Welfare Quality®
Assessment protocol for poultry

Acknowledgement

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  ASG Veehouderij BV, Lelystad, The Netherlands.

  Welfare Quality® project office
  Mrs. Anke de Lorm
  PO Box 65, 8200 AB Lelystad, The Netherlands
  Anke.delorm@wur.nl

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Foreword

The European Welfare Quality® project developed standardized ways of assessing animal welfare and a standardized way of integrating this information to enable farms and slaughterhouses to be assigned to one of four categories (from poor through to good animal welfare).
One of the innovations of the Welfare Quality® animal welfare assessment system is that it focuses more on animal-based measures (e.g. directly related to animal body condition, health aspects, injuries, behaviour, etc.). Existing approaches largely concentrate on design or management-based characteristics (e.g. size of cage or pen, flooring specifications etc.). Of course, this does not mean that resource-based or management-based factors are ignored in Welfare Quality®; and many of these are important features of the system. A particular attraction of using animal-based measures is that they show the 'outcome' of the interaction between the animal and its environment (housing design and management) and this combined outcome is assessed by the Welfare Quality® assessment system.
This protocol provides a description of the Welfare Quality® assessment procedure for poultry.

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 Bosse Algers, Arnd Bassler, Raphaëlle Botreau, Steve Brown, Laëtitia Colin, Paolo Ferrari, Björn Forkman, Ernst Froehlich, Christine Graml, Henk Gunnink, Tersia Heiskanen, Ingrid de Jong, Anne Larsen, Tine Lentfer, Christine Leterrier, Ute Knierim, Knut Niebuhr, Victoria Sandilands, Marion Staack, Esther Struelens, Susanne Waiblinger, Francoise Wemelsfelder, Sue Haslam, Heike Schulze Westerath, Rebecka Westin, Lindsay Wilkins, Steve Wotton and Patrick Zimmerman for their work in the development of the final protocols.

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

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

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Table of content

Introduction

Animal welfare is an important attribute of an overall 'food quality concept' and consumers expect their animal-related products, especially food, to be produced with respect for the welfare of the animals. Recent surveys carried out by the European 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 outlines the Commission's planned initiatives and measures to improve the protection and welfare of animals for the period 2006-2010. The Action Plan aims to ensure that animal welfare is addressed in the most effective manner possible, in all EU sectors and through EU relations with Third Countries. Among other things the Action Plan foresees a classification system for animal welfare practices, to differentiate between cases where minimum standards are applied and cases where even higher standards are used. It also foresees setting up standardised indicators whereby production systems which apply higher animal welfare standards than the minimum standards get due recognition. The option of an EU label for animal welfare is also put forward, to promote products obtained in line with certain animal welfare standards.

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

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

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

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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.

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 poultry and is restricted to the key production animals, which are broiler chicken and laying hens. The document is divided to present the collection of data for broiler chicken measured on farm and then the collection of data measured at the slaughterhouse, but which are used in the assessment of broiler welfare on farm. Thus these two sections complement each other and are used together in the calculation of welfare scores for broiler chicken on farm. The following section presents the collection of data for laying hens measured on farms. As yet there is no protocol for collection of data at slaughter and no calculation of welfare scores for laying hens.

Glossary

ADT	Avoidance distance test
Cm	Centimetre(s)
(C-) m^2	Square (centi-) metre
DOA	Dead on arrival
e.g.	*exempli gratia*: for example
h	Hour(s)
i.e.	*id est*: that is
Kg	Kilogram(s)
Ls	Line speed (birds per minute)
Min	Minute(s)
NO(T)	Novel object (test)
QBA	Qualitative behaviour assessment
RS	Recording sheet
s	Second(s)
VAS	Visual analogue scale

1 Scope

This poultry protocol will deal with measures related to the welfare assessment for two categories of poultry; broiler chickens and laying hens. The descriptions are kept as short as possible and for training purposes more detailed descriptions of the measures are recommended. The information gathered covers the production period on farm for broiler chicken and laying hens and the period at the end of life, including transport and slaughter, for broiler chicken (see Figure 1).

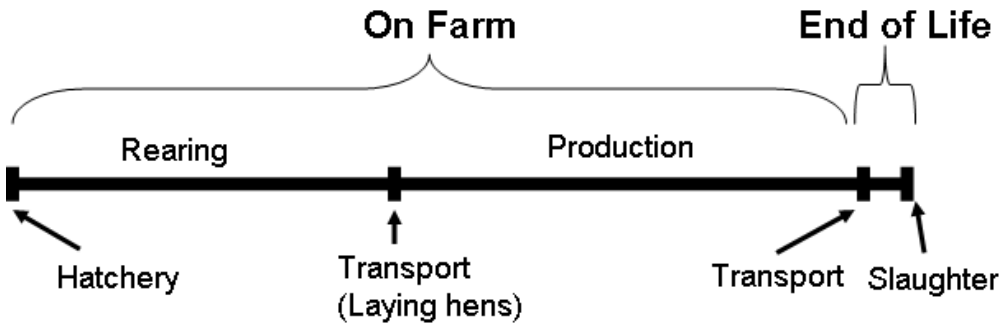


Figure 1 Schematic reproduction of the different periods in the life of production poultry.

At least four major periods can be distinguished: the hatchery, the pullet rearing period for laying hens (which runs from hatching to point of lay), the production period (chicken meat and eggs); and the end of life of the animal, where it will be transported and slaughtered (see Table 1). Some specific periods are not yet included in the protocols for some categories of animals:

- For broilers 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 hatchery or the pullet rearing period (laying hens). No data will be collected during the time the animals are transported, although measures taken at the slaughterhouse will indirectly allow assessment of the welfare of broilers during transport to be assessed. Neither do we consider parent or other poultry breeding stock;
- Transport between farms, for example as sometimes occurs between rearing and production periods is not considered;
- The protocol is not applicable to other avian species such as ostriches, turkeys, geese, ducks, quail or guinea fowl;

This is also shown in Table 1.

	Rearing	**Producing**	**End of life**
Broiler chicken			
Laying hens			

Included in poultry protocols Not included in protocols

Table 1 Periods in the life of poultry which are considered in the Welfare Quality® protocols.

The protocols described in this section apply only to broiler chicken and laying hens (*Gallus gallus*). The protocols for broiler chicken and laying hens are applicable in a wide range of animal units, whether they are extensive or intensive.

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 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 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 those reasons, a list of current normative legal texts is not provided for within the Welfare Quality® protocols.

However, the current key legislative framework can be found at the webpage of EUR-lex, where the relevant treaties, legislation, case-law and legislative proposals can be consulted.[1] If the application or interpretation of any element of this standard conflicts with legislation, current acting legislation always has priority.

[1] 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 manager on the farm, the driver of the transport vehicle 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

Broiler chicken *(Gallus gallus)*
Domesticated fowl of genotypes suitable for meat production

Flock cycle
A broiler flock cycle starts when the one-day old chicks are placed in the broiler house and ends when the flock is transported to the slaughterhouse
A laying hen flock cycle starts when a young flock, about 16 weeks, is placed in the laying bird house and ends when the flock is slaughtered.

Laying hen *(Gallus gallus)*
Domesticated fowl of genotypes predominantly selected for laying eggs, and additionally sometimes used for meat production

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 maintaining good litter quality

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

Pullet (*Gallus gallus*)
Young laying birds before onset of egg laying

Resource-based measure
Measure that is taken regarding the environment in which the animals are kept
NOTE Resource-based measures contain 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

Welfare category
Final categorization given to an animal unit that indicates the overall welfare of animals in that particular unit
NOTE This is expressed on a 4 level scale: not classified, acceptable, enhanced, and excellent

Welfare criterion
Represents a specific area of welfare concern that has to be addressed to satisfy good animal welfare
NOTE An example of a welfare criterion is “absence of prolonged hunger”

Welfare measure
Measure taken on an animal unit that is used to assess a welfare criterion
NOTE A measure can be animal-based, resource-based or management-based

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

Welfare Quality® protocol
Description of the measures that will be used to calculate the overall assessment of welfare
NOTE The protocols also specify how the data will be collected

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

4 Background Welfare Quality® protocols

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

4.1 Overall structure of the project

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

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

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

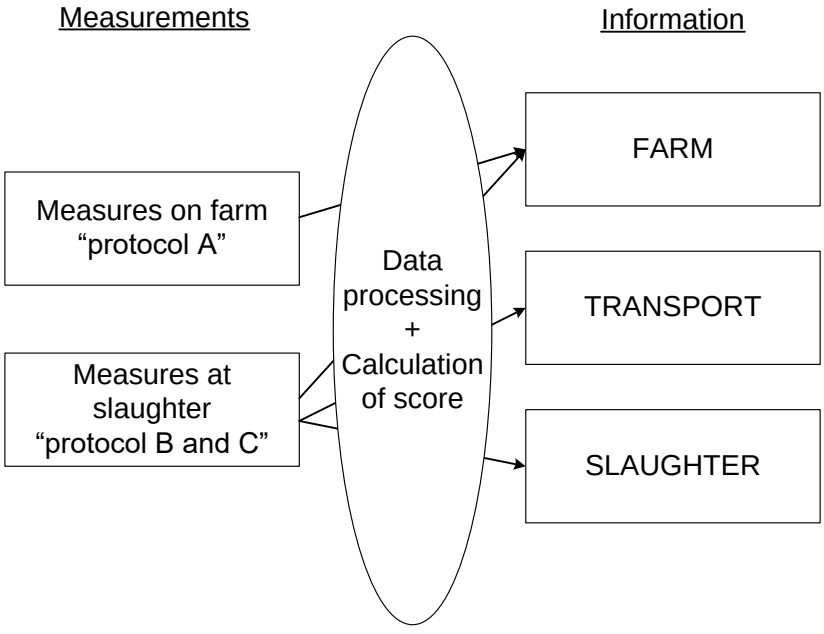


Figure 2 The different sources of information in Welfare Quality®. It is outside the scope of this document, but potential use of the output generated includes information provided to consumers, advisors and retailers.

4.2 Basic principles

4.2.1 Introduction

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

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

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

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

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

4.2.2 Defining welfare principles and criteria

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

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

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

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

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

More detailed definitions of welfare criteria are described below.

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

4.2.3 Measures developed to check criteria

Whenever possible, the final Welfare Quality® assessment measures have been evaluated with respect to their validity (does the measure reflect some aspect of the actual welfare of animals), reliability (acceptable inter or intra observer repeatability and robustness to external factors e.g. time of day or weather conditions) and their feasibility. A further important aspect of this data collection is that value judgements are minimized, i.e. the assessor counts or classifies animals according to a simple series of categories illustrated by pictures or video clips. Hence measures in the protocols do not require veterinary diagnostic expertise or specialist animal behaviour knowledge to be accurately recorded. Some measures which were initially proposed did not meet these conditions and were dropped from the scheme early in the evaluation process, whereas other measures have been accepted in anticipation of further improvements and refinements. This latter concession is because at least one measure per criterion is needed to assess overall animal welfare. For some criteria, it has been necessary to include resource- and/or

management-based measures because no animal-based measure was sufficiently sensitive or satisfying in terms of validity, reliability, or feasibility.

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

4.2.4 Calculation of scores

Once all the measures have been performed on an animal unit, a bottom-up approach is followed to produce an overall assessment of animal welfare on that particular unit: first the data collected (i.e. values obtained for the different measures on the animal unit) are combined to calculate criterion-scores; then criterion-scores are combined to calculate principle-scores; and finally the animal unit is assigned to one welfare category according to the principle-scores it attained (Figure 3). A mathematical model has been designed to produce the overall assessment.

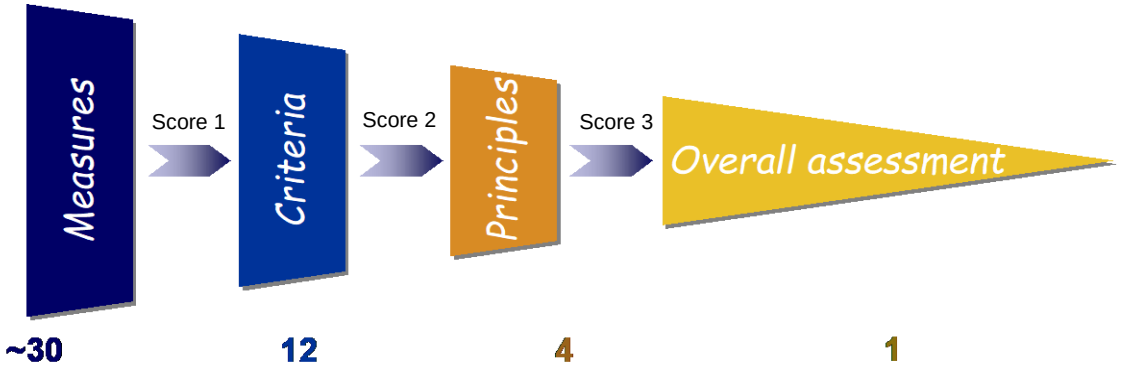


Figure 3 Bottom-up approach for integrating the data on the different measures to an overall assessment of the animal unit.

Calculation of criterion-scores

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

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

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

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

- When all measures used to check a criterion are taken at farm level and are expressed in a limited number of categories, a decision tree is produced. An example is provided in Explanation box 1.
- When a criterion is checked by only one measure taken at individual level, this scale generally represents the severity of a problem and the proportion of animals observed can be calculated (e.g. percentage animals walking normally, percentage moderately lame animals, percentage severely lame animals). In that case a weighted sum is

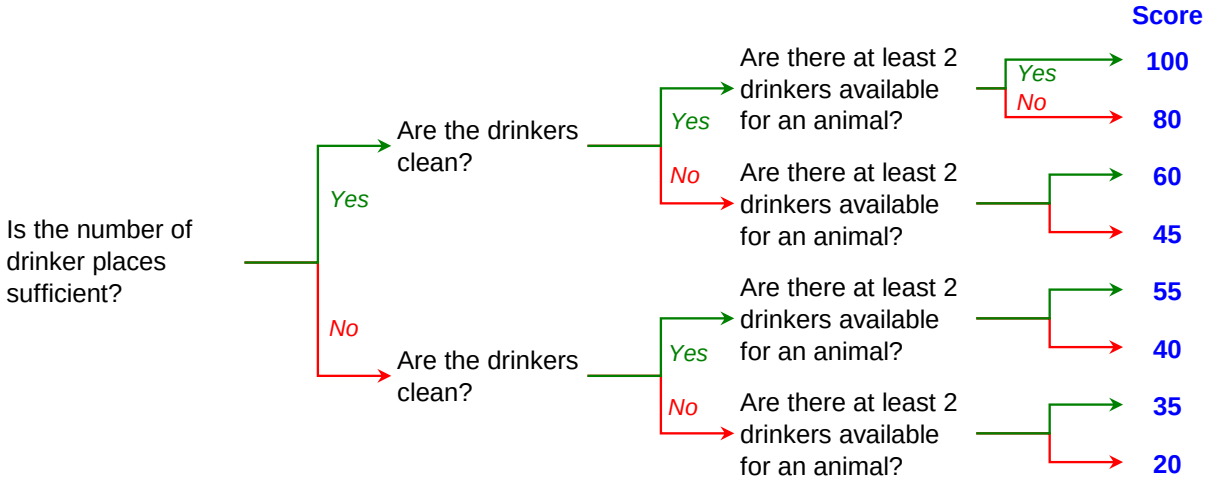
calculated, with weights increasing with severity. An example is provided in Explanation box 2.

- When the measures used to check a criterion lead to data expressed on different scales (e.g. percentage animals lying outside the lying area, or average latency to lie down expressed in seconds), data are compared to an alarm threshold that represents the limit between what is considered abnormal and that considered to be normal. Then the number of alarms is used as the measure value. An example is provided in Explanation box 3.

Experts from animal sciences were consulted to interpret the raw data in terms of welfare. When necessary, alarm thresholds were defined by consultation with them. Then experts were asked to score virtual farms. In the situations where weighted sums were to be calculated, this consultation was used to define weights that produce the same ranking of farms as the one given by experts.
This exercise showed that experts do not in general follow a linear reasoning, e.g. for a given disorder a 10 % increase does not yield the same decrement in expert scores at the bottom of the [0,100] scale (where most animals get this disorder) than at the top of the scale (when most animals are normal). It is therefore necessary to resort to non-linear functions to produce criterion-scores, in this case I-spline functions. Briefly, I-spline functions allow calculation of portions of curves so as to obtain a smooth representative curve. They are expressed in the form of cubic functions (Explanation box 2).

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

Explanation box 1: Decision tree as applied to absence of prolonged thirst in fattening pigs
Thirst is not assessed directly on animals because signs of dehydration can be detected only in extreme cases. Rather, the number of drinking places, their functioning and their cleanliness are assessed. The recommended number of pigs is calculated (10 pigs per functioning drinking place and 5 for a drinking place of reduced capacity). If there are more pigs in the pen than recommended then the number of drinking places is considered insufficient. Thereafter, cleanliness of drinkers and whether pigs have access to two drinkers in the same pen is considered. The following decision tree is applied:



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

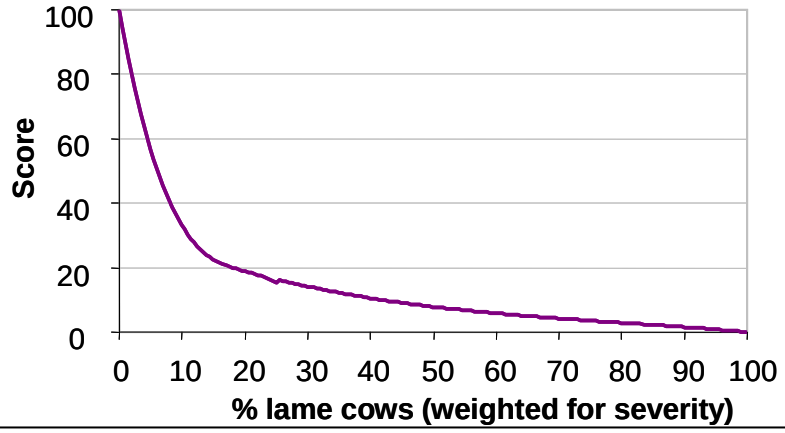
The % of animals moderately lame and the % of animals severely lame are combined in a weighted sum, with a weight of 2 for mild lameness and 7 for severe lameness. This sum is then transformed into an index that varies from 0 to 100:

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

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

When $\mathbf{I} \leq 65$ then Score = $(0.0988 \times \mathbf{I}) - (0.000955 \times \mathbf{I}^2) - (5.34 \times 10^{-5} \times \mathbf{I}^3)$

When $\mathbf{I} \geq 65$ then Score = $29.9 - (0.944 \times \mathbf{I}) - (0.0145 \times \mathbf{I}^2) + (1.92 \times 10^{-5} \times \mathbf{I}^3)$



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).

Calculation of principle-scores from criterion-scores

Criterion-scores are synthesized to calculate principle-scores. For instance, the scores obtained by an animal unit for absence of injuries, absence of disease, and absence of pain due to management procedures are combined to reflect compliance of this unit with the principle 'good health'. Animal and social scientists were consulted, and considered some criteria to be more important than others (e.g. in most animal types, 'Absence of disease' is considered to be more important than 'Absence of injuries' which in turn is more important than 'Absence of pain induced by management procedures'). Nevertheless, synthesis does not allow compensation between

scores (e.g. absence of disease does not compensate for injuries and vice versa). A specific mathematical operator (Choquet integral) was used to take into account these two lines of reasoning. In short, the Choquet integral calculates the difference between the minimum score and the next minimum score and attributes a weight (called 'capacity') to that difference. This process is repeated until the highest score is reached. In the species-specific sections, only the 'capacities' are given (μ_x for the capacity of a criterion x, μ_{xy} for the capacity of a group made of 2 criteria x and y, etc.). An example of the calculation of principle-scores is provided in Explanation box 4.

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

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

$$\text{Principle-score} = \begin{cases} S_6 + (S_7 - S_6)\mu_{78} + (S_8 - S_7)\mu_8 & \text{if } S_6 \le S_7 \le S_8 \\ S_6 + (S_8 - S_6)\mu_{78} + (S_7 - S_8)\mu_7 & \text{if } S_6 \le S_8 \le S_7 \\ S_7 + (S_6 - S_7)\mu_{68} + (S_8 - S_6)\mu_8 & \text{if } S_7 \le S_6 \le S_8 \\ S_7 + (S_8 - S_7)\mu_{68} + (S_6 - S_8)\mu_6 & \text{if } S_7 \le S_8 \le S_6 \\ S_8 + (S_6 - S_8)\mu_{67} + (S_7 - S_6)\mu_7 & \text{if } S_8 \le S_6 \le S_7 \\ S_8 + (S_7 - s_8)\mu_{67} + (S_6 - S_7)\mu_6 & \textit{if } S_8 \le S_7 \le S_7 \end{cases}$$

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 due to procedures)

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

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

Assignment of animal units to the welfare categories

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

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

Enhanced: the welfare of animals is good.

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

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

'Aspiration values' are defined for each category. They represent the goal that the farm should try to achieve to be assigned to a given category. The excellence threshold is set at 80, the one for enhanced at 55 and that for acceptability at 20. But, just as criteria do not compensate each other within a principle (see above), high scores in one principle do not offset low scores in another, so categories cannot be based on average scores. At the same time, it is important that the final classification reflects not only the theoretical acknowledgement of what can be considered

excellent, enhanced etc. but also what can realistically be achieved in practice. Therefore, a farm is considered ‘excellent’ if it scores more than 55 on all principles and more than 80 on two of them while it is considered ‘enhanced’ if it scores more than 20 on all principles and more than 55 on two of them. Farms with ‘acceptable’ levels of animal welfare score more than 10 on all principles and more than 20 on three of them. Farms that do not reach these minimum standards are not classified (Figure 4). An indifference threshold equal to 5 is applied: For instance, 50 is not considered significantly lower than 55.

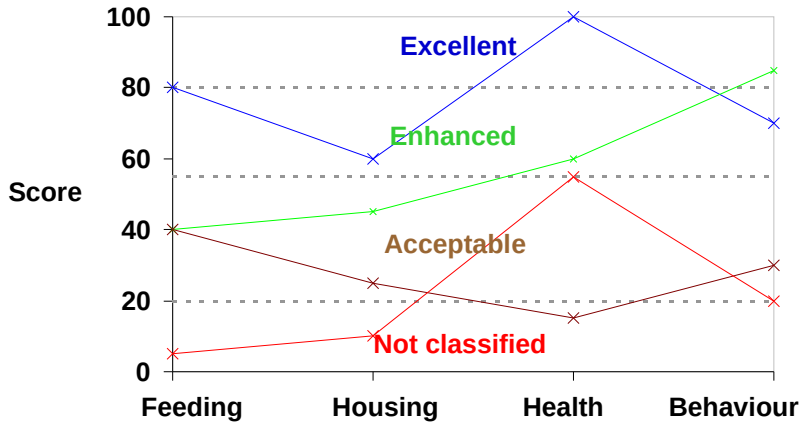


Figure 4 Examples of farms in the four welfare categories.

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

Final comments

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

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

5 Welfare Quality® applied to broiler chicken

The assessment of welfare is a multi–disciplinary process since 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 adaptations to assess the welfare of broiler chicken on farm and at the slaughterhouse.

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

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

Trained assessors will use either animal–based, management-based or resource–based measures to achieve a representative assessment of broiler chicken welfare on each farm. Many different measures are assessed, and many 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, i.e. Yes/No) or a continuous scale (e.g. cm) is used.

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

5.1A Collection of data for broiler chicken on farm (measured on farm)

	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	*This criterion is measured at the slaughterhouse*
	2	Absence of prolonged thirst	Drinker space
Good housing	3	Comfort around resting	Plumage cleanliness, litter quality, dust sheet test
	4	Thermal comfort	Panting, huddling
	5	Ease of movement	Stocking density
Good health	6	Absence of injuries	Lameness, hock burn, foot pad dermatitis
	7	Absence of disease	On farm mortality, culls on farm
	8	Absence of pain induced by management procedures	*This criterion is not applied in this situation*
Appropriate behaviour[1]	9	Expression of social behaviours	*As yet, no measure is developed for this criterion*

[1] *At the slaughter house, no management procedures such as beak trimming, claw cutting etc are carried out. However, stunning and slaughter processes are carried out and these are assessed under the heading 'assessed at slaughter'

	10	Expression of other behaviours	Cover on the range, free range
	11	Good human-animal relationship	Avoidance distance test (ADT)
	12	Positive emotional state	Qualitative behavioural assessment (QBA)

5.1A.1 Good feeding

5.1A.1.1 Absence of prolonged hunger
This criterion is measured at the slaughterhouse (see § 5.1B.1)

5.1A.1.2 Absence of prolonged thirst

Title	**Drinker space (birds per drinker)**
Scope	Resource-based measure: Broiler chicken
Sample size	Animal unit
Method description	Calculate the total number drinkers in the house according to drinker type. **Nipples:** Calculate nipples per meter and then multiply by total track length. **Cups:** Calculate number of cups per meter and then multiply by total track length. **Bell drinkers:** Estimate number of bell drinkers in the house. The total number of birds in the house must also be provided.
Classification	**Flock level:** **Number** of nipples **Number** of cups **Number** of drinkers **Number** of birds

5.1A.2 Good housing

5.1A.2.1 Comfort around resting

Title	**Plumage cleanliness**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	Before measurement, increase the light intensity inside the house if necessary (as usually done by animal unit manager when inspecting the flock). Birds use their feathers to keep warm, to protect themselves from moisture dirt and skin infections. Clean and healthy birds spend a lot of time keeping their feathers ‘preened’ – and if their feathers become wet or soiled with litter (bedding), faeces or dirt, the feathers can lose their protective properties and so severe soiling with either dirt or faeces can have significant effects on bird welfare. Assess the cleanliness of the plumage.

	Walk slowly inside the house and catch birds one by one (10 in the same location). Examine the breast of the birds and score using a recording sheet (Annex B). If birds are very mobile (for example in free range systems) it may be necessary to pen small groups of birds to catch them. Score using the classification described below.
Classification	**Flock level:** **Percentage** of birds scoring '0' **Percentage** of birds scoring '1' **Percentage** of birds scoring '2' **Percentage** of birds scoring '3'

			
0	**1**	**2**	**3**

Title	**Litter quality**
Scope	Resource- and management-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	Assess the quality of the bedding in the house according to the parameters described below. Poor litter quality may indicate difficulties in managing the litter which may reflect in skin and foot lesions related to poor litter quality. <u>General comment on sampling and litter thickness:</u> Look at a number of locations in the house (minimum 4, maximum 6) (i.e. under drinkers and feeders, along the edges of the house and close to the doorways) to check whether there is a big variation in litter thickness across the house. If so, can you detect areas of litter which differ in appearance, or is the litter very uniform? If areas are different, then ensure that you sample using the method described from these areas of differing litter to reflect overall variability in the house.
Classification	**0** – Completely dry and flaky, i.e. moves easily with the foot **1** – Dry but not easy to move with foot **2** – Leaves imprint of foot and will form a ball if compacted, but ball does not stay together well **3** – Sticks to boots and sticks readily in a ball if compacted **4** – Sticks to boots once the cap or compacted crust is broken

Title	**Dust sheet test**
Scope	Management-based measure: Broiler chicken

Sample size	Animal unit
Method description	The dust sheet test is conducted using a sheet of black A4 size paper. Put the paper onto a clip board and place it above bird height (i.e. to prevent pecking by birds) on a horizontal surface, preferably away from feed machinery. Position the paper when first entering the house. Then remove the sheet at the end of the assessment (which will take an approximately fixed time interval). Write with a finger on the paper to get an impression of the amount of dust on the paper. Classify the dust level found on the paper as follows: a. None b. Little c. Thin covering d. Lot of dust e. Paper colour not visible
Classification	**0** – No evidence of dust (score 'a') **1** – Minimal evidence of dust (score 'b' or 'c') **2** – Evidence of dust (score 'd' or 'e')

5.1A.2.2 Thermal comfort

Title	**Panting**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	Panting is defined as breathing rapidly in short gasps. High temperatures will cause birds to pant – this is a natural response – however, persistent panting indicates that the thermal environment is not being maintained at a temperature which is comfortable for the birds in the long term. When a bird 'pants' it increases its respiratory rate to allow rapid exchange of air to prevent overheating. The visible signs of panting are that the birds often sit upright, open their beak and often make visible respiratory movements. Examine groups of birds at up to 5 well-distributed locations. If birds are panting, count out 100 birds (do not disturb them and leave them sitting where they are) and estimate how many of the 100 birds are panting.
Classification	**Group level:** **Percentage** of the sample showing panting

Title	**Huddling**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	When birds are cool or cold, they will often group together into tight groups, sitting closely alongside each other, often in 'clumps' with areas of empty space in between. This huddling is usually distinct from the normal 'loose grouping' that birds will show when resting. Huddling can be a natural response to lower temperatures – however, long maintained or persistent huddling indicates that the thermal environment is not being maintained at a temperature which is comfortable for the birds in the long term. Huddling is less common than panting, as birds are usually kept adequately warm due to their stocking density and their production of metabolic heat. In free range unheated housing huddling may be more commonly seen. It is however possible for bird to get cold in cold

	weather or if the house temperature falls due to high ventilation rates. Examine groups of birds at up to 5 well-distributed locations. If birds are clearly huddled together, due to the difficulty in identifying groups of 100 birds, estimate what proportion of the flock is affected by huddling. In some houses where gas brooders or heaters are used, it may be seen that birds huddle in colder spots in the house. Estimate the proportion of the whole flock engaged in this behaviour.
Classification	**Group level:** Estimated **percentage** of flock showing huddling behaviour

5.1A.2.3 Ease of movement

Title	**Stocking density**
Scope	Resource-based measure: Broiler chicken
Sample size	Animal unit
Method description	First calculate the total dimension of useable space in which birds are kept in m^2 and then divide it by number of birds present, according to one of the two methods below (numbers or weight). **House area:** Measure internal dimensions of the house. If there is a farm statement for the house area – do a simple check by measuring house length by width to check that farm statement is correct. If the stated dimension of a house seems reliable (there has been a previous credible inspection which has measured available space) one may be able to use these measures instead of re-measuring the house. If the assessor solely relies on the stated estimate for space provided by the farm this can sometimes be incorrect. If no farm statement is available, measure house (length x width) and subtract for house 'furniture' (feeders, drinkers, structural elements of the building etc.) which reduce the space available to the animals. It may also be possible to use ultrasound or laser measurers to increase the speed of measurement (not good in dusty environments or bright light). Furthermore, a practical approach to measuring large houses is to measure a bay (i.e. section) and multiply by the number of bays, or measure one cage or nest module and multiply by the total number. **Number of animals:** Ask for mortality figures to calculate the number of actual birds. Look for paper evidence of delivery numbers of birds, and, after slaughter, the number of birds slaughtered, which should be quite accurate (as long as traceability of batches is good). **Weight loading:** Animal weights at a given age are often calculated by the animal unit manager by trial weighing a small number of birds. Some farms have step on automatic weighers, which can give average weights for the birds (however, small birds, sick birds, lame birds do not use the weighers).
Classification	House area **m^2** and Average bird weight **kg** and

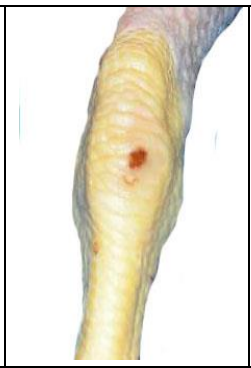
	Number of birds

5.1A.3 Good health

5.1A.3.1 Absence of injuries

Title	**Lameness (gait score)**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	Lameness is the inability to use one or both limbs in a normal manner. It can vary in severity from reduced ability or inability to bear weight, to total immobility. For all farm visits, which are made close to slaughter age, 150 birds approximately will be caught using a catching pen at random locations generated by computer. For very flighty birds (for example some free range birds) it may be necessary to catch small pens of birds. Each bird is individually encouraged to walk out of the pen and is scored as it does so. For each bird caught, the gait score will be recorded. The flock average gait score can be calculated by multiplying the number of birds in each gait score category, then dividing the total by the total number of birds scored. Birds are classified according to these criteria: 0. Normal, dextrous and agile 1. Slight abnormality, but difficult to define 2. Definite and identifiable abnormality 3. Obvious abnormality, affects ability to move 4. Severe abnormality, only takes a few steps 5. Incapable of walking
Classification	**Individual level:** **Number** of animals in each scoring class (0,1,2,3,4,5) and **Percentage** of animals in each scoring class (0,1,2,3,4,5).

Title	**Hock burn**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	Hock burn is a contact dermatitis found on the skin of the caudal (back) part of the hock joint. The skin is turned dark by contact with litter and consequently skin lesions can result. The scoring scale allows assessment of the severity of these lesions (see photographic reference). Assess the presence of hock burns with regard to the severity scale. Scoring categories 0/1/2/3/4 as photographic illustration. Assess the number of animals in each scoring category and combine the categories for classification.
Classification	**Individual level:** **a** – No evidence of hock burn (score ‘0’) **b** – Minimal evidence of hock burn (score ‘1’ and ‘2’) **c** – Evidence of hock burn (score ‘3’ and ‘4’)

				
0	**1**	**2**	**3**	**4**

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Title	**Foot pad dermatitis**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	Foot pad dermatitis is a contact dermatitis found on the skin of the foot, most commonly on the central pad, but sometimes also on the toes. The skin is turned dark by contact with litter and consequently deep skin lesions can result. The scoring scale allows an assessment of the severity of these lesions (see photographic reference). Assess the presence of hock burns with regard to the severity scale, scoring categories 0/1/2/3/4 as photographic illustration. Assess the number of animals in each scoring category and combine the categories for classification.
Classification	**Individual level:** **a** – No evidence of foot pad dermatitis (score '0') **b** – Minimal evidence of foot pad dermatitis (score '1' and '2') **c** – Evidence of foot pad dermatitis (score '3' and '4')

				
0	**1**	**2**	**3**	**4**

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5.1A.3.2 Absence of disease

Title	**On farm mortality**
Scope	Management-based measure: Broiler chicken
Sample size	Animal unit
Method description	Mortality is defined as the 'uncontrolled' death of animals (as distinct from culling/euthanasia). The animals may die from, for example, septicaemia, respiratory disease, acute infection or dehydration. Any animal which is 'found dead' on the floor in the house, or out on the field is considered a mortality.

	The animal unit manager is asked about mortality management on the farm based on data collected from farm records. Using house records of animal numbers placed, minus number died (but not including those actively culled, which are included in the measure 'culls on farm'): Number of animals placed in house from the hatchery (A) Total number of animals found dead in the last flock cycle (M). Calculate the percentage mortality using the following equation: Percentage of mortality = (M/A) x 100
Classification	**Farm level:** **Percentage** of mortality on farm during the last flock cycle

Title	**Culls on farm**
Scope	Management-based measure: Broiler chicken
Sample size	Animal unit
Method description	Culling is defined as birds which are actively and humanely killed by the animal unit manager for disease control purposes, or for lameness, sickness or disease. These are known as 'culls'. The animal unit manager is asked about mortality management on the farm based on data collected from farm records. Using house records of bird numbers placed, minus those actively culled (but not including those found dead, which are included in the measure 'on farm mortality '): Number of birds placed in house from hatchery (A) Total number of birds which were <u>actively</u> culled (but not including those which died without being culled) during the flock cycle (C) Calculate the percentage culled using the following equation. Percentage of culling = (C/A) x100
Classification	**Percentage** culling

5.1A.3.3 Absence of pain induced by management procedures

This criterion is not applied in this situation.

5.1A.4 Appropriate behaviour

5.1A.4.1 Expression of social behaviours

As yet, no measure is developed for this criterion.

5.1A.4.2 Expression of other behaviours

Title	**Cover on the range**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to§ 5.1A.5
Method description	Note that this measure is applicable to free range or extensive systems only. If no free range area is present this measure is not applicable (and will be recorded as 0%). Cover on the range can be vegetation which the birds can use for cover (e.g. deep grass, trees, maize) or manmade shelters (e.g. tents, roofs, elevated camouflage nets, but not closed poultry houses). Cover offers environmental variation to the birds and protection from aerial threats and predators which are considered a restriction to birds' use of the

	range in some outdoor systems. Examine the free range area and estimate the percentage of free range area that is covered by trees, bushes, or artificial shelters. Estimate the proportion of the range which is covered – stand where the entire range is visible, or ensure that the entire range is observed. Calculate for 3 houses if there are multiple houses on the site. If houses share an area of range without fences, then calculate for a 'combined flock' if this is possible.
Classification	**Flock level:** Estimated **percentage** of covered range

Title	**Free range**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	Note that this measure is applicable to free range or extensive systems only. If no free range area is present this measure is not applicable (and will be recorded as 0%). This measure is an indicator of both the birds' ability to choose the environment in which it ranges, and also the suitability of the environment for birds. The proportion of birds using the range is taken as an estimate of the entire percentage of the flock seen outside of the house. Count (an approximation) the number of birds visible using the range from one house (if multiple houses share the range, this may be more complex). Stand where the entire range is visible, or ensure that the entire range is observed. Calculate for 3 houses if there are multiple houses on the site. If houses share an area of range without fences, then calculate for a 'combined flock' if this is possible. Calculate the percentage of the entire flock that uses the range at the time of your visit according to the following method, from records of the known number of birds in each area; Percentage of birds using range = (Estimated number observed on range / total placed excluding those lost to mortality or thinning) x 100
Classification	**Flock level:** Estimated **percentage** of birds outdoors

5.1A.4.3 Good human–animal relationship

Title	**Avoidance Distance Test (ADT)**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.1A.5
Method description	The assessor approaches a group of at least 3 birds in the litter area, squats for 10 seconds and then counts the number of birds at arm's length (i.e. within 1 m of the observer). Every attempt to approach a group of birds is considered as a trial, even if all birds from the group withdraw from the approaching or squatting assessor. Repeat the trial 21 times. Carry out the trial at a number of different locations around the house to avoid repeat scoring of birds. Record the number of birds within arm's length at each trial.
Classification	**Individual level:** Total **number** of birds in reach (Tr)

5.1A.4.4 Positive emotional state

<table>
<tr><td>Title</td><td>Qualitative Behaviour Assessment (QBA)</td></tr>
<tr><td>Scope</td><td>Animal-based measure: Broiler chicken</td></tr>
<tr><td>Sample size</td><td>Animal unit (depending on number of observation points, see method description)</td></tr>
<tr><td>Method description</td><td>Qualitative Behaviour Assessment (QBA) considers the expressive quality of how animals behave and interact with each other and the environment i.e. their ‘body language’.

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 in which to visit these observation points, and 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 any of the animals you have seen. ‘Maximum’ means that at this point this expressive quality is dominant across all observed animals. Note that it is possible to give more than one term a maximum score; animals could for example be both entirely calm and content.

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, that as the score gets higher, the meaning of the score gets more negative, not more positive.

The terms used for the QBA broiler assessment are:

Active
Calm
Friendly
Relaxed
Content
Positively occupied
Helpless
Tense
Scared
Comfortable
Inquisitive
Drowsy

</td></tr>
</table>

	• Fearful • Unsure • Playful • Agitated • Energetic • Nervous • Confident • Frustrated • Distressed • Depressed • Bored
Classification	**Flock level:** **Continuous scales** for all body language parameters from minimum to maximum.

5.1A.5 Sampling and practical information

Different numbers of animals must be sampled for different measures; these are summarized in Table 3.

Table 3 Order for carrying out measures, sample size and time required for broiler chicken on farm.

Measure	**Sample method and/or number of birds to sample**	**Approximate time required (min)**
Panting	100 birds examined visually at up to 5 locations	5
Huddling	100 birds examined visually at up to 5 locations	5
Qualitative behaviour assessment (QBA)	Observations made at between 1 and 8 points [x]	20
Avoidance distance test (ADT)	21 sample sites, 10 seconds squatting at each site + 30 seconds movement between sites	20
Lameness	150 birds selected from 4 locations	40
Plumage cleanliness	100 birds picked up - 10 birds from 10 locations	60 (combined total for cleanliness, foot pads, hock burn)
Foot pad dermatitis		
Hock burn		
Litter quality	5 areas in the house	10 total (2 minutes per area)
Stocking density	Establish the total number of birds placed (minus those died or culled) and divide by the available area	5
Drinker space	Calculate number of drinkers x area per drinker and divide by number of birds placed	5
Dust sheet test	Position the dust test sheet at the start of observation period and then assess at the end	5
Cover on the range	Group assessment on 3 houses (if possible)	5
Free range	Group assessment on 3 houses (if possible)	5
On farm mortality	Establish number of birds found dead (not culled) in relation to total number placed	5
Culls on farm	Establish number of birds culled in relation to total number placed	5

	Total	**195 minutes** (3 hrs. 15 min.)

[X] Qualitative assessment: observation time per spot- 5 minutes in case of 4 spots and 10 minutes in case of 2 spots

Selecting broiler chicken for assessment on farm

- Birds are assessed in the last few days before slaughter. Consistent with the slaughter timetable and possible planning it is recommended that birds are examined within 5 days of slaughter.
- Gait scoring, panting, huddling and litter quality should be assessed in the same sites. The assessor should look at between 4 and 6 areas in the house, selecting these areas to be well distributed around the house and accounting for litter variability and thickness.
- The birds assessed for foot pad dermatitis, cleanliness and hock burns are taken from the same sample group.
- For the hock burn, plumage cleanliness and foot pad dermatitis measures at least 100 broiler chickens per flock should be assessed: 10 birds taken from 10 areas of the house including 2 areas located near to drinkers, 2 areas located near to feeders, 3 areas located near a wall, 3 areas located away from drinkers and feeders (resting area).

5.1B Collection of data for broiler chicken on farm (measured at slaughterhouse)

These measures are assessments of disease which are made at the slaughterhouse – but which reflect disease conditions indicating the farm life of the bird 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 broiler chicken on farm.

	Welfare Criteria		**Measures**
Good feeding	1	Absence of prolonged hunger	Emaciation
	2	Absence of prolonged thirst	*This criterion is measured at the farm*
Good housing	3	Comfort around resting	*This criterion is measured at the farm*
	4	Thermal comfort	*This criterion is measured at the farm*
	5	Ease of movement	*This criterion is measured at the farm*
Good health	6	Absence of injuries	Breast blister, hock burn, foot pad dermatitis
	7	Absence of disease	Ascites, dehydration, septicaemia, hepatitis, pericarditis, abscess
	8	Absence of pain induced by management procedures	*This criterion is not applied in this situation*
Appropriate behaviour	9	Expression of social behaviours	*As yet, no measure is developed*
	10	Expression of other behaviours	*This criterion is measured at the farm*
	11	Good human-animal relationship	*This criterion is measured at the farm*
	12	Positive emotional state	*This criterion is measured at the farm*

5.1B.1 Good feeding

5.1B.1.1 Absence of prolonged hunger

Title	**Emaciation**
Scope	Animal-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Sample size according to § 5.1B.5
Method description	Collect information from the meat inspection team at the slaughter house on emaciation of birds. Slaughterhouses will reject emaciated birds as being unfit for human consumption.

	By using data from slaughterhouse rejections it will be possible to determine how many birds were rejected for emaciation (E) from the total number slaughtered from the flock (n). Classify emaciation according to the following calculation. Emaciation percentage = (Number emaciated rejected (E) / Total number slaughtered (n)) X100%
Classification	**Flock level:** **Percentage** of emaciated birds

5.1B.1.2 Absence of prolonged thirst

This criterion is assessed at the farm (see §5.1A).

5.1B.2 Good housing

5.1B.2.1 Comfort around resting

This criterion is assessed at the farm (see §5.1A).

5.1B.2.2 Thermal comfort

This criterion is assessed at the farm (see §5.1A).

5.1B.2.3 Ease of movement

This criterion is assessed at the farm (see §5.1A).

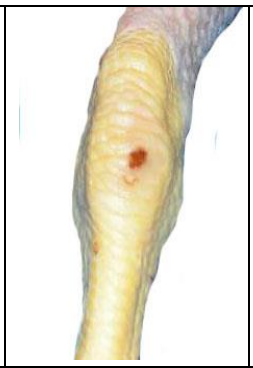
5.1B.3 Good health

5.1B.3.1 Absence of injuries

Title	**Breast blister**
Scope	Animal-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Sample size according to § 5.1B.5
Method description	Breast blisters are caused by dermatitis of the skin overlying the keel (the central part of the breast area). The skin is softened and sometimes discoloured and may be infected and 'sticky,' or show as a raised blister. Observe birds on the line for 5 to 10 minutes. Doing so will provide a sample of n (line speed birds per minute (ls) x number of minutes (t)). Record number of birds passing per minute (line speed birds/min (ls)). Subsequently observe the birds where the breast is clearly visible after plucking. Count number of birds with breast blister lesions ('b'). 0 No evidence of breast blister 1 Evidence of breast blister To classify use the calculation below, in which t = period of observation (minutes), b = number of birds with breast blister lesion, ls = line speed (birds per minute) and n = number of birds observed in total (t x ls). Percentage of birds with breast blister = (b / n) x 100%
Classification	**Individual level:** **Percentage** of birds with breast blister

			
0 No breast blister	**1 Breast blister**	**Breast blister before incision**	**Breast blister after incision**

Title	**Hock burn**
Scope	Animal-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Sample size according to § 5.1B.5
Method description	Hock burn is a contact dermatitis found on the skin of the caudal (back) part of the hock joint. The skin is turned dark by contact with litter and consequently skin lesions can result. The scoring scale allows assessment of the severity of these lesions. During three separate recording periods of five minutes, score a proportion of the birds passing the observation point - this will provide a sample of n (line speed birds per minute (ls) x number of minutes (t)). Observe the birds where the hocks are clearly visible after plucking. Record number of birds passing per minute. Count number of birds with hock lesions (1/2/3/4) – use the scoring category in photographic reference. To classify use calculation below, in which t = period of observation (minutes), H 0/1/2/3/4 = number of birds with hock burn lesion, ls = line speed (birds per minute) and n = number of birds observed in total (t x ls). Percentage of birds with hock burn in each category = (H(0), H(1) etc… / n) x 100%. Assess the number of animals in each scoring category and combine the categories for classification.
Classification	**Individual level:** **a** – No evidence of hock burn (score ‘0’) **b** – Minimal evidence of hock burn (score ‘1’ and ‘2’) **c** – Evidence of hock burn (score ‘3’ and ‘4’)

				
a	**b**	**b**	**c**	**c**

Title	**Foot pad dermatitis**
Scope	Animal-based measure: Broiler chicken at slaughter (scope according to § 5.1B.5)
Sample size	Sample size according to § 5.1B.5
Method description	Foot pad dermatitis is a contact dermatitis found on the skin of the foot, most commonly on the central pad, but sometimes also on the toes. The skin is turned dark by contact with litter and consequently deep skin lesions can result. The scoring scale allows an assessment of the severity of these lesions. During three separate recording periods of five minutes, score a proportion of the birds passing the observation point where the foot pad is visible - this will provide a sample of n (line speed birds per minute (ls) x number of minutes (t)). Observe the birds where the bottom of the feet is clearly visible. Record the number of birds passing per minute. Count the number of birds with foot pad lesions (1/2/3/4) – use the scoring category in the photographic reference. If an automated camera system is used, three scores are reported – 0 (as 0 below), 1 (as 1 below), 2. To classify use the calculation below, in which t = period of observation (minutes), F 0/1/2/3/4 = number of birds with foot pad lesion, ls = line speed (birds per minute) and n = number of birds observed in total (t x ls). Percentage of birds with foot pad lesions in each category = (F(0), F(1) etc../n) x 100% Assess the number of animals in each scoring category and combine the categories for classification.
Classification	**Individual level:** **a** – No evidence of foot pad dermatitis (score ‘0’) **b** – Minimal evidence of foot pad dermatitis (score ‘1’ and ‘2’) **c** – Evidence of foot pad dermatitis (score ‘3’ and ‘4’)

Scale for manual (visual observation) at slaughterhouse

				
0	**1**	**2**	**3**	**4**

5.1B.3.2 Absence of disease

Title	**Ascites**
Scope	Animal,- and management-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Animal unit
Method description	Ascites is an accumulation of tissue fluid in the lungs, air sacs and abdomen resulting from cardiac insufficiency. Using data from slaughter house rejection records (collected for public health and disease monitoring purposes) it will be possible to determine how many birds were rejected for ascites from the total number slaughtered from the flock (n). Collect information from the meat inspection team at the slaughter house. They will reject birds with ascites as being unfit for human consumption and will record the number of birds rejected for ascites as they inspect them. Percentage of each category = (nx (where x = ascites)/total number slaughtered in group (n)) x 100(%)
Classification	**Flock level:** **Percentage** of animals with ascites

Title	**Dehydration**
Scope	Animal-, and management-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Animal unit
Method description	Dehydration is a state in which the tissues of the bird become deficient in water – usually as a result of disease making the bird unable to access water supplies, but also potentially (more rarely) due to failure of provision of water. Using data from slaughter house rejection records (collected for public health and disease monitoring purposes) it will be possible to determine how many birds were rejected for dehydration from the total number slaughtered from the flock (n). Collect information from the meat inspection team at the slaughter house. They will reject birds with dehydration as being unfit for human consumption and will record the number of birds rejected for dehydration as they inspect them. Percentage of each category = (nx (where x = dehydration)/total number slaughtered in group (n)) x 100%

Classification	**Flock level:** **Percentage** of animals with dehydration

Title	**Septicaemia**
Scope	Animal-, and management-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Animal unit
Method description	Septicaemia is a generalized infection of the tissues of the bird following overwhelming infection. The internal organs become discoloured, with localized visible areas of infection. Using data from slaughter house rejection records (collected for public health and disease monitoring purposes) it will be possible to determine how many birds were rejected for septicaemia from the total number slaughtered from the flock (n). Collect information from the meat inspection team at the slaughter house. They will reject birds with septicaemia as being unfit for human consumption and will record the number of birds rejected for septicaemia as they inspect them. Percentage of each category = (nx (where x = septicaemia)/total number slaughtered in group (n)) x 100%
Classification	**Flock level:** **Percentage** of animals with septicaemia

Title	**Hepatitis**
Scope	Animal-, and management-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Animal unit
Method description	Hepatitis is a localized infection of the liver, often with visible changes to the liver including discolouration, localised abcessation or infected areas and fibrin formation. Using data from slaughter house rejection records (collected for public health and disease monitoring purposes) it will be possible to determine how many birds were rejected for hepatitis from the total number slaughtered from the flock (n). Collect information from the meat inspection team at the slaughter house. They will reject birds with hepatitis as being unfit for human consumption and will record the number of birds rejected for hepatitis as they inspect them. Percentage of each category = (nx (where x = hepatitis)/total number slaughtered in group (n)) x 100%
Classification	**Flock level:** **Percentage** of animals with hepatitis

Title	**Pericarditis**
Scope	Animal-, and management-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Animal unit
Method description	Pericarditis is an inflammation of the tissue which surrounds the heart – discoloration and thickening of this tissue (the pericardium) is visible on the slaughter line, and is caused by infection or is associated with

	ascites. Using data from slaughter house rejection records (collected for public health and disease monitoring purposes) it will be possible to determine how many birds were rejected for pericarditis from the total number slaughtered from the flock (n). Collect information from the meat inspection team at the slaughter house. They will reject birds with pericarditis as being unfit for human consumption and will record the number of birds rejected for pericarditis as they inspect them. Percentage of each category = (nx (where x - pericarditis)/total number slaughtered in group (n)) x 100%
Classification	**Flock level:** **Percentage** of animals with pericarditis

Title	**Abscess (sub-cutaneous pus)**
Scope	Animal-, and management-based measure: Broiler chicken (scope according to § 5.1B.5)
Sample size	Animal unit
Method description	Abscess is a localized area of (usually bacterial) infection – resulting in tissue damage or necrosis and production of pus or inflammatory responses and visible as swollen areas, pus or areas of tissue discolouration. Using data from slaughter house rejection records (collected for public health and disease monitoring purposes) it will be possible to determine how many birds were rejected for abscess from the total number slaughtered from the flock (n). Collect information from the meat inspection team at the slaughter house. They will reject birds with one or more abscesses as being unfit for human consumption and will record the number of birds rejected for abscess as they inspect them. Percentage of each category = (nx (where x - abscess)/total number slaughtered in group (n)) x 100%
Classification	**Flock level:** **Percentage** of animals with abscess

5.1B.3.3 Absence of pain induced by management procedures

This measure is not applied in this situation.

5.1B.4 Appropriate behaviour

5.1B.4.1 Expression of social behaviours

This criterion is measured at the farm (see §5.1A).

5.1B.4.2 Expression of other behaviours

This criterion is measured at the farm (see §5.1A).

5.1B.4.3 Good human–animal relationship

This criterion is measured at the farm (see §5.1A).

5.1B.4.4 Positive emotional state

This criterion is measured at the farm (see §5.1A).

5.1B.5 Sampling and practical information

Table 4 Order for carrying out measures, sample size and expected time required for farm broiler chicken at slaughter.

Measure	Sample method or number of birds to sample	Time required (min)
Breast blisters	Observe birds for 5 to 10 minutes (which may represent up to 1200 birds at 120 birds/min) – and calculate the percentage of birds with breast blisters in this observed group	10
Hock burn	2 separate sample periods of 5 min (which may represent up to 500-1000), score proportion with each category of hock burn as percentage of whole	10
Foot pad dermatitis	2 separate sample periods of 5 min (which may represent up to 500-1000), score proportion with food pad dermatitis as percentage of whole	10
Emaciation	Data collected from existing meat hygiene inspection process (common across Europe)	10
Ascites		
Dehydration		
Septicaemia		
Hepatitis		
Pericarditis		
Abscess		
	Total time	**40 minutes**

Selecting broiler chicken for assessment

- Use the same selection of birds for the measures breast blisters, hock burn and foot pad dermatitis.
- The other measures within the slaughterhouse assessment for broiler chicken can be derived from slaughterhouse records.

5.2 Calculation of scores for broiler chicken on farm

5.2.1 Criterion scores

5.2.1.1 Absence of prolonged hunger

The % emaciated birds is calculated as

$$\% \text{ emaciated birds} = p = \frac{\text{Number of rejected birds due to emaciation}}{\text{Number of birds from the house}} \times 100$$

p is used to calculated index I:

I = 0-100*(p - 6.5)/6.5)
with 6.5 being the lowest % emaciated birds resulting in a score 0

Then the index is transformed into a score with I-spline functions (Figure 5) as follows:

When $I \leq 80$ then Score = $(0.77643 \times I) - (0.0094591 \times I^2) + (0.000081106 \times I^3)$
When $I \geq 80$ then Score = $-2293.9 + (86.796 \times I) - (1.0847 \times I^2) + (0.0045613 \times I^3)$

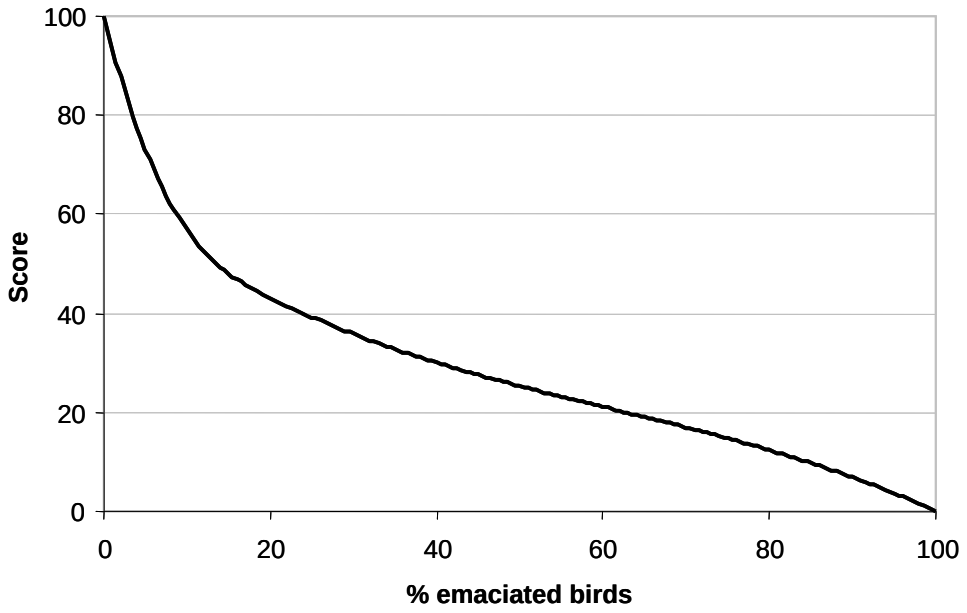


Figure 5 Calculation of scores for absence of hunger according to the proportion of emaciated birds (x axis, 100(%emaciated birds – 6.5)/(6.5)).

5.2.1.2 Absence of prolonged thirst

The recommended number of birds for the number of water points is calculated from the number of each type of water point, and the number of birds recommended per water point of each type (r.):

$$n_r(x) = \left(n_n(x) \times r_n\right) + \left(n_b(x) \times r_b\right) + \left(n_c(x) \times r_c\right)$$

with n_n , number of nipples
n_b , number of bells
n_c , number of cups
and the recommended number of birds for each type of drinker being set at
$r_n = 10$
$r_b = 100$
$r_c = 28$

The actual number of birds in the house (n) is compared to the recommended number of birds:

$$p = \frac{n_r}{n} \times 100$$

p represents the % of compliance of the house with the recommendation.

The following index is calculated:

$$I = \left(\frac{(p - min)}{(max - min)} x100 \right)$$

with min = 20% and max = 200% that can be observed (Corresponding to the number of birds being 5 times less than the capacity of drinkers and twice more than that capacity).

Then the index is transformed into a score with I-spline functions (Figure 6) as follows:

When I ≤ 50 then Score = (0.047725 x I)+ (0.057212 x I^2) - (0.00057530 x I^3)
When I ≥ 50 then Score = -98.409 + (5.9522 x I) - (0.060879 x I^2) + (0.00021197 x I^3)

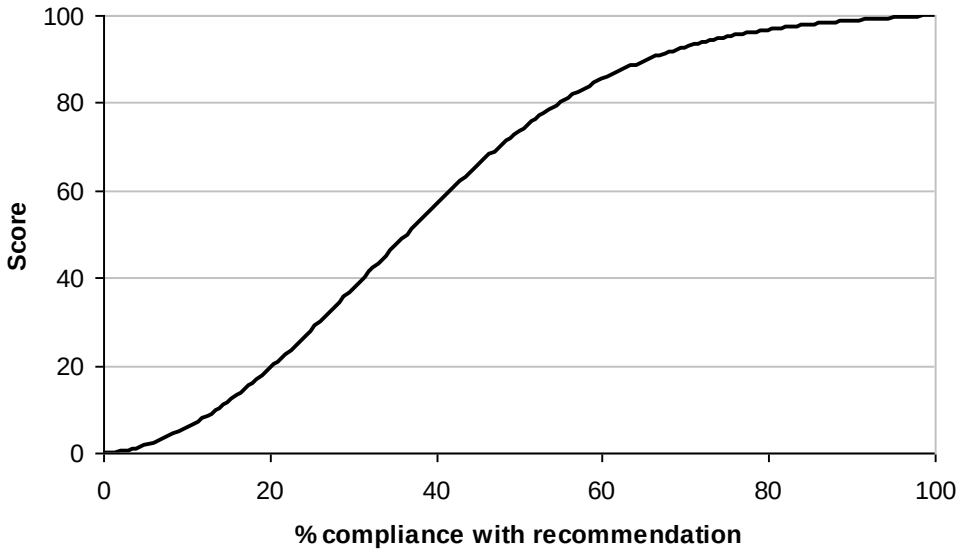


Figure 6 Calculation of scores for absence of thirst according to an index expressing the % of compliance of the house with the recommended number of drinking places.

5.2.1.3 Comfort around resting

Three partial scores are calculated before being aggregated.

Cleanliness of birds

An index is calculated for the cleanliness of bird according to the % birds slightly dirty, moderately dirty and dirty.

Index_cleanliness = $\left(100 - \frac{2(\%slightlydirty) + 7(\%moderatelydirty) + 13(\%dirty)}{13}\right)$

This index is then converted to a score according to the following I-spline functions (Figure 7):
When I ≤ 70 then Score = (1.0186 x I) - (0.014551 x I^2) + (0.00012263 x I^3)
When I ≥ 70 then Score = -267.04 + (12.463 x I) - (0.17804 x I^2) + (0.00090116 x I^3)

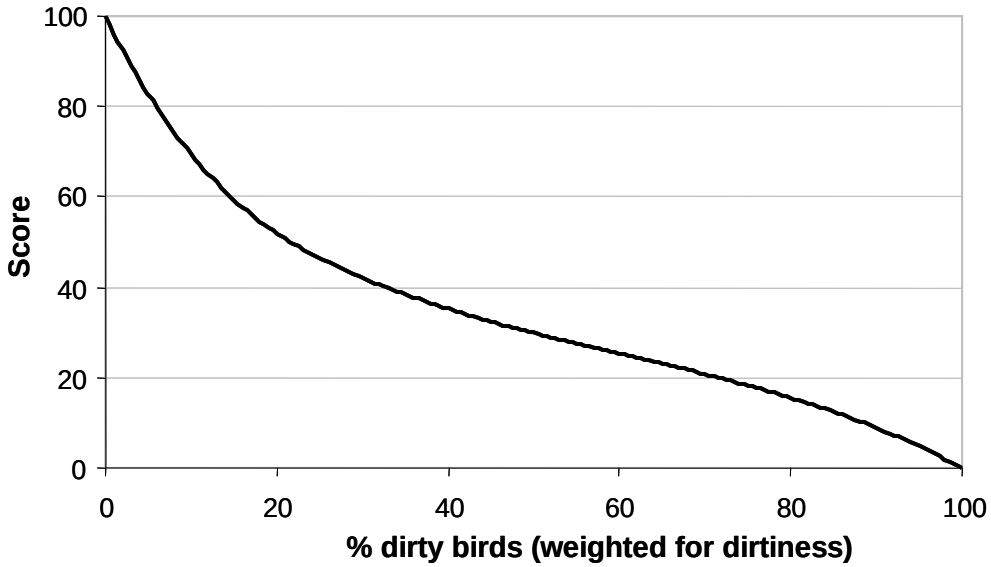


Figure 7 Calculations of scores for cleanliness according to the % dirty birds (weights: 0.15, 0.54, and 1 for birds slightly dirty, moderately dirty, and dirty).

Litter quality

A score is attributed to each location observed (max 10) as follows:

Level of ordinal scale for litter quality	Score
4 (Wet & sticky)	0
3	14
2	34
1	67
0 (Dry)	100

Then at farm level, the score is the worst score obtained on at least 15% locations (at least 15% of locations obtain this score or a lower one).

Dust

Dust	Score
4 (Paper colour not visible)	0
3 (A lot of dust, some black paper visible)	20
2 (Thin covering of dust)	53
1 (Little dust)	78
0 (No dust, all paper visible)	100

Subcriterion-score

The three partial scores are combined using a Choquet integral with the following parameters

μ_1	μ_2	μ_3
0.25	0.28	0.13

μ_{12}	μ_{13}	μ_{23}
0.60	0.35	0.28

5.2.1.4 Thermal comfort

The proportion of birds panting and the proportion of birds huddling are assessed on up to five locations. For each location, a score is attributed depending on the proportion of birds panting / huddling:

	Score
4 (all animals pant or huddle)	19
3 (more than half the animals pant or huddle)	29
2 (approximately half the animals pant or huddle)	39
1 (few animals pant or huddle)	69
0 (no animal pants or huddles)	100

*first we check if a 4 can be attributed, if not then we check if a 3 can be attributed, etc.

At farm level, the score is the worst score on at least 15% of locations (at least 15% of locations obtain this score or a lower one).

5.2.1.5 Ease of movement

The stocking density (d) is used to calculate an index I:

$I = ((100/(44-4)) \times (44-d) = 2.5 \times (44 - d)$

where 44 and 4 represent the maximum and minimum stocking density that can be observed on a farm.

I can only vary between 0 and 100 therefore

When $d > 44$ then $I = 0$
When $d < 4$ then $I = 100$

The index is turned into a score according to I-spline functions (Figure 8):

When $I \leq 30$ then $Score = (2.6077 \times I) - (0.051672 \times I^2) + (0.00050863 \times I^3)$
When $I \geq 30$ then $Score = 12.019 + (1.4058 \times I) - (0.011609 \times I^2) + (0.000063483 \times I^3)$

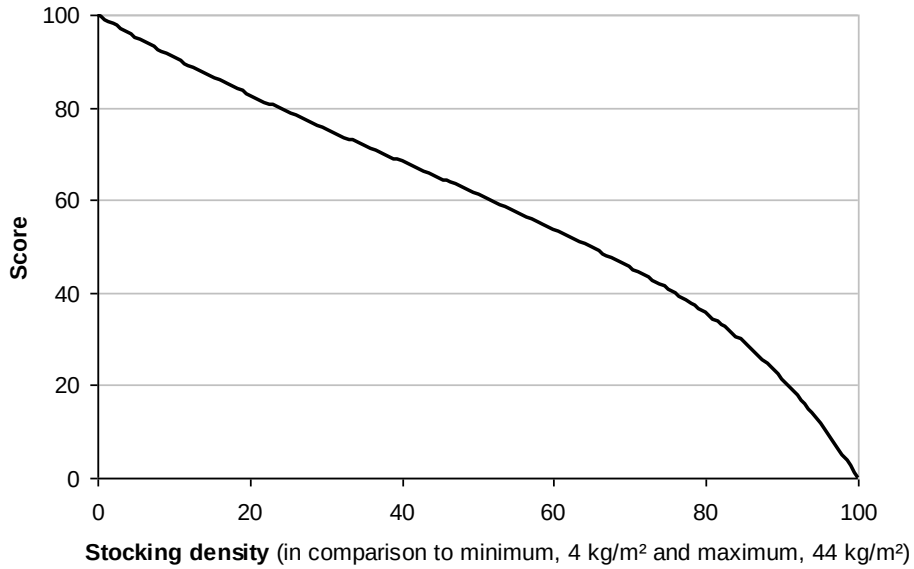


Figure 8 Calculation of scores for ease of movements according to stocking density.

5.2.1.6 Absence of injuries

Four partial scores are calculated before being integrated.

Breast blisters
The % of birds not affected by breast blisters is turned into a score using I-spline functions:
Let I_b = 100 - % birds with breast blisters

I_b is turned into a score S_b using I-spline functions (Figure 9):

When $I_b \leq 80$ then $S_b = (0.27267 \times I_b) - (0.0026928 \times I_b^2) + (0.000031115 \times I_b^3)$
When $I_b \geq 80$ then $S_b = -4386.9 + (164.78 \times I_b) - (2.0591 \times I_b^2) + (0.0085993 \times I_b^3)$

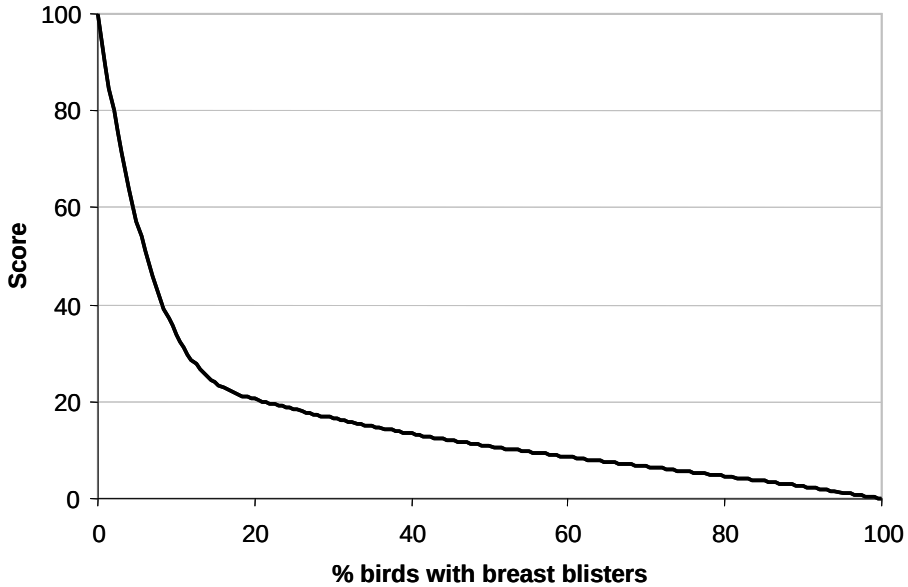


Figure 9 Calculation of scores according to % birds with breast blisters.

Hock burns

The % birds moderately affected by hock burns (%hock1) and the % birds severely affected by hock burns (%hock2) are used to calculate an index:

$$I_h = \left(100 - \frac{(\%hock1) + 5(\%hock2)}{5}\right)$$

I_h is turned into a score S_h using I-spline functions (Figure 10):

When $I_h \leq 85$ then $S_h = (0.50649 \times I_h) - (0.0059587 \times I_h^2) + (0.000063436 \times I_h^3)$
When $I_h \geq 85$ then $S_h = -8279.7 + (292.73 \times I_h) - (3.4439 \times I_h^2) + (0.013545 \times I_h^3)$

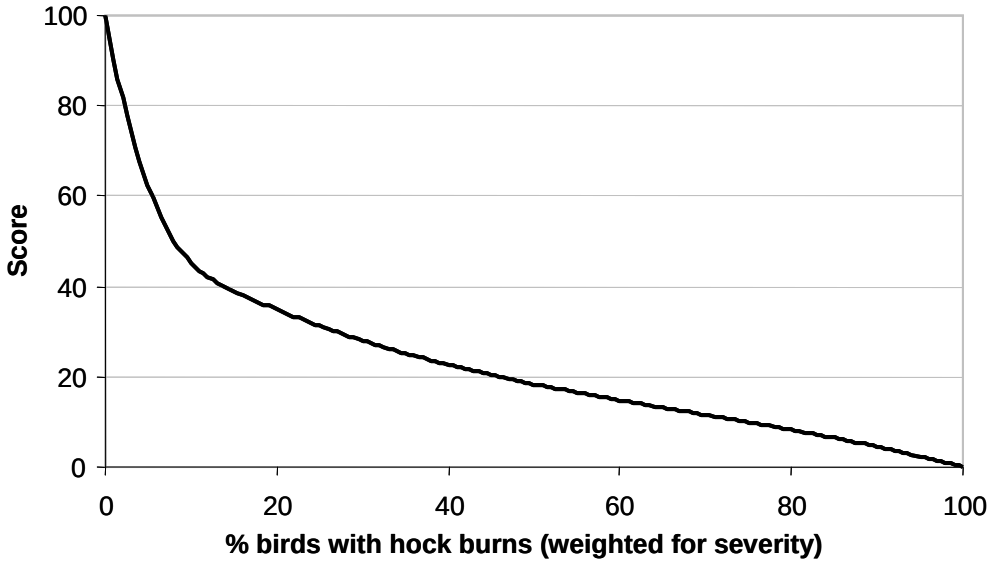


Figure 10 Calculation of scores according to % birds with hock burns (weights: 0.2 and 1 for moderate and severe hock burns).

Foot pad dermatitis

The % birds moderately affected by foot pad dermatitis (%podo dermatitis1) and the % birds severely affected by foot pad dermatitis (%podo dermatitis2) are used to calculate an index:

$$I_p = \left(100 - \frac{2(\%pododermatitis1) + 7(\%pododermatitis2)}{7}\right)$$

I_p is turned into a score S_p using I-spline functions (Figure 11):

When $I_p \leq 70$ then $S_p = (0.50686 \times I_p) - (0.0072409 \times I_p^2) + (0.000081315 \times I_p^3)$
When $I_p \geq 70$ then $S_p = -513.33 + (22.507 \times I_p) - (0.32152 \times I_p^2) + (0.0015779 \times I_p^3)$

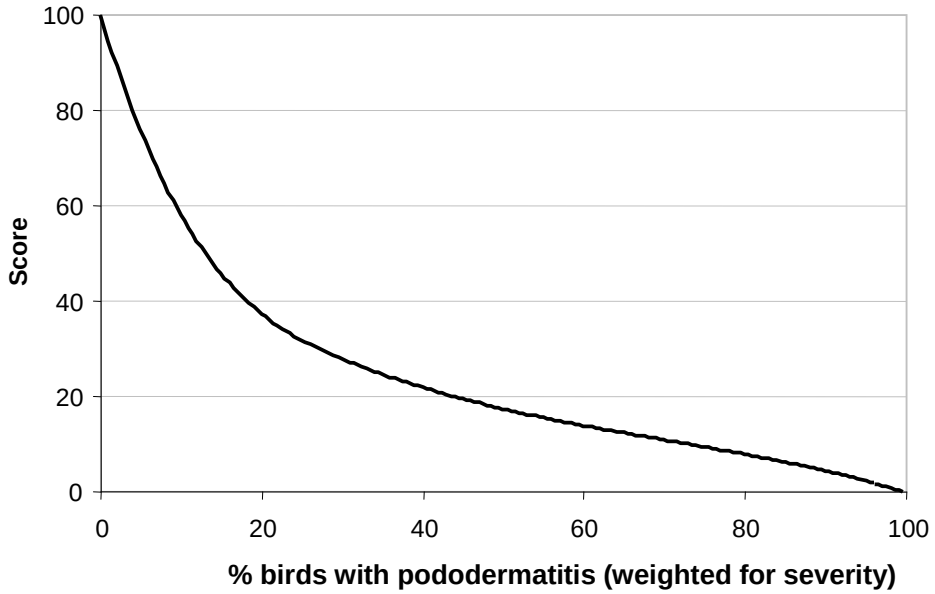


Figure 11 Calculation of scores according to % birds affected by foot pad dermatitis (weights: 0.29 for moderate and 1 for severe foot pad dermatitis).

Lameness

The % birds moderately lame (%lame1) and the % birds severely lame (%lame2) are used to calculate an index:

$$I_l = \left(100 - \frac{(\%lame1) + 5(\%lame2)}{5}\right)$$

I_l is turned into a score S_l using I-spline functions (Figure 12):

When $I_l \leq 80$ then $S_l = (0.28221 \times I_l) - (0.0029368 \times I_l^2) + (0.000041416 \times I_l^3)$
When $I_l \geq 80$ then $S_l = -3822.8 + (143.64 \times I_l) - (1.7949 \times I_l^2) + (0.0075078 \times I_l^3)$

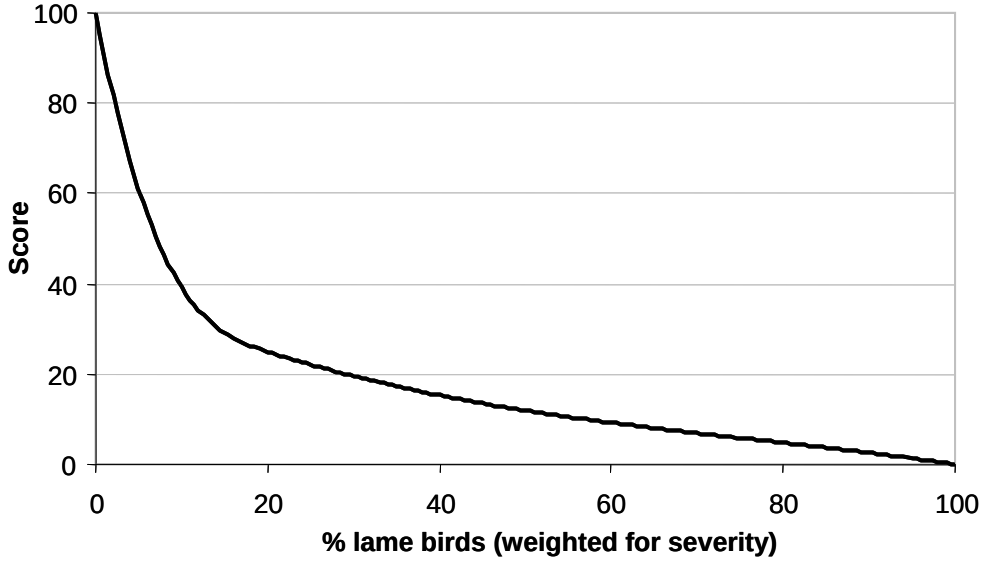


Figure 12 Calculation of scores according to % lame birds (weights: 0.2 and 1 for moderate and severe lameness).

Subcriterion-score
The four subscores S_b, S_h, S_p, S_l are combined using a Choquet integral with the following parameters:

μ_b	μ_h	μ_p	μ_l
0.00	0.00	0.00	0.00

μ_{bh}	μ_{bp}	μ_{bl}
0.24	0.00	0.23

μ_{hp}	μ_{hl}	μ_{pl}
0.00	0.00	0.17

μ_{bhp}	μ_{bhl}	μ_{bpl}	μ_{hpl}
0.46	0.50	0.40	0.17

5.2.1.7 Absence of disease

The symptoms are grouped into 5 categories, with 1 or 3 symptoms per category:

- ascites
- dehydration
- septicaemia, hepatitis, pericarditis
- abscesses
- mortality and culling

The following thresholds are defined for warnings and alarms:

Measure	Data measured	Warning $T_{1,1}$	Alarm $T_{1,2}$
Ascites (observed at slaughterhouse)	M_0	0.5	1
Dehydration (observed at slaughterhouse)	M_1	0.5	1
Septicaemia	M_2	0.75	1.5
Hepatitis / Jaundice (observed at slaughterhouse)	M_3	0.75	1.5
Pericarditis (observed at slaughterhouse)	M_4	0.75	1.5
Abscess / Subcutaneous pus (observed at slaughterhouse)	M_5	0.5	1
Number of animals found dead on farm, taking into account culling:			
▪ *Mortality when < 20% due to culling*	M_{6a}	3	6
▪ *Mortality when 20% ≤ < 50% due to culling*	M_{6b}	3.5	7
▪ *Mortality when ≥ 50% due to culling*	M_{6c}	4	8

The incidence of each symptom is compared with the warning and alarm thresholds. These thresholds depend on the incidence of disease symptoms. The thresholds for mortality depend on the incidence of culling:

Within a category, a serious problem is recorded if the incidence of at least 1 symptom is above the alarm threshold; a moderate problem is recorded if the incidence of at least 1 symptom is above the warning threshold and none is above the alarm threshold; otherwise it is considered that there is no problem.

An index I is calculated from the number of moderate problems and serious problems:

$$I = \left(\frac{100}{5} \times \left(5 - \frac{5(warnings) + 13(alarms)}{13}\right)\right)$$

where 5 is the number of disease categories.

I is turned into a score using I-spline functions as follows (Figure 13):

When $I \leq 60$ then Score = $(0.39746 \times I) - (0.0056602 \times I^2) + (0.000082673 \times I^3)$
When $I \geq 60$ then Score = $-115.37 + (6.1659 \times I) - (0.10180 \times I^2) + (0.00061679 \times I^3)$

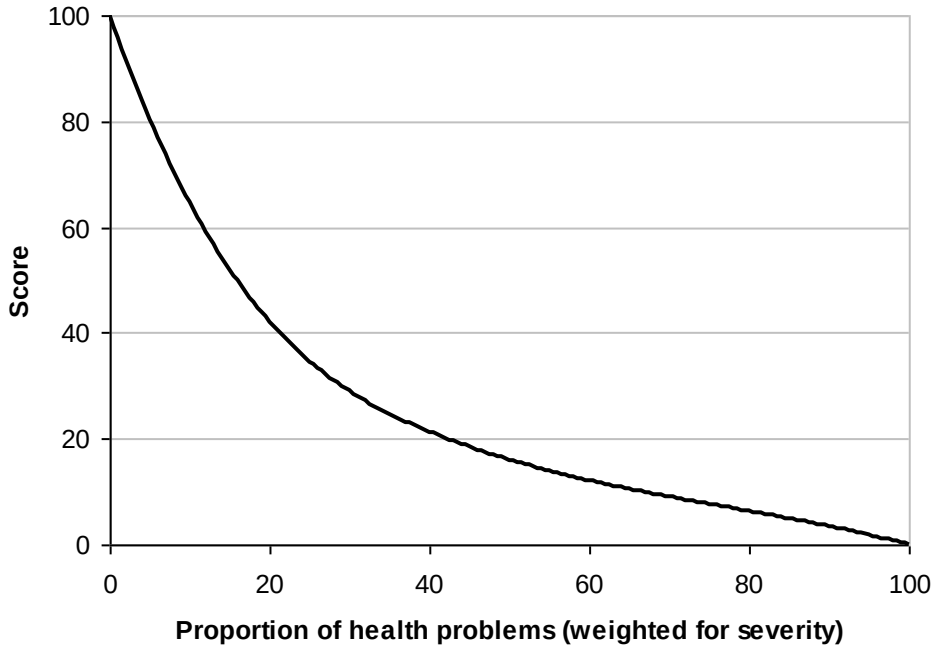


Figure 13 Calculation of scores for absence of diseases according to the proportion of symptoms for which the incidence is above the warning or the alarm thresholds (weights: 0.38 for warnings and 1 for alarms).

5.2.1.8 Absence of pain induced by management procedures

No routine mutilations are performed in broilers. Therefore, whatever the farm, the scores for absence of pain induced by management procedures, it is always 100.

5.2.1.9 Expression of social behaviours

As yet this criterion is not assessed for broilers.

5.2.1.10 Expression of other behaviours

The proportion of birds outdoors is estimated on a 5-level scale. Each level corresponds to a score:

Proportion of bird outdoors	*Score*
0%	13
Less than 50%	44
About 50%	66
More than 50%	82
100%	95

5.2.1.11 Good human-animal relationship

The theoretical number of birds that should be within arm's reach of the observer if the birds were evenly spread in the barn is calculated from stocking density. This theoretical number is equal to the stocking density (expressed in birds per m^2) multiplied by π/2 (we divide by two the exact surface of a circle which radius is 1 m, to cover for the space taken by the observer).
The number of birds that are actually within arm's reach of the observer (i.e. within 1 m) is then compared to that theoretical number of birds. An index representing the % birds within 1 m is calculated:

I = 100 x (number of birds within arm's reach / theoretical number of birds)

The index is turned into a score according to spline functions (Figure 14):

When $I \leq 20$ then Score = $24.631 + (8.9944 \times I) - (0.32423 \times I^2) + (0.0031378 \times I^3)$
When $I \geq 20$ then Score = $95.660 + (0.46453x\ I) - (0.014127 \times I^2) + (8.7479 \times 10^{-5} \times I^3)$

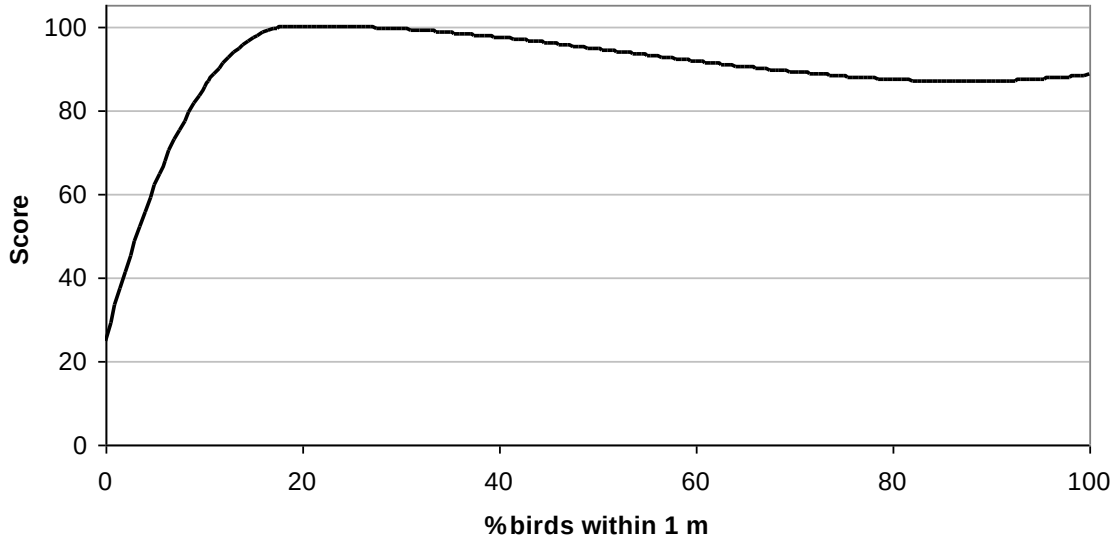


Figure 14 Calculation of scores for good human-animal relationship according to the proportion of birds within 1 m of the observer.

5.2.1.12 Positive emotional state

The values (between 0 and 125) obtained by a farm for the 22 terms of the Qualitative Behaviour Assessment are turned into an index using a weighted sum:

$$Index = -2.7938 + \sum_{k=1}^{20} w_k N_k$$

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

The weights of the various terms in this sum are issued from a Principal Component Analysis:

Terms	Weights
Active	0.00593
Relaxed	0.00528
Helpless	-0.04383
Comfortable	0.01274
Fearful	-0.00295
Agitated	-0.00148
Confident	0.00916
Depressed	-0.01651
Calm	0.00449
Content	0.01321
Tense	-0.00283
Inquisitive	0.00625
Unsure	-0.00114
Energetic	0.00726
Frustrated	-0.01062
Bored	-0.01367
Friendly	0.00676
Positively Occupied	0.01018
Scared	0.00011
Drowsy	-0.01105
Playful	0.00746
Nervous	-0.00039
Distressed	-0.03121

Finally this index is transformed into a score using I-spline functions (Figure 15) as follows:

When $I \leq 0$ then Score = $-(10 \times I) - (1.25 \times I^2)$
When $I \geq 0$ then Score = $50 + (11.667 \times I) - (0.55556 \times I^2)$

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

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

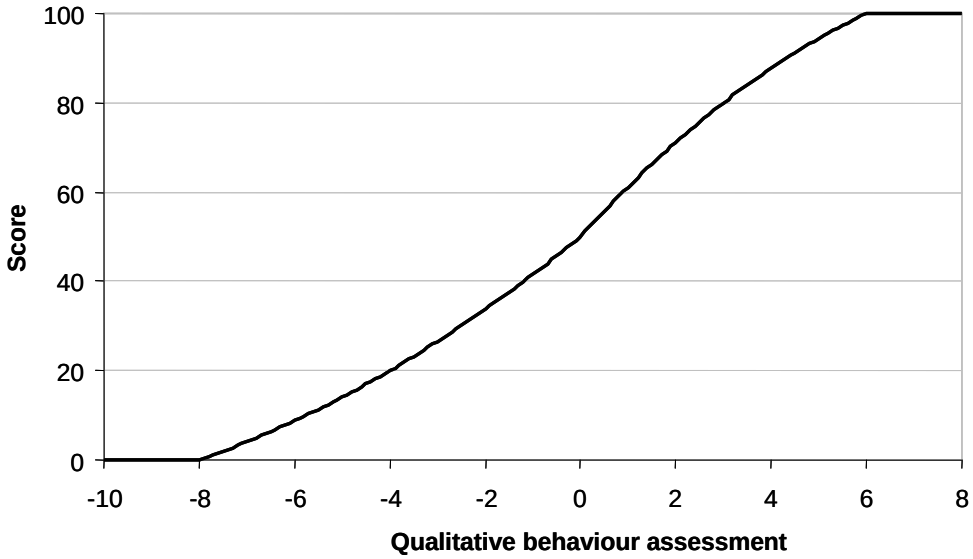


Figure 15 Calculation of scores for positive emotional state according to the values the farm obtained for the various terms used in Qualitative Behaviour Assessment (combined in a weighted sum).

5.2.2 Principle-scores

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

Principle Good feeding

μ_1	μ_2
0.09	0.26

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

Principle Good housing

μ_3	μ_4	μ_5
0.20	0.18	0.23

μ_{34}	μ_{35}	μ_{45}
0.20	0.33	0.26

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

Principle Good health

μ_6	μ_7	μ_8
0.06	0.19	0.10

μ_{67}	μ_{68}	μ_{78}
0.34	0.17	0.19

with 6, Absence of injuries; 7, Absence of disease; 8, Absence of pain induced by managementprocedures.

Principle Appropriate behaviour

μ_9	μ_{10}	μ_{11}	μ_{12}
0.11	0.09	0.10	0.16

μ_{910}	μ_{911}	μ_{912}
0.14	0.11	0.17

μ_{1011}	μ_{1012}	μ_{1112}
0.19	0.19	0.24

μ_{91011}	μ_{91012}	μ_{91112}	μ_{101112}
0.55	0.51	0.46	0.50

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

Expression of social behaviour is not directly assessed in broilers in the present assessment (but may be assessed in future developments). The missing criterion-score is replaced by the best score among other related measures - a) Expression of other behaviours, b) Good human-animal relationship, and c) Positive emotional state.

Due to the positive values of the interactions between criterion-scores, principle-scores are always intermediate between the lowest and the highest values obtained at criterion level, and closer to the minimum value.
Within each principle, some criteria are considered more important than others (and will contribute to a large extent to the principle-score):

- Within principle “Good feeding”, Criterion “Absence of prolonged thirst” is considered more important than Criterion “Absence of prolonged hunger”.
- Within principle “Good housing”, Criterion “Ease of movement” is considered more important than Criterion “Comfort around resting”, which in turn is considered more important than Criterion “Thermal comfort”.
- Within principle “Good health”, Criterion “Absence of disease” is considered more important than Criterion “Absence of injuries” which in turn is considered more important than Criterion “Absence of pain induced by management procedures”.
- Within principle “Appropriate behaviour”, Criterion “Expression of other behaviours” and Criterion “Positive emotional state” are considered slightly more important than Criterion “Good human-animal relationship” which in turn is considered more important than Criterion “Expression of social behaviours”.

Examples of principle-scores resulting from criterion-scores are provided in Tables 5 to 8 below.

Table 5 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 prolonged hunger	Absence of prolonged thirst	*Good feeding*
25	75	38
40	60	45.2
50	50	50
60	40	41.8
75	25	29.5

Table 6 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	*36*
50	25	75	*39*
75	25	50	*38*
50	50	50	*50*
50	75	25	*35*
75	50	25	*35*

Table 7 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	*32*
25	75	50	*35*
50	25	75	*32*
75	25	50	*31*
50	50	50	*50*
50	75	25	*38*
75	50	25	*35*

Table 8 Examples of scores for "Appropriate behaviour" according to combinations of Criterion-scores for "Expression of social behaviours", "Expression of other behaviours", "Good human-animal relationship", and "Positive emotional state".

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

5.2.3 Overall assessment

The synthesis of the four principle-scores into an overall assessment is done similarly for all animal types. The overall assessment is explained in Chapter 4.

5.3 Collection of data for broiler chicken at slaughterhouse

	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	Feed withdrawal time
	2	Absence of prolonged thirst	Water withdrawal time
Good housing	3	Comfort around resting	*As yet, no measure is developed*
	4	Thermal comfort	Panting on lorry and/or lairage
	5	Ease of movement	Stocking density in crates
Good health	6	Absence of injuries	Wing damage, bruising
	7	Absence of disease	Dead on arrival (DOA)
	8	Absence of pain induced by management procedures	Pre-stun shock, effectiveness of stunning
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	Positive emotional state	Flapping on the line

5.3.1 Good feeding

5.3.1.1 Absence of prolonged hunger

Title	**Feed withdrawal time**
Scope	Resource-based measure: Broiler chicken
Sample size	Animal unit
Method description	This measure is derived from farm and transport records (records of time taken to load and transport the birds, which are kept by the slaughterhouse on arrival). Record the duration of feed withdrawal at three levels; 1. Period of non-feeding before catching (on-farm) T(f) 2. Period of non-feeding during transport T(t) 3. Period of non-feeding during lairage T(l) The total period of feed withdrawal is composed of on-farm withdrawal time T(f) + transport time T(t) + period whilst held in lairage T(l). Calculation goes according to this; Total feed withdrawal time - T(f) + T(t) + T(l)
Classification	Time (**minutes**)

5.3.1.2 Absence of prolonged thirst

Title	**Water withdrawal time**
Scope	Resource-based measure: Broiler chicken
Sample size	Animal unit
Method description	This measure is derived from farm and transport records (records of time taken to load and transport the birds), which are kept by the slaughterhouse on arrival. Record the duration of water withdrawal at three levels; 1. Period of water withdrawal before catching (on-farm) Tw(f) 2. Period of water withdrawal during transport Tw(t) 3. Period of water withdrawal during lairage Tw(l)

	The total period of water withdrawal is composed of on-farm withdrawal time Tw(f) + transport time Tw(t) + period whilst held in lairage Tw(l). Calculation goes according to this; Total water withdrawal time - Tw(f) + Tw(t) + Tw(l)
Classification	Time (**minutes**)

5.3.2 Good housing

5.3.2.1 Comfort around resting

As yet, no measure is developed.

5.3.2.2 Thermal comfort

Title	**Panting on lorry and/or lairage**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.3.5
Method description	Panting is defined as breathing rapidly in short gasps. High temperatures will cause birds to pant – this is a natural response – however, persistent panting indicates that the thermal environment is not being maintained at a temperature which is comfortable for the birds in the long term. When a bird 'pants' it increases its respiratory rate to allow rapid exchange of air to prevent overheating. The visible signs of panting are that the birds often sit upright, open their beak and often make visible respiratory movements. Observe 20 crates of birds from the front, middle and back of the lorry (or from a stack of crates in the lairage). Calculate the number of birds per crate. Multiply by number of crates observed. Count the number of birds panting in the crates assessed. Percentage of birds panting = ((number of birds seen panting)/(Number of birds per crate x Number of crates assessed)) x100%
Classification	**Group level:** **Percentage** of birds panting on lorries and lairage

5.3.2.3 Ease of movement

Title	**Stocking density in crates**
Scope	Resource-based measure: Broiler chicken
Sample size	Sample size according to § 5.3.5
Method description	Measure 1 crate of uniform size. Count birds in 10 crates to create average number of birds per crate. Measure the crate dimensions (m x m) = calculate area in m^2 . Subsequently record average bird weight (kg) and the number of birds per crate (n). Bird stocking density during transport = (Birds per crate(n) x average bird weight (kg)) / crate area m^2.
Classification	Average bird weight **(kg)** and Area of average crate **(m^2)** and Stocking density in crates (**kg/m^2)**

5.3.3 Good health

5.3.3.1 Absence of injury

Title	**Wing damage (fractures)**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.3.5
Method description	This measure assesses injury due to catching, transport and removal from transport crates. Wing damage can be identified by visible 'dropped wings' on the slaughter transport line. In this case the wing is clearly hanging down indicating fracture or dislocation. Sample wing damage from moving line at the slaughter house. Sample size can be up to the entire flock. Observe the birds just after 'hang on'. Record the number of birds passing per minute (line speed birds/min). Count number of birds with 'dropped wings' (Z). Then calculate the percentage of birds with wing damage according to the total flock assessed. Percentage of birds with damaged wing = ((Number of birds observed (Z)) / (Line speed x number of minutes of observation)) x 100
Classification	**Individual level:** **Percentage** of birds with damaged wings

Title	**Bruising**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.3.5
Method description	This measure assesses the bruising visible on the carcasses, distinguished from post mortem carcase damage (which will not have caused haemorrhage into the tissues). Sample from the moving line at the slaughter house at a position where the thigh, back, and legs of the bird are clearly visible. Sample size can be up to the entire flock. Observe the birds after plucking, or at the first available point where the whole (uncut) carcase can be observed. Record the number of birds passing per minute (line speed birds/min) and count number of birds with bruising (R). Percentage of birds with bruising = ((Number of birds observed (R)) / (Line speed x number of minutes of observation)) x 100
Classification	**Individual level:** **Percentage** of birds with bruising

5.3.3.2 Absence of disease

Title	**Dead On Arrival (DOA)**
Scope	Animal-based measure: Broiler chicken
Sample size	Animal unit
Method description	Mortality is the 'uncontrolled' death of birds (as distinct from culling) – birds may die from, for example- septicaemia, respiratory disease, acute infection, dehydration. Any bird which is 'found dead' in the crate at unloading is considered a mortality. Determine the number of birds to be slaughtered in a group, or the total number of birds to be delivered from the farm (n) from available records. Subsequently calculate total number of birds arriving dead after transport (D), by counting number of birds placed in the 'dead on arrival' bin. Percentage DOA = (total number of dead birds after transport (D) / total number in batch or flock (n)) x 100%

Classification	**Flock level:** **Percentage** of birds DOA

5.3.3.3 Absence of pain induced by management procedures

Title	**Pre-stun shocks**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.3.5
Method description	A 'pre-stun shock' occurs when a bird receives a premature electrical shock from the stunning bath. This can occur when the bird's head or wing touches splashed water or wet surfaces (electrified) at the very start of the entrance to the stunner. The bird will make avoidance movements and often flap and vocalize – this will prevent the bird affected from being effectively stunned and may also cause other birds to react. Sample from the moving line after 'hang on' and at the entrance to the stunning bath at the slaughter house. Record number of birds passing per minute (ls) (line speed birds/min). Count number of birds which show avoidance movements, flapping or vocalisation when they touch the entrance ramp to the stunner (nsc). Percentage of birds experiencing pre-stun shock = (Number of birds observed with pre-stun shock (nsc)) / (Line speed (ls) x number of minutes of observation (t)) x 100%
Classification	**Flock level:** **Percentage** of birds receiving a pre-stun shock

Title	**Effectiveness of stunning**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.3.5
Method description	At the stunner exit, the main body posture should be examined. Two types of stunning are considered here, these are: **Electrical stunning:** Unconsciousness is achieved through an epileptic seizure. At the stunner exit the behavioural signs of this include: • Neck arched with head directed vertically • Open eyes • Wings held closely to the body • Rigidly extended legs and constant rapid body tremors • No rhythmic breathing and no movement around the abdominal vent area **Gas stunning:** Birds stunned with gas will be fully relaxed, with closed eyes and no body tremor if stunned properly. Observe the birds from the moving line at the exit of the electrical water bath, and after the automatic or manual neck cutter. Record the number of birds passing per minute (ls) (line speed birds/min). Count the number of birds which show evidence of ineffective stunning (nis). Percentage of birds ineffectively stunned = (Number of birds observed ineffectively stunned (nis)) / (Line speed (ls) x number of minutes of observation (t)) x 100%
Classification	**Flock level:**

	Percentage of birds ineffectively stunned

5.3.4 Appropriate behaviour

5.3.4.1 Expression of social behaviours

This measure is not applied in this situation.

5.3.4.2 Expression of other behaviours

This measure is not applied in this situation.

5.3.4.3 Good human-animal relationship

This measure is not applied in this situation.

5.3.4.4 Positive emotional state

Title	**Flapping on the line**
Scope	Animal-based measure: Broiler chicken
Sample size	Sample size according to § 5.3.5
Method description	Birds may flap their wings vigorously particularly where the line makes abrupt changes of direction. Observe the birds just after 'hang on' and record number of birds showing vigorous flapping. Record the number of birds passing per minute (ls) (line speed birds/min). Count the number of birds which show flapping (nf). Percentage of birds flapping on line = ((Number of birds observed (nf)) / (Line speed (ls) x number of minutes of observation (t)) x 100%
Classification	**Flock level:** **Percentage** of birds showing flapping on the line

5.3.5 Sampling and practical information

Table 9 Order for carrying out measures, sample size and time required for broiler chicken at slaughter.

Measure	**Sample method and/or number of birds to sample**	**Time required (min)**
Feed withdrawal time	Whole flock - Take times from farm and transport records	5
Water withdrawal time	Whole flock - Take times from farm and transport records	5
Stocking density in crates	Measure 1 crate to establish crate size, count birds in 10 crates selected from across lorry, calculate average stocking density	10
Panting on lorry and/or lairage	Observe 20 crates from the front, 20 from the middle and 20 from the back of the lorry (giving a total of 60 crates) and for each crate estimate the proportion of birds panting	10
Flapping on the line	Observe birds passing on the line for 5 to 10 minutes. Calculate the number of birds showing flapping behaviour as a percentage of the total observed	10
Wing damage	Observe birds passing on the line for a minimum of 10 minutes up to entire flock and calculate the number of birds showing	10

	hanging wing or fractures as a percentage of the total observed	
Pre-stun shocks	Observe birds passing on the line for 5 to 10 minutes. Calculate the number of birds showing pre-stun shocks as a percentage of the total observed	10
Effectiveness of stunning	Observe birds passing on the line for 5 to 10 minutes and calculate the number of birds showing signs of incomplete stunning as a percentage of the total observed	10
Bruising	Observe the whole (uncut) carcass passing the line for 5 to 10 minutes and calculate the number of birds showing signs of bruising associated with catching, transport or hanging.	10
Dead on Arrival (DOA)	Whole flock - Ask to see the records for the total number of birds hung alive on the shackles and those discarded as dead on arrival	5
	Total	**85 minutes** (1 hour 25 min)

5.4 Calculation of scores for broiler chicken at slaughterhouse

Not included in the protocol at the moment.

6 Welfare Quality® applied to laying hens

The assessment of welfare is a multi–disciplinary process since assessment of 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 adaptations to assess the welfare of laying hens on farm.

In this chapter, a description of each measure for laying hens 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 with the aid of photographs and video clips. For some of the health measures, this involves being able to recognize 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.

Trained assessors will use either animal–based, management–based or resource–based measures to achieve a representative assessment of laying hen welfare of each farm. Many different measures are assessed, and many 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, i.e. Yes/No) or a continuous scale (e.g. cm) is used.

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

6.1 Collection of data for laying hens on farm

	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	Feeder space
	2	Absence of prolonged thirst	Drinker space
Good housing	3	Comfort around resting	Shape and total length of available perches, evidence of red mites, dust sheet test
	4	Thermal comfort	Panting, huddling
	5	Ease of movement	Stocking density, perforated floors
Good health	6	Absence of injuries	Keel bone deformation, skin lesions, foot pad dermatitis, toe damage
	7	Absence of disease	On farm mortality, culls on farm, enlarged crops, eye pathologies, respiratory infections, enteritis, parasites, comb abnormalities
	8	Absence of pain induced by management procedures	Beak trimming
Appropriate behaviour	9	Expression of social behaviours	Aggressive behaviour, plumage damage, comb pecking wounds

	10	Expression of other behaviours	Use of nest boxes, use of litter, enrichment measures, free range, cover on the range, covered veranda
	11	Good human-animal relationship	Avoidance distance test (ADT)
	12	Positive emotional state	Novel object test (NOT), qualitative behaviour assessment (QBA)

6.1.1 Good feeding

6.1.1.1 Absence of prolonged hunger

Title	**Feed space (per bird)**
Scope	Resource-based measure: Laying hens
Sample size	Animal unit
Method description	Calculate the total number or length of available feeders according to feeder type. First the assessor should note down the type of feeder (pan, track or chain), to be able to interpret the feed space per bird - round feeder or a straight feeder. **Pan feeders:** Calculate the circumference of one pan (cm), multiply by the number of pans and divide by total bird numbers. **Track or chain feeders:** When possible measure the length of one 'side' and the length of the 'end', exclude areas which the birds cannot reach (including corners) and then multiply by the number of loops or tracks to give a total length. For feed troughs that can be reached from 2 sides multiply length by 2. Then divide the total feed length by number of hens present at moment of monitoring.
Classification	Length of feed space (**cm**) and **Number** of birds in the house

6.1.1.2 Absence of prolonged thirst

Title	**Drinker space (birds per drinker)**
Scope	Resource-based measure: Laying hens
Sample size	Animal unit
Method description	Calculate the total number or length of available drinkers in the house according to drinker type. First the assessor should note down the type of drinker to be able to interpret the drinker space per bird. **Drinker points:** Calculate the number of drinker points in one row and multiply by the number of lines. Divide the total number of drinker points by the total number of animals (to give birds per drinker). **Nipples:** Calculate nipples per meter and then multiply by total track length. Divide by the total number of animals (to give birds per nipple). **Bell drinkers:** Calculate the circumference of one bell, multiply this by the number of

	bells and divide by number of hens present at the time of monitoring (to give cm per animal). The result can be expressed in two ways, depending upon whether the farm has nipples/cups or bell drinkers.
Classification	**Number** of birds in the house and **Number** of available nipples and Space available at drinkers in **cm**/animal

6.1.2 Good housing

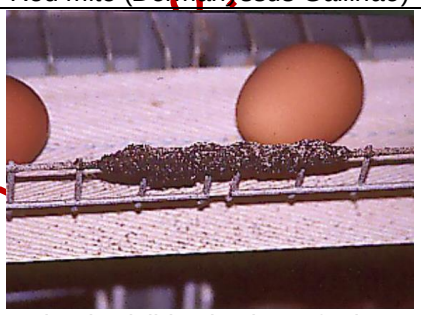
6.1.2.1 Comfort around resting

Title	**Shape and total length of available perches**
Scope	Resource-based measure: Laying hens
Sample size	Animal unit
Method description	First examine the perches for shape. Record if any of the perches have sharp edges (e.g. wooden, rectangular perches are considered to have sharp edges, but not if the edges are rounded; round or mushroom-shaped perches are considered to have no sharp edges). Then examine if more than 50% of the perches are positioned in a specific resting zone. A resting zone can be created with A-frames with perches or a perch area on top of a multi-level system (the resting zone may be contain water lines, but is usually without feeders). Calculate the total length of available and accessible perches in the house to be examined. **A-frames with perches:** Calculate the number of perches per A-frame, multiply by length of A-frame and number of A-frames to calculate total perch length in the house. **Multi-level systems:** Measure the length of one perch on a floor, multiply by number of perches present on all floors to assess total perch length**.** **Cages:** Measure the total perch length in one cage and multiply by number of cages present in the house**.** **Perch length per bird** Divide the total perch length by the total number of hens present at the time of assessment to calculate the perch length per bird (cm per animal).
Classification	**0** – No sharp edges on perch **2** – Presence of sharp edges on perch and **0** – More than 50% of the perch length is positioned in a resting zone **2** – From 0 to 50% of the perch length is positioned in a resting zone and Perch space per bird in **cm** per bird

Title	**Evidence of Red Mites**
Scope	Animal- and resource-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Examine both the equipment in the house and actual birds for red mites (*Dermanyssus gallinae*). Common mite infestation sites are under perches and in cracks and crevices. See photographic reference. Red mites can often be found by scraping in cracks and crevices with a sharp implement. Another way to find mites is to hold a piece of white paper underneath the wire floor or perch and to knock on it, any red mites will then fall onto the paper and can be seen. Severe infestations can be seen clearly as 'clumps' of mites bunched together. Severe infestations can also be seen as blood spotting on eggs. Furthermore inspect the birds for presence of red mites by checking the comb, legs and breast skin- and check dead birds if they are present. Combine all of the findings of the inspection of the birds and the house into one score.
Classification	**0** – No red mites detectable on birds and in the house **1** – Red mites found on birds or in the house, but not in large numbers and not clearly visible (e.g. no or few mites found on hens, and mites found in the house are hidden in cracks and crevices but not in many places and not in large quantities) **2** – Large quantities of red mites found on birds and/or in the house (e.g. large numbers of mites are evident)

Red mite (*Dermanyssus Gallinae*)

Severe infestation of red mites, clearly visible clutches of mites



Clearly visible clutches of mites

Blood spots on an egg

Title	**Dust sheet test**
Scope	Management-based measure: Laying hens
Sample size	Animal unit

Method description	The dust sheet test is conducted using a black A4 size paper. Choose a spot that is in the area the birds live in, but not too close to feed hoppers or other equipment that causes dust. The paper should also be out of reach of the birds. Position the black paper when you first enter the house – and then remove the sheet at the end of the assessment. Write with a finger on the paper to get an impression of the amount of dust on the paper. Classify the dust level found on the paper as follows: a None b Little c Thin covering d Lot of dust e Paper colour not visible
Classification	**0** – No evidence of dust (score 'a') **1** – Minimal evidence of dust (score 'b' or 'c')**2** – Evidence of dust (score 'd' or 'e')

6.1.2.2 Thermal comfort

Title	**Panting**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Panting is defined as breathing respiration in short gasps. High temperatures will cause birds to pant – this is a natural response – however, persistent panting indicates that the thermal environment is not being maintained at a temperature which is comfortable for the birds in the long term. When a bird 'pants' it increases its respiratory rate to allow rapid exchange of air to prevent overheating. The visible signs of panting are that the birds often sit upright, open their beak and often make visible respiratory movements. Estimate the percentage of animals of the total flock that perform panting behaviour, based on inspection of the whole flock (e.g. both at the back of the house, halfway and at the front of the house). Make a flock walk at the start of the protocol, halfway through the measurements in the hen house and at the end of the assessments in the hen house recording the percentage of animals panting after each walk.
Classification	**Flock level:** **Percentage** of birds showing panting

Title	**Huddling**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	When birds are cool or cold, they will often group together into tight groups, sitting closely alongside each other, often in 'clumps' with areas of empty ground in between, this is defined as huddling. Huddling can be a natural response to lower temperatures, however, long periods of or persistent huddling indicates that the thermal environment is not being maintained at a temperature which is comfortable for the birds in the long term. Huddling is less common than panting as birds are usually kept adequately warm due to their stocking density and their highly insulating feather cover. It is however possible for birds to get cold in cold weather

	or at cold spots in the house due, for instance, to cold drafts. The birds will often choose warmer sites in the house to 'huddle' – near to patches of warm air. This huddling is usually distinct from the normal 'loose grouping' that birds will show when resting. Only count birds that huddle due to thermal reasons. Do not count birds that pile up for unknown reasons. Estimate the percentage of animals of the total flock that perform huddling behaviour, based on inspection of the whole flock. Make a flock walk at the start of the protocol, halfway through the assessment in the hen house and at the end of the assessments in the hen house and record the percentage of animals huddling.
Classification	**Flock level:** **Percentage** of birds huddling

6.1.2.3 Ease of movement

Title	**Stocking density**
Scope	Resource-based measure: Laying hens
Sample size	Animal unit
Method description	Examine both litter and slatted floor area in the house, i.e. the total space in the house that is permanently accessible for the birds, which is assessed according to available reported information or is calculated based on available litter area and slatted floor area. **Availability of official reports:** In case of the availability of official reports of local authorities, use the available space indicated in these reports. **Litter space and systems with slatted floors:** Measure the total available litter space and total available slatted area (length x width in m^2). Space taken by "furniture" (feeders, drinkers, perches) is not usually subtracted from the total available space. Nest space is not calculated as available space. Only count space that is permanently available to the birds, thus free range area is not taken into account, but a covered veranda area can be included in the calculation if this area is permanently available. **Cage houses and systems with slatted floors:** It may be possible to measure a cage or section and multiply this by the number of cages / sections present. Platforms are calculated as available space if they are at least 30 cm wide. Divide the total available space by the total number of hens in the house examined (cm^2 per animal).
Classification	**cm^2** / animal

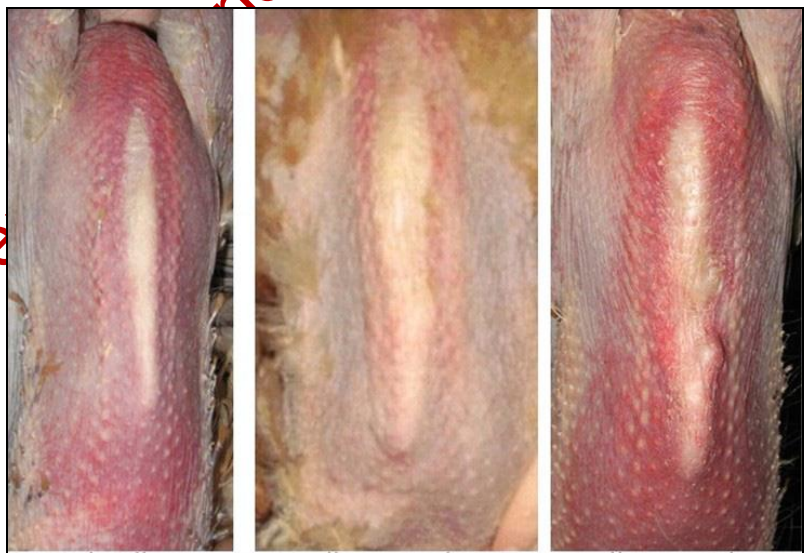
Title	**Perforated floors (% of available space)**
Scope	Resource-based measure: Laying hens
Sample size	Animal unit
Method description	Examine the amount of all perforated floor area (wooden or plastic slatted area or areas of netting) in relation to total available space. Calculate the percentage of perforated floor by dividing the total area of

	perforated floor by the total available space (slatted and litter floor). Examine the type of perforated floor. Estimate the percentage of perforated floors consisting of wire mesh.
Classification	**Percentage** of slatted floor of total available space and **Percentage** of perforated floors consisting of wire mesh

6.1.3 Good health

6.1.3.1 Absence of injuries

Title	**Keel bone deformation**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Keel bones are normally straight without dips, bulbs, deviation or other palpable abnormality. Abnormalities can be caused by badly shaped perches, healed breaks (fractures) or by decalcification of the keel. A keel bone deformation is any abnormality from the normal straight shape of the keel. Examine the breast of the hen by looking at it (in case of featherless breast) or by running fingers alongside and over the keel bone. Collection of birds for assessment can be made by either penning (corralling) birds or by picking up individual birds in several areas of the henhouse. The number of places to collect hens is dependent on the housing system and the number of compartments. Pick up a bird from within the penned group or from the litter or slatted floor, inspect the keel area visually and palpate the area. In cage systems take the birds from different areas of the house and from different tier levels. Compare to the photographic reference and assess according to the following: **0** – No deviations, deformations or thickened sections, keel bone completely straight **2** – Deviation or deformation of keel bone (including thickened sections)
Classification	**Flock level:** **Percentage** of birds in the flock in each category (0,2)



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Title	**Skin lesions**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Skin lesions are wounds that have not yet healed. Little wounds in a shape of punctiform pecks (holes) or scratches are not considered as lesions, but if there are 3 or more pecks and/or scratches then these are taken into account. Examine the rear and legs of the hen for presence of skin lesions. Pick up a bird from within the penned group or from the litter or slatted floor. Examine the rear end and the legs of the hen. Lift the feathers to examine the skin. The number of places to collect hens is dependent on the housing system and the number of compartments. In cage systems take the birds from different areas of the house and from different tier levels. Assess the individual birds according to the following: **0** – No lesions, only single (<3) pecks (punctiform damage <0.5 cm diameter) or scratches **1** – At least one lesion <2 cm diameter at largest extent of ≥3 pecks or scratches **2** – At least one lesion ≥2 cm diameter at largest extent
Classification	**Flock level:** **Percentage** of birds in the flock in categories 0,1,2

Title	**Foot pad dermatitis**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	The feet of hens should have smooth skin without any wounds or abnormalities. Wire floors can cause hard patches or other proliferations (thickening) of the epithelium. Inflammation or skin damage can cause a swelling of the foot, called bumble foot. This starts with a minor swelling, but can finally result in very swollen balloon-shaped feet. Although this inflammation can heal during the flock cycle, these lesions can cause distress to the bird. The cause of bumble foot is not completely clear, but perch design, hygiene and genotype may have an influence. Pick up a bird from within the penned group or from the litter or slatted floor. In cage systems take birds from different areas of the house and from different tier levels: Examine both feet of the hen and choose the foot with the worst condition to score according to the following: **0** – Feet intact, no or minimal proliferation of epithelium **1** – Necrosis or proliferation of epithelium or chronic bumble foot with no or moderate swelling **2** – Swollen (dorsally visible)
Classification	**Flock level:** **Percentage** of the flock in each scoring category 0,1,2

	
1: proliferation of epithelium	2: bumble foot (dorsally visible)

Title	**Toe damage**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Due to poor equipment design toes can be trapped and injured (or even torn off). Toe damage is defined as wounds on one or more toes and/or missing (parts of) one or more toes. 100 birds are examined and information from these birds will be included in the final score. The final score is based on both the inspection of 100 birds ans visual observations during other work in the hen house and the number of birds with toe damage assessed. The classification reflects the number of birds with toe damage.
Classification	**Flock level:** **0** – No evidence of damaged toes **1** – Fewer than 3 birds with damaged toes **2** – 3 or more birds with damaged toes

6.1.3.2 Absence of disease

Title	**On farm mortality**
Scope	Management-based measure: Laying hens
Sample size	Animal unit
Method description	Mortality is defined as the 'uncontrolled' death of animals (as distinct from culling/euthanasia). The animals may die from, for example, septicaemia, respiratory disease, acute infection or dehydration. Any animal which is 'found dead' in the house, or out on the field is considered a mortality. The animal unit manager is asked about mortality management on the farm based on data collected from farm records. Using house records of animal numbers placed, died and culled: Number of animals placed in house from previous animal unit (A) Total number of animals which died and were found dead (but were not actively culled) during the flock cycle (M) If no information is specifically available on culled birds, simply use the flock records on mortality (which will then reflect mortality and culled together) Calculate the percentage mortality using the following equation:

	Percentage of mortality = (M/A) x 100
Classification	**Percentage** of mortality on farm during the flock cycle

Title	**Culls on farm**
Scope	Management-based measure: Laying hens
Sample size	Animal unit
Method description	Culling is defined as birds which are actively and humanely killed by the animal unit manager for disease control purposes, lameness, sickness or disease. These birds are known as 'culls'. Use farm records of the flock in the house to determine the number and percentage of culled birds. The animal unit manager is asked about mortality management on the farm based on data collected from farm records. Estimate the number of birds that are culled by checking the farm records. If no written information or no accurate information is available from the animal unit manager, mark this issue as not known. In that situation culls will be included in the mortality figure. The percentage of birds culled can be calculated by dividing the number of culled birds by the number of birds housed. If culling is not specifically recorded then this should be noted – as this implies that all deaths are 'uncontrolled'.
Classification	**Percentage** culling on farm during flock cycle

Title	**Enlarged crops**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	An enlarged crop is a condition in which the crop becomes distended with fluid and decomposing food. This abnormal development of the crop is usually visible as a pronounced swelling on the lower neck of the bird. The final score is based on both the inspection of the 100 birds and visual observations during other work done in the henhouse. Classification reflects the number of birds with enlarged crops.
Classification	**Flock level:** **0** – No evidence of enlarged crops **1** – Fewer than 3 birds with enlarged crops **2** – 3 or more birds with enlarged crops

Title	**Eye pathologies**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	This measure assesses the flock in relation to eye pathologies. Eye pathologies include swelling of the eyelids and the skin around the eyes, closure of the eye/eyes and discharge from the eyes. The final score is based on both the inspection of the 100 birds and visual observations during other work done in the henhouse. Classification reflects the number of birds with eye pathologies.
Classification	**Flock level:** **0** – No evidence of eye pathologies **1** – Fewer than 3 birds with eye pathologies **2** – 3 or more birds with eye pathologies

Title	**Respiratory infections**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	This measure assesses the flock in relation to respiratory infections. Respiratory infections cause increased or laboured respiratory effort, sneezing and are often associated with audible breathing sounds. The final score is based on both the inspection of the 100 birds and visual observations during other work done in the henhouse. Classification reflects the number of birds with respiratory infections.
Classification	**Flock level:** **0** – No evidence of respiratory infections **1** – Fewer than 3 birds with respiratory infections **2** – 3 or more birds with respiratory infections

Title	**Enteritis**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	This measure assesses the flock in relation to enteritis. Enteritis includes gut infections or digestive metabolism abnormalities often resulting in altered faecal state – discoloured faeces or increased liquid content or diarrhoea. The final score is based on both the inspection of the 100 birds and visual observations during other work done in the henhouse.
Classification	**Flock level:** **0** – No evidence of enteritis **1** – Fewer than 3 birds with enteritis **2** – 3 or more birds with enteritis

Title	**Parasites (excluding red mites)**
Scope	Animal- and management-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Poultry species are susceptible to several parasites, including lice, mites, ticks, fleas, and intestinal worms. They can be harmful as they may transmit disease. Parasites can live on the birds (mites and lice) and can be seen if the feather cover is inspected and moved aside by hand. Parasites can also live inside the hen (intestinal worms) and then mostly are not visible. The presence of worms can be suspected if hens are pale and weak. The presence of worms can be established by inspecting the faeces. Examine the henhouse and housing system. Evidence of fleas can be visible on windows or doors, where they leave their faeces. Beetles can be found in manure pits. Check manure belts to see if manure contains large numbers of worms. The final score is based on both the inspection of the 100 birds and visual observations during other work done in the henhouse. Inspect the comb and the breast and legs by pushing the feathers aside to check for lice and mites.
Classification	**Flock level:** **0** – No flea faeces on windows & doors **2** – Flea faeces on windows & doors

	and **0** – No evidence of parasites **2** – Evidence of parasites

Title	**Comb abnormalities**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	A normal comb has an even red colour and no wounds or scratches. The final score is based on both the inspection of the 100 birds and visual observations during other work done in the henhouse. Apart from pecking wounds (these are scored separately) other comb abnormalities should be scored as well. Examples of comb abnormalities that are considered • There should be no blue or black areas present • Hens at the peak of production may have a slightly paler comb, but combs which are very pale may indicate anaemia • If hens are dehydrated, combs may look 'dried out' and blue
Classification	**Flock level:** **0** – No evidence of comb abnormalities **1** – Fewer than 3 birds with comb abnormalities **2** – 3 or more birds with comb abnormalities

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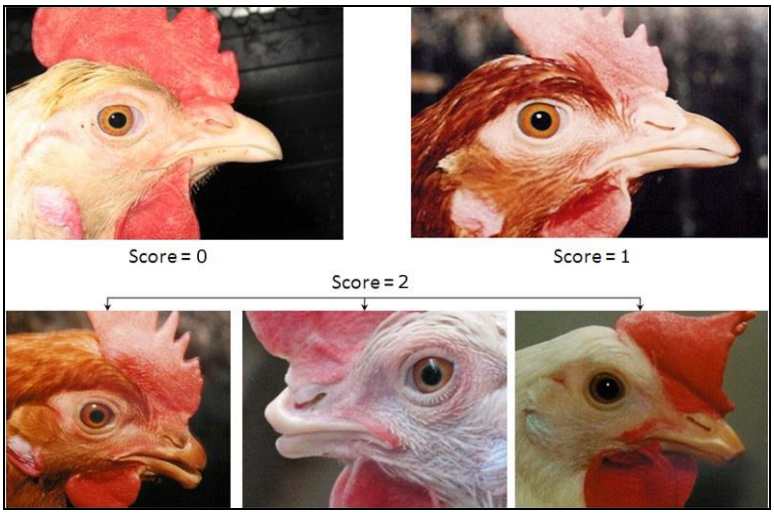
6.1.3.3 Absence of pain induced by management procedures

Title	**Beak trimming**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Beak trimming can lead to abnormalities of the beak. Score 100 birds - pick up the birds from within the penned group or from the litter or slatted floor. In cage systems tae the birds from different areas of the house and from different tier levels: Examine the beak on both sides according to classification presented in the photographic reference.
Classification	**Individual level:** **0** – No trimming and no abnormalities **1** – Moderate to light trimming with moderate to no abnormalities (or no trimmed birds, but nonetheless with abnormalities on the beak) **2** – Severe trimming, with clear abnormalities



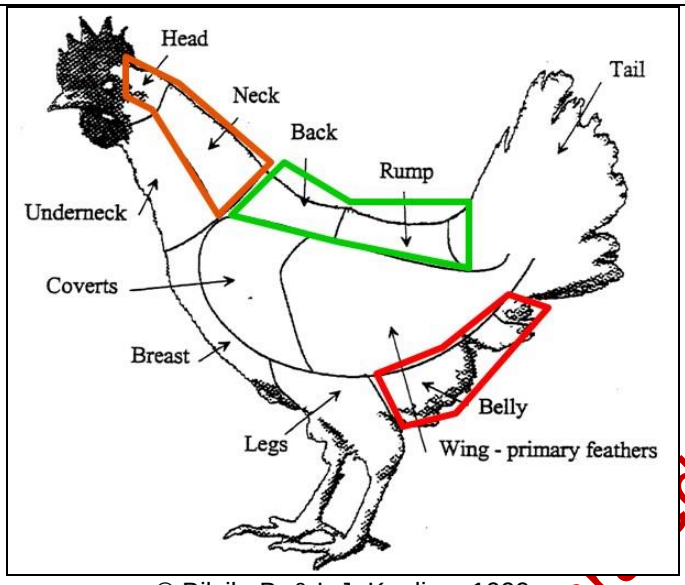
© Score 0: Gunnink, WUR; © scores 1 and 2: Fiks-van Niekerk, WUR

6.1.4 Appropriate behaviour

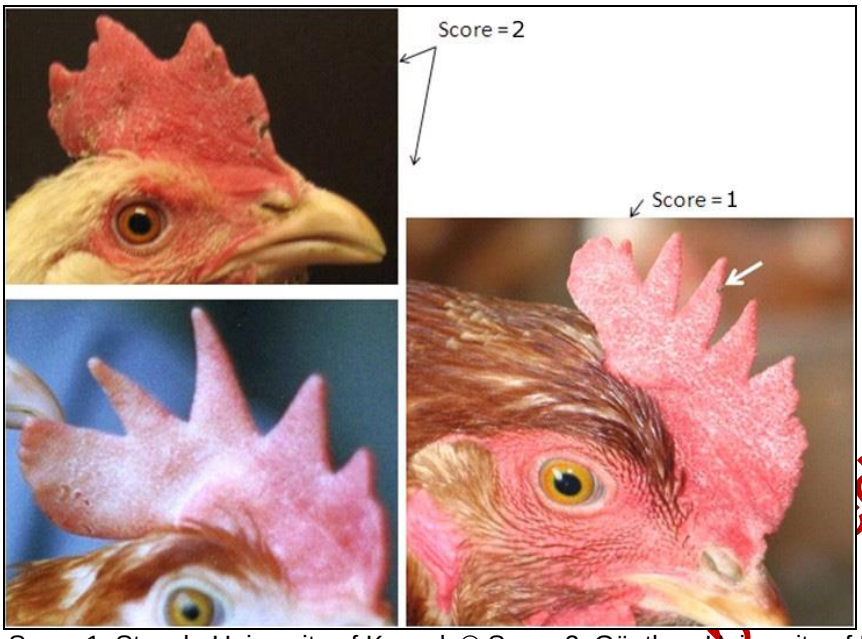
6.1.4.1 Expression of social behaviours

Title	**Aggressive behaviours**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Aggressive behaviour is defined as fighting, severe pecking at other birds or chasing other birds (when observed more than twice). Aggressive behaviours often signalled by a loud squawk or vocalisation. During the work in the henhouse the behaviour of the hens is observed.
Classification	**Flock level:** **0 –** No evidence of aggressive behaviour **2 –** Evidence of aggressive behaviour

Title	**Plumage damage**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	The feathers of normal birds should be smooth with no signs of disturbance. All feather shafts then usually point in one direction resulting in a protective and insulating cover to the skin. Due to abrasion against wire, feather shafts can be broken. Due to pecking behaviour feathers can be disturbed, broken or even torn out. Areas where feather damage usually starts are the tail, neck and cloacal region. Birds are visually inspected individually. Score each animal according to three individual body parts (see photographic reference). For each bird 3 scores are given (i.e. 1 for each body part): being the back and rump together, around the cloacae (belly) and head and neck together. The 3 body parts are chosen to give information regarding the cause of feather damage: damage to feathers of the back and rump usually indicate feather pecking, damage to the feathers of head and neck can be caused by abrasion, and feather damage to the belly can be seen in highly productive animals. (However, the latter can also be caused by vent pecking.).

	 © Bilcik, B. & L.J. Keeling, 1999 For each body part a score is given on a 3-point scale: **a** – no or slight wear, (nearly) complete feathering (only single feathers lacking); **b** – moderate wear, i.e. damaged feathers (worn, deformed) or one or more featherless areas < 5 cm in diameter at the largest extent; **c** – at least one featherless area ≥ 5 cm in diameter at the largest extent To achieve a single general score per bird the scores of the 3 body parts are combined according to the following classification. **Individual level:** **0** – All body parts have score 'a' **1** – One or more body parts have score 'b', but no body part has score 'c' **2** – One or more body parts have score 'c'
Classification	**Percentage** of birds with scoring categories 0,1,2

Title	**Comb pecking wounds**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Pick up a bird from within the fenced or field area or from the litter or slatted floor. In cage systems take the birds from different areas of the house and from different tier levels: Examine the comb on both sides and look for pecking wounds and score using the photographic reference. Do not score healed lesions (scars). **Individual level:** **0** – No evidence of pecking wounds **1** – Less than 3 pecking wounds **2** – Starting from 3 pecking wounds and more
Classification	**Percentage** of birds with scoring categories 0,1,2.



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6.1.4.2 Expression of other behaviours

Title	**Use of nest boxes**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	This measure cannot be made in systems without nest boxes (i.e. the score for this measure will be '0'). For non-cage systems: examine all nest rows and estimate the distribution of nest boxes throughout the system. Estimate the distribution of eggs over the egg belt within each nest row, by checking the number of eggs coming off the egg belt when running. Check if, on average, the same number of eggs are lying on the first, middle and last part of the egg belt. Check if on average the same number of eggs are collected from all nest rows. If it is not possible to see the egg belts running, ask the animal unit manager to provide information on the distribution of eggs. Estimate the nest space per bird: • For single nest boxes: count the number of nest boxes and divide this by the number of hens • For group nest boxes: measure the nest surface and multiply this by the number of nest boxes. Then divide this total nest space by the number of hens present at the moment of monitoring. The outcome is the nest space per bird (in cm^2)
Classification	**Flock level:** **0 -** Nest boxes available **2 -** No nest boxes available and **0** – Distribution of nest boxes throughout the system is even. **2** – Distribution of nest boxes throughout the system is not even. and

	0 – Distribution of eggs within nest row is even. **2** – Distribution of eggs within nest row is not even. and **0** – Distribution of eggs between rows is even. **2** – Distribution of eggs between rows is not even. and Nest space per bird: - single nest boxes: hens/nest - group nest boxes: cm^2/hen nest space

Title	**Use of litter**
Scope	Animal-based measure : Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Dust bathing and scratching behaviour are important behaviours for laying hens. There should be enough space for the hens to perform dust bathing in groups as this is a social behaviour that birds tend to perform together. In an appropriate situation one can see several birds sitting together performing dust bathing behaviour (sitting in the litter and shaking the litter into the feathers) without being disturbed by other birds (e.g. due to excessive pecking behaviour). A less ideal situation is when birds can perform dust bathing behaviour but not as a group. Apart from dust bathing scratching and manipulating litter is an important behaviour to the hens. Assess the overall use of the litter during the work in the henhouse.
Classification	**Flock level:** **0** – Birds are seen performing dust bathing with 2 or more birds together **1** – Single birds are seen dust bathing or no dust bathing birds are observed, but birds are seen scratching and manipulating the litter **2** – No litter present or no dust bathing or scratching/manipulating of litter is seen

Title	**Enrichment measures**
Scope	Resource-based measure : Laying hens
Sample size	Animal unit
Method description	Check the area inside and around the henhouse for enrichment. Enrichments may be: extra materials to manipulate (e.g. ropes hanging down to peck at, bales of hay) or structures to make the environment less barren (e.g. shelter roofs in the free range, dust bathing areas). Record if there is any enrichment of the area and if it is used by the birds.
Classification	**0** – Between 50% and 100% of the birds are using the enrichments **1** – Less than 50% of the birds are using the enrichments **2** – No enrichments available or 0% of the birds are using the enrichments

Title	**Free range**
Scope	Resource-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Note that this measure is applicable to free range or extensive systems only.

	This measure is an indicator of both the birds' ability to choose the environment in which it ranges, and also the suitability of the environment for birds. Check the area around the henhouse and the walls of the house. Record if there is any range area present and if it is accessible for the birds. If the openings to the range are closed, check if they will be opened later. Check if the range is used by the birds by estimating the number of hens in the range.
Classification	**0** – Between 50% and 100% of the birds are using the range **1** – Fewer than 50% of the birds are using free range **2** – No access to range or 0% of the birds are using the range

Title	**Cover on the range**
Scope	Resource-based measure : Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Note that this measure is applicable to free range or extensive systems only. If no free range area is present this issue is not applicable. This issue must then be recorded as 0%. Cover on the range can be vegetation which the birds can use for cover (e.g. deep grass, trees, maize) or man-made shelters (e.g. tents, roofs, elevated camouflage nets, but not 'closed poultry houses'). Cover offers environmental variation to the birds and protection from aerial threats and predators which are considered a restriction to birds' use of range in some outdoor systems. Ask the animal unit manager for information. Furthermore, examine the free range area and estimate the percentage of the range area that is covered by trees, bushes, or artificial shelters.
Classification	Estimated **percentage** of the range covered

Title	**Covered veranda**
Scope	Resource-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method description	Check the covered veranda, if present. Record if there is any covered veranda and if it is accessible for the birds. If the openings to the covered veranda are closed, check if they will be opened later. Check if the covered veranda is used by the birds by estimating the number of hens in the covered veranda.
Classification	**0** – Between 50% and 100% of the birds are using the covered veranda **1** – Less than 50% of the birds are using the covered veranda **2** – No access to covered veranda or 0% of the birds are using the range

6.1.4.3 Good human–animal relationship

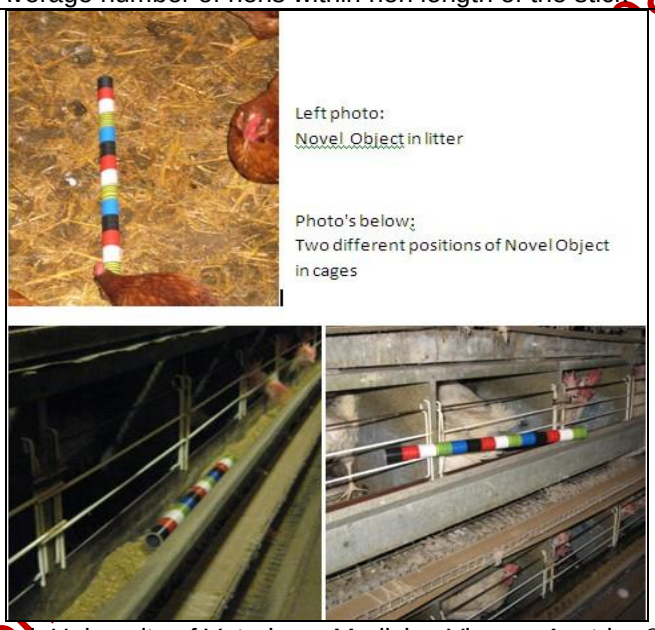
Title	**Avoidance Distance Test (ADT)**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5
Method	Choose 3 different litter areas or aisles alongside an elevated slatted

description	floor or rows of cages and test hens based on the two different housing systems (see below). Ideally these 3 areas or aisles reflect the various areas in the house (e.g. middle aisle, outside aisle). **Non-cage systems:** Walk slowly parallel to the slatted floor through the litter area at a distance of 1.5 meter from the edge of the slatted area. The hand is held in a fixed position in front of the abdomen of the assessor, directly above and in line with the birds feet. When a hen is sitting on the edge of the slatted area, turn 90 degrees and stand facing the hen. Then walk with a pace of one step per second towards the hen, looking at its toes. When the hen turns away or retreats (both feet step aside or away), the distance is measured from the hand of the assessor to the earlier position of the feet of the hen. **Cage systems:** The test is performed in the tier level which is visible by the assessor (which usually corresponds with tier level 2 or 3 depending on the cage design). The assessor walks down the corridor with small steps and at a distance of 60 cm from the body to the cage front. While walking, any bird with its head out (including the comb) of the front wire-mesh of the cage is selected. The assessor approaches the selected hen with one hand held 15 cm in front of the body starting the approach from a distance of 60 cm (from the hand to the front of the cage). After selecting any hen with a head out of the cage the assessor turns towards the hen and approaches the bird at a speed of 1 step/sec until the bird withdraws into the cage. Then the distance from the assessor's hand to the front wire-mesh is measured. **In general:** Results are rounded to the nearest 5 cm. If a hen retreats due to other reasons than your approach, the test is stopped and another hen is chosen to perform the test. The average of all individual outcomes for the avoidance distance test is calculated.
Classification	**Individual level:** Record the average distance between hand of the tester and the place where the feet of the hen used to be in cm.

6.1.4.4 Positive emotional state

Title	**Novel Object Test (NOT)**
Scope	Animal-based measure: Laying hens
Sample size	Sample size according to § 6.1.5

Method description	Select 4 places in the henhouse, representing the distribution of the flock. In non-cage houses these should be locations in the litter. In cage houses the Novel Object (NO) is positioned in/on the feed trough of the cage level that is at breast height of the assessor. The NO used in this test is a 50 cm long stick with coloured bands with a diameter of approximately 2.5 cm width (see photographic reference). Choose 4 locations in the litter area in the house. Wait for 5 minutes after entering the house (to let the birds settle) and then place the NO in the litter and step back 1.5 m. Starting immediately, count every 10 seconds (for a total of 2 minutes) the number of hens at a distance of less than 1 birds length of the NO. This consequently results in 12 counts per location. For cage houses the NO is placed in the feeder (see picture) and the number of hens in the front half of the cage is counted. If the NO is not clearly visible to the birds, it should be placed higher. This means that it is either placed on top of the feeder (see picture) or, if this is not possible, the NO is hung on the edge of the feed trough.
Classification	**Flock level:** Average number of hens within hen length of the stick



© Left photo: Grafl, University of Veterinary Medicine Vienna, Austria; © lower 2 photos: Gunnink, WUR

Title	**Qualitative Behaviour Assessment (QBA)**
Scope	Animal-based measure: Laying hens
Sample size	Animal unit (depending on number of observation points, see method description)
Method description	Qualitative Behaviour Assessment (QBA) considers the expressive quality of how animals behave and interact with each other and the environment i.e. their 'body language'. 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

<table>
<tr><td></td><td>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 carried out 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 any of the animals you have seen. ‘Maximum’ means that at this point this expressive quality is dominant across all observed animals. Note that it is possible to give more than one term a maximum score; animals could for example be both entirely calm and content.

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 the QBA laying hens assessment are:

Active
Calm
Friendly
Relaxed
Content
Positively occupied
Helpless
Tense
Scared
Comfortable
Inquisitive
Drowsy
Fearful
Unsure
Playful
Agitated
Energetic
Nervous
Confident
Frustrated
Distressed
Depressed
Bored

</td></tr>
<tr><td>Classification</td><td>Flock level:
Continuous scales for all body language parameters from minimum to maximum</td></tr>
<tr><td></td><td></td></tr>
</table>

6.1.5 Sampling and practical information

Table 10 Order for carrying out measures, sample size and time required for laying hens on farm.

Measure	Sample method or number of birds to	Time required

	sample	(min)
On farm mortality	Farm records - Establish number of birds actively culled in relation to total number placed.	10
Culls on farm	Farm records - Establish number of birds culled (not lost) in relation to total number placed.	
Use of nest boxes	Establish the distribution of eggs over rows and nest boxes. If this is not possible, ask animal unit manager and check records. Calculate the nest space per bird.	5[Z]
Huddling	Group observation (3 times, combined to 1 score), is carried out while doing other work in the house, so only some time required to write outcome down	1
Panting	Group observation (3 times, combined to 1 score), is carried out while doing other work in the house, so only some time required to write outcome down.	1
Qualitative behaviour assessment (QBA)	Observations made at 2-8 points [X]	30 [X]
Novel object Test (NOT)	Object placed at 4 sites in the house, each site taking 5 minutes waiting, 2 minutes to assess + 1 minute (movement time) + 3 minutes preparation.	35
Avoidance Distance Test (ADT)	21 hens are assessed from 7 different areas, 10 seconds approaching at each site + 20 seconds recording + 30 seconds movement between sites.	30
Plumage damage Keel bone deformation Comb abnormalities Comb pecking wounds Skin lesions Foot pad dermatitis Beak trimming	100 birds picked - 10 birds from 10 locations	180-240 -[Y]
Shape and total length of available perches	Establish the total perch length and divide it by the number of hens housed.	5 -[Z]
Stocking density	Establish the total number of birds placed and divide by the available area.	15 -[Z]
Feeder space	Calculate number of feeders x area/length per feeder and divide by number of birds placed.	5 -[Z]
Drinker space	Calculate number of drinkers x area per drinker and divide by number of birds placed.	5 -[Z]
Perforated floor	Establish the total available slatted floor area, the type and the state of repair.	5 -[Z]
Use of litter	Observe dust bathing and/of scratching/manipulating litter.	2
Dust sheet test	Place dust test sheet at the start of observation period and then assess at the end	5

Evidence of red mites or other parasites	Check environment of birds. Also check flock in general and more precise 100 birds for parasites. If possible also check dead birds.	1
Aggressive behaviour	Check for aggressive behaviour of the birds.	
Cover on the range	Check free range area and make calculation.	5
Free range	Check free range area, covered veranda and area inside the house	
Enrichment measures		
Covered veranda		
Toe damage	Based on impressions during time spent in the house and when recording 100 birds – 10 birds from different locations	5
Enlarged crops		
Eye pathologies		
Respiratory infections		
Enteritis		
	Total	**345-405 minutes** (6-7 hours) [-Y]

[X] Qualitative assessment: observation time per spot, 5 minutes in case of 4 spots and 10 minutes in case of 2 spots
[Y] Variation mainly due to variation in scoring 100 birds. Not included are the calculations afterwards that need to be carried out
[Z] Not included are the calculations afterwards that need to be carried out to get the totals

Selecting laying hens for assessment

- The same 100 selected hens can be used for the several clinical assessments; these are keel bone deformation, skin lesions, comb abnormalities, comb pecking wounds, foot pad dermatitis, beak trimming and plumage damage.
- Additionally, for these measures the following selection method should be used: 100 birds per flock should be selected from various points in the house. Ideally the selection should reflect the various areas in the house (perches, nest boxes, litter, slatted floor, covered veranda, free range). A selection can be made by either penning (corralling) birds or by picking up individual birds in several areas of the henhouse. The number of places to collect hens is dependent on the housing system and the number of compartments.
- In general, for the various observations and measurements the person carrying out the protocol can observe birds in various parts of the henhouse.
- The measure use of litter, evidence of red mites, parasites and aggressive behaviours are carried out while doing other work in the house, so time indication in Table 10 reflects only the time required to write the outcomes down.
- In cage systems take the birds from different areas of the house and from different tier levels.

6.2 Calculation of scores for laying hens on farm

Not included in the protocol at the moment

6.3 Collection of data for laying hens at slaughterhouse

Not included in the protocol at the moment.

6.4 Calculation of scores for laying hens at slaughterhouse

Not included in the protocol at the moment.

Annex A: Guidelines for visit to the animal unit

Broiler chicken

List of equipment needed

Equipment	Remark
Clean appropriate clothing and footwear	Preferably use farm clothing and footwear, ensure your own clothing is clean and disinfected (if farm clothing and footwear appears not to be available)
Clean scoring sheets	New set for each farm
Clip board	For scoring sheets
Pen/pencils	pencil will continue to write in a dusty environment
Laminated reference photo sheet for foot pads, hocks, cleanliness	This card presents the scoring categories and is used as a check during scoring
Dräger or Kitagawa apparatus and ammonia tubes (2)	To determine NH3-levels (additional information if levels seem very high)
Catching pen	To catch birds for lesion and cleanliness scoring and gait scoring
Luxmeter	For measuring light level (additional information if levels seem very low)
A 10 meter rule	For measuring dimensions of the broiler house
A4 sheet of black paper	For measuring dust levels
Camera	To make photo's of record sheets, which is a fast way of collecting some farm record data (only with farmer permission).

Communication with the farmer

At the first contact with the farmer the following issues should be addressed:

- Introduction of the assessor: from what organisation, what authority
- Brief explanation of the aim of the visit and the protocol
- Estimation of time needed for the farm visit
- Ask the age of the birds and make sure they are in the desired age range
- Agreement that assessor can work in the hen house and is allowed to catch birds
- State that unnecessary disturbance will be avoided
- Agreement to bring equipment to the farm
- Reassure the farmer that the equipment will be clean
- Discuss any specific bio security and 'bird free days' arrangements which the farmer may request
- Check working hours of farmer: when can the visit start?
- How much time is required from the farmer? When will (s)he be available?
- Agree on a date and starting time for the visit
- Ask farmer to bring farm records and if available official measuring reports for the broiler house

Bio-security measures

In communication with the farmer it is good to ask for any requirements with regards to time between farm visits (e.g. is there any time requirement that the assessor should not have been in contact with poultry).

Make sure all equipment taken to the farm has been thoroughly cleaned and disinfected. It is advisable to transport all equipment in a closed box, in this way minimal contamination of the car occurs.

Laying hens

List of equipment needed

Equipment	Remark
Clean appropriate clothing and footwear	Preferably use farm clothing and footwear, ensure your own clothing is clean and disinfected (if farm clothing and footwear appears not to be available)
Clean scoring sheets	New set for each farm
Clip board	For scoring sheets
Pen/pencils	Pencil will continue to write in a dusty environment
Black permanent marker	To mark birds on left leg after clinical scoring; in this way no bird will be scored twice
Clinical scoring chart	This chart presents the scoring categories and is used as a check during scoring
Measuring tape (2m)	For ADT-test and for measuring farm equipment
Dräger or Kitagawa apparatus and ammonia tubes (2)	To determine NH3-levels
Catching pen	To catch birds
Novel object	50 cm long and 2.5 cm diameter stick with coloured bands (see photographic reference)
Novel object calibration sheet/square	To determine the exact distance to the novel object The sheet/square is 62,5 cm wide and 110 cm long
Novel Object measuring frame and cap	To determine which birds are within 30 cm of the stick
Stop watch	For timing NOT-test
A 10 meter rule and a rigid meter	For measuring sizes in the henhouse
A4 sheet of black paper	For measuring dust levels
Camera	To make photos of record sheets, which is a fast way of collecting the data (only with farmer permission).

<u>Communication with the farmer</u>

At the first contact with the farmer the following issues should be addressed:

- Introduction of the assessor: from what organisation, what authority
- Brief explanation of the aim of the visit and the protocol
- Estimation of time needed for the farm visit
- Ask the age of the birds and make sure they are in the desired age range
- Agreement that assessor can work in the hen house and is allowed to catch birds
- State that unnecessary disturbance will be avoided
- Agreement to bring equipment to the farm
- Reassure the farmer that the equipment will be clean
- Discuss any specific bio security and ‘bird free days’ arrangements which the farmer may request
- Check working hours of farmer: when can the visit start?
- How much time is required from the farmer? When will (s)he be available?
- Agree on a date and starting time for the visit

-
- Ask farmer to bring farm records and if available official measuring reports of the laying hen house

Bio-security measures

In communication with the farmer it is advisable to ask for any requirements with regards to time between farm visits (e.g. is there any time requirement that the assessor should not have been in contact with poultry).

Make sure all equipment taken to the farm has been thoroughly cleaned and disinfected. It is advisable to transport all equipment in a closed box, i.e. in this way minimal contamination of the car occurs.

Sequence of recording

The sequence of the recordings is partly dependant on when the farmer is available. Also in layer units it is inadvisable to disturb the birds in the morning, when eggs are laid. The checklist in Annex B lists the measures in the preferred order, but the assessor may carry them out in any order he finds practical depending on farm arrangements.

Annex B: Recording sheets

B1. Recording Sheet broiler chicken on farm

Audit Protocol Instruction: Broiler chickens on farm

Name	
Date	
Farm name	
Number of birds on site (at the time of the visit)	
Number of birds originally placed in House (x)	
Number of birds in House (x) at the time of visit	
Date placed	
Age at day of inspection	
Hatchery	
Parent flock age (s)	
Genotype	
Average bird weight at time of visit (taken from records of weights taken by the producer)	

1. Estimate the percentage of birds panting/huddling at five locations in the house (use this table to record at different locations as you move around the house carrying out other test activities). Panting and huddling are indicators of thermal environment – panting indicates too hot, huddling indicates too cold – this is a range of behaviours for one measure (temperature). Estimate the percentage of birds panting (hot) or huddling (cold).

Location	1	2	3	4	5
Estimate % panting / huddling	Estimate %	Estimate %	Estimate %	Estimate %	Estimate %
Tick if Panting P (✓) OR Huddling H (✓)	P H	P H	P H	P H	P H

Note - At this point during the inspection - please place the black paper sheets for the dust test –

Place the black paper sheets above bird height near to the house entrance

2 Qualitative Behaviour Assessment

Please be sure that the lines of the QBA measures are 125 mm.

Active Min. Max.

Relaxed Min. Max.

Comfortable Min. Max.

Fearful Min. Max.

Agitated Min. Max.

Confident Min. Max.

Depressed Min. Max.

Calm Min. Max.

Content Min. Max.

Tense Min. Max.

Unsure Min. Max.

Energetic Min. Max.

Frustrated Min. Max.

Bored Min. Max.

Friendly Min. Max.

Positively Occupied Min. Max.

Scared Min. Max.

Nervous Min. Max.

Happy Min. Max.

Distressed Min. Max.

3. Touch test, repeat the trial 21 times. Record the number of birds at arms length at each trial, and then the number of birds actually touched. If no birds have been touched after 12 trials – stop the test at 12 trials.
(Stop) in table below.

Trial	**Number at arms length**	**Number touched**	**Trail**	**Number at arms length**	**Number touched**	**Trial**	**Number at arms length**	**Number touched**
1			**8**			**15**		
2			**9**			**16**		
3			**10**			**17**		
4			**11**			**18**		
5			**12 *(Stop)***			**19**		
6			**13**			**20**		
7			**14**			**21**		

4. Gait score Location 1 (L1): Gait score of around 25 birds (caught with catching pen)

Gait score L1		
Gait score category	**Number of birds score in this category**	**Total L1**
0		
1		
2		
3		
4		
5		

Location 2 (L2): Gait score of around 25 birds (caught with catching pen) and litter score.

Gait score L2		
Gait score category	**Number of birds score in this category**	**Total L2**
0		
1		
2		
3		
4		
5		

Location 3 (L3): Gait score of around 25 birds (caught with catching pen) and litter score.

Gait score L3		
Gait score category	**Number of birds score in this category**	**Total L3**
0		
1		
2		
3		
4		
5		

Location 4 (L4): Gait score of around 25 birds (caught with catching pen) and litter score.

Gait score L4		
Gait score category	**Number of birds score in this category**	**Total L4**
0		
1		
2		
3		
4		
5		

Location 5 (L5): Gait score of around 25 birds (caught with catching pen) and litter score.

Gait score L5		
Gait score category	**Number of birds score in this category**	**Total L5**
0		

1		
2		
3		
4		
5		

Location 6 (L6): Gait score of around 25 birds (caught with catching pen) and litter score.

Gait score L6		
Gait score category	**Number of birds score in this category**	**Total L6**
0		
1		
2		
3		
4		
5		

5. Litter score.

0. Completely dry and flaky – moves easily with the foot.
1. Dry but not easy to move with foot.
2. Leaves imprint of foot and will form a ball if compacted, but ball does not stay together well.
3. Stick to boots and sticks readily in a ball if compacted.
4. Sticks to boots once the cap or compacted crust is broken.

	Score Location 1	**Score Location 2**	**Score Location 3**	**Score Location 4**	**Score Location 5**	**Score Location 6**
Litter score						

6. Cleanliness, foot pad dermatitis, hock burn breast burn

Location 1 (L1): Pen approximately 10 - 20 birds and score cleanliness, foot pad dermatitis, hock burn breast burn.

Repeat until 100 birds have been scored. DO NOT USE THE SAME BIRDS AS USED FOR GAIT SCORING

Cleanliness score (0-3: 0=clean 3=dirty)				**Foot Pad Dermatitis Score (0-4: 0=absent 4=severe)**					**Hock Burn Score (0-4: 0=absent 4=severe)**				
0	**1**	**2**	**3**	**0**	**1**	**2**	**3**	**4**	**0**	**1**	**2**	**3**	**4**

0	**1**	**2**	**3**	**0**	**1**	**2**	**3**	**4**	**0**	**1**	**2**	**3**	**4**

7. Space: measure the length and width of the house. Calculate the stocking density using data collected at the beginning of the audit or later from the slaughterhouse.

Length (m) (L)	Width (m) (W)

8. Drinker space

There are a number of different drinker types. Calculate the number or ratio of drinker points: birds or length of water trough per bird.

Number of bell drinkers	Circumference of bell drinkers (cm)	Number of nipple drinkers	Number of cup drinkers

9. Dust: Inspect the black paper sheet which you placed near to the entrance door. Write something with your finger on the black paper:

No dust, all black paper visible	Little dust	Thin covering of dust	A lot of dust, but some black paper visible	Paper colour not visible

10. Estimate the proportion of the range covered (For birds with access to range).
Make your assessment at 3 sites to ensure that representative of farm as a whole.

	None (0%)	Less than 5 %	5-10%	10-20%	>20%
Site 1					
Site 2					
Site 3					
Overall					

11. Estimate the proportion of animals outside? (For birds with access to range)
Make your assessment at 3 sites to ensure that representative of farm as a whole.

	None (0%)	Less than 50 %	about 50%	More than 50 %	100 %
Site 1					
Site 2					
Site 3					

Overall					

12. Mortality From the farm records, calculate the percentage mortality (not including culled birds).

Number of birds placed in house from hatchery (A)	Total number of birds which died during the flock cycle (B)

13. Culls using house records of bird numbers placed and number actively culled: (do not include birds which were 'found dead' only those actively culled by the animal unit manager for disease control etc.).

Total number of birds which were culled during the flock cycle (B).

B2. Recording Sheet broiler chicken at slaughterhouse

Audit Protocol Instruction: transport, lairage, stunning and slaughter of broiler chickens

Processing plant	
Name of farm assessed birds are from	
Date	
Time	
House number	
Number of birds from the house delivered overall to slaughter	
Genotype	
Stunner type	
Average Bird Weight	

Equipment required

Stop watch Foot pad, hock burn, breast burn and cleanliness charts
Tape measure, Clip board, Flashlight (to see birds in dark parts of the factory e.g. stunning area), Pen/pencil

From Slaughterhouse records collect the following (if available)

1. Calculate the total duration of food and water withdrawal period for your flock. You will need to ask the contact at the plant for these details. This information may have been collected during the farm visit or you may need to telephone the animal unit manager to find it.

Feed withdrawal period on farm (Tf) (minutes)	Water withdrawal period on farm (Twf) (minutes)	Journey time (Jt) (minutes) = Tt and Twt	Waiting time in lairage (Lt) (minutes) = Tl and Twl

2. Stocking density in crates.

Ask your plant contact: how long and how wide the bird transport crates are and how many birds are in each crate: OR count the number of birds in 10 crates.

Crate number	1	2	3	4	5	6	7	8	9	10	Average number of birds per crate
Number of birds											

Measure a bird transport crate: Calculate the average stocking density of birds in crates on the transport vehicle (birds/m^2)

Length (cm) (L)	Width (cm) (W)

3. Panting and huddling are indicators of thermal environment – panting indicates too hot, huddling indicates too cold – this is a range of behaviours for one measure (temperature). Estimate the percentage of birds panting (huddling and so showing cold stress) on the lorry and in the lairage.

Crate	1	2	3	4	5	6	7	8	9	10
Number in crate										
Number panting										
Number huddling										

Crate	11	12	13	14	15	16	17	18	19	20
Number in crate										
Number panting										
Number huddling										

Ask your plant contact what **the linespeed** is OR measure the number of **birds passing a given point** during 3 separate minutes.

Line speed

4. Assess the % of birds flapping on the shackle line.

Assessment time (minutes)	Number of birds showing flapping on the line

5. Measure percentage of birds with wing fractures.

Recording period (duration of period, min)	1	2	3	4	5	6	7	8	9	10
Number of birds seen with fractured (hanging down) wing										

6. Measure percentage of birds receiving pre-stun shocks.

Recording period (duration of period, min)	1	2	3	4	5	6	7	8	9	10
Number of birds receiving pre-stun shocks										

7. Assess stunner effectiveness at stunner exit.

Recording period (duration of period min)	1	2	3	4	5	6	7	8	9	10
Number of birds not effectively stunned										

8. Measure percentage of birds with breast burn on the line immediately after de-feathering by observing birds passing on the line for a known time interval.

Breast burn score	Number of birds with score 1
Total number of birds	
Total number of birds observed (Time x line speed)	

9. Measure percentage of birds with foot burn on the line after de-feathering.

Foot pad dermatitis score	Number of birds with score 0	Score 1	Score 2	Score 3	Score 4
Number of birds					
Total number of birds					

10. Measure percentage of birds with hock burn on the line after de-feathering.

Hock burn score	Number of birds with score 0	Score 1	Score 2	Score 3	Score 4
Number of birds					
Total number of birds					

11. Measure percentage of birds with bruising.

Recording period (duration of period, min)	1	2	3	4	5	6	7	8	9	10
Number of birds seen with recent bruising.										

12. Reject information and other information (record the number of birds from which each sample is taken (Tn)– for example – xx Emaciated birds from total yy of flock seen)

Downgrade condition (welfare related)	Number of birds reject position 1	Number of birds reject position 2	Number of birds reject position 3
Dead on Arrival			
Emaciated birds			
Ascites			
Dehydration			
Septicaemia			
Hepatitis			
Pericarditis			
Abscess			
Tn - Total number of birds passing during observation period			

B3. Recording Sheets laying hens on farm

Name assessor	
Date	
Farm name	
Start time	
House number	
Number of birds on site (at the time of the visit)	
Date placed	
Age at placing	
Age at day of inspection	
Name of person interviewed	
Number of hens on site **Number of males on site**	
Genotype	
Type of house: furnished/aviary/floor system /other	
Free range: yes/no	
Veranda: yes/no	

Number of sections in the house **Sections divided by: wire/closed**	
Ventilation; mechanical/natural/other	
Other	
Weather: bright sunlight/dim light/cloudy	
Outside temperature: ºC/F	
Rain/snow/wind/other	

1. Mortality From the farm records, calculate the percentage mortality (not including culled birds):

Number of birds placed in house from rearer (A)	Total number of birds which died during the flock cycle (B).	Percent Mortality (B/A) x 100
	□ Not known	

2. Culls Using house records of bird numbers placed and number culled:

Number of birds placed in house from rearer (A)	Total number of birds which were culled during the flock cycle (B).	Percent Culled (B/A) x 100
	□ Not known	

3.. Dust sheet test in Henhouse

Place the black paper sheets above bird height near to the entrance

4. Panting

Estimate the percentage of birds panting (impression at start of work in henhouse, average of complete house)

Estimated % of birds panting	

5. Huddling

Estimate the percentage of birds huddling: (impression at start of work in henhouse, average of complete house)

Estimated % of birds huddling (only count birds that huddle for thermal reasons)	

6. Qualitative behaviour assessment (QBA)

Please observe the animals from near the house entrance and in the centre of the house for 20 minutes in total in n 2-4 places. Then assess their behavioural expression (‘body language’) by scoring the following terms:

Active — Min. — Max.

Relaxed — Min. — Max.

Comfortable — Min. — Max.

Fearful — Min. — Max.

Agitated — Min. — Max.

Confident — Min. — Max.

Depressed — Min. — Max.

Calm — Min. — Max.

Content — Min. — Max.

Tense — Min. — Max.

Unsure — Min. — Max.

Energetic — Min. — Max.

Min. — Max.

Frustrated

Min. Max.

Bored

Min. Max.

Friendly

Min. Max.

Positively Occupied

Min. Max.

Scared

Min. Max.

Nervous

Min. Max.

Happy

Min. Max.

Distressed

General comments and observations:

7. Novel Object test (NOT)

Wait 5 min at location before putting down novel object

Novel object test. Location a:

Time after placement (s)	10”	20''	30”	40''	50”	1’	1’10”	1’20"	1'30”	1’40"	1’50”	2’	Total NOT (a)
Number of birds at a distance of less than a bird length of the NO													

Novel object test. Location b:

Time after placement (s)	10”	20''	30”	40''	50”	1’	1’10”	1’20"	1'30”	1’40"	1’50”	2’	Total NOT (b)
Number of birds at a distance of less than a bird length of the NO													

Novel object test. Location c:

Time after placement (s)	10”	20''	30”	40''	50”	1’	1’10”	1’20"	1'30”	1’40"	1’50”	2’	Total NOT (c)
Number of birds at a distance of less than a bird length of the NO													

Novel object test. Location d:

Time after placement (s)	10”	20''	30”	40''	50”	1’	1’10”	1’20"	1'30”	1’40"	1’50”	2’	Total NOT (d)
Number of birds at a distance of less than a bird length of the NO													

Average outcome NOT = (NOT (a) + NOT (b) + NOT (c) + NOT (d)) / 4	

8. Avoid distance Test (ADT)

Avoidance Distance Test. Location a:

Bird number	1	2	3	4	5	6	7	Total AD(a)
Avoidance distance (cm)								

Avoidance Distance Test. Location b:

Bird number	8	9	10	11	12	13	14	Total AD(b)
Avoidance distance (cm)								

Avoidance Distance Test. Location c:

Bird number	15	16	17	18	19	20	21	Total AD(c)
Avoidance distance (cm)								

Mean avoidance distance = (Ad(a)+Ad(b)+Ad(c)) / 3	

9. Estimate the percentage of birds panting (estimation before starting with the clinical scoring; impression of complete house)

Estimated % of birds panting	

10. Estimate the percentage of birds huddling: (estimation before starting with the clinical scoring; impression of complete house)

Estimated % of birds huddling (only count birds that huddle for thermal reasons)	

11. Clinical Scoring

Bird number	Plumage (0-2; 0=good 1=no score 2; 2= ≥1 naked patch ≥5cm)	Keel score (0/2;0=no deformation 2=deformation)	Comb pecking wounds (0-2; 0=none 1=<3 pecks 2=≥3 pecks)	Skin lesions (0-2; 0=no 1=<2cm or≥3 pecks; 2=≥2cm)	Foot pad dermatitis (0-2; 0=intact 1=some problems 2=swollen)	Beak trimming (0=no trim, no abnormality; 1=light 2=severe/abnormal)	Remarks
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
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26							
27							
28							
29							

Bird number	Plumage (0-2; 0=good 1=no score 2; 2= ≥1 naked patch ≥5cm)	Keel score (0/2;0=no deformation 2=deformation)	Comb pecking wounds (0-2; 0=none 1=<3 pecks 2=≥3 pecks)	Skin lesions (0-2; 0=no 1=<2cm or≥3 pecks; 2=≥2cm)	Foot pad dermatitis (0-2; 0=intact 1=some problems 2=swollen)	Beak trimming (0=no trim, no abnormality; 1=light 2=severe/abnormal)	Remarks
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
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59							
60							

Bird number	Plumage (0-2; 0=good 1=no score 2; 2= ≥1 naked patch ≥5cm)	Keel score (0/2;0=no deformation 2=deformation)	Comb pecking wounds (0-2; 0=none 1=<3 pecks 2=≥3 pecks)	Skin lesions (0-2; 0=no 1=<2cm or≥3 pecks; 2=≥2cm)	Foot pad dermatitis (0-2; 0=intact 1=some problems 2=swollen)	Beak trimming (0=no trim, no abnormality; 1=light 2=severe/abnormal)	Remarks
61							
62							
63							
64							
65							
66							
67							
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71							
72							
73							
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89							

Bird number	Plumage (0-2; 0=good 1=no score 2; 2= ≥1 naked patch ≥5cm)	Keel score (0/2;0=no deformation 2=deformation)	Comb pecking wounds (0-2; 0=none 1=<3 pecks 2=≥3 pecks)	Skin lesions (0-2; 0=no 1=<2cm or≥3 pecks; 2=≥2cm)	Foot pad dermatitis (0-2; 0=intact 1=some problems 2=swollen)	Beak trimming (0=no trim, no abnormality; 1=light 2=severe/abnormal)	Remarks
90							
91							
92							
93							
94							
95							
96							
97							
98							
99							
100							
Mean score							

12. Other Questions/Observations

Space measurements/ food water, litter observations

Is there a written report used of previous credible inspection which has measured available space?	0= No 1= Yes, type/authority: …….. ……..

13. Perches

Exclude (parts of) perches which the birds cannot access (including corners).

For A-frames:

Number of perches per A-frame	Number of A-frame	Length of A-frame	Total perch length	Number of birds placed minus mortality to date	Perch length per bird (cm)

For multi-level systems:

Length of one perch	Number of perches	Total perch length	Number of birds placed minus mortality to date	Perch length per bird (cm)

For cages:

Total perch length per cage	Number of cages	Total perch length	Number of birds placed minus mortality to date	Perch length per bird (cm)

Shape and position of the perches:

Shape in cross section	0 - No presence of sharp edges on perch	2 - Presence of sharp edges on perch
Presence of a resting zone (with perches, but no feeders)	0 - more than 50% of the perch length is positioned in a resting zone	2 - 0-50% of the perch length is positioned in a resting zone

14. Use of nest boxes

Are there nest boxes?	0= yes / 2= no	
Are the nests evenly spaced throughout the system?	0= yes / 2= no	
Is the distribution of eggs within nest rows even?	0= yes / 2= no	
Is the distribution of eggs between rows even?	0= yes / 2= no	

Single nest –calculate number of birds per nest.

Total number of nests	Number of birds placed	Bird: nest ratio

Group nest – calculate available nest box area per bird.

Number of nests	Nest area per nest (m^2)	Number of birds placed	Birds / m^2 of nest area

15. Space: measure the length and width of the house. Calculate the stocking density using data collected at the beginning of the audit

Cages

Usable area / cage (cm^2)	Number of hens / cage	Number of cages	Stocking density: Usable area / bird (cm^2/hen)	Number of birds placed (N)	Number of birds which died or were culled (M)	Number of birds in the house (N – M) (B)

Non-Cages

Overall litter floor area (m^2) (L)	Overall usable non-litter floor area (m^2) (W)	Total usable area (m^2) (L + W)=(U)	Number of birds placed (N)	Number of birds which died or were culled (M)	Number of birds in the house (N – M) (B)	Stocking density: birds/ m^2 usable area (B / U)

16. Feeders

Record feeder type……

Feed space per bird.

Number of pan feeders	Circumference of pan feeders (cm)	Total feeder access length (cm)	Track length x 2	Track length x 1	Number of birds placed	Cm feeder access per bird

17. Drinkers

Calculate the number or ratio of drinker points: birds or length of water trough per bird.

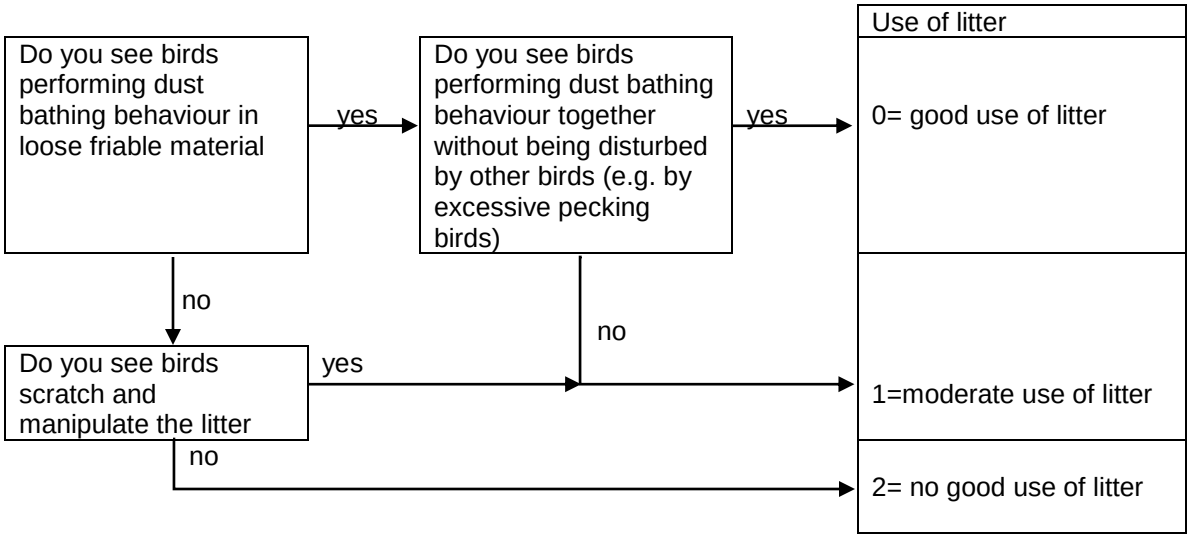
Number of bell drinkers	Circumference of bell drinkers (cm)	Number of nipple drinkers	Number of cup drinkers	Number of birds placed	Cm drinker access per bird	Bird: nipple drinker ratio

18. Perforated floors

Indicate the % of total space covered with perforated floors and describe the type / style of perforated flooring material

Total % of usable area covered with perforated floor	
% of total perforated floor made of wire mesh	

19. Use of litter



20. Expression of social behaviours

Do you see aggressive behaviour?	0 = No 2= Yes	

21. Enrichment measures

	0= Between 50% and 100% of the birds are using it	1= Less than 50% of the birds are using it	2= Not available or 0% of the birds are using it
Enrichments (e.g. hanging ropes, bales of hay, partitions, roofs in free range area)			
Free range			
Covered veranda			

22. Clinical conditions: Estimate the proportion of birds with the following conditions:

	0= ≤3 birds	1=>3 birds, <25% birds	2= ≥25% of birds
With enlarged crops			
With eye pathologies			
With respiratory infections			
With enteritis			
With toe damage			
With comb abnormalities			

23. Evidence of Red mites

Red mite infestation	0= No red mites detectable on birds and in the house	1= Red mites found on birds or in the house, but not in large quantities and not clearly visible	2= Large quantities of red mites found on birds and/or in the house

24. Parasites (other than red mites)

1	Is there fly mesh on windows & doors?	0 = No 2 = Yes	
	Is there any evidence of parasites? (beetles, lice, worms)	0 = No 2 = Yes	

B4. Recording Sheet laying hens at slaughterhouse

Not included in the protocol at the moment.

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 (formerly known as UNIK), Kassel	Germany
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	Chili

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

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Colophon

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Welfare Quality® consortium
Represented by the coordinator
ASG Veehouderij BV, Lelystad, The Netherlands
Welfare Quality® project office
P.O. Box 65
8200 AB Lelystad, The Netherlands

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