit of the batch, as when all or a part of the calves on the unit have to be observed, could be extended to 300.

Observations are performed at the pen level. The assessor stands in the corridor in front of the pen. The assessor takes 3 minutes to observe each pen and record all of the information at individual and pen level. At the end of the observation the assessor moves to the next pen until the full sample is observed.

And in large groups:

- 100 calves are observed. They are randomly chosen in the batch and equally distributed amongst pens

Observation is performed at the individual level. The assessor enters the pen and randomly chooses a calf. He/she takes 1 minute to record all the information. At the end of the observation he/she chooses another calf until 100 calves are observed (the number of calves observed should be equally distributed amongst pens)

Selecting veal calves for behaviour assessment

Scan sampling observations

Sampling method:

For these measures sample sizes are the following:

- In small groups 36 pens (or if less pens available, all pens) are observed.
- In large groups a maximum of 9 pens is observed (between 20 and 100 calves per pen).

Preparation:

- Ensure that the lights are on.
- In small groups, 4 pens are observed at the same time. In large groups, 1 pen is observed.
- Observations take 10 minutes with 5 scans at 2 min intervals.
- Pen which are observed and the order in which they are observed are previously randomly selected.
- 10 min observations are performed three times with different pens (i.e. 3x 4 pens) for small groups. For large groups it depends on the number of pens on the farm. If possible repeat observations three times with different pens (i.e. 3 x1pen).

Observation:

- The assessor takes place in the middle of the 4 pens, or at the front of the pen, with large groups.
- The assessor waits five minutes before starting the observation, so that the calves can get used to him/her.
- After these 5 minutes, the stopwatch is started and the observation starts with a scan of the first pen, further observations are made in a clockwise direction around the pens.
- Every 2 minutes the behaviour of all calves is scan sampled using the ethogram. The total number of observations per pen is 5 scans within 10 minutes.

Repetition

- At the end of the 10 min observation period the assessor walks to the next four pens (in small pen group systems) or to the next large pen (in large pen group systems) and the procedure starts again.
- Observations as outlined above take place three times during the day (morning, noon, afternoon) using different pens if available.

Avoidance distance / Calf escape test

Preparation:

- Pens are randomly selected and so the test order is defined.
- Small groups: all calves in a pen will be observed.
- Large groups: a percentage of the calves (randomly selected before the test; using a list of ear tag numbers) will be observed.
- Ensure that the lights are on.
- In small groups, all the calves have to get up, if necessary woken up by the assessor. For large groups it is not necessary to rouse all calves at the beginning of the test. Calves will be tested when they are standing.
- The approach of each calf is focused on the head, i.e. the assessor tries to touch the snout /muzzle with an arm that is stretched out a little.

Qualitative behaviour assessment (QBA)

- The assessor should first familiarize him/herself with the unit, decide on the observation point/s, fill out the form (name, date, time of the day, farm, housing unit, number of animals in unit, breed) and describe the system.
- The assessor then leaves the unit for 5-10 minutes in order to let the animals go back to their normal undisturbed behaviours.
- The assessor enters the unit and observes how the animals behave for 10 to 2.5 minutes at each observation point (10 min if only one area is observed). After all the observation points have been visited, the assessor walks out of the unit and scores the QBA descriptors on a scale from 0 to 125 mm.

-

5.2 Collection of data for veal calves on farm welfare (measured at slaughterhouse)

These measures are assessments of disease which are made at the slaughterhouse – but they reflect disease conditions indicating the farm life of the veal calves and are not reflections of the slaughter process. Therefore they are calculated together with the previous on-farm assessment, and jointly form the basis for the overall assessment for veal calves on farm.

	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	This criterion is not applied in this situation
	2	Absence of prolonged thirst	This criterion is not applied in this situation
Good housing	3	Comfort around resting	This criterion is not applied in this situation
	4	Thermal comfort	This criterion is not applied in this situation
	5	Ease of movement	This criterion is not applied in this situation
Good health	6	Absence of injuries	This criterion is not applied in this situation
	7	Absence of disease	Lung lesions, abomasal lesions, ruminal plaque
	8	Absence of pain induced by management procedures	This criterion is not applied in this situation
Appropriate behaviour	9	Expression of social behaviours	This criterion is not applied in this situation
	10	Expression of other behaviours	This criterion is not applied in this situation
	11	Good human-animal relationship	This criterion is not applied in this situation
	12	Absence of fearfulness	This criterion is not applied in this situation

5.2.1 Good feeding

5.2.1.1 Absence of prolonged hunger

This criterion is not applied in this situation.

5.2.1.2 Absence of prolonged thirst

This criterion is not applied in this situation.

5.2.2 Good housing

5.2.2.1 Comfort around resting

This criterion is not applied in this situation.

5.2.2.2 Thermal comfort

This criterion is not applied in this situation.

5.2.2.3 Ease of movement

This criterion is not applied in this situation.

5.2.3 Good health

5.2.3.1 Absence of injuries

This criterion is not applied in this situation.

5.2.3.2 Absence of disease

<table>
<tr><td>Title</td><td>Lung lesions</td></tr>
<tr><td>Scope</td><td>Animal-based measure: Veal calves</td></tr>
<tr><td>Sample size</td><td>Sample size according to § 7.1B.5</td></tr>
<tr><td>Method description</td><td>For this measure 100 to 200 lungs per batch are assessed for the presence of lung lesions. Visual observations take place for each individual lung on the slaughter line.

The assessor identifies the beginning of the batch of calves to observe. He stands just before the meat inspection control were the lungs are detached from the carcass and put onto the line. He/she observes the first 100 or 200 lungs from the batch or all lungs if the batch is less than 100 calves. He/she performs an inspection of the right and left sides of the lung (5 cranial lobes) spending about 10seconds per lung.

Each lung is given a score for pneumonia discoloration (0 to 3) and for attached tissues due to pleuritis (absent or present).
For pneumonia discoloration, the left and right side of the lungs (cranial lobes) are observed and scored using the scales below:

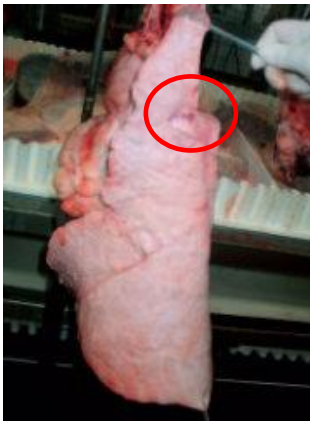
<table>
<tr><th>Individual level</th><th>Discoloration</th><th>Description</th></tr>
<tr><td>0</td><td>No</td><td>Normal pale orange colour</td></tr>
<tr><td>1</td><td>Minimal</td><td>One spot of grey-red discoloration</td></tr>
<tr><td>2</td><td>Mild/moderate</td><td>One larger or several small spots of grey-red discoloration (less than one lobe)</td></tr>
<tr><td>3</td><td>severe</td><td>Grey-red discoloration area (at least one full lobe) and/or presence of abscesses</td></tr>
</table>
The worst score obtained by one of the two sides of the lung is attributed to the lung (see photographic illustration).For attachment of tissues (pleuritis), the whole lung is observed and scored using the following grid:

<table>
<tr><th>Individual level</th><th>Attached tissues</th><th>Description</th></tr>
<tr><td>0</td><td>No</td><td>All lobes can be separated</td></tr>
<tr><td>2</td><td>Yes</td><td>Lobes are attached together or to other tissues (e.g. pericardium)</td></tr>
</table>

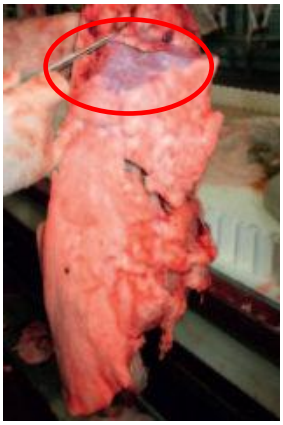
The percentage of lungs with attached tissues and the mean discoloration score and percentage of lungs for each score of discoloration of the batch are calculated.
See photographic illustration.</td></tr>
<tr><td>Classification</td><td>Herd level:
Percentage of lungs for each score of discoloration
and
Percentage of lungs with attached tissues (i.e. score 2).</td></tr>
</table>

Lung lesion

Score 0 - No pneumonia
Normal pale orange colour



Score 1 - Minimal pneumonia
1 spot of grey-red discoloration



Score 2 - Mild/moderate pneumonia
1 larger or several small spots of grey-red discoloration (less than 1 lobe)

Score 3 – severe pneumonia
Grey-red discoloration area (at least one full lobe) and/or presence of abscesses

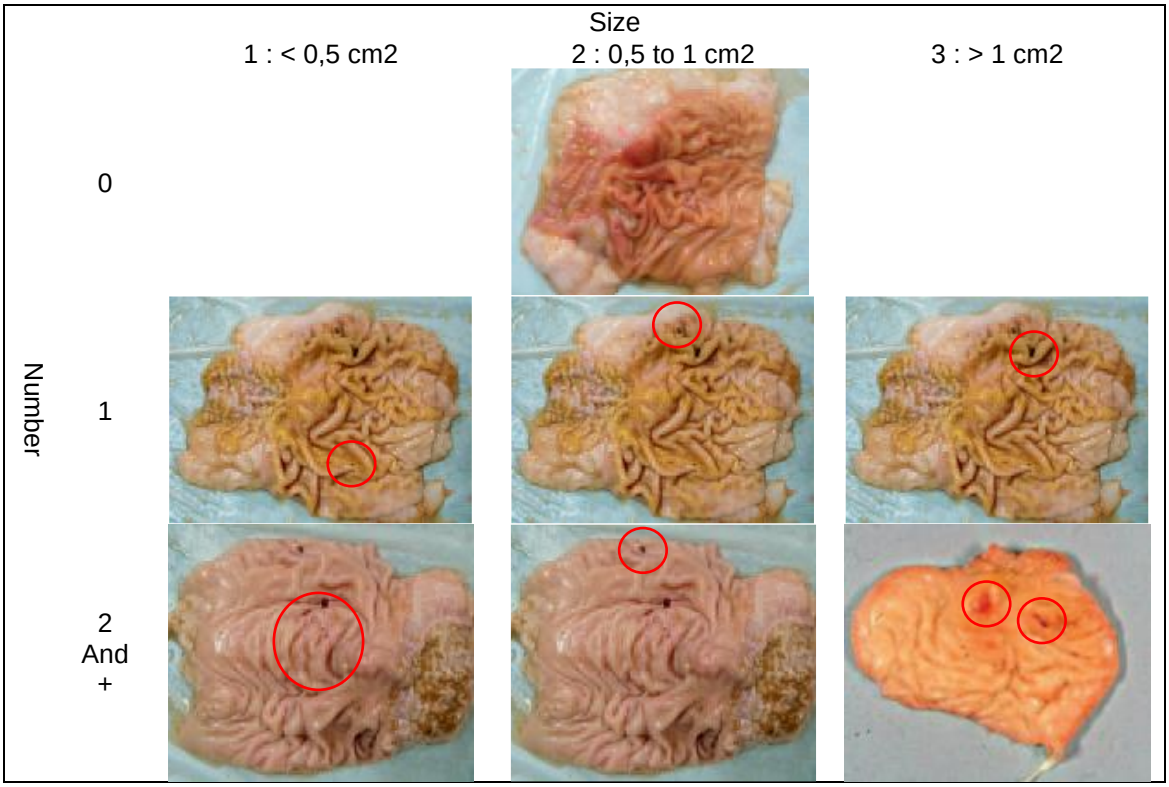
Lung attached tissues:

Score 0 – absent
All lobes can be separated

Score 2 – present
Lobes are attached together or to other tissues (e.g. pericardium)

Title	**Abomasal lesions**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1B.5
Method description	For this measure 60 abomasa per batch are assessed for the presence of abomasal lesions. Visual observation of each abomasum is performed to evaluate the incidence of mucosal lesions (see photographic illustration). The assessor identifies the beginning of the batch of calves to observe, while standing in the room were the bowels are cleaned. For the 60 abomasa observed, a 10-15 cm section of the pyloric area is cut and placed in a separate box. These sections are longitudinally cut and cleaned with water by the assessor. He/she observes the sections and counts the number of lesions (from erosions to open ulcers) using the following grid: Size of lesion 1 2 3

	count	<0,5cm²	0,5 to 1cm²	>1 cm²
		0, 1, 2, 3, 4 and +	0, 1, 2, 3, 4 and +	0, 1, 2, 3, 4 and +
	After observation, the abomasal sections are put into the animal products bin with the rest of the waste.			
Classification	**Mean** lesion score: Mean lesion score (0 to 24)= [(no. of lesions size 1 x 1) + (no. of lesions size 2 x 2) + (no. of lesions size 3 x 3)] The % of abomasa with at least one large lesion (size 3) and the mean lesion score are calculated for each batch.			



Title	**Ruminal plaque**
Scope	Animal-based measure: Veal calves
Sample size	Sample size according to § 7.1B.5
Method description	For this measure 60 rumens per batch are assessed for presence of plaque. Plaque is a pathological condition of the ruminal wall, consisting of multiple patches on the rumen mucosa with coalescing and adhering papillae covered by a sticky mass of feed, hair and cell debris (which feel like spots of chewing gum trampled into a door mat) (see photographic illustration). Record whether or not there was any plaque present. **Individual level:** **0** – Ruminal plaque not present **2** – Ruminal plaque present
Classification	**Herd level:** The **percentage** of rumens with at least one plaque.

Score 0: absent

Score 2: present

5.2.3.3 Absence of pain induced by management procedures

This criterion is not applied in this situation.

5.2.4 Appropriate behaviour

5.2.4.1 Expression of social behaviours

This criterion is not applied in this situation.

5.2.4.2 Expression of other behaviours

This criterion is not applied in this situation.

5.2.4.3 Good human–animal relationship

This criterion is not applied in this situation.

5.2.4.4 Positive emotional state

This criterion is not applied in this situation.

5.2.5 Sampling and practical information

Sampling

Observations are performed at commercial slaughter houses where the observed batches are slaughtered. Batches can be slaughtered in one group or on several days. In the second case, one or two dates are chosen for observations depending on the size of the groups of calves slaughtered. For each batch 100 or 200 lungs, 60 abomasa and 60 rumens are observed. Furthermore, see Table 21.

Table 21 *Sample size and time required for measures for veal calves (on farm) collected at the slaughterhouse.*

Parameter	Sample size	Time needed approximately
Clinical measures		
- Lung lesions	100 to 200 lungs	- Min 60 min
- Abomasal lesions	60 abomasa	- Min 120 min
- Ruminal plaque	60 rumens	

5.3 Calculation of scores for veal calves on farm

5.3.1 Criterion-scores

5.3.1.1 Absence of prolonged hunger

The % of very lean calves is used to calculate an index:
Index = 100 - % of very lean calves

Then the index is transformed into a score with spline functions as follows:
When I≤80 then Score = - (0.00000000000070013430248402 x I) + (0.00000000000002915856033761 x I^2) – (0.00000000000000027519139142 x I^3)
When I≥80 then Score = -6399.99884112858+ (239.99996122358672323571227 03 x I) – (2.99999568723236365030970 8 x I^2) + (0.01249999840552917448888 16 x I^3)

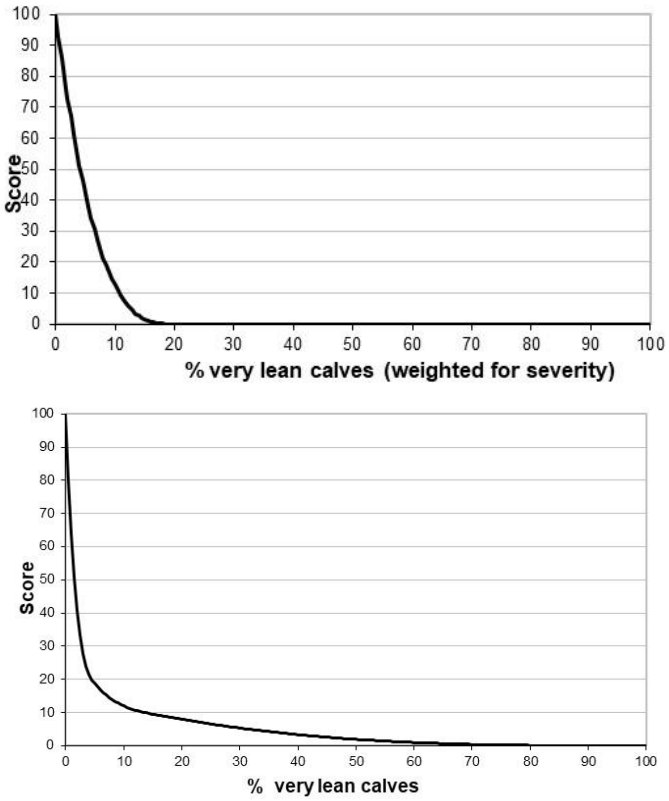
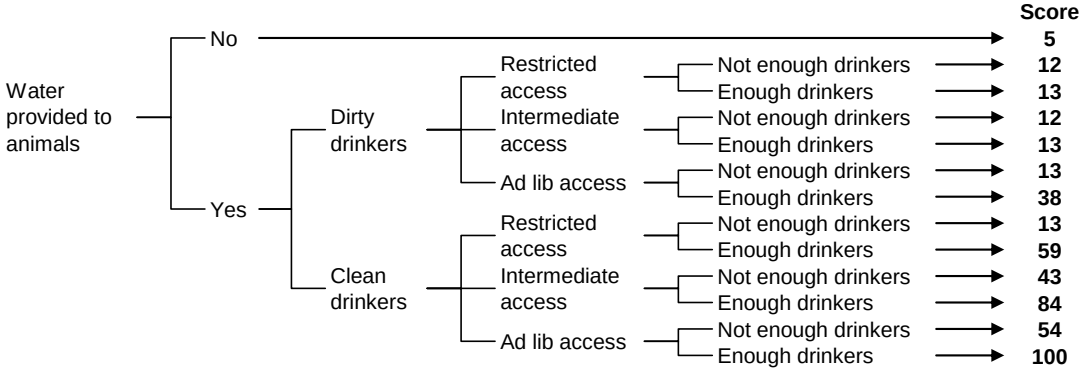


Figure 30 Calculation of scores for absence of hunger according to % of very lean animals.

5.3.1.2 Absence of prolonged thirst

A decision tree is used to attribute a score to according to the combination of water supply, timing of water availability, cleanliness of drinkers, and number of drinking points per animals*:



*The number of drinking points is considered sufficient if there is one point for no more than 20 animals.

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.

5.3.1.3 Comfort around resting

Two partial scores are calculated, one for bursae and one for cleanliness of the calves, before being combined into a criterion score.

Two indexes are calculated, one for each measure:

I_l = 100 – (% calves with bursae)

I_s = 100 – (% dirty calves)

They are transformed into scores:
the index for bursae is computed into a score thanks to I-spline functions as follows:

When $\mathbf{I_l} \leq 80$ then Score = $(0.00000000000026965950142084 \times \mathbf{I_l})$
$- (0.00000000000001334287186909 \times \mathbf{I_l}^2) + (0.00004009668508393684252 22 \times \mathbf{I_l}^3)$

When $\mathbf{I_l} \geq 80$ then Score = -3833.81341147580906181246973 57
$+ (143.76799790215883945165842 31 \times \mathbf{I_l}) - (1.79709991636002919257464 33 \times \mathbf{I_l}^2) + (0.00752801278546426626964 16 \times \mathbf{I_l}^3)$

the index for cleanliness is computed into a score thanks to I-spline functions as follows:

When $\mathbf{I_s} \leq 40$ then Score = $(2.55206816380980860969884 82 \times \mathbf{I_s})$
$- (0.02732354095765006027352 05 \times \mathbf{I_s}^2) + (0.00010610229752175482698 97 \times \mathbf{I_s}^3)$

When $\mathbf{I_s} \geq 40$ then Score = -3.53371723773258139544850 56+ $(2.81709695660861303423416 76 \times \mathbf{I_s})$
$- (0.03394926077711566542172 15 \times \mathbf{I_s}^2) + (0.00016131662934805850195 30 \times \mathbf{I_s}^3)$

S_l and S_s are combined to produce a score for comfort around resting (S) thanks to a Choquet integral where:

μ_l = 0.66

μ_c = 0.31

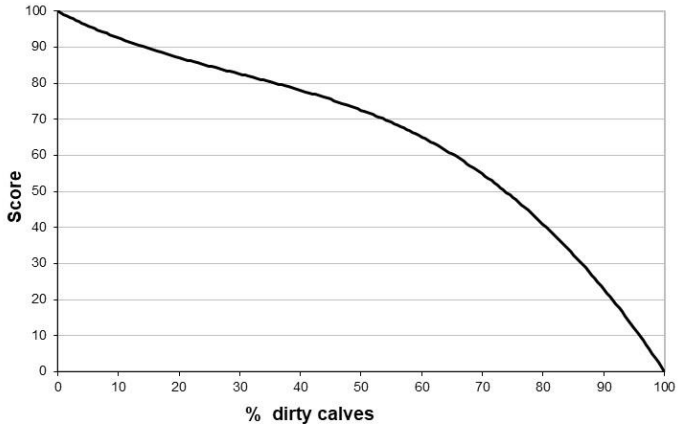


Figure 31 *Calculation of partial scores for comfort around resting according to % of dirty calves*

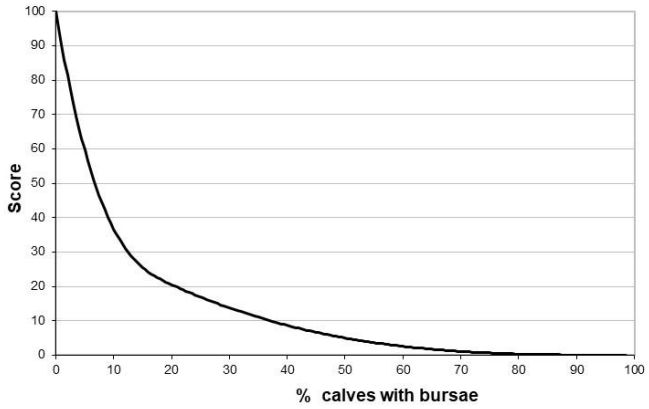


Figure 32 *Calculation of partial scores for comfort around resting according to % of calves with a bursae*

5.3.1.4 Thermal comfort

An index is calculated from the % wet calves:

Index **I** = 100 – (% wet calves)

When I≤80 then Score = (0.00000000004009881803607 56 x I) + (0.00503834117106262673740 91 x I^2) - (0.00003778755878011559170 85x I^3)

When I≥80 then Score = -5593.86461965339185553602874 28+ (209.76992643836871366147533 99x I) - (2.61708577585056545444786 02 x I^2) + (0.01088772973400629721918 43 x I^3)

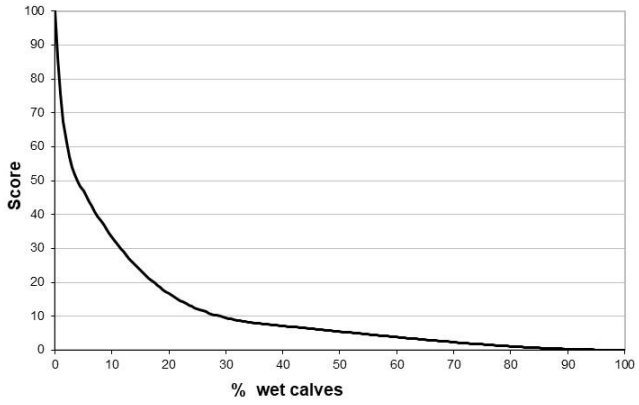


Figure 33 *Calculation of scores for thermal comfort according to % of wet calves.*

5.3.1.5 Ease of movement

A score for ease of movement is attributed to each group observed according to the slipperiness of the floor:

Quality of the floor	Score
Dangerous	0
Very slippery	15
Slippery	25
Moderately slippery	50
Slightly slippery	75
Not at all slippery	100

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.

5.3.1.6 Absence of injuries

The measures are defined as follows:

- Lameness – the calf shows abnormality of movement caused by reduced ability to use one or more limbs in a normal manner
- Bitten tail/ear – the calf presents chewing wounds as damaged tail/ear with/without presence of fresh blood or scab

These two measures are scored independently one from the other without a scale for severity of the injury. As such we do not keep track if both injuries are on the same animal but we have the following data at farm level:

Regarding lameness:

Categories	Normal	Lame
% of observed calves	p_0	p_1

with $p_0 + p_1 = 100$

Regarding bitten tail/ear:

Categories	Normal	Bitten tail/ear
% of observed calves	q_0	q_1

with $q_0 + q_1 = 100$

Two partial scores are calculated, one for lameness, and one for bitten tail/ear, before being combined into a criterion score.

Partial score for lameness: The % of lame calves is used to calculate the index for lameness:

Index = 100 – (% calves lame).

This index is computed into a score thanks to I-spline functions as follows:

When $\mathbf{I_s} \leq 84$ then Score = $(-0.00000000001899502665601 17 \times \mathbf{I_s})$
$+(0.00079425077610790735874 18 \times \mathbf{I_s}^2) - (0.00000579929138215679170 30 \times \mathbf{I_s}^3)$

When $\mathbf{I_s} \geq 84$ then Score = $-14160.193847856731736101210 1173$
$+ (505.72117361274553104522055 95 \times \mathbf{I_{sl}}) - (6.01969552134254826114556 64 \times \mathbf{I_s}^2)$
$+ (0.02388503170236501438328 25 \times \mathbf{I_s}^3)$

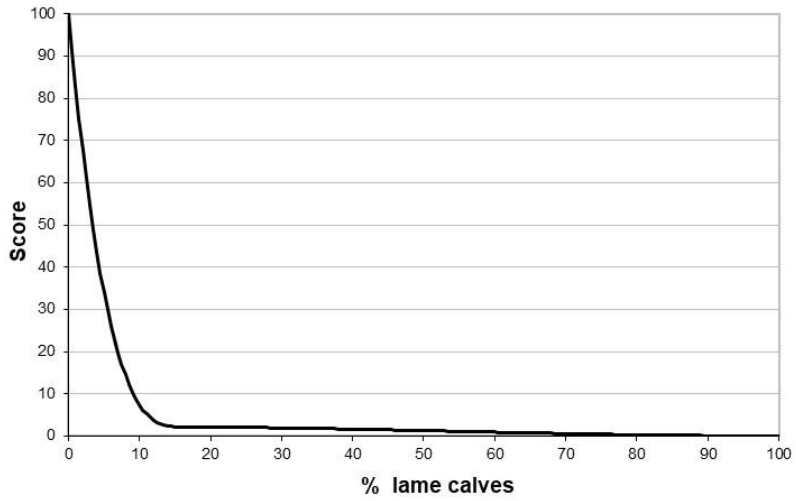


Figure 34 *Calculation of scores for absence of injuries according to % of lame calves.*

Partial score for bitten tail/ear: The % of calves with bitten tail/ear is used to calculate an index for bitten tail/ear:

Index = 100 – (% calves with bitten tail/ear).

This index is computed into a score thanks to I-spline functions as follows:

When $I_I \leq 81$ then Score = $(2.96294791255915\ E^{-11} \times I_I) - (1.1735752864422\ E^{-12} \times I_I^2) + (1.06108128258\ E^{-14} \times I_I^3)$

When $I_I \geq 81$ then Score = $-7748.0789940707 + (286.965903490332 \times I_I) - (3.54278909906061 \times I_I^2) + (0.0145793796344433 \times I_I^3)$

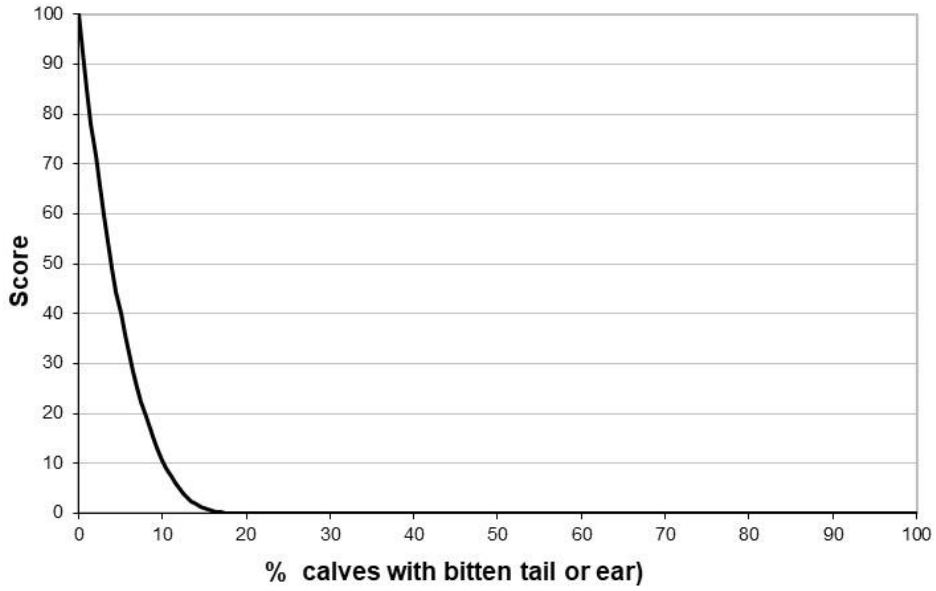


Figure 35 *Calculation of scores for absence of injuries according to % of calves with bitten tail or ear.*

Score for absence of injuries: The two partial scores are combined using a Choquet integral. The parameters of the Choquet integral are:

μ_s=0.35 and μ_I=0.29

5.3.1.7 Absence of disease

The frequency of symptoms (expressed as % calves affected) is compared to warning and alarm thresholds as follows:

Measure[1]	Alarm threshold	Warning threshold
Coughing	12%	6%
Increased respiratory rate	7%	4%
Pneumonia[2]	25%	13%
Pleuritis	3%	2%
Nasal discharge	13%	6%
Diarrhoea	10%	5%
Abomasal lesions[3]	25%	13%
Plaque in rumen	25%	13%
Bloated rumen	10%	5%
Obviously sick calves	10%	5%
Dull calves	6%	3%
Mortality	4%	2%

[1] Expressed as % calves affected
[2] % of calves with severe pneumonia (score 3)
[3] % of calves with at least one large lesion (size 3)

In regards to the 'alarm' threshold for anemia it has been proposed to consider the initial haemoglobin level of the calves (first Hb check) as follows:

Initial (i.e. 3 weeks after arrival)	During visit (i.e. 13 weeks after arrival)
% of calves with Hb below 4.5mmol/L	% of calves with Hb below 4.5mmol/L
< 10	alarm at 9
10-15	alarm at 11
15-20	alarm at 13
> 20	alarm at 15

The frequency of symptoms (expressed as % of calves affected) is compared to warning and alarm thresholds as follows:

Measure[1]	**Alarm threshold**	**Warning threshold**
Coughing	11.1	5.6
Abnormal breathing	6.3	3.1
Pneumonia	21.0	10.5
Pleuritis	20.6	10.3
Nasal discharge	12.8	6.4
Liquid manure	12.0	6.0
Abomasal lesions	46.0	23.0
Plaque in rumen	36.0	18.0
Bloated rumen	9.1	4.5
Obviously sick calves	7.0	3.5
Dull calves	5.8	2.9
Mortality	4.9	2.5
Haemoglobin < 4.5 mmol/l	6.3	3.2

[1] % of calves affected

Symptoms are grouped areas

- Coughing, Abnormal breathing, Nasal discharge, Pneumonia, Pleuritis (respiratory disease)
- Liquid manure, Bloated rumen, Abomasal lesions, Rumen plaques (digestive disorders)
- Haemoglobin (anemia)
- Dull calves, Obviously sick calves, Mortality (general)

total number of areas = 4

The severity of problems is estimated per area:

- if in an area the frequency of one symptom is above the warning threshold and the others are below the alarm threshold, 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

$$\mathbf{I} = \left(\frac{100}{N_{tot}} \times \left(N_{tot} - \frac{\sum_{k=0}^{2} w_k N_k}{w_2} \right) \right)$$

with N_{tot} = number of areas = 4

N_k number of problems according to intensity

k= 0 no problems

k= 1 warnings
k= 2 alarms

w_k weight of problems

$w_0 = 0$

$w_1 = 1$

$w_2 = 3$

When **I** ≤ 25 then Score = (0.16369739440081637615 87582x **I**) + (0.01531894538298755360783 42 x $\mathbf{I}^2$) - 0.00012571761751497848524 05x $\mathbf{I}^3$)

When **I** ≥ 25 then Score = -2.07994163867287662483818 17 + (0.41329039104389458936239 52x **I**) + (0.00533522551722127608836 43x $\mathbf{I}^2$) + (0.00000739864736206720385 87 x $\mathbf{I}^3$)

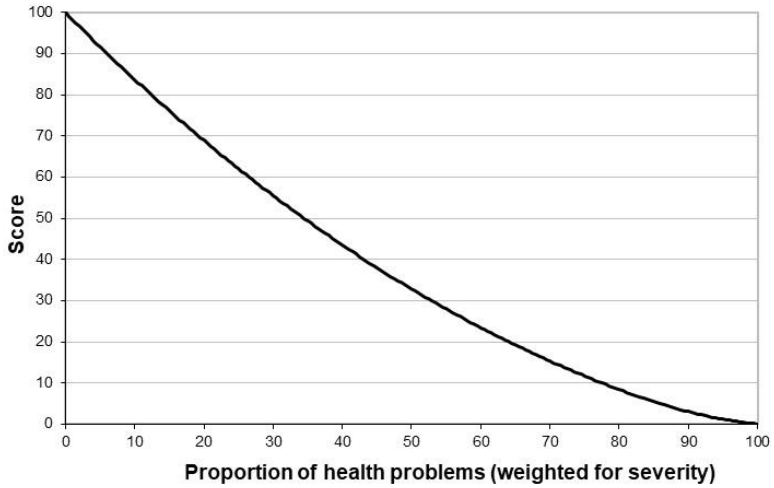
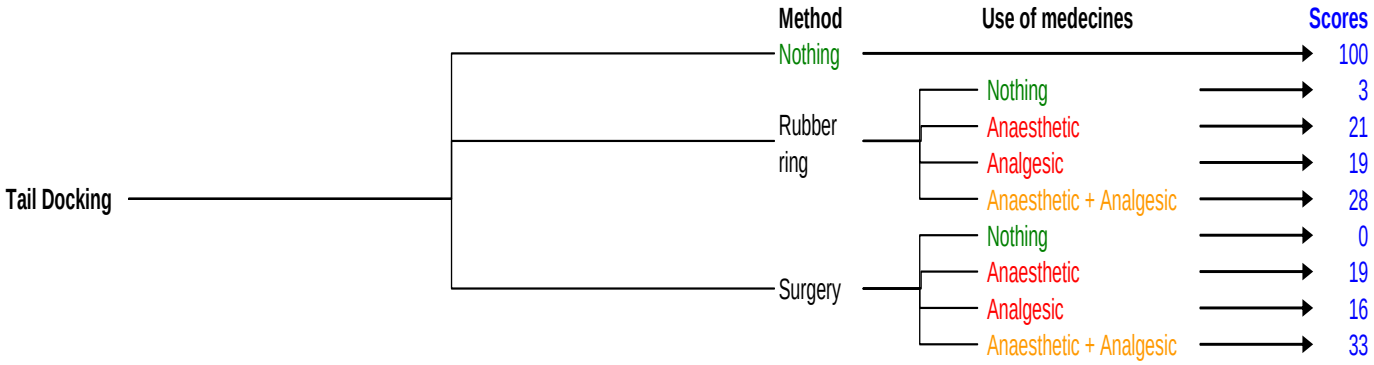


Figure 36 *Calculation of scores for absence of diseases according to the proportion of areas for which symptoms are above the warning or the alarm threshold (weights: 0.33 for warning and 1 for alarm).*

5.3.1.8 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 tail docked. A decision tree is used to attribute scores:



5.3.1.9 Expression of social behaviours

The % of calves performing social licking is used to calculate an index:

Index **I** = 100 – (% of calves performing social licking)

Index **I** is then transformed into a score thanks to B-spline functions:

When I≤80 then Score = (0.172610241562739 x I) + (-0.00971074033269292 x I^2)
+ (0.000188827826822316 x I^3)
When I≥80 and I≤85 then Score = -6732.55682506796 + (249.750590142192 x I)
- (3.09600132385883 x I^2) + (0.0129204018154552 x I^3)
When I≥85 and I≤90 then Score = 21681.6527648101 - (734.00350441739 x I) + (8.25474672770482 x I^2)
- (0.0307257635108063 x I^3)
When I≥90 and I≤94.5 then Score = 11663.2536017581 – (429.448035387058 x I)
+ (5.19824577716442 x I^2) - (0.020621524032217x I^3)

When I≥94.5 then Score = 609954.040173841- (19305.0326940745 x I) + (203.692780393196 x I^2)
- (0.716376654982287x I^3)

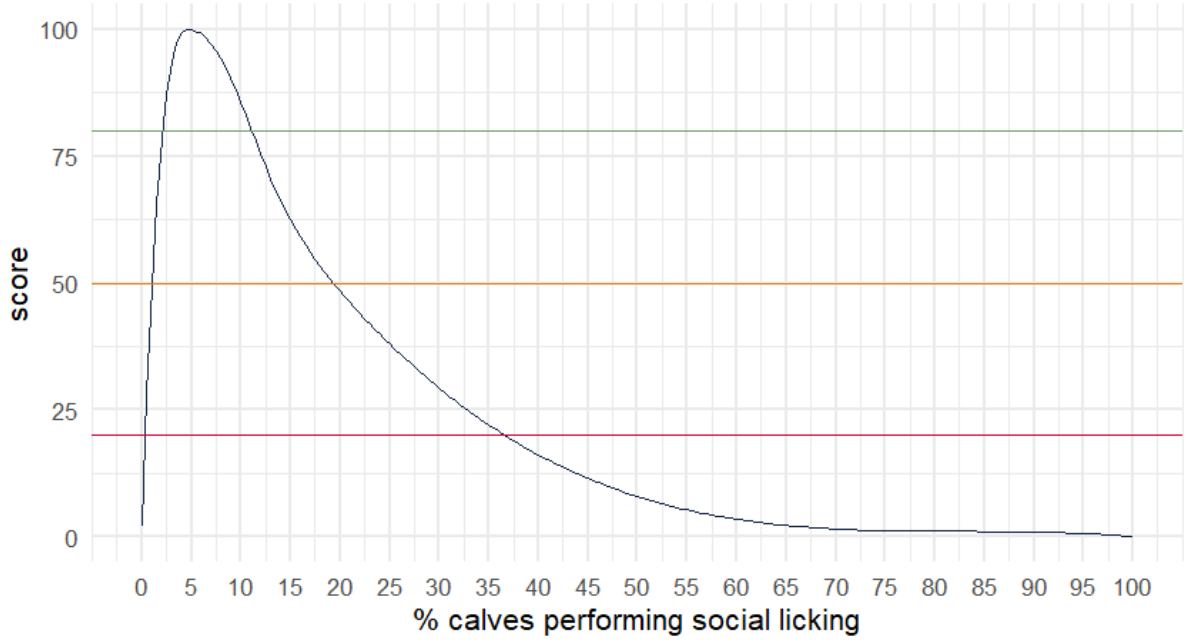


Figure 37 *Calculation of scores for expression of social behaviour according to % of calves performing social licking.*

5.3.1.10 Expression of other behaviours

<u>Partial score for abnormal oral behaviour</u>
An index is calculated from the % of calves performing abnormal oral behaviours:

Index $\mathbf{I_p}$ = 100 - (% calves performing abnormal oral behaviours)

$\mathbf{I_p}$ is transformed into a score S_p thanks to I-spline functions:
When $\mathbf{I_p} \leq 70$ then S_p = - (0.000000000001003813127958 7 x $\mathbf{I_p}$)
+ (0.000000000000004687844143 79 x $\mathbf{I_p}^2$) + (0.000037969667957814807308 1 x $\mathbf{I_p}^3$)
When $\mathbf{I_p} \geq 70$ then S_p = - 788.014942255923415359575301 4
+ (33.772069072007006695912423 3 x $\mathbf{I_p}$) - (0.482458131056657357760286 7 x $\mathbf{I_p}^2$) + (0.002335389345587993766700 8 x $\mathbf{I_p}^3$)

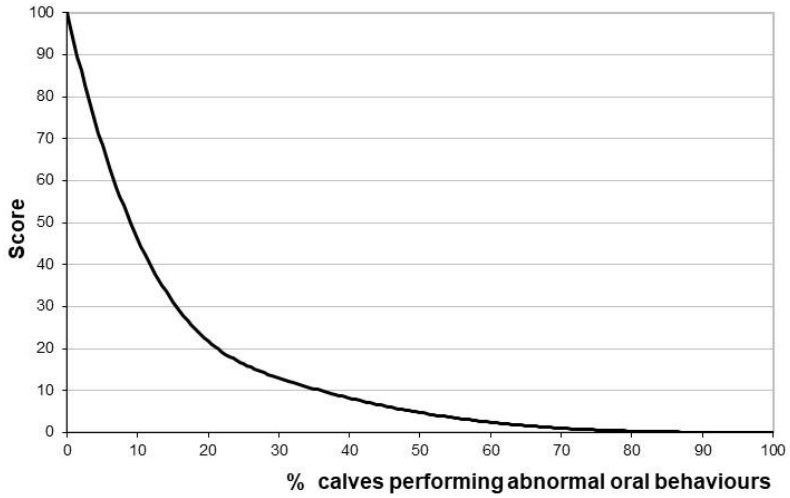


Figure 38 *Calculation of scores for expression of other behaviours according to % of calves performing abnormal oral behaviour.*

Partial score for urine drinking

An index is calculated from the % of calves with signs of urine drinking

Index $\mathbf{I_a}$ = 100 - (% calves with signs of urine drinking)

$\mathbf{I_a}$ is transformed into a score S_a thanks to spline functions:

When $\mathbf{I_a} \leq 87$ then $S_a = (0.00000000004008644132377 53 \times \mathbf{I_a}) - (0.00000000000159051671173 39 \times \mathbf{I_a}^2) + (0.00000000000001396880115 30 \times \mathbf{I_a}^3)$

When $\mathbf{I_a} \geq 87$ then $S_a = -29972.954418990731937810778 6179 + (1033.549838925562198710395 0232 \times \mathbf{I_a}) - (11.879879815612305549166 1944 \times \mathbf{I_a}^2) + (0.045516768694593097432 9322 \times \mathbf{I_a}^3)$

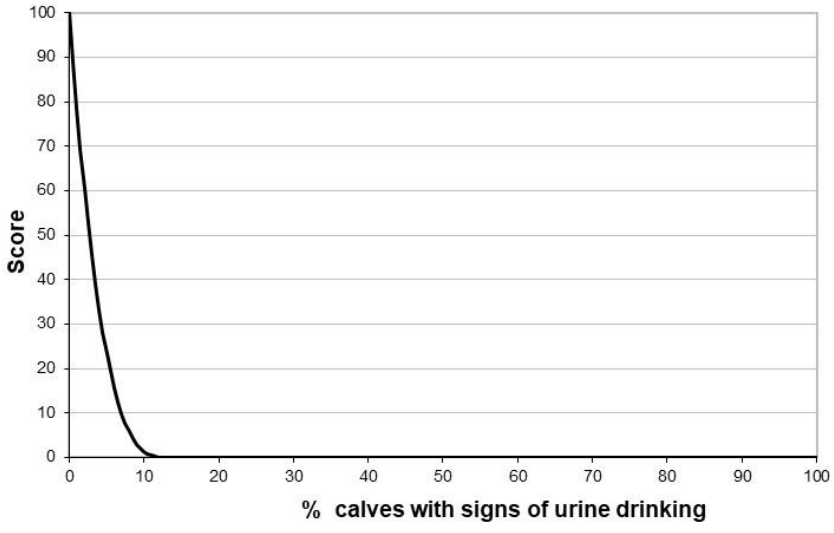


Figure 39 *Calculation of scores for expression of other behaviours according to % of calves with signs of urine drinking*

Score for expression of other behaviour:

S_p and S_a are combined into a score thanks to a Choquet integral. The parameters of the Choquet integral are:

$\mu_p = 0.11$ and $\mu_a = 0.61$

5.3.1.11 Good human-animal relationship

The test consists of targeting one calf, approaching this calf and looking at how close it can be approached. Even though the test was developed on a 5 point scale, it has been decided to keep the best category of calves, those that can be touched.

The % calves that can be touched (**I**) is transformed into a score thanks to I-spline functions:
When **I** ≤ 40 then S = (3.40643900933759979920978 37 x **I**) - (0.0523318046715347678921049 x **I**^{2})
+ (0.000330997315992034976586 0 x **I**^{3})
When **I** ≥ 40 then S = 14.3179763621012554608569189 + (2.3325907822848472861210212 x **I**)
- (0.0254855989969006331563595x **I**^{2}) + (0.000107278935378311154826 2 x **I**^{3})

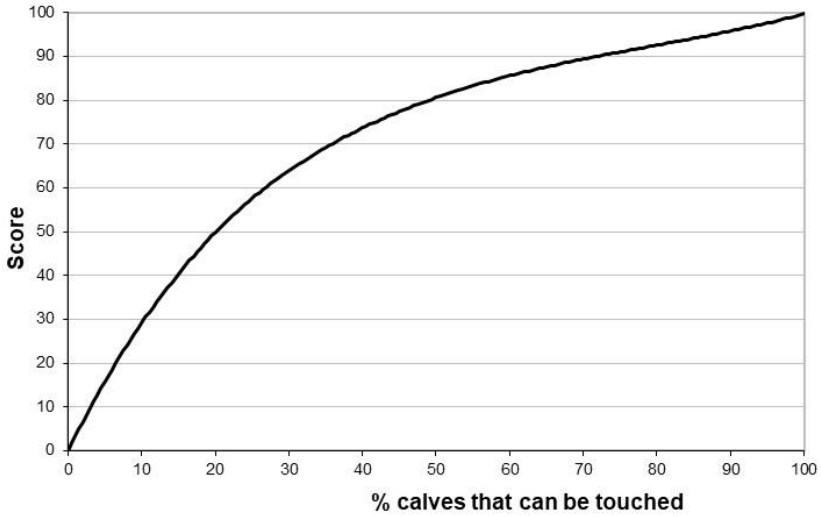


Figure 40 Calculation of scores for good human animal relationship according to % of calves that can be touched.

5.3.1.12 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 thanks to a weighted sum:

$$I = 0.44544 + \sum_{k=1}^{20} W_k N_k$$

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	-0.00376
Relaxed	0.01559
Fearful	-0.00930
Agitated	-0.01237
Depressed	-0.01081
Calm	0.00823
Tense	-0.01357
Indifferent	0.00649
Frustrated	-0.01482
Friendly	0.01239
Bored	-0.00508
Playful	0.00334
Lively	0.00476
Inquisitive	-0.00100
Boisterous	-0.00131
Uneasy	-0.01543
Sociable	0.01162
Apathetic	-0.01383
Happy	0.01241
Distressed	-0.01016

This index is then transformed into a score using I-spline functions (Figure 40) as follows:
When $I \leq 0$ then Score = $-(10 \times \mathbf{I}) - (1.25 \times \mathbf{I}^2)$
When $I \geq 0$ then Score = $50 + (11.667 \times \mathbf{I}) - (0.55556 \times \mathbf{I}^2)$

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 41 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).

5.3.2 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	0.25

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

Principle Good housing

μ_3	μ_4	μ_5
0.23	0.19	0.19

μ_{34}	μ_{35}	μ_{45}
0.23	0.32	0.28

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

Principle Good health

μ_6	μ_7	μ_8
0.07	0.22	0.12

μ_{67}	μ_{68}	μ_{78}
0.42	0.22	0.22

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	0.07	0.14

μ_{910}	μ_{911}	μ_{912}
0.07	0.07	0.16

μ_{1011}	μ_{1012}	μ_{1112}
0.12	0.17	0.26

μ_{91011}	μ_{91012}	μ_{91112}	μ_{101112}
0.39	0.49	0.52	0.46

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 generally intermediate between the lowest and the highest values obtained at criterion level, and closer to the minimum value.

Within each principle, some criteria can be 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”, the three criteria (“Ease of movement”, “Comfort around resting” and “Thermal comfort”) have about the same importance.
- Within principle “Good health”, Criterion “Absence of disease” is considered more important than Criterion “Absence of injuries” and Criterion “Absence of pain induced by management procedures”.
- Within principle “Appropriate behaviour”, the criterion “Positive emotional state” is more important than Criteria “Good human-animal relationship”, “Expression of social behaviours” and “Expression of other behaviours”.

Examples of principle-scores resulting from criterion-scores are provided in Tables 22 to 25 below.

Table 22 *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 23 *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	38
75	25	50	39
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 24 *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	36
50	25	75	34
75	25	50	32
40	50	60	43
40	60	50	44
50	40	60	43
50	50	50	50
50	75	25	41
75	50	25	37
50	60	40	46
60	40	50	43
60	50	40	45

Table 25 *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	50	50	65	43
35	50	65	50	44
35	65	35	65	43
35	65	50	50	40
35	65	65	35	42
50	35	50	65	39
50	35	65	50	45
50	50	35	65	44
50	50	50	50	44
50	50	65	35	50
50	65	35	50	42
50	65	50	35	43
65	35	35	65	41
65	35	50	50	40
65	35	65	35	44
65	50	35	50	37
65	50	50	35	43
65	65	35	35	42

5.3.3 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.

5.4 Collection of data for veal calves at slaughterhouse

As yet not included in the protocol.

5.5 Calculation of scores for veal calves at slaughterhouse

As yet not included in the protocol.

Annex A: Guidelines for visit to the animal unit

Calves

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 veal calves on farm

Not included within the protocol at the moment

B2. Recording Sheets for veal calves at slaughter

Post mortem observation: Abomasum

Page:

Assessor:

Date:

Farm:

Assessor	Farm

	Pyloric area				Torus pylorus
No.	lesion present[1]	1*	2*	3*	lesion present[1]
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
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20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					

	Pyloric area				Torus pylorus
No.	lesion present[1]	1*	2*	3*	lesion present[1]
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
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56					
57					
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59					
60					

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

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

Page: Assessor: Date: Farm:

Post mortem observation: Lungs

		pneumonia[2]				pleuritis
No. Calf	No.	none 0	minimum 1	mild 2	severe 3	present[1]
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
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	36					

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

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Page: Assessor: Date: Farm:

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	97					
	98					
	99					
	100					

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

[2]: tick the corresponding box

Annex C: Contributors to Welfare Quality

Welfare Quality partners	Country
ID-Lelystad, Instituut voor dierhouderij en diergezondheid, Lelystad	The Netherlands
IFIP Institut du Porc, Rennes	France
Cardiff University (formerly known as UWC: University of Wales, Cardiff), Cardiff	United Kingdom
Coopérative Interdépartementale Aube, Loiret, Yvonne, Nièvre	France
Aarhus University (formerly known as DIAS: Danish Institute of Agricultural Sciences), Aarhus	Denmark
University of Natural Resources and Applied Life Sciences, Vienna	Austria
University of Kassel, Kassel	Germany
Institut national de recherche pour l'agriculture, l'alimentation et l'environnement – INRAE (formerly known as INRA Institut National de la Recherche Agronomique) , Paris	France
Institut de l'Elevage, Paris	France
Institut de Recerca i Tecnologia Agroalimentàries, Girona	Spain
Institut Supérieur d'Agriculture Lille, Lille	France
Veterinärmedizinische Universität Wien,Vienna	Austria
Katholieke Universiteit Leuven, Leuven	Belgium
University of Copenhagen (formerly known as KVL: The Royal Veterinary and Agricultural University), Copenhagen	Denmark
UPRA France Limousin Selection, Boisseuil	France
Teagasc - The National Food Centre, Carlow	Ireland
National Institute for Consumer Research, Oslo	Norway
Norwegian Agricultural Economics Research Institute, Oslo	Norway
ASG Veehouderij BV (formerly known as: Praktijkonderzoek Veehouderij BV), Lelystad	The Netherlands
Scottish Agricultural College, Edinburgh	United Kingdom
Sveriges Lantbruksuniversitet, Uppsala	Sweden
Universitat Autònoma de Barcelona, Barcelona	Spain
Göteborg University, Göteborg	Sweden
Università degli Studi di Milano, Milan	Italy
University of Newcastle upon Tyne, Newcastle upon Tyne	United Kingdom
Department of Business Administration, School of Economics and Management, Lund University, Lund	Sweden
Agricultural University of Norway, Department of Animal and Aquacultural Sciences, Aas	Norway
Università degli Studi di Parmai, Parma	Italy
Università degli Studi di Padova-Dipartimento di Scienze Zootecniche, Padua	Italy
University of Pisa Dipartimento di Agronomia e Gestione dell'Agroecosistema- Sezione Economia', Pisa	Italy
The University of Bristol, Bristol	United Kingdom
Université Pierre et Marie Curie (Paris 6 University), Paris	France
The University of Reading, Reading	United Kingdom
Wageningen University, Wageningen	The Netherlands
Department of Political Science, Stockholm University, Stockholm	Sweden
Centro Ricerche Produzioni Animalia SpA, Reggio Emilia	Italy
Vyzkumny ustav zivocisme vyroby, Prague	Czech Republic
The University of Exeter, Exeter	United Kingdom
University of Toulouse le Mirail, Toulouse	France
Instituut voor Landbouw- en Visserijonderzoek, Merelbeke	Belgium
Universidad de la República, Montevideo	Uruguay
Faculty of Veterinary Medicine, Mexico City	Mexico
Department of Animal Science, Faculty of Agriculture and Veterinary Sciences, Sao Paolo	Brasil
Veterinary Faculty, Universidad de Chile, Santiago	Chile

Colophon

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