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Valoración del bienestar animal en una explotación ganadera de vacas nodrizas

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Resumen

La creciente preocupación del bienestar animal por parte de los consumidores ha provocado modificaciones en las explotaciones para mejorar el bienestar de sus animales. Así mismo, esta mayor sensibilidad por parte del consumidor no solo ha favorecido este hecho, sino que también ha incentivado la renovación de la legislación vigente, y ha despertado el interés por la creación de certificaciones, que aseguren ese bienestar de manera más transparente a los consumidores.

Los objetivos de este estudio han sido dos, la valoración del bienestar en una explotación de vacas nodrizas, y posteriormente, la redacción de una propuesta de mejora, con la finalidad de optimizar sus índices productivos, ya que se ha visto que la mejora en el bienestar repercute directamente sobre los índices productivos de los animales, y por tanto la rentabilidad de la explotación.

Para ello se utilizó una adaptación del protocolo Welfare Quality® para vacas lecheras, que se basa en la medición del bienestar dividido en cuatro criterios principales, la buena alimentación, la buena salud, el confort en las instalaciones y el comportamiento apropiado. Dado que la granja disponía de dos corrales con instalaciones algo diferentes se midió el bienestar en cada corral por separado, obteniendo como resultado las calificaciones de “Bueno” y “Aceptable”.

Debido a que la investigación actual se basa principalmente en vacuno lechero y terneros de cebo, se concluyó que sería interesante investigar más sobre este sector dentro de las explotaciones de vacuno, para que las explotaciones de vacas nodrizas puedan obtener también estas certificaciones.

Palabras clave: *Protocolo Welfare Quality®, vacuno de carne, estrés, propuesta de mejora, certificaciones en bienestar animal.*

Abstract

The growing concern about animal welfare by the consumers has led to modifications in farms to improve the welfare of their animals. Likewise, this greater sensitivity of the consumer has not only promote this fact, but also has encouraged the renewal of current legislation, and has raised interest in the creation of certifications, which ensure that well-being in a more transparent way to consumers.

The main objectives of this study have been: the assessment of well-being in a suckler cow farm, and subsequently, the drafting of an improvement proposal, in order to optimize its productive indice. Since it has been seen that the improvement in the Well-being has a direct impact on the productive indices of the animals, and therefore the profitability of the farm.

With this purpose, an adaptation of the Welfare Quality® protocol for dairy cows has been used, which is based on the measurement of well-being divided into four main criteria: good nutrition, good health, comfort in the facilities and appropriate behavior. Since the farm had two pens with different facilities, well-being was measured in each pen separately, obtaining as a result the scores of “Enhanced” and “Acetable”.

Due to the fact that the current research is mainly based on dairy cattle and fattening calves, it was concluded that it would be interesting to investigate more about this sector within beef farms, so that suckler cow farms can also obtain these certifications.

1. Introducción

1.1 El sector vacuno en España

En España el sector del vacuno de carne supone el 6,3% de la producción final agraria, y es la tercera producción ganadera más importante económicamente, por detrás de las de porcino y aves, siendo el sector del vacuno, uniendo la producción láctea y la cárnica, aproximadamente un 17% de la producción final ganadera en el 2018 (1). Sin embargo, si se analizan los datos obtenidos en cuanto a producción de toneladas de carne de enero a agosto de 2020, se advierte un aumento en la producción total de carne, en el sector del bovino, de un 9% como se puede observar en la figura 1 (2). A nivel europeo el sector de producción de vacuno de carne en el 2018 estuvo en cuarta posición, con Francia, Alemania y Reino Unido por delante en este orden (1).

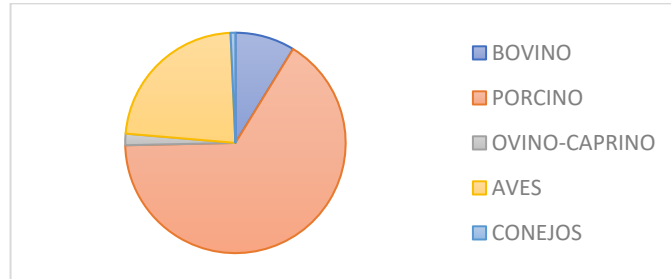


Figura 1. Producción de toneladas de carne por especies en España (2).

España ha sufrido un aumento de la producción en este sector durante los últimos años, en el 2018 el número total de sacrificios se incrementó un 5,7%, lo que supone un aumento del 3,5% en la producción de carne respecto al 2017 (1) y como hemos visto anteriormente sigue en aumento, habiendo llegado en 2020 a una producción total de 436.162 toneladas de carne (2).

1.1.1. Censo

En España el tamaño medio de las explotaciones de vacas nodrizas es de 25 animales en el 71,2% de las explotaciones y solo un 3,9% tienen un censo mayor de 100 hembras siendo el censo medio de nodrizas por explotación de 21,7 vacas. Si se analiza desde un punto de vista regional se puede ver que hay grandes diferencias en las cantidades; en el caso de la Cornisa Cantábrica observamos un elevado número de explotaciones con bajo censo, unas 8'8 nodrizas por granja de media y, sin embargo en la zona de la Dehesa o

Pirineos observamos granjas con un censo mayor de media: unas 38,2 y 26 vacas respectivamente. Si el análisis se hace por Comunidades Autónomas se observa que La Rioja es la que tiene mayor tamaño de explotación, con un tamaño medio de 61 nodrizas y en el extremo opuesto Canarias y Baleares con un censo medio de 8 hembras por granja (3).

En el caso de los machos, la media nacional por explotación se sitúa en un 0'98, y destaca la Comunidad Valenciana con una media de 6 machos por explotación. Todo esto nos indica que se trata de un sector muy atomizado, muchas granjas de pequeño tamaño distribuidas por el territorio, igual que en el sector de vacas de leche (3).

1.1.2. Comercio exterior y consumo en España

En cuanto a la importancia económica la gran actividad exportadora de estos últimos años ha hecho que la balanza comercial fuera ligeramente positiva en España por primera vez en el 2018. Respecto al comercio internacional de carne de vacuno las exportaciones superan a las importaciones desde el año 2010. Del total de la carne exportada un 86,6% se comercializó en la Unión Europea, en Portugal, Italia, Francia y Países Bajos principalmente, y solo un 13,4% se comercializaron fuera de la Unión Europea, llegando principalmente a Argelia, Marruecos y Hong-Kong (1).

En cuanto al consumo de carne a nivel español en el 2019, en comparación al 2018, se observó una disminución del 1,3% en el consumo de carne en los hogares españoles que ha sido compensado económicamente con una subida del precio medio del 2,6%. En España el consumo de carne lleva una tendencia a la baja desde el año 2012 sumando ya un 14,3% menos en el periodo 2012-2019 (4).

1.2. El bienestar animal en el sector vacuno

El bienestar animal, su investigación y la aparición de diferentes maneras de interpretarlo va íntimamente ligado a la evolución de las diferentes posturas éticas que ha ido adoptando la sociedad a lo largo de la historia. Sin embargo, el concepto de bienestar animal como disciplina o ciencia es reciente. En lo relativo a normativa de obligado cumplimiento, se puede destacar la aparición del concepto de bienestar animal en la legislación en el año 1876 en Gran Bretaña y en el 1960 en Estados Unidos (5).

Al investigar sobre el bienestar animal a raíz de las preocupaciones éticas sobre la calidad de vida de estos se destacó que debían llevar vidas naturales, que había que evitarles sufrimientos prolongados y por último que debía asegurarse su buena salud (6).

En el año 1964 ya se empezó a hablar del sufrimiento como falta de bienestar en los animales y en el año 1970 la comunidad científica comienza la investigación sobre el bienestar animal, relacionándolo con procesos fisiológicos como el estrés. A raíz de todas las investigaciones pasa a entenderse el bienestar como un concepto más amplio incluyendo ya tanto el estado mental como el fisiológico (5).

Durante la década de los 80 se avanza en la investigación del bienestar animal y sobre cuáles son los mejores indicativos para la evaluación del mismo, destacándose dos vertientes principales. Por un lado, encontramos la biológica funcional, que sostiene que la ausencia de estrés es indicativa de la satisfacción de sus necesidades biológicas y la capacidad de adaptación al ambiente por parte de los animales, y por otro, la sentimental que afirma que el bienestar animal está relacionado con el estado emocional positivo y la ausencia de estados emocionales negativos, como el sufrimiento (5).

Tradicionalmente los científicos se han centrado más en los campos de la eficiencia y la productividad de las explotaciones, para mejorar su rentabilidad dejando el bienestar animal individual en un segundo plano, no obstante, en los últimos años se tiende más a un enfoque individual del bienestar animal teniendo como beneficio secundario mejorar la producción de la explotación, por ejemplo, mejorando el alojamiento se reducirían las lesiones en las pezuñas, reduciendo la aparición de cojeras y los animales al no sufrir dolor mejorarían sus índices productivos (7).

No obstante, en la investigación del bienestar animal es importante tener en cuenta todos los factores relacionados con el animal, y por tanto no puede predominar una condición sobre otra. En el caso de centrarse en la salud, se puede proteger a los animales con eficientes barreras para evitarles cualquier patología, pero esto probablemente les impediría mostrar su comportamiento natural, en el caso opuesto en el que se centrara en que los animales pudieran expresar su comportamiento natural, llevaría a dejar a los animales expuestos a inclemencias del tiempo o depredadores (7).

Teniendo en cuenta esto, la Organización Mundial de la Sanidad Animal (OIE) define el bienestar animal como la situación en que un animal, estando sano, tenga cubiertas todas sus necesidades, cumpliendo las llamadas 5 libertades (8).

La primera dice que los animales deben estar libres de sufrir hambre o sed, es decir con acceso tanto a una cantidad suficiente de alimento como una dieta equilibrada, que cubra todas sus necesidades nutricionales y que tengan también acceso a agua suficiente y de buena calidad. La segunda cita que deben estar libres de sufrir incomodidades, que las instalaciones sean adecuadas para la especie y les permitan refugiarse de las inclemencias del tiempo. La tercera indica que estén libres de sufrir dolor, enfermedades o heridas y, en el caso de sufrirlas, se detectara de manera inmediata para proceder al tratamiento adecuado. La cuarta señala que deben poder expresar su comportamiento normal, para lo que deben disponer de espacio suficiente y de la posibilidad de interactuar con animales de la misma especie, pudiendo establecer conductas propias del animal como lo harían en libertad. La quinta y última libertad dice que los animales han de estar libres de estrés o miedo, y para ello es imprescindible establecer un buen protocolo de manejo (8).

Se ha visto que el bienestar animal es un pilar esencial en la ganadería, garantizando la posterior calidad y seguridad alimentaria de los productos derivados además, reduce los costes de producción haciendo en muchas ocasiones las explotaciones más eficientes y sostenibles. También es muy importante tener en cuenta la opinión del consumidor, cada vez más concienciado en este aspecto y que busca tanto la sostenibilidad en la producción como el correcto cuidado y respeto a los animales (9).

La sociedad ha criticado duramente la producción ganadera en intensivo, sobre todo en el norte de Europa y el norte de América, desarrollando un fuerte movimiento en favor de los derechos de los animales, lo que ha provocado cambios importantes en la legislación sobre la industria ganadera en Europa. Este hecho ha provocado modificaciones en las explotaciones ganaderas que, a pesar de hacer que se incrementen los costes de producción y por tanto el valor en el mercado, se ha comprobado que la sociedad está dispuesta a asumir el aumento en el precio valorando por encima de esto, el bienestar de los animales en la explotación (10).

Además, se ha observado que los consumidores perciben los productos de animales con un elevado bienestar animal como productos de mayor calidad, considerándolos también como más saludables, higiénicos y sabrosos. Para incentivar a los consumidores a asumir este aumento en el precio del producto final, es importante informarles de manera adecuada, con una etiqueta con información clara y que indique la certificación de la explotación de origen de tal manera que sea posible realizar la trazabilidad de dicho producto (11).

Esta creciente preocupación de los consumidores finales sobre el bienestar de los animales en las explotaciones ha favorecido, no solo la renovación en la legislación, sino que los propios ganaderos se interesen en obtener certificaciones que acrediten el valor añadido del bienestar animal en las explotaciones, como es el caso de las certificaciones Welfare Quality® o de asociaciones ganaderas que promueven la creación de sellos de calidad específicos del bienestar animal.

1.2.1. Requisitos legislativos del bienestar animal

En referencia a la normativa y directrices oficiales, actualmente vigentes en relación al Bienestar Animal, cabe destacar que emanan desde diferentes niveles: el internacional, el comunitario, el nacional y el autonómico. Todos ellos mantienen unos objetivos comunes, tratando de establecer los requisitos mínimos para asegurar el bienestar de los animales a lo largo de toda la cadena productiva.

1.2.1.1. Internacional

A nivel internacional, entre las diversas publicaciones de la Organización Mundial de la Sanidad Animal (OIE), se encuentra el Código Sanitario para los Animales Terrestres en el que redacta los principios generales para el bienestar animal en los sistemas de producción. Publica el código con la finalidad de ofrecer normas cuyo objetivo es mejorar tanto el bienestar como la sanidad animal (12).

En este código se habla tanto de la importancia de la adaptación previa de los animales al introducirlos en una explotación como de los aspectos ambientales adecuados para la explotación según la especie animal que vayan a alojar. También indica la importancia de asegurar un ambiente óptimo para los animales con una adecuada calidad del aire, temperatura y humedad adecuadas, correcta nutrición y control de enfermedades entre otros puntos. Es importante tener en cuenta que este código no es de obligado cumplimiento ya que son directrices internacionales, su finalidad es proporcionar una guía al usuario (12).

1.2.1.2. Unión Europea y España

A nivel de la Unión Europea existen diversas normas relativas al bienestar animal de obligado cumplimiento para todos los Estados Miembros. Por un lado, se desarrollan diferentes normas de ámbito transversale de la producción animal, como son el Reglamento 2017/625 relativo a los controles y otras actividades oficiales realizados para garantizar la aplicación de la legislación sobre alimentos y piensos, y de las normas sobre salud y bienestar de los animales, sanidad vegetal y productos fitosanitarios (13) y el Reglamento 2016/429 relativo a las enfermedades transmisibles de los animales (14). Donde, en ambos, se hace referencia al bienestar animal como un requisito indispensable en la producción ganadera.

Por otro lado, existen diferentes normas cuyo objetivo específico es establecer las directrices de obligado cumplimiento en referencia al bienestar de los animales en todas las fases de producción, desde los requisitos en las explotaciones ganaderas hasta los del momento del sacrificio.

La Directiva 98/58/CE, relativa a la protección de los animales en las explotaciones ganaderas, en la que en el Artículo 7 insta a los Estados miembros a adoptar las medidas adecuadas para que, tanto el criador como el propietario, aseguren el bienestar de los animales de la explotación (15).

A raíz de esta Directiva surge en España el Real Decreto 348/2000, en el que se establecen las normas mínimas para la protección de los animales en las explotaciones ganaderas, aplicable a todos los animales criados con el fin de obtener productos derivados de ellos. Entre los requisitos se incluye que los animales sean cuidados por un número de personal adecuado al tamaño de la explotación, con conocimientos y competencias adecuadas a su función (16).

Esta norma exige al menos una inspección diaria de todos los animales asegurando que el intervalo es suficiente para evitarles cualquier sufrimiento, para ello la explotación deberá contar con la iluminación adecuada, natural o artificial. Si en una de estas inspecciones se halla un animal enfermo o herido este recibirá inmediatamente la atención necesaria, consultando a un veterinario lo antes posible y en el caso de ser necesario serán separados para procurarles la atención adecuada (16).

También se deberá asegurar que los animales recibirán una alimentación sana y adecuada a sus necesidades en función de la edad, la especie..., todos deberán tener acceso tanto al alimento como al agua a intervalos

adecuados a sus necesidades y no se le administrará ninguna otra sustancia a excepción de las administradas con fines terapéutico, profilácticos o para tratamientos zootécnicos. Por último, respecto al procedimiento de cría, no se deberá ocasionar daño alguno a los animales en estos procedimientos, ya sean naturales o artificiales, entre otros requisitos (16).

Por otro lado se debe mencionar la Ley 32/2007 relativa al cuidado de los animales en su explotación, transporte, experimentación y sacrificio, genérica y en la que se establecen las infracciones y sanciones en el caso de no salvaguardar el bienestar animal (17). Además, se debe destacar también la Ley Orgánica 15/2003, de 25 de noviembre, que modifica la Ley Orgánica 10/1995, del Código Penal, en la que se tipifica el maltrato a los animales como delito, pudiendo llegar a la pena de cárcel en casos graves (18).

En cuanto a la legislación específica del ganado bovino se dispone únicamente el Real Decreto 1047/1994, relativo a las normas mínimas para la protección de terneros, y cuyo ámbito de aplicación se reduce a animales menores de 6 meses de edad confinados para cría y engorde. Este Real Decreto incluye especificaciones para el espacio mínimo del que debe disponer el animal en función de su peso, o que solo podrán permanecer en recintos individuales los animales menores de 8 semanas. También regula las condiciones de cría, limitando las horas de luz natural o artificial a las que pueden ser expuestos los animales, el tipo de suelo autorizado para asegurar el confort de los terneros y en este caso, las inspecciones deberán hacerse un mínimo de dos veces al día, una más que los animales adultos. En relación a la alimentación, indica que el calostro deberá administrarse en las primeras 6 horas de vida y contempla un mínimo de dos raciones diarias, que garanticen el aporte necesario de todos los nutrientes, entre otras cosas (19).

1.2.2. Recomendaciones para mejorar el bienestar

Se puede destacar que, además de los requisitos legislativos de obligado cumplimiento, existen también recomendaciones para los bovinos, como la Recomendación Relativa a los Bovinos adoptada por el Comité Permanente del Convenio Europeo, sobre la Protección de los Animales en las Explotaciones en su 17 reunión, (21 de octubre de 1988) en la que informa sobre pautas recomendables para la explotación, pero que no son de obligado cumplimiento. Se pueden encontrar recomendaciones como la de disponer de un potro o manga de manejo, para facilitar la manipulación adecuada de los animales al examinarlos o tratarlos de manera individual, si la granja es de reproducción disponer de parideras para que las vacas no sean molestadas durante el parto, evitar los ruidos fuertes continuos o esporádicos en la explotación, hacer inspecciones diarias de todos los equipos de la granja para evitar problemas como que, en una granja con ventilación mecánica el aparato falle y pueda provocar acumulación de gases, o evitar el uso de ayudas mecánicas, diferentes de cuerdas o cadenas, para asistir un parto (20).

También indica la manera más adecuada de realizar la inspección de los animales para optimizarla, recomendando prestar atención en la observación de la condición corporal, movimientos y posturas de los animales, la rumia, el estado general del pelo, piel, ojos, orejas y extremidades. Hace también referencia a la

actividad y los sonidos producidos de manera normal por un animal sano, que el comportamiento del animal corresponda a su edad, género y estado fisiológico, como podría ser un ternero mamando, un adulto que come o está tumbado rumiando... y siendo motivo de alerta observar animales apáticos, con falta de apetito o que presente secreciones en ojos o nariz, etc. (20).

Como se ha indicado el bienestar es un campo que se ha ido investigando mucho en los últimos años, y entre otras cosas, se ha visto que las instalaciones tienen una importante repercusión en el bienestar de las vacas. Se ha observado que el tiempo que las vacas dedican a descansar es muy importante para su bienestar, ya que el tiempo que están echadas optimiza la rumia, produciendo mayor cantidad de saliva y reduciendo así el riesgo de sufrir acidosis ruminal (21).

También se ha podido ver que animales que permanecen demasiado tiempo de pie tienen mayor riesgo de padecer cojeras, ya que la presión en la pezuña aumenta, disminuyendo el flujo sanguíneo y favoreciendo la hipoxia. Otro punto a tener en cuenta sobre la importancia de la zona de descanso es la jerarquía, si no hay espacio disponible para todas las vacas la lucha por conseguir un sitio provoca estrés aumentando el riesgo a tener problemas reproductivos o enfermedades (21).

Por lo tanto, para favorecer que las vacas pasen el mayor tiempo posible tumbadas, es recomendable que el corral disponga de una zona de descanso con espacio suficiente para todas las vacas y cama de compost o paja, ya que hay indicios de que las vacas se sienten más cómodas así. En el caso de que la explotación cuente con cubículos, es importante que tengan un tamaño adecuado a los animales que haya en el corral y en un número suficiente (21).

Otro punto a tener en cuenta en relación al bienestar es el mantenimiento de una temperatura adecuada, ya que el estrés por calor tiene varios riesgos asociados, no solo la disminución de producción láctea, empeorando la alimentación del ternero, sino que también inhibe la rumia. Además, también reduce de manera drástica los índices reproductivos, porque disminuye la síntesis y liberación de GnRH y LH, inhibiendo así la ovulación. Estos factores hacen que sea importante controlar, en la medida de lo posible, lo que se ha denominado como temperatura efectiva, que es un valor resultante de la humedad relativa, la radiación solar y la ventilación (22).

Para reducir el estrés térmico se pueden tomar medidas tan sencillas como la colocación de un techo que proteja a los animales del sol directo o cambios en el manejo de la alimentación. Se ha visto que los animales bajo estrés térmico reducen su consumo de alimento por lo que en épocas de más calor podría ser recomendable tomar medidas como la modificación de la dieta aumentando el aporte energético y reduciendo el proteico o distribuir la ración en los momentos del día que menos calor hace, a primera y a última hora (22).

Otros factores que se deben tener en cuenta son los relacionados con el diseño de la explotación. Entre ellos se destaca el diseño de los comederos y el material empleado para el suelo (23).

En relación a los comederos es cierto que hay controversia sobre si los autoblocantes, comederos que el operario puede bloquear cuando el animal está comiendo con la finalidad de retenerlo de manera temporal, proporcionan mayor bienestar que los de rail, que consisten en comederos lineales sin separaciones individuales. Bach A. *et al.* compararon ambos sistemas concluyendo que, en el caso de los autoblocantes se facilitaba el acceso y el tiempo de ingestión en vacas sumisas. Otra ventaja de los autoblocantes es la facilidad que aportan al manejo. Otro factor en el que se observó una repercusión positiva fue el aumento de espacio de comedero por vaca, dar 100cm por vaca supuso una reducción del 57% en los comportamientos agonistas, que son los comportamientos asociados a la jerarquía (23).

El material empleado para el suelo del corral es importante, ya que puede repercutir positiva o negativamente sobre la aparición de cojeras, que como se ha citado anteriormente reduce el bienestar de los animales, el uso de materiales como gomas en la zona de alimentación o en pasillos reduce las lesiones producida por el hormigón (23).

1.2.3. Sistemas de medición del bienestar animal en rumiantes

El bienestar animal representa la manera en que el animal se relaciona con las condiciones del entorno que le rodea, y se considera que este tiene bienestar animal si puede experimentar las 5 libertades. Como se ha visto, el mantenimiento del bienestar no solo es interesante desde el punto de vista ético, sino que también es interesante que se tenga en cuenta por la repercusión negativa que supone, tanto en parámetros productivos como en calidad del producto derivado (24).

Para medir de manera general el bienestar animal se pueden tener en cuenta diferentes aspectos, estos pueden dividirse en dos grupos, los aspectos individuales y los aspectos grupales. En relación a los aspectos individuales se establecen indicadores generales como la condición corporal o el aspecto general del animal, su comportamiento o la aparición de signos de enfermedad como secreciones anormales o presencia de prolapso. Sobre los aspectos grupales se tiene en cuenta la distribución y densidad de los animales en el espacio asignado, la presencia de estereotipias y el comportamiento entre los animales de un mismo corral (24).

Por otro lado, el bienestar se puede medir también a través de los datos productivos de la explotación, analizando tasas de mortalidad, muertes perinatales, datos de producción de leche o intervalos entre partos, tasas de concepción, abortos y distocias presentes en la explotación (24).

El estudio de los parámetros fisiológicos es otro método de control del bienestar animal, entre los que se encuentra la medición de hormonas como el cortisol, las catecolaminas o las hormonas reproductivas.

También se pueden realizar el estudio de los parámetros metabólicos que se pueden medir a través del hemograma, como el nivel de glucemia o la medición del catabolismo proteico o lipídico, o los indicadores inmunológicos y los biofísicos, entre los que se encuentran el ritmo cardíaco, la presión arterial y la temperatura corporal (25).

En el caso de los indicadores nombrados anteriormente se obtendrían niveles de cortisol aumentados en situaciones de estrés, sin embargo, en la misma situación se observaría una glucemia menor, por el mayor gasto energético que suponen estas condiciones. En relación al hematocrito en condiciones de estrés también se vería un aumento de los valores normales, al someter a un animal a situaciones estresantes se liberan catecolaminas que provocan una contracción esplénica, lo que derivaría en un aumento del hematocrito (26).

Otro parámetro medible es la urea, ya que se incrementa su concentración como respuesta a una situación de estrés. Este aumento se debe a un mayor catabolismo proteico, que produce grupos amino que los hepatocitos transforman en urea, aumentando su concentración en sangre, con la finalidad de excretarlo por el sistema renal después de la filtración glomerular (27).

Otro método útil para la posible valoración del bienestar animal es a través de certificaciones concretas, dentro de las cuales cabe destacar la certificación Welfare Quality®, en la que se unifican varios parámetros diferentes con la finalidad de hacer una valoración no solo individual del animal, sino también en relación al ambiente que la rodea, obteniendo así una visión más holística del bienestar.

1.2.4. Certificaciones en bienestar animal

Las certificaciones de bienestar animal nacen de la reclamación, por parte del consumidor, de asegurar el bienestar animal en las explotaciones y de la demanda, por parte de los ganaderos, de demostrar al consumidor el cumplimiento no solo de la legislación sino de requisitos extra para obtener estándares de calidad superiores.

1.2.4.1. Sellos de calidad

Existen diferentes sellos de calidad que nacen gracias a las diferentes asociaciones ganaderas que buscan no solo certificar las granjas con bienestar animal, sino crear un logo fácilmente reconocible por el consumidor, de manera que puedan identificar los productos cuyo origen son granjas certificadas, avalando así su compromiso con el bienestar animal.

Existe el sello de calidad creado por la Interprofesional del Porcino de Capa Blanca, sello “Compromiso Bienestar Certificado”, cuyo logotipo podemos observar en la figura 2 (28), o los creados por la Organización Interprofesional del Ovino y Caprino de Carne (INTEROVIC) (29), que se pueden observar en la figura 3. Ambos persiguen la finalidad de avalar las buenas prácticas llevadas a cabo por las explotaciones certificadas, tanto en materia de sanidad y bienestar como de manejo, bioseguridad y trazabilidad. Para que una explotación de

porcino obtenga el sello deberá cumplir no solo con la normativa marcada por la legislación comunitaria, sino también con requisitos más exigentes (28).



Figura 2. Logotipo del sello de calidad INTERPORC. (28)



Figura 3. Logotipo del sello INTEROVIC. (29)

A este sello de INTERPORC se han unido las interprofesionales de porcino ibérico, conejo, pollo, vacuno, ovino y caprino para impulsar la creación de un sello único, para todas estas especies ganaderas, que avale el compromiso adquirido por parte del sector cárnico en materia de bienestar animal. Esto refleja el compromiso de los ganaderos españoles con el bienestar animal durante todas las etapas de la vida de los animales (30).

El objetivo de este sello común es el de armonizar las certificaciones de bienestar, con la finalidad hacer que el consumidor reconozca la garantía de buenas prácticas a lo largo de la cadena de producción. Esta iniciativa es pionera a nivel mundial (30).

El sector de la producción animal presentó en Madrid, en noviembre de 2019, el sello “Compromiso Bienestar Animal” (figura 4) nombre que ha recibido el sello único que certifica el bienestar animal bajo los estándares más exigente del mundo (31).



Figura 4. Sello de calidad “Compromiso Bienestar Animal”. (31)

También existen otros sellos de calidad como el sello “ANDA” de la Asociación Nacional para la Defensa de los Animales, que certifica huevos de gallinas con sistemas de cría campero o ecológico, que además de incluir el bienestar animal apuesta por favorecer el desarrollo rural, ayudando a pequeños ganaderos (32). Y el sello “Garantía Ganadera” que, a través de la certificadora Gestión de Servicios Agrarios y de Apoyo la Ganadería Familiar (SGS), avala los servicios ofrecidos por Central Lechera Asturiana y a los ganaderos asociados, garantizando su compromiso con el bienestar en sus explotaciones (33).

1.2.4.2. Welfare Quality®

La certificación Welfare es una certificación independiente que se encuentra gestionada por el IRTA (Instituto de Investigación y Tecnología Agroalimentaria) en colaboración con Neiker-Tecnalia, Instituto Vasco de Investigaciones Agrarias, y se basa en el proyecto europeo de bienestar animal Welfare Quality® y el europeo Welfare Indicators (AWIN), que han desarrollado métodos para controlar y evaluar el bienestar animal en

granjas y mataderos, cuyo objetivo es la certificación de las explotaciones para que estas obtengan el sello de calidad WelfairTM®, cuyo logo se puede observar en la figura 5 (9).



Figura 5. Sello de WelfairTM®. (9)

La certificación Welfare Quality® nace en 2013, cuando varias empresas de certificación españolas realizaron una consulta al Instituto de Investigación y Tecnología Agroalimentarias (IRTA) sobre la posibilidad de iniciar el desarrollo de certificaciones de bienestar animal en las explotaciones, esta consulta estuvo motivada por la solicitud de varios de los ganaderos (34).

Gracias a esto se comenzó un proyecto llevado a cabo por los investigadores del Programa de Bienestar Animal del IRTA y la Asociación Española de Normalización y Certificación (AENOR), concediéndose el primer sello de bienestar animal en el año 2014, con la aplicación del protocolo de vacuno lechero, en el que se ha basado este trabajo (34).

En 2015 se redactó una ampliación del protocolo de vacuno con el vacuno de cebo en granja y en matadero. Posteriormente se fueron poniendo en marcha más proyectos para la redacción de protocolos de diferentes ámbitos y actualmente disponen de protocolos para porcino, ovino, aves y conejos (34).

Dentro de las certificaciones Welfare uno de los puntos más interesantes, que marcó el proyecto, fue el objetivo de conseguir integrar el bienestar animal dentro de la cadena de producción de una manera práctica y sencilla para poder informar al consumidor de manera clara sobre el bienestar de los animales de los que se han obtenido los diferentes productos que se pueden encontrar en el mercado (35).

Para que una explotación obtenga la certificación Welfare es imprescindible el cumplimiento de la legislación, si no se cumple los mínimos mencionados anteriormente la explotación puede ser valorada por el auditor, pero no obtendrá la certificación hasta subsanar las no conformidades.

Como se ha dicho anteriormente el proyecto Welfare Quality® se funda con el objetivo de satisfacer tanto las exigencias del mercado, como la preocupación social en relación al bienestar animal por lo tanto, dada la importancia del bienestar animal en las explotaciones, se consideró interesante realizar un estudio sobre la valoración del bienestar animal de las vacas nodrizas en una granja en Masanasa. Obtener un certificado de bienestar animal en una explotación de vacuno de carne, permite poner en mayor valor los terneros nacidos en ella y la carne derivada de las vacas que, al final de su etapa productiva, serán destinadas a consumo humano, obteniendo así un extra de calidad en el producto.

Para la valoración se escogió este protocolo Welfare, por ser uno de los más completos disponibles a día de hoy y por ser uno de los más estandarizados a nivel europeo, además otra de las ventajas que presenta este protocolo es que para su diseño se seleccionaron medidas prácticas, de manera que con un tiempo limitado de observación y con un manejo mínimo de los animales se pueda analizar el nivel de bienestar animal presente en la explotación.

2. Objetivos

- Valorar el bienestar animal en una explotación de vacas nodrizas a través de una adaptación del protocolo Welfare Quality® destinado a vacas lecheras.
- Realizar una propuesta de mejora en relación al bienestar animal en la explotación de vacas nodrizas estudiada.

3. Material y métodos

Se procedió a la valoración del bienestar en una granja situada en Masanasa, con un total de 88 vacas que son cruce de Charolesa. La explotación cuenta con cuatro operarios, que se encargan del cuidado diario de los animales. Los dos titulares de la explotación tienen la vivienda en el propio recinto, lo que facilita el control de los animales. Se alimenta a los animales por un lado, con forraje a base de paja de arroz y cebada disponible *ad libitum*, y por otro lado, con subproductos de la industria alimentaria variados, tales como residuos de panadería, pulpa de cítricos, stock de ensaladas, fruta y verdura de destrío, entre otros. También disponen de bloques de sal y de agua *ad libitum*.

La explotación dispone de dos corrales independientes, el Corral 1 en el que se encuentran 40 vacas y el Corral 2 en el que hay 48 vacas. Los corrales son ambos exteriores, con una zona techada que se corresponde a la zona de alimentación y el Corral 1 dispone también de otra zona techada.

El manejo reproductivo es de monta natural y los machos están presentes en el corral todo el año, en el momento de la visita cada corral disponía de 2 machos. En cuanto a las vacas preñadas, paren en el propio corral, disponen de vallado móvil con el que crean pequeños corrales para el parto, donde la vaca y el ternero recién nacido pasan unos días, luego retiran el vallado y se unen al resto de animales en el corral, en el que el ternero permanecerá hasta el destete, a los 4 o 5 meses. Para los terneros hay un comedero al que solo ellos tienen acceso donde disponen de pienso.

Para la medición se utilizó una adaptación del protocolo Welfare Quality® de vacas lecheras ya que los animales de la explotación de estudio son vacas nodrizas, para las que no hay un protocolo específico. Para tomar todas las medidas indicadas fueron necesarios dos días, uno por cada corral de la explotación. Se comenzó el día 9 de marzo de 2020 por el corral 1 que dispone de una extensión de 1500m², y el segundo día, el 12 de marzo de 2020, que se tomaron los datos del corral 2 que cuenta con una extensión de 6000m².

El Corral 1 dispone de suelo pavimentado y dos zonas cubiertas, la zona de alimentación y una zona de descanso, dispone de dos bebederos, pero en el momento de la toma de medidas uno de los dos no funcionaba, así que solo se tuvo en cuenta el bebedero que funcionaba, que contaba con una longitud de 2,56 metros con posibilidad de beber por ambos lados. El comedero del que dispone este corral es lineal, que recorre toda la longitud del corral, unos 69 metros aproximadamente, sin separaciones individuales. En cuanto al manejo del Corral 1, 26 o 27 de las vacas presentes pasan 7 meses al año en pasto (de abril a noviembre), en una explotación localizada en Siete Aguas y no hay un criterio establecido para seleccionar los animales que cambian de explotación. Pasados los 7 meses vuelven al Corral 1 a pasar los otros 5 meses del año.

El Corral 2 no dispone de suelo pavimentado y solo tiene una pequeña zona cubierta, que es la zona de alimentación. Los comederos son cuadrados y dispone de dos bebederos, con unas dimensiones de 1,57 metros y 0,54 metros de longitud.

Para valorar el bienestar el protocolo Welfare Quality® dividió las mediciones en 4 bloques principales y cada uno se subdividió en 12 criterios de bienestar, que miden entre 30 y 50 parámetros diferentes, se pueden observar en la tabla 1. Estos parámetros no solo analizan al animal, sino que también analizan el entorno y la gestión de los animales. El protocolo completo original puede consultarse en el Anexo II

Tabla 1. Valores medidos en el protocolo Welfare Quality® para vacuno lechero. Fuente: Protocolo Welfare Quality®

PRINCIPIOS	CRITERIOS DE BIENESTAR	MEDIDAS
BUENA ALIMENTACIÓN	Ausencia de ayuno prolongado	Condición corporal
	Ausencia de sed prolongada	Suministro de agua, limpieza de los bebederos, flujo de agua y funcionamiento de los bebederos
CONFORT EN LAS INSTALACIONES	Confort descanso	Tiempo para tumbarse, limpieza de ubre, cuarto trasero superior y cuarto trasero inferior
	Confort térmico	No hay medidas desarrolladas
	Facilidad de movimiento	Presencia de amarres y acceso al pasto
BUENA SALUD	Ausencia de lesiones	Cojeras o alteraciones del tegumento
	Ausencia de enfermedades	Tos, secreción nasal u ocular, disnea, diarrea, timpanismo y mortalidad
	Ausencia de dolor inducido por el manejo	Descornado y corte de cola
COMPORTAMIENTO APROPIADO	Expresión social	Comportamientos agonistas
	Expresión de otros comportamientos	Acceso al pasto
	Relación humano-animal	Distancia de huida
	Estado emocional positivo	Evaluación del comportamiento

Para realizar el cálculo de la valoración global de la explotación en primer lugar se miden los parámetros obteniendo puntuaciones de 0 a 100, siendo 0 la peor y 100 la mejor. El siguiente paso es combinar los resultados con fórmulas específicas para obtener la puntuación de cada criterio. A continuación, a través de integrales de Choquet, se combinan los resultados de los criterios para obtener la puntuación de cada principio y en último lugar, con los resultados de cada principio se obtiene la valoración global de la explotación ganadera estudiada.

3.1. Toma de medidas

Para realizar la toma de medidas en primer lugar es necesario calcular el tamaño de población de estudio (n), esto depende del número de animales presente en el corral. Este tamaño mínimo, para realizar las mediciones de cada criterio, lo marca el protocolo y se puede ver en la tabla 2. En el caso de la explotación objeto de estudio, los corrales contaban con 40 y 48 vacas, por lo tanto, en ambos casos la población mínima de estudio es de 30 animales.

Tabla 2. Población mínima necesaria para la medición. Fuente: protocolo Welfare Quality®

TAMAÑO DEL CORRAL	POBLACIÓN DE ESTUDIO	POBLACIÓN MÍNIMA DE ESTUDIO
30	30	30
40	30	30
50	33	30

3.1.1. Buena alimentación

Para la medición de la buena alimentación se tienen en cuenta dos criterios, por un lado, la ausencia de ayuno prolongado y por otro la ausencia de sed prolongada.

Para medir la ausencia de ayuno prolongado se valoró la condición corporal de las vacas presentes en el corral con una puntuación de 0 a 2, siendo 0 una vaca con una condición corporal normal, 1 una vaca muy delgada y 2 una vaca obesa, en función de los criterios propios de la raza. Se observa a los animales, sin tocarlos, desde atrás evaluando la base de la cola y en la parte lateral la zona del lomo.

Para la medición de la ausencia prolongada de sed se deben analizar varios puntos, la limpieza del agua, el caudal, el tipo de puntos de agua y que funcionan todos en el momento de la inspección. En referencia al tipo de bebederos existen varias opciones, en el caso de canales abiertos, como es el caso de la explotación de estudio, se mide la longitud del canal y si se trata de cazoletas, chupetes u otros dispositivos individuales se cuenta el número de puntos de agua disponibles en el corral.

En cuanto a la limpieza se puntúa de 0 a 2 siendo 0 un bebedero limpio en el momento de la inspección, 1 un bebedero parcialmente sucio pero con agua fresca y limpia y 2 los bebederos en los que tanto el agua como el bebedero presenta suciedad como materia flotando y placas pegadas al bebedero.

El flujo de agua no se midió ya que si el tipo de bebedero es un canal con reservorio grande no es necesario medirlo.

3.1.2. Confort de las instalaciones

Para medir el confort de las instalaciones se utilizan diferentes parámetros: la facilidad de movimiento, el confort térmico y el confort en el descanso.

En el caso del confort en el descanso se calculó a través de varios criterios, que se explican a continuación.

Para valorar el tiempo que tardan en tumbarse el tamaño de la muestra debe ser como mínimo de 6 animales, sin embargo el día de nuestra inspección solo se pudo contabilizar el tiempo de 2 vacas tumbándose en el Corral 1 y en el Corral 2 se contabilizaron 5 vacas.

El registro de la secuencia comienza cuando la articulación carpiana del animal está doblada y bajada (antes de tocar el suelo), y termina cuando el cuarto trasero del animal toca el suelo y el animal saca la extremidad delantera de debajo del cuerpo. Se registra el tiempo necesario para acostarse en segundos y solo en animales que no se vean afectados por interacciones con otros animales o con humanos.

La limpieza de los animales se midió observando las ubres, la parte inferior de las extremidades posteriores y la parte superior y flanco de las extremidades posteriores. El grado de limpieza se midió según el grado de suciedad presente en las zonas de estudio y el criterio fue la presencia de salpicaduras o de placas, capas tridimensionales de suciedad. Este criterio se puntuó como 0 animales sin suciedad o con salpicaduras moderadas y 2 animales con presencia de placas, calculando posteriormente el porcentaje de animales con suciedad en cada una de las zonas valoradas.

El confort térmico no se midió porque aún no hay un criterio establecido para su estudio.

Para medir la facilidad de movimiento se valoró el sistema de alojamiento siendo una puntuación de 0 en el caso de alojamientos en libertad y 2 el caso de animales que permanecen atados en el establo. En este punto también se tuvo en cuenta la posibilidad del acceso a un área de ejercicio exterior, siendo 0 si hay acceso, y contabilizando las horas al día que tienen acceso, y 2 en el caso de no tener acceso, y la disponibilidad de pasto siendo 0 si hay disponibilidad y 2 si no hay disponibilidad y en caso de haber disponibilidad se calcula los días al año que tienen acceso y las horas de pasto al día.

3.1.3. Buena salud

En la valoración de la buena salud se tuvieron en cuenta tres puntos diferentes, fueron la ausencia de lesiones, la ausencia de enfermedades y la ausencia del dolor inducido por el manejo.

Para medir la ausencia de lesiones se contaron los animales con alteraciones del tegumento y cojeras.

Como alteraciones del tegumento se entiende la presencia de alteraciones de la piel de un diámetro mínimo de 2 cm como las áreas con pérdida de cabello, posible hiperqueratosis (siendo estas lesiones leves) y piel dañada, ya sea en forma de costra o herida, dermatitis por ectoparásitos (siendo estas lesiones graves). Por otro lado, las cojeras se puntuaron de 0 a 2, siendo 0 animales sin cojera, 1 animales con cojera leve y 2 animales con cojera severa, finalmente se calcula el porcentaje de animales cojos en el corral.

La valoración de las cojeras en los animales se aplica en el caso de animales capaces de moverse libremente y en un ambiente controlado individualmente, es decir, animales sueltos o animales que se mantienen en puestos de amarre, pero se liberan al menos dos veces a la semana. La cojera se describe como una anomalía de movimiento caracterizándose por la capacidad reducida de usar una o más extremidades de manera normal. La cojera puede variar en severidad, desde capacidad reducida o incapacidad para soportar peso. Los indicadores de cojera serían los siguientes:

- Caída irregular del pie.
- Ritmo temporal desigual entre las extremidades.
- Peso no soportado por el mismo tiempo en cada una de las cuatro patas.

Se tienen en cuenta los siguientes atributos de marcha:

- Sincronización de pasos.
- Ritmo temporal.
- Soportar el peso en las patas.

Para evaluar la puntuación de la marcha del animal todos los animales deben caminar en una línea recta sobre una superficie dura, nivelada y no resbaladiza en la que normalmente caminan. El evaluador debe verlos desde un lado y / o por detrás. Los animales no deben ser evaluados cuando están girando. La puntuación utilizada es la siguiente:

- 0 - No cojo: la sincronización de los pasos y la carga de peso son iguales en las cuatro patas.
- 1 - Cojo: ritmo temporal imperfecto en zancada creando cojera.
- 2 - Severamente cojo: fuerte renuncia a soportar peso en una extremidad, o más de una extremidad afectada.

Para medir la puntuación de ausencia de enfermedades se contaron como enfermos animales que presentaran tos, secreción nasal u ocular, disnea, diarrea, timpanismo, descarga vulvar, entre otros.

- Tos: se define como una expulsión repentina y ruidosa de aire de los pulmones. Se registra mediante muestreo de comportamiento continuo. Se dividieron los dos corrales en dos segmentos y de cada segmento se observaron unas 20 vacas de media. El tiempo total de observación fue de 20 minutos por corral, 10 minutos por segmento.

- Descarga nasal: la descarga nasal se define como flujo claramente visible desde las fosas nasales de transparente a amarillo / verde y a menudo de consistencia espesa. El animal evaluado no debe ser tocado. Los animales son puntuados con un 0 sino tiene descarga y un 2 si la descarga es evidente.
- Descarga ocular: se define como flujo claramente visible (húmedo o seco) desde el ojo, de al menos 3 cm de largo. El animal evaluado no debe ser tocado. Los animales son puntuados con 0 si no hay descarga visible y 2 si hay descarga visible.
- Disnea: se define como la dificultad para respirar. La expiración es apoyada por los músculos del tronco, mayormente acompañado por un sonido pronunciado. La frecuencia respiratoria está ligeramente elevada. El animal evaluado no debe ser tocado. Los animales son puntuados con 0 si no hay signos y 2 si hay signos de disnea.
- Diarrea: se define como estiércol acuoso suelto debajo de la cabeza de la cola o ambos lados de la cola, área afectada debe ser al menos del tamaño de una mano. El animal evaluado no debe ser tocado y se puntúa con 0 si no hay signos y 2 si hay signos de diarrea.
- Descarga vulvar: la descarga vulvar se define como la salida de material purulento de la vulva o placas de pus en el lado inferior de la cola (no confundir con: mucosidad viscosa en animales al final de la gestación). El animal evaluado no debe ser tocado y se puntúa con 0 si no hay signos y 2 si hay signos de secreción.
- Mortalidad: la mortalidad se define como la muerte incontrolada de animales, así como los casos de eutanasia y sacrificio de urgencia. Se le pregunta al gerente de la explotación sobre el número de vacas que murieron en la granja, fueron sacrificadas debido a enfermedades o accidentes o fueron sacrificadas de urgencia durante los últimos 12 meses. También se pueden usar los registros de la granja.
- Distocias: la incidencia de distocia se define como el número de partos donde se requirió asistencia durante los últimos 12 meses. Los datos se recopilan de los registros del rebaño, o se le pide al gerente de la explotación. El número medio de los partos (anualmente) también se registra.
- Vacas caídas: vacas que han estado tumbadas durante 24h en los últimos 12 meses

En relación a la ausencia de dolor producido por el manejo se tienen en cuentas prácticas como descorne y corte de cola, para valorarlo se pregunta al gerente si son prácticas habituales, cuál es el procedimiento utilizado y sobre el uso de anestésicos y antiinflamatorios durante el proceso. La puntuación se obtiene a través de un árbol de decisiones, en caso de que fueran prácticas habituales, valorándose por separado el descorne y el corte de cola, y valorando por un lado el método utilizado y por otro el uso de anestésicos y analgésicos en el proceso.

3.1.4. Comportamiento apropiado

Para la evaluación del comportamiento apropiado se tuvieron en cuenta cuatro aspectos diferentes: la expresión social, la expresión de otros comportamientos, la relación humano-animal y el estado emocional positivo.

En cuanto a la expresión social se observaron comportamientos agonistas, que se definen como el comportamiento social relacionado con la jerarquía e incluye comportamientos agresivos y sumisos. Aquí, solo se

tuvieron en cuenta las interacciones agresivas. Se evaluó el recuento de los comportamientos enumerados a continuación y su duración. Los comportamientos agonistas estudiados fueron:

- Contacto con la cabeza: golpeando o empujando con la frente o cuernos y el atacado no abandona su posición, no hay desplazamiento.
- Huida: el atacante golpea con la cabeza y el atacado huye.
- Persecución: el atacante golpea con la cabeza, el atacado abandona su posición y el atacante le sigue.
- Enfrentamiento:
 - Dos individuos empujan sus cabezas vigorosamente el uno contra el otro.
 - Movimiento de empuje lateral.
- Dos animales se considera que reanudan la lucha si lo hacen después de más de 10 segundos o si el atacante cambia de objetivo.

Se midió el número de animales por corral o segmento, el número de animales enfrentados y su duración. El tiempo máximo de observación fue de 10 minutos por corral y en el caso de corrales con más de 25 animales se dividen en 2 o más segmentos, que también se observan durante 10 minutos. Los dos corrales de estudio contaban con más de 25 animales, por lo que ambos se dividieron en dos segmentos de 20 animales cada uno. En el caso de múltiples segmentos dentro de un corral, los animales que se encuentran acostados, de pie o alimentándose a través de los límites de los segmentos se cuentan en la sección donde se encuentra la parte principal de su cuerpo.

La expresión de otros comportamientos se mide por el acceso a pasto de los animales presentes en la explotación valorando los días al año con acceso a pasto y las horas al día que pasan en el pasto, y es necesario un mínimo de 6 horas diarias para que puntúe.

Para medir la relación humano-animal en el corral se utilizó una población de estudio de 20 animales, ya que se debe probar al menos la mitad de los animales en un corral, en el caso de no poder probar la mitad de los animales, se selecciona aleatoriamente la cantidad de animales necesaria para alcanzar el tamaño muestral adecuado.

Se mide la distancia a la que el animal deja acercarse a una persona mientras come. Para ello se sitúa una persona en la zona de alimentación a una distancia de 2 metros (si es posible) en frente del animal a probar y la cabeza del animal debe estar completamente pasada el comedero o riel de cuello, sobre la alimentación.

Antes de comenzar se debe asegurar que el animal esté atento o se dé cuenta de la presencia de la persona que va a realizar la acción. Si un animal no está obviamente atento, pero tampoco claramente distraído, puede ser probado. Una forma de atraer la atención de los animales es hacer algunos movimientos delante de ellos (en la posición inicial).

Para realizar la medición el observador se acerca al animal a una velocidad de un paso por segundo, cada paso de una longitud de aproximadamente 60 cm con el brazo extendido por delante del cuerpo, en un ángulo de

aproximadamente 45°, con el dorso de la mano hacia el animal y mirándolo al hocico, no a los ojos. Se camina hacia el animal hasta que aparezcan signos de abstinencia, o hasta que se pueda tocar el hocico.

El movimiento de retirada se define como los siguientes comportamientos: el animal retrocede, gira la cabeza hacia un lado, tira la cabeza hacia atrás tratando de salir de la rejilla de alimentación o sacude la cabeza. En caso de retirada, se estima la distancia de evitación según la distancia entre la mano y el hocico en el momento de retirada.

Si la retirada se realiza a una distancia inferior a 10 cm, el resultado de la prueba es todavía 10 cm. Si puede tocar el hocico la distancia de evitación se marca como 0 cm. El encargado de la medición debe asegurarse de que la mano esté siempre más cerca del animal durante la aproximación, no la rodilla o los pies, especialmente cuando se acerca a animales que se están alimentando o tienen la cabeza en una posición baja. Si la reacción no es clara se puede volver a probar los animales nuevamente más adelante. Los niveles se miden en porcentaje de animales en cada grupo y los grupos dependen de la distancia a la que se ha dado el movimiento de retirada, siendo:

- 0 cuando se puede tocar el animal.
- 1 si se puede acercar a menos de 50cm, pero no tocarlo.
- 2 en el caso de acercarse a una distancia de entre 50-100cm.
- 3 si no se puede acercar a menos de 100cm.

Y se calcula el porcentaje de animales dentro de cada puntuación para sacar la puntuación a nivel de grupo.

Con la medición del estado emocional positivo se valora cómo los animales se comportan e interactúan entre sí y con su entorno, es decir, su “lenguaje corporal”. Se selecciona entre uno y ocho puntos de observación (dependiendo del tamaño y estructura del corral) que juntas cubran las diferentes áreas del corral, en nuestro caso ambos corrales se dividieron en dos segmentos. Una vez situado en el punto de observación se debe esperar algunos minutos para permitir que los animales vuelvan a comportarse sin molestias. Con el cronómetro, para comprobar el tiempo, se analizan los animales que se pueden ver bien desde el punto de observación escogido, y se analiza la calidad expresiva de su actividad a nivel grupal. Es probable que los animales inicialmente estén incómodos y la respuesta a esto puede ser incluida en la evaluación. El tiempo total de observación no debe exceder los 20 minutos.

Cuando se haya completado la observación en todos los puntos seleccionados, se califican los 20 puntos descritos usando la escala visual analógica. Se debe tener en cuenta que solo se realiza una evaluación por granja. La escala se define por un punto mínimo izquierdo y máximo derecho. Mínimo significa que, en este punto, la calidad expresiva indicada por el término está completamente ausente en cualquiera de los animales analizados, máximo significa que en este punto esta cualidad expresiva es dominante en todos los animales observados, se ha de tener en cuenta que es posible dar a más de un término una puntuación máxima. Para calificar cada término se dibuja

una línea a través de la escala de 125 mm en el punto apropiado. La medida para ese término es la distancia en milímetros desde el punto mínimo hasta el punto donde se marque la línea en la escala. Los términos medidos en este protocolo fueron:

- | | | |
|---------------|---------------|-------------|
| • Activo | • Frustrado | • Irritable |
| • Relajado | • Amigable | • Incómodo |
| • Miedoso | • Aburrido | • Sociable |
| • Inquieto | • Juguetón | • Apático |
| • Calmado | • Entretenido | • Feliz |
| • Contento | • Animado | • Afligido |
| • Indiferente | • Curioso | |

La escala utilizada para la medición de este punto es la siguiente, y se marca una diferente para cada término analizado:

Min	Max
-----	-----

3.2. Cálculo de los criterios parciales

En el cálculo de los criterios parciales se transforman las mediciones obtenidas en una puntuación que va de 0 a 100, siendo 0 la peor puntuación y 100 la mejor.

Generalmente hay tres maneras de calcular los criterios parciales: a través de un árbol de decisiones, con una suma ponderada o por umbrales de alarma.

Se utiliza un árbol de decisiones cuando las medidas calculadas para medir el criterio se toman a nivel de granja y el número de categorías es limitado.

Por otro lado, la suma ponderada se utilizará cuando el criterio que se estudia se hace a través de una sola medida a nivel individual, esta escala generalmente representa la importancia de un problema y la proporción de animales con ese problema, calculándose en porcentaje de animales.

Cuando el cálculo del criterio se expresa en diferentes escalas como la media de tiempo de descanso expresada en segundos, los datos se comparan con umbrales de alarma que representan el límite entre lo que es correcto y lo que no está bien.

Por último, si la medida se ha tomado a nivel grupal, la puntuación atribuida es igual a la peor puntuación obtenida a ese nivel, siempre y cuando al menos el 15% de los animales observados estén en grupos que obtuvieron esa puntuación o una menor.

Dado que las medidas tomadas y los resultados obtenidos en este caso no tienen una función lineal, se hace necesario utilizar funciones no lineales para calcular estos criterios parciales, de ahí que se utilicen funciones I-spline, las cuales permiten calcular de diferente manera diferentes partes de la curva de representación de resultados obtenida.

3.3. Cálculo de los criterios principales

Los criterios principales se calculan combinando los resultados de los diferentes criterios parciales a través de las integrales de Choquet.

Los criterios parciales (calculados con anterioridad) se aúnan para conformar los criterios principales (“Buena alimentación”, “Confort en las instalaciones”, “Buena salud”, “Comportamiento apropiado”). Dentro de cada criterio principal, unos criterios parciales tendrán más peso que otros.

Para tener estos dos puntos en cuenta se utilizan las integrales de Choquet que calculan la diferencia entre la puntuación mínima y la siguiente mínima puntuación atribuyendo una importancia específica a cada uno (μ_x siendo x un criterio parcial). Así mismo, esta importancia también se da para la conjunción de dos criterios parciales diferentes (μ_{xy} , siendo “ x ” un criterio parcial e “ y ” otro diferente).

De tal manera que el cálculo final se realiza siguiendo las fórmulas de la integral de Choquet que se observan a continuación:

$$Criterio\ principal = \left\{ \begin{array}{l} S_6 + (S_7 - S_6)\mu_{78} + (S_8 - S_7)\mu_8 si\ S_6 \leq S_7 \leq S_8 \\ S_6 + (S_8 - S_6)\mu_{78} + (S_7 - S_8)\mu_7 si\ S_6 \leq S_8 \leq S_7 \\ S_7 + (S_6 - S_7)\mu_{68} + (S_8 - S_6)\mu_8 si\ S_7 \leq S_6 \leq S_8 \\ S_7 + (S_8 - S_7)\mu_{68} + (S_6 - S_8)\mu_6 si\ S_7 \leq S_8 \leq S_6 \\ S_8 + (S_6 - S_8)\mu_{67} + (S_7 - S_6)\mu_7 si\ S_8 \leq S_6 \leq S_7 \\ S_8 + (S_7 - S_8)\mu_{67} + (S_6 - S_7)\mu_6 si\ S_8 \leq S_7 \leq S_6 \end{array} \right.$$

Donde, por ejemplo, S_6 , S_7 y S_8 son las puntuaciones obtenidas, en la granja objeto, para los Criterios de Ausencia de heridas (número 6) siendo 80, Ausencia de Enfermedades (número 7) siendo 70 y Ausencia de dolor producido por manejo (número 8) siendo 60. La fórmula utilizada sería:

$$60 + (70 - 60)\mu_{67} + (80 - 70)\mu_6\ ya\ que\ S_8 \leq S_7 \leq S_6$$

Y se multiplica por la importancia atribuida a cada parámetro de las integrales correspondientes, estos valores pueden encontrarse en el protocolo, en el Anexo II.

3.4. Valoración global

A través del cálculo de los criterios principales se puede conocer cuál es la valoración global de la explotación objeto de estudio. Dicha valoración puede ser (de mayor a menor nivel):

- Excelente: el bienestar animal está al máximo nivel y el umbral se establece en 80 puntos.

- Bueno: el bienestar es bueno con una puntuación obtenida entre 55 y 80 puntos.
- Aceptable: el bienestar cumple con los requisitos mínimos y corresponde a puntuaciones entre 20 y 55.
- No Clasificado: el bienestar es bajo y considerado inaceptable y se atribuirá a puntuaciones menores a 20 puntos.

En función de los resultados obtenidos en los criterios principales, el protocolo dispone de una tabla, en la que se indica como interpretarlos para obtener la valoración final de la explotación. En la tabla 3 se establecen los límites de puntuación para cada valoración.

Tabla 3. Clasificación de la explotación en función de la puntuación obtenida. Fuente: Protocolo Welfare Quality®.

VALORACIÓN	LÍMITE DE PUNTUACIÓN (DE LOS CRITERIOS PRINCIPALES)	COMPENSACIÓN ENTRE CRITERIOS PRINCIPALES EVALUACIÓN DE LA EXPLOTACIÓN
Excelente	80 o superior	Al menos 2 criterios superiores a 80. Todos superiores a 55.
Bueno	55 o superior	Al menos 2 criterios superiores a 55. Todos superiores a 20.
Aceptable	20 o superior	Al menos 3 criterios superiores a 20. Todos los criterios superiores a 10.
No Clasificada	Por debajo de 20	Todos aquellos que no lleguen al mínimo estandarizado.

4. Resultados

4.1. Corral 1

4.1.1. Buena alimentación

4.1.1.1. Ausencia prolongada de ayuno

En la tabla 4 se observan los resultados de la condición corporal de los animales en el corral, como se puede observar se contaron 27 animales con una condición corporal normal, 2 muy delgados y 1 obeso.

Tabla 4. Resultados de la medición de la condición corporal en el Corral 1.

CONDICIÓN CORPORAL	NÚMERO DE ANIMALES
0	27
1	2
2	1
TOTAL	30

Considerando $I_a = 100 - (\% \text{ de vacas muy delgadas})$

→ Cuando $I \leq 80$: Puntuación = $0 + (0,22166 \times I) - (0,00277074 \times I^2) + (0,000059271 \times I^3)$

→ Cuando $I \geq 80$: Puntuación = $-2961,314 + (111,2709 \times I) - (1,390887 \times I^2) + (0,005843 \times I^3)$

En el Corral 1 se observaron 2 vacas consideradas muy delgadas de los 30 animales, lo que supone que un 6,66% de los animales está muy delgado. Por tanto, sabiendo que $I = 100 - \%$ de vacas muy flacas obtenemos un valor I_a de 93,33 que se sustituyó en la I-spline para resultados $I \geq 80$ indicada anteriormente y se obtuvo un resultado de 58,50 puntos para ausencia de ayuno prolongado.

4.1.1.2. Ausencia prolongada de sed

Se utilizó el árbol de decisiones, en el que a través de unas preguntas obtenemos la puntuación final del criterio, se puede observar en la figura 6.

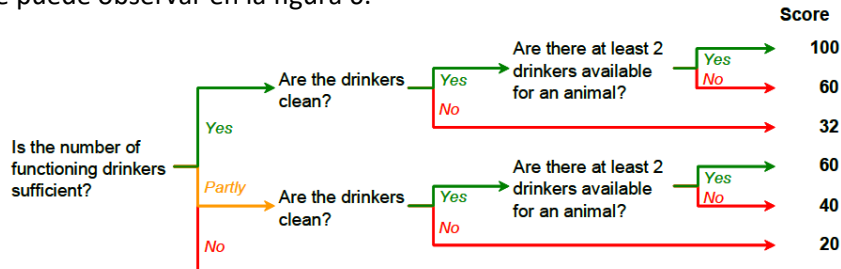


Figura 6. Árbol de decisiones para obtener la puntuación del criterio Ausencia de Sed.

- ¿Es suficiente el número de bebederos en funcionamiento? Sólo hay 1 bebedero y mide 2,57 metros de largo (a cada lado), por tanto, si hay 6 cm para cada animal, la respuesta es Sí.
- ¿Están limpios los bebederos? Se encontraban algo contaminados y con algo de paja, pero limpios en general. La respuesta es Sí.
- ¿Hay por lo menos dos bebederos accesibles a cada animal? Dado que sólo hay 1 bebedero para todos los animales, la respuesta es No.

Por lo tanto, el resultado obtenido en ausencia prolongada de sed fue de 60 puntos.

4.1.2 Confort de las instalaciones

4.1.2.1. Confort en el descanso

El confort en el descanso se mide por umbrales de alarma para cada criterio tenido en cuenta, se indica si los resultados son normales, o si hay un problema moderado o severo. Esto puede observarse en la tabla 5.

Tabla 5. Límites de los umbrales de alarma para los diferentes criterios medidos en relación al confort en el descanso. Fuente: Protocolo Welfare Quality®.

	Normal	Problema moderado	Problema severo
Tiempo necesario para tumbarse	≤ 5,20 s	5,20 s < ≤ 6,30 s	> 6,30 s
Limpieza: parte inferior de las patas traseras	≤ 20 %	20% < ≤ 50 %	> 50 %
Limpieza: ubre	≤ 10 %	10% < ≤ 19 %	> 19 %
Limpieza: cuarto trasero superior	≤ 10 %	10% < ≤ 19 %	> 19 %

Se calculó el número total de problemas severos y moderados detectados en la explotación y se atribuyó una importancia general de 1 para la limpieza y de 3 para el descanso. Para el cálculo de la suma ponderada los pesos se establecieron en función de si los resultados fueron severos o moderados, siendo 9 en el caso de severos y 4 en el de moderados.

En el caso del Corral 1 los resultados para cada punto fueron:

- Para el criterio “tiempo necesario para tumbarse” se obtuvo una media de 6,2 segundos en los animales observados, lo que se considera un problema leve, por lo que el cálculo fue: $1 \times 3 \times 4$ (1 porque era el primer problema moderado, 3 porque era el peso atribuido a descanso y 4 porque era el peso atribuido a problemas moderados).
- En cuanto a “limpieza de la parte inferior de las patas traseras” se contabilizaron 22 animales sucios, lo que supuso un 73,33%, por lo tanto, se trataba de un problema severo y el cálculo fue: $1 \times 1 \times 9$ (1 porque era el primer problema severo, 1 porque era el peso atribuido a limpieza y 9 porque era el peso atribuido a un problema severo)
- Para la “limpieza de las ubres” se contabilizaron 2 vacas sucias, lo que supuso un 6,6% de las ubres sucias, por tanto, se consideró normal.
- Para la “limpieza de los cuartos traseros” se contabilizaron 11 vacas sucias, lo que supuso un 36,66%, por tanto, fue nuestro segundo problema severo en cuanto a limpieza y el cálculo fue: $2 \times 1 \times 9$ (2 porque era el segundo problema severo, 1 porque era el peso atribuido a limpieza y 9 porque era el peso atribuido a los problemas severos).

Por lo tanto, hubo un problema moderado de descanso y dos severos de limpieza, por lo que la suma ponderada se calculó sumando los problemas moderados y los severos de la siguiente manera: $(1 \times 3 \times 4) + (2 \times 1 \times 9) = 30$ con lo que se calcula el valor de I:

$$I = 100 - \left(100 \times \frac{30}{108} \right) \rightarrow I = 72,22$$

Y para el cálculo de la puntuación final de confort en el descanso se sustituyó el valor I en la función I-spline correspondiente:

$$\rightarrow \text{Cuando } I \leq 62: \text{Puntuación} = (0,569 \times I) + (0,00456 \times I^2) - (3,78 \times 10^{-5} \times I^3)$$

$$\rightarrow \text{Cuando } I \geq 62: \text{Puntuación} = -153 + (7,97 \times I) - (0,115 \times I^2) + (0,000604 \times I^3)$$

Obteniendo un resultado final de 50,30 puntos.

4.1.2.2. Facilidad de movimiento

Para obtener la puntuación para la facilidad de movimiento se analizaron los datos a través de un árbol de decisiones que se puede observar en la figura 7, en la que se pueden leer las diferentes preguntas en relación a si los animales permanecen atados y durante cuánto tiempo.

Como los animales no permanecen atados en ningún momento la puntuación final fue de 95.

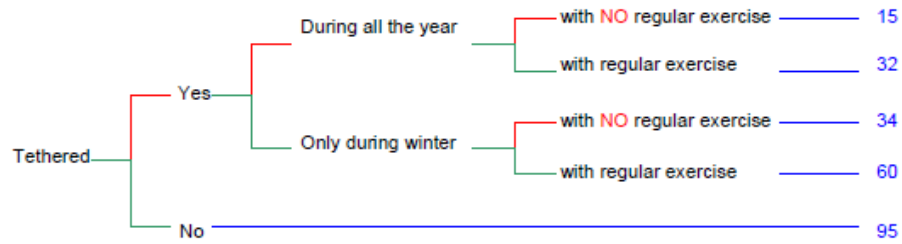


Figura 7. Árbol de decisiones para obtener la puntuación del criterio Ausencia Prolongado de Sed.

Fuente: Protocolo Welfare Quality®.

4.1.3. Buena salud

4.1.3.1. Ausencia de lesiones

- Para el cálculo de ausencia de alteraciones del tegumento se calculó mediante la siguiente fórmula:

$$I_p = 100 - \left(\frac{\text{lesiones leves}\% + 5 \times \text{lesiones graves}\%}{5} \right)$$

$$\rightarrow I_p = 100 \times \frac{33,33\% + 5 \times 0}{5} \rightarrow I_p = 93,33$$

Y posteriormente se sustituyó el valor de I_p en la ecuación I-spline correspondiente:

$$\rightarrow \text{Cuando } I_p \leq 65: \text{Puntuación} = (0,43168 \times I_p) - (0,0065044 \times I_p^2) + (0,00012589 \times I_p^3)$$

$$\rightarrow \text{Cuando } I_p \geq 65: \text{Puntuación} = 29,9 - (0,944 \times I_p) + (0,0145 \times I_p^2) + (1,92E-05 \times I_p^3)$$

Al ser el resultado de la I mayor a 65 se sustituyó en la función I-spline y el resultado obtenido fue de 84 puntos.

- Para la valoración de las cojeras se calculó el porcentaje de animales con cojera leve y el porcentaje de animales con cojera severa y se calculó el índice I_c . De los 30 animales estudiados se observaron 8 animales con cojera moderada, siendo un 26,66%, y 2 animales con cojera severa, siendo un 6,6%.

$$I_c = 100 - \frac{2x \% \text{ de cojeras leves} + 7x \% \text{ de cojeras severas}}{7}$$

$$I_c = 100 - \frac{2x 26,66 + 7x 6,6}{7} \rightarrow I_c = 85,8$$

$$\rightarrow \text{Cuando } I_c \leq 78: \text{Puntuación} = (0,075011 \times I_c) - (0,000024206 \times I_c^2) - (0,0000449587 \times I_c^3)$$

$$\rightarrow \text{Cuando } I_c \geq 78: \text{Puntuación} = -2129,521777 + (81,9796965 \times I_c) - (1,0500843 \times I_c^2) + (0,004532395 \times I_c^3)$$

Como el resultado de la I es mayor a 78 al sustituir en la función I-spline correspondiente se obtuvo un resultado de 36,81 puntos.

- Para obtener el resultado final de ausencia de lesiones se combinaron los resultados de cojeras y alteraciones mediante una integral de Choquet, usando como $\mu_s=0,56$ y $\mu_l=0,31$

$$\text{Puntuación} = 36,81 + (84 - 36,81) \times 0,56 = 63,23 \text{ puntos.}$$

4.1.3.2. Ausencia de enfermedades

La ausencia de enfermedades se mide a través de umbrales de alarma, que indican si hay un problema grave en el corral cuando se supera el umbral de alarma o si el problema es leve cuando se supera el umbral de advertencia, y se pueden observar en la tabla 6.

Tabla 6. Umbrales de alarma para cada síntoma medido en el criterio Ausencia de Enfermedades.

Fuente: Protocolo Welfare Quality®.

SÍNTOMAS	UMBRAL DE ADVERTENCIA	UMBRAL DE ALARMA
% de vacas con secreción nasal	5	10
% de vacas con secreción ocular	3	6
Media de tos por vaca en 15 minutos	3	6
% de vacas con disnea	3,25	6,5
% de vacas con diarrea	3,25	6,5
% de vacas con secreción vulvar	2,25	4,5
% de distocias	2,75	5,5
% de vacas caídas	2,75	5,5
% de mortalidad	2,25	4,5

En el Corral 1 no se observaron animales que presentaran ninguno de estos síntomas, de los resultados obtenidos ninguno de los parámetros superó el umbral de alarma ni de advertencia, por lo que el resultado en este caso fue de 100 puntos.

4.1.3.3. Ausencia del dolor producido por el manejo

En la explotación de estudio no se descorna ni corta la cola a los animales por lo que la puntuación obtenida en este criterio fue de 100 puntos.

4.1.4. Comportamiento adecuado

4.1.4.1. Expresión social

Se calculó una suma ponderada, siendo 4 el peso de los golpes de cabeza y 11 el de los desplazamientos y la fórmula resultante para el cálculo de I es la siguiente:

$$I = 100 \times (4380 - 4(\text{golpes de cabeza}) + 11(\text{desplazamientos})) / 4380$$

Se observaron 3 contactos con la cabeza y 6 desplazamientos en 1 hora. Por tanto, sustituyendo en la fórmula anterior se obtuvo una I de: $I = 98,20$.

Por último, este índice se transforma en una puntuación mediante funciones I-spline.

- Cuando $I \leq 70$: Puntuación = $(0,396 \times I) - (0,00558 \times I^2) + (0,000123 \times I^3)$
- Cuando $I \geq 70$: Puntuación = $86,8 - (3,32 \times I) + (0,0474 \times I^2) - (0,000129 \times I^3)$

Al sustituir el valor I obtenido en la función se obtuvo una puntuación final de 97,70.

4.1.4.2. Expresión de otros comportamientos

La expresión de otros comportamientos se mide por el acceso a pasto y como se ha explicado anteriormente en el caso de este corral los animales no tienen acceso a pasto por lo que el resultado es de 0 puntos.

4.1.4.3. Relación humano-animal

Los resultados que se obtuvieron fueron:

- P0 (animales que se pudieron tocar) = 45%
- P1 (animales a los que se pudo acercarse a menos de 50 cm) = 55%
- P2 (animales a los que se pudo acercarse entre 50 y 100 cm) = 0%
- P3 (animales a los que no se pudo acercarse a 100 cm) = 0%

Por lo que el resultado de I se calculó con la siguiente fórmula:

$$I = 100 - \left(\frac{3P1 + 11P2 + 26P3}{26} \right) \rightarrow I = 100 - \left(\frac{3 \times 55 + 0 + 0}{26} \right) \rightarrow I = 93,65$$

Para obtener la puntuación final se sustituyó el valor I en la función adecuada:

- Cuando $I \leq 70$: Puntuación = $(0,738 \times I) - (0,0108 \times I^2) + (0,000114 \times I^3)$
- Cuando $I \geq 70$: Puntuación = $-262 + (11,9 \times I) - (0,171 \times I^2) + (0,000874 \times I^3)$

Al ser I mayor a 70 se utilizó la segunda ecuación I-spline y la puntuación final obtenida fue de 70,56.

4.1.4.4. Estado emocional positivo:

Los valores obtenidos, en milímetros, (entre 0 y 125, que es la longitud máxima posible) para cada uno de los 20 términos, indicados en Material y Métodos, de la evaluación cualitativa del comportamiento se convierten en un índice utilizando una suma ponderada:

$$I = -3,4049 + \sum_{k=1}^{20} w_k N_k$$

Donde N_k es el valor obtenido por uno de los términos k dados, y w_k es el peso atribuido al término k.

Los resultados obtenidos en el Corral 1 pueden verse en la tabla 7, junto con los cálculos según el valor atribuido para cada término y el sumatorio de todos los términos. En esta tabla la columna "Valor Atribuido" corresponde a los milímetros marcados para cada uno de los términos valorados, la columna "Peso Específico" corresponde a valor atribuido a cada término y la columna "Valor Específico" corresponde a la multiplicación

del “Valor Atribuido” por el “Peso Específico” de cada término, y de esta última columna es de la que se obtiene el sumatorio para el cálculo de la I.

Tabla 7. Resultados de la medición del criterio Estado Emocional Positivo en el Corral 1.

TÉRMINO	VALOR ATRIBUIDO	PESO ESPECÍFICO	VALOR ESPECÍFICO
Activo	97,75	0,00768	0,75072
Relajado	123,92	0,01004	1,2441568
Calmado	122,85	0,00881	1,0823085
Contento	107,7	0,01213	0,1306401
Indiferente	89,44	-0,01116	-0,9981504
Frustrado	28,02	-0,01609	-0,4508418
Amigable	109,92	0,01172	1,2882624
Aburrido	76,5	-0,01087	-0,831555
Entretenido	125	0,01183	1,47875
Curioso	104,53	0,00048	0,0501744
Irritable	15,09	-0,02182	-0,3292638
Animado	97	0,00028	0,02716
Inquieto	6,46	-0,01032	-0,0666672
Sociable	59,27	0,00527	0,3123529
Felices	101,3	0,01468	1,487084
Afligido	18,32	-0,02027	-0,3713464
Juguetón	52,8	0,00109	0,057552
Miedoso	4,31	-0,01286	-0,0554266
Incómodo	5,39	-0,0162	-0,087318
Apático	6,46	-0,01562	-0,1009052
		SUMATORIO	5,7934476

Sustituyendo en la fórmula anterior se obtiene el valor I que dio como resultado $I = 1,212$ y por último, este índice se transforma a continuación en una puntuación mediante funciones I-spline como se indica a continuación:

→ Cuando $I \leq 0$: Puntuación = $-(10 \times I) - (1,25 \times I^2)$

→ Cuando $I \geq 0$: Puntuación = $50 + (11,667 \times I) - (0,55556 \times I^2)$

Obteniendo como resultado una puntuación de 74,71.

4.1.5. Valoración global del Corral 1

En la tabla 8 se puede ver una recopilación de todos los resultados obtenidos en el Corral 1 y el cálculo de la puntuación global del corral, donde la columna “Puntuación Global” indica la fórmula de la integral de Choquet que se utilizó para el cálculo, y en la figura 8 se pueden ver de manera más grafica las puntuaciones globales obtenidas.

Tabla 8. Resultados de los diferentes criterios del Corral 1 y cálculo de la puntuación global con la integral de Choquet.

CRITERIOS GENERALES	CRITERIOS PARCIALES	PUNTUACIÓN PARCIAL	PUNTUACIÓN GLOBAL
BUENA ALIMENTACIÓN	AUSENCIA HAMBRE	58,50	$58,50+(60-58,50)*0,27=58,90$
	AUSENCIA SED	60	
CONFORT INSTALACIONES	CONFORT DESCANSO	50,30	$50,30+(95-50,30)*0,37+(95-95)*0,11=55,74$
	CONFORT TERMICO	Al no poder medirlo se atribuye la puntuación máxima obtenida: 95	
	FACILIDAD MOVIMIENTO	95	
BUENA SALUD	AUSENCIA LESIONES	63,23	$63,23+(100-63,23)*0,24+(100-100)*0,24=72,05$
	AUSENCIA ENFERMEDADES	100	
	AUSENCIA DOLOR MANEJO	100	
COMPORTAMIENTO APROPIADO	EXPRESIÓN SOCIAL	97,70	$0+(70,57-0)*0,52+(74,71-70,57)*0,18+(97,70-74,71)*0,10=39,74$
	EXPRESIÓN OTROS	0	
	RELACIÓN H/A	70,57	
	ESTADO EMOCIONAL POSITIVO	74,71	

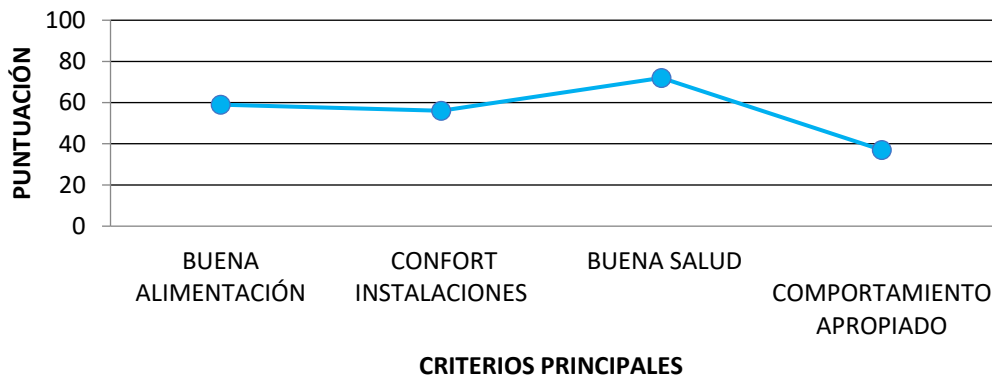


Figura 8. Puntuaciones globales de cada bloque obtenidas en el Corral 1.

Al obtener tres criterios por encima de 55 y que todos los criterios obtuvieran una puntuación mayor de 20 la calificación de bienestar animal obtenida en el corral 1 fue de “Bueno”.

4.2. Corral 2

4.2.1. Buena alimentación:

4.2.1.1. Ausencia prolongada de ayuno:

En la tabla 9 se observan los resultados de la condición corporal de los animales en el corral.

Tabla 9. Resultados de la medición de la condición corporal obtenida en el Corral 2.

CONDICIÓN CORPORAL	NÚMERO DE ANIMALES
0	23
1	0
2	7
TOTAL	30

Hubo 0 vacas que se consideraron flacas entre 30. Lo que supone el 0%. Por tanto, $I=100$

Siendo I mayor que 85, se substituyó su valor en la segunda fórmula de ecuación I-spline, dando un resultado de 100 puntos.

4.2.1.2. Ausencia prolongada de sed

Se utilizó el árbol de decisión:

- ¿Es suficiente el número de bebederos? Hay 2 bebederos, uno mide 1,575 metros de largo y el otro mide 54 cm, por tanto, no cumple el hecho de que haya 2 abrevaderos por cada animal, así mismo no hay al menos 6 cm para cada una $(54+157,5) \text{ cm}/40 \text{ vacas} = 5,28 \text{ cm/vaca}$. Por lo tanto, la respuesta es parcialmente.
- ¿Están limpios los bebederos? Se encontraban algo contaminados y con algo de paja, pero limpios en general. La respuesta es Sí.
- ¿Hay por lo menos dos bebederos accesibles a cada animal? Dado que sólo hay 1 bebedero para cada animal, la respuesta es Sí.

Por lo tanto, la puntuación final fue de 60.

4.2.2. Confort en instalaciones

4.2.2.1. Confort en el descanso

- En relación al “tiempo necesario para tumbarse” el cálculo medio fue de 5,2 segundos por tanto, no constituyó un problema.
- Para la “limpieza de la parte inferior de las patas traseras” se observó que 11 presentaron suciedad, lo que supuso el 33,33%, por tanto fue un problema moderado. 1x1x4.
- En relación a “limpieza de las ubres” no presentaron ubres sucias, por tanto no hubo ningún problema en este caso.
- Para la “limpieza de la parte superior de los cuartos traseros” se observó que 5 vacas presentaron suciedad, lo que supuso el 16,66%, por tanto fue el segundo problema moderado en cuanto a limpieza; 2x1x4.
- No hubo ningún problema de descanso, ni grave ni moderado, pero sí dos problemas moderados de limpieza.

Por lo tanto la suma ponderada fue $2 \times 1 \times 4 = 8$, dando como resultado $I = 92,59$, y sustituyendo en la I-spline la puntuación obtenida fue de 78,33

4.2.2.2. Facilidad de movimiento

La facilidad de movimiento se calculó a través de un árbol de decisiones. Como los animales no permanecían atados en ningún momento la puntuación final fue de 95.

4.2.3. Buena salud

4.2.3.1. Ausencia de lesiones:

- Para ausencia de alteraciones del tegumento se observaron 9 de 30 animales con lesiones leves, lo que supuso el 22,5% y se calculó mediante la siguiente fórmula:

$$I = 100 \times \frac{22,5 + 5 \times 0}{5} \rightarrow I = 95,5$$

Al ser el resultado de la I mayor a 65 sustituimos en la función I-spline y el resultado obtenido fue de 88,71 puntos.

- En cuanto a cojeras se observaron 8 animales de los 30 con cojera, 5 moderadamente cojos y 3 con cojera severa, lo que supuso un 16,66% de cojeras moderadas y un 10% de cojeras severas, por lo tanto se calculó el valor I_c :

$$I_c = 100 - \frac{(2 \times 16,66) + (7 \times 10)}{7} \rightarrow I_c = 85,24$$

Como el resultado de la I fue mayor a 78 al sustituir en la función I-spline correspondiente se obtuvo un resultado de 35,76 puntos.

- Para obtener el resultado final de ausencia de lesiones se combinaron los resultados de cojeras y alteraciones mediante una integral de Choquet, usando como $\mu_s=0,56$ y $\mu_l=0,31$

$$Puntuación = 35,80 + (88,71 - 35,80) \times 0,56 = 65,43 \text{ puntos.}$$

4.2.3.2. Ausencia de enfermedades

En este corral no se observó ninguna de las alteraciones descritas en material y métodos para este criterio. Se registraron 2 toses en 15 minutos y en el último año se contó 1 vaca muerta en el corral. El análisis de estos datos para obtener la puntuación en este caso se realizó por límites de alarma, ninguno de los puntos observados superó el límite establecido, por lo que la puntuación final fue de 100.

4.2.3.3. Ausencia del dolor producido por el manejo

En la explotación de estudio no se descorna ni se corta la cola a los animales por lo que la puntuación obtenida en este criterio fue de 100.

4.2.4. Comportamiento adecuado

4.2.4.1. Expresión social

- Comportamiento agonista: Los comportamientos agonistas vistos entre los dos segmentos del corral fueron 2 contactos de cabeza y 1 desplazamiento, por lo que el resultado se calculó con la siguiente fórmula:

$$I_s = 100 \times \left(\frac{4380 - (4 (n^\circ \text{ de golpes en la cabeza}) + 11 (n^\circ \text{ de desplazamientos}))}{4380} \right) \rightarrow I_s = 99,56$$

- Por último, este índice se transformó en una puntuación mediante funciones I-spline obteniendo una puntuación de 98,79.

4.2.4.2. Expresión de otros comportamientos

La expresión de otros comportamientos se mide por el acceso a pasto y como se ha explicado anteriormente en el caso de este corral los animales no tienen acceso a pasto por lo que el resultado fue de 0 puntos.

4.2.4.3. Relación humano-animal

No se pudo valorar.

4.2.4.4. Estado emocional positivo

Se pueden observar los diferentes valores que se obtuvieron para cada término en la tabla 10.

Tabla 10. Resultados obtenidos en la valoración del criterio Estado Emocional Positivo en el Corral 2.

TÉRMINO	VALOR ATRIBUIDO	PESO ESPECÍFICO	VALOR ESPECÍFICO
Activo	100	0,00768	0,768
Relajado	125	0,01004	1,255
Calmado	118,4782	0,00881	1,04379294
Contento	107,6087	0,01213	1,30529353
Indiferente	106,52174	-0,01116	-1,18878262
Frustrado	15,2173913	-0,01609	-0,24484783
Amigable	107,065217	0,01172	1,25480434
Aburrido	54	-0,01087	-0,58698
Entretenido	123,91	0,01183	1,4658553
Curioso	101,630435	0,00048	0,04878261
Irritable	31,5217391	-0,02182	-0,68780435
Animado	80,4347826	0,00028	0,02252174
Inquieto	5,97826087	-0,01032	-0,06169565
Sociable	34,7826087	0,00527	0,18330435
Felices	122,282609	0,01468	1,7951087
Afligido	15,7608696	-0,02027	-0,31947283
Juguetón	125	0,00109	0,13625
Miedoso	5,4347826	-0,01286	-0,0698913
Incómodo	4,34782609	-0,0162	-0,07043478
Apático	15,2173913	-0,01562	-0,23769565
		SUMATORIO	5,8111085

El resultado de I fue de 2,406 y calculando la I-spline se obtuvo un resultado de 74,85 puntos.

4.2.5. Valoración global del Corral 2

Se puede observar los resultados finales de la valoración global del Corral 2 en la tabla 11 y de manera más gráfica en la figura 9.

Tabla 11. Resultados de los diferentes criterios del Corral 2 y cálculo de la puntuación global con la integral de Choquet.

CRITERIOS GENERALES	CRITERIOS PARCIALES	PUNTUAJE PARCIAL	PUNTUACIÓN GLOBAL
BUENA ALIMENTACIÓN	AUSENCIA HAMBRE	100	$60+(100-60)*0,12=64,8$
	AUSENCIA SED	60	
CONFORT INSTALACIONES	CONFORT DESCANSO	78,33	$78,33+(95-78,33)*0,37+(95-95)*0,11=84,5$
	CONFORT TÉRMICO	Al no poder medirlo se atribuye la puntuación máxima obtenida: 95	
	FACILIDAD MOVIMIENTO	95	
BUENA SALUD	AUSENCIA LESIONES	65,43	$65,43+(100-65,43)*0,37+(100-100)*0,11=78,22$
	AUSENCIA ENFERMEDADES	100	
	AUSENCIA DOLOR MANEJO	100	
COMPORTAMIENTO APROPIADO	EXPRESIÓN SOCIAL	98,79	$0+(74,85-0)*0,18+(98,79-74,85)*0,10=16,01$
	EXPRESIÓN OTROS	0	
	RELACIÓN H/A	No se puede calcular en este caso. Por tanto la integral de Choquet será entre 3 variables	
	ESTADO EMOCIONAL POSITIVO	74,85	

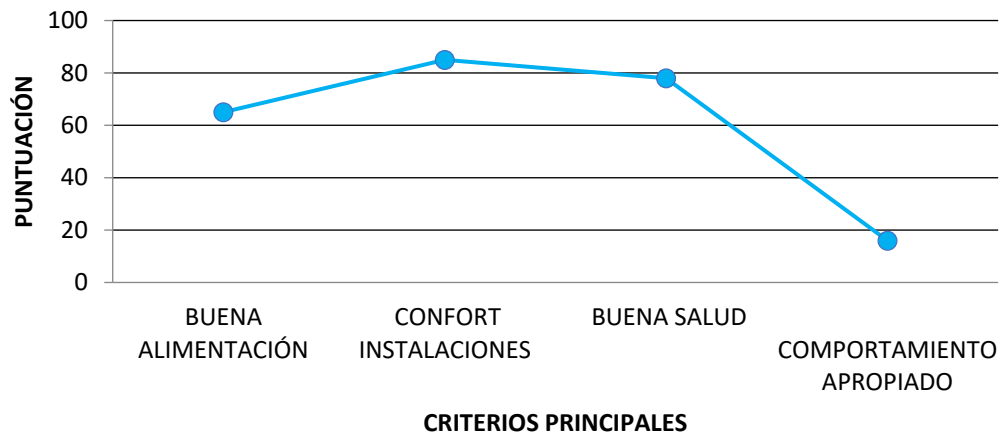


Figura 9. Puntuaciones globales de cada bloque obtenidas en el Corral 2.

El Corral 2 obtuvo tres puntuaciones por encima de 55, sin embargo, la puntuación de Comportamiento Apropiado no llegó a los 20 puntos por lo que su calificación fue de “Aceptable”.

5. Discusión

En relación a los resultados obtenidos en el estudio del Corral 1 se pueden destacar varios puntos, en referencia al criterio general *Buena Alimentación* se observa que, para su *parcial Ausencia Prolongada de Hambre*, la puntuación se ve muy reducida siendo solo 2 de las 30 vacas estudiadas las que se consideraron muy delgadas. Esto se debe a que es un criterio de gran importancia, ya que la mala alimentación afecta muy negativamente al bienestar.

Sobre el criterio parcial *Confort en el Descanso* se observa una puntuación media debido a que en el momento de la medición las vacas presentaban mucha suciedad adherida. Esto puede deberse a que el suelo del corral es de pavimento lo que impide la filtración de la orina en la tierra y el acúmulo de heces, provocando la aparición de barrizales y obligando a la presencia de cama, que si no se mantiene adecuadamente favorece también la acumulación de suciedad en los animales. Esto provoca una disminución en la puntuación del criterio principal *Confort de las Instalaciones* en el que la puntuación obtenida en los otros dos criterios parciales era la máxima.

El suelo pavimentado puede afectar negativamente al bienestar de los animales, si el corral no dispone de una buena cama con un mantenimiento óptimo. El mantenimiento de la humedad en la cama y el carácter abrasivo del pavimento favorecen la aparición de problemas podales (36). Esto se observa también en el criterio parcial *Ausencia de Lesiones* debido a la presencia de varios animales que presentaron cojera. Este hecho afecta negativamente a la puntuación final del criterio principal *Buena Salud*.

En el caso del Corral 1 se debe tener en cuenta que la mitad de las vacas se trasladan unos 6 meses al año a una explotación en Siete Aguas, donde tienen acceso al pasto las 24 horas del día. Si esto los ganaderos lo hicieran de manera controlada, asegurando una rotación de lotes, es decir, que cada dos años todas las vacas del corral fueran a dicha explotación, podría tenerse en cuenta en el criterio parcial *Expresión de Otros Comportamientos*, ya que se requiere un mínimo de 6 horas al día durante el año con acceso al pasto, incrementando significativamente la puntuación obtenida en *Expresión de Otros Comportamientos*. Este aumento en este criterio parcial provocaría una mejora relevante en la puntuación final del criterio principal *Comportamiento Apropiado*.

Como conclusión de los resultados obtenidos en el Corral 1 cabe destacar que, a pesar de que la valoración final del bienestar en los animales es de “Bueno” con pequeñas mejoras podría calificarse como “Excelente”, siendo esta la valoración máxima y aportando un valor añadido tanto a los animales como a los productos derivados.

Por otro lado, y en relación al Corral 2, son reseñables los resultados obtenidos en diferentes criterios, en relación al criterio principal *Buena Alimentación* se observa que, su puntuación disminuye debido a que, los centímetros de bebedero por animal no llegan a los 6cm que exige el protocolo. Es por ello que, en la puntuación del parcial *Ausencia de Sed*, no se obtiene una puntuación alta influyendo negativamente al resultado del criterio general sobre la alimentación.

En este corral se observaron varias lesiones en el tegumento, lo que provoca una disminución en la puntuación del criterio parcial *Ausencia de Lesiones*. Esto puede deberse a que el material empleado para el cerramiento del corral no estaba correctamente mantenido. La disminución en esta puntuación afecta directamente a la puntuación final del criterio principal *Buena Salud*.

La baja puntuación obtenida en el criterio principal *Comportamiento Apropiado* en este corral se debe, por un lado, a la ausencia de acceso al pasto, y por otro, a la imposibilidad de la medición del criterio parcial *Relación Humano-Animal*. Como se ha explicado anteriormente, si se facilitara el acceso al pasto a los animales de este corral la puntuación mejoraría notoriamente.

La imposibilidad de valorar el criterio *Relación Humano- Animal* se debe a la necesidad de que los comederos sean lineales, ya que para realizar dicha medición el animal debe estar comiendo mientras el auditor se acerca lentamente con la mano extendida, y en dicho corral los comederos eran cuadrados, lo que impidió la medición.

En este caso, no se tuvo en cuenta la variable al calcular la puntuación final del criterio principal, sin embargo, esto afecta negativamente a esta puntuación, no aportando ningún valor que ayude a contrarrestar el hecho de que el parcial *Expresión de Otros Comportamientos* sea 0. Por esta razón se considera que podría ser interesante estudiar una alternativa para la medición de este criterio cuando los comederos no sean lineales, ya que se ha visto que la relación humano-animal está muy relacionada al bienestar de los animales (36).

Para finalizar la valoración de los resultados obtenidos en el Corral 2, que a pesar de haber obtenido puntuaciones de “Excelente” en los criterios principales de Confort en Instalaciones y Buena Salud, y una puntuación de “Bueno” en Buena Alimentación, se ha calificado el bienestar del corral como “Suficiente” por no llegar a 20 la puntuación final del criterio principal Comportamiento Adecuado por lo expresado anteriormente.

En los resultados obtenidos se han observado diferencias y similitudes entre los dos corrales de una misma explotación que seguidamente se presentan y se puede observar en la figura 10.

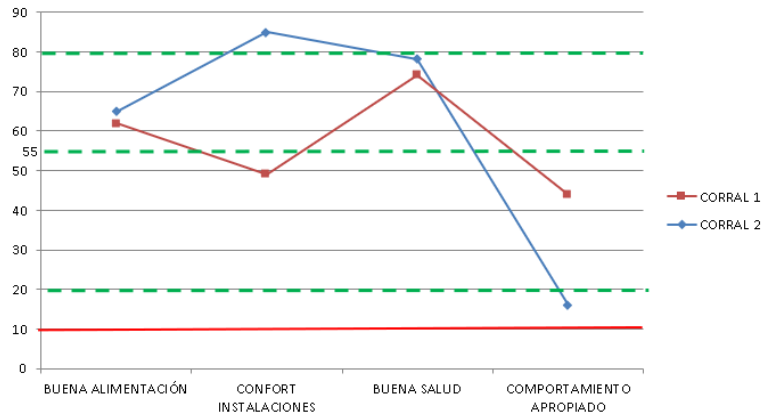


Figura 10. Comparación de las puntuaciones globales de cada bloque obtenidas.

Las puntuaciones obtenidas en los criterios principales *Buena Alimentación* y *Buena Salud* son similares en ambos corrales, sin embargo, los resultados en *Confort en las Instalaciones* y *Comportamiento Adecuado* difieren en gran medida. Estas disparidades se deben a la diferencia en el pavimento en el caso del *Confort en las Instalaciones* y, en *Comportamiento Adecuado*, a la imposibilidad de la medición del criterio parcial *Relación Humano Animal* en el Corral 2.

Es importante destacar que la explotación cumplía con los requisitos mínimos exigidos por la normativa vigente, ya que si no fuera así la certificación no podría aplicarse, pues lo que se busca, al crear los “Sellos de Calidad”, es aportar un extra al bienestar animal mínimo exigido.

Como propuesta de mejora en la explotación una vez valorados los resultados obtenidos en los dos corrales se plantean una serie de recomendaciones a la explotación:

- En cuanto al Corral 1:
 - Valorar el sistema de alimentación del corral a fin de saber por qué, con la misma dieta, en este corral se observan vacas muy delgadas y en el otro no.
 - Mejorar el mantenimiento de la cama en el corral, a fin de reducir la humedad y la suciedad adherida a los animales, disminuyendo también los problemas podales. Un mejor manejo por parte del ganadero para la detección temprana de las cojeras, el mantenimiento adecuado de la cama y el cuidado y mantenimiento de las pezuñas son métodos económicos para reducir los problemas de cojeras, asociados a reducciones en la producción láctea y a peores índices de fertilidad (37).
 - En relación a lo anterior, se recomienda realizar revisiones podales rutinarias para reducir las lesiones y corregir los defectos que puedan formarse en la pezuña, a fin de reducir la presencia de cojeras.
 - Hacer la selección de animales que se trasladan a la explotación en Siete Aguas, dividiendo los animales en dos lotes, de manera que se asegure la rotación de los lotes y asegurando el acceso a pasto de todos los animales.

- En cuanto al Corral 2:
 - Aumentar los centímetros de bebedero por animal, añadiendo un bebedero más o ampliando los ya existentes para disponer de un mínimo de 6 cm por animal. Esta medida se basa en la necesidad de aproximadamente 60 cm de bebedero para que el animal beba, y al estimarse que en un corral 1 de cada 10 animales está bebiendo, se establece el mínimo por animal en 6 cm (38).
 - Valorar el estado de los materiales presentes en el corral, a fin de reducir las lesiones presentes en el tegumento.
 - Valorar la posibilidad de transportar los animales de este corral a la explotación de Siete Aguas los otros 5 meses, con el mismo sistema de rotación de lotes.

Después de realizar la adaptación y la medición del protocolo basado en Welfare Quality® sería importante comentar la necesidad de un protocolo específico para vacas nodrizas, ya que es posible que después de valorar en profundidad las diferencias entre las explotaciones lecheras y nodrizas se tengan en cuenta diferentes criterios. Un ejemplo de estas modificaciones sería la creación de sistemas de medición alternativos para la relación humano-animal ya que se ha visto que este punto influye de manera directa en el bienestar de los animales (38).

En relación a las ventajas de este protocolo se pueden destacar la facilidad y repetibilidad de las mediciones, ya que no es necesario el manejo de los animales, ni es un sistema de medición invasivo como podría ser la valoración de los parámetros del hemograma, o la concentración de cortisol en sangre. Otra ventaja que se puede destacar es la manera tan gráfica en la que se exponen los resultados, facilitando su interpretación y la obtención de conclusiones.

En relación a las desventajas es destacable la necesidad de formación previa para limitar la subjetividad en la medición de algunos de los criterios. Otro hecho a tener en cuenta es la posible variación en la toma de datos en función de las condiciones climatológicas, sería más representativo realizar varias tomas de datos en diferentes días, y utilizar una media de los valores obtenidos.

Por otra parte, sería recomendable hacer estudios para tener diferentes alternativas a la medición de los criterios, para casos en los que las instalaciones no son como las contempladas en el protocolo, tal y como ocurre en el caso de esta explotación para el criterio parcial *Relación Humano-Animal* en el Corral 2, de manera que se pueda tener en cuenta la variable.

6. Conclusiones

1. Los resultados obtenidos tras la aplicación del Protocolo Welfare Quality® en la explotación de estudio ha sido una calificación de “Bueno” en caso del Corral 1 y de “Aceptable” en el Corral 2.

2. Para la propuesta de mejora el punto que se considera más necesario en el Corral 1 es un mayor control de los animales que pasan 6 meses en pasto, dividiendo el corral en dos lotes y asegurando la rotación de los mismos.
3. En el caso del Corral 2, la propuesta de mejora que se considera más importante es la de ampliar los bebederos de manera que haya al menos 6 centímetros de bebedero por animal.
4. Se considera necesario investigar más sobre el bienestar animal en este sector para realizar un protocolo adaptado a las vacas nodrizas.

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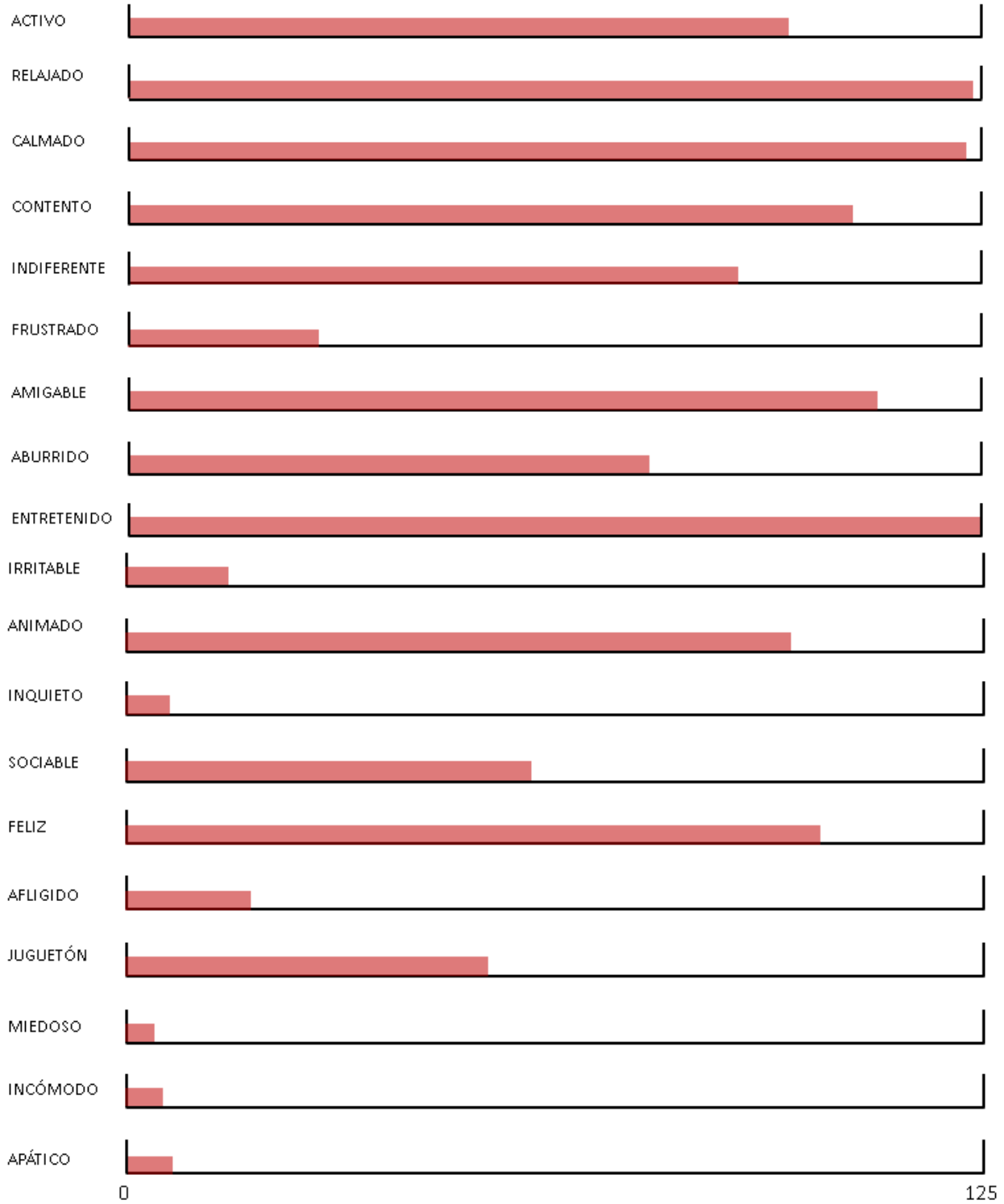
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Anexos

Anexo I: resultados de los Corrales 1 y 2

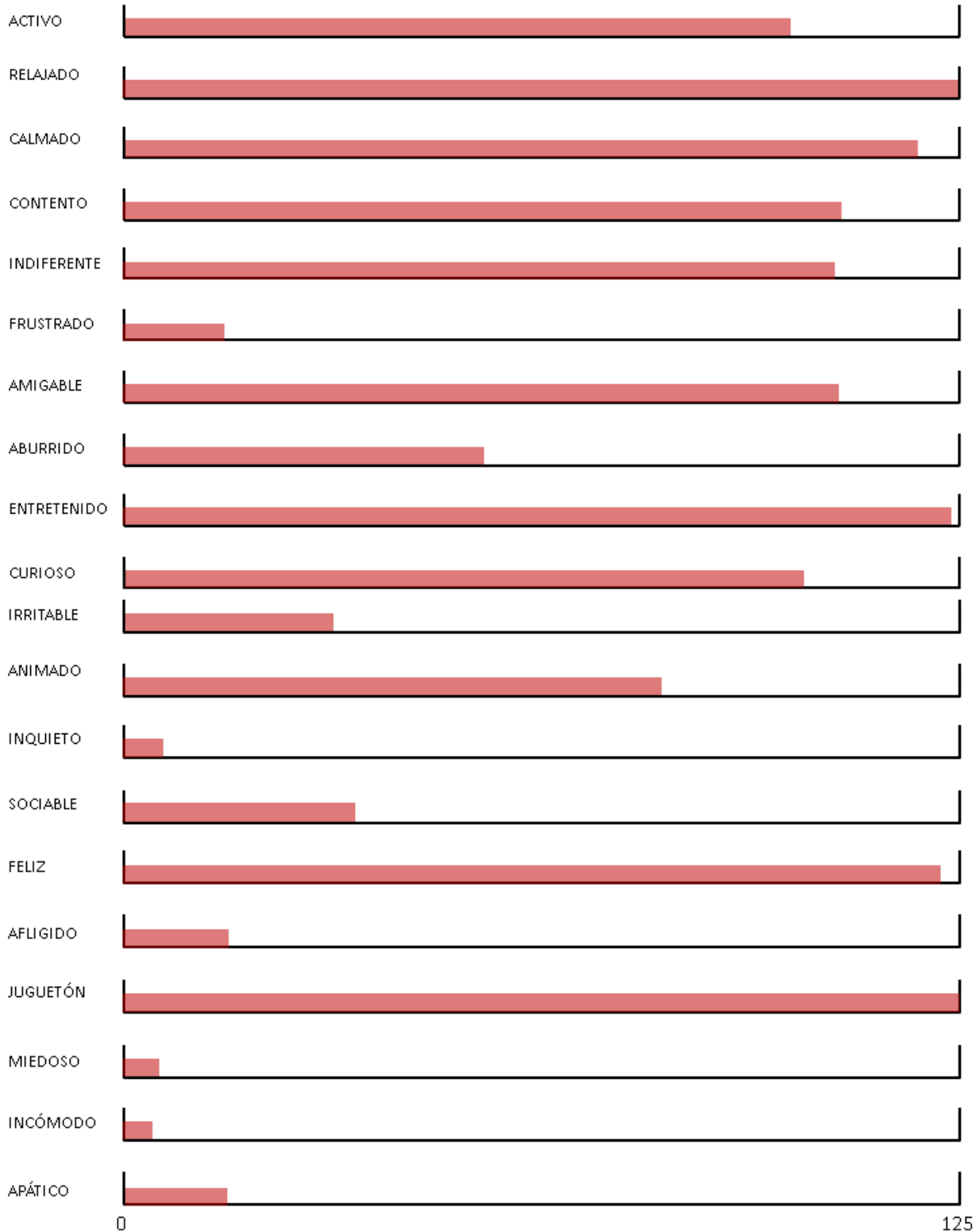
Datos obtenidos en el Corral 1:



CONDICIÓN CORPORAL	LIMPIEZA			COJERA
	PARTE SUPERIOR	PARTE INFERIOR	UBRE	
0	0	1	0	1
0	1	1	1	1
0	1	2	0	0
0	0	1	0	0
0	0	0	0	0
0	0	1	0	0
0	0	1	0	0
0	0	2	0	0
1	1	2	0	1
0	0	1	0	0
0	0	0	0	0
2	1	1	0	1
0	0	1	0	2
0	0	1	0	0
0	0	1	0	0
0	1	1	0	0
0	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	1	2	0	1
0	0	0	0	0
0	0	0	0	0
0	1	2	0	0
0	0	2	0	0
0	1	2	1	1
0	0	2	0	1
0	1	2	0	1
0	0	1	0	0
0	0	0	0	0
1	1	2	0	2

DISTANCIA HUMANO ANIMAL	
	cm
1	0
2	10
3	10
4	0
5	0
6	0
7	0
8	10
9	20
10	15
11	0
12	0
13	10
14	0
15	10
16	10
17	15
18	30
19	0
20	10

Datos obtenidos en el Corral 2:



CONDICIÓN CORPORAL	LIMPIEZA			COJERA
	PARTE INFERIOR	PARTE SUPERIOR	UBRE	
2	0	0	0	0
0	0	0	0	1
0	1	0	0	0
0	0	0	0	2
2	1	0	0	1
0	1	1	0	0
0	0	0	0	0
0	1	1	0	0
0	0	0	0	2
0	0	0	0	0
0	0	0	0	0
0	0	1	0	0
0	0	0	0	0
2	1	0	0	0
2	0	0	0	1
0	1	0	0	1
0	0	0	0	0
0	0	0	0	0
0	1	1	0	0
0	0	0	0	0
0	0	0	0	0
0	1	0	0	0
0	0	0	0	0
0	0	0	0	0
0	1	0	0	0
0	0	0	0	0
0	0	0	0	0
2	1	0	0	0
0	0	0	0	0
0	0	1	0	2
0	0	0	0	1
2	0	0	0	0



Welfare Quality® Assessment protocol for cattle

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

Acknowledgement *“The present document originates from the Welfare Quality® research project which has been co-financed by the European Commission, within the 6th Framework Research, contract No. FOOD-CT-2004-506508. The text represents the authors’ views and does not necessarily represent a position of the Commission who will not be liable for the use made of such information”.*

Disclaimer

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

- Training and validation in the methods and protocols is essential.
- Ownership or possession of these assessment documents alone does not indicate capacity to carry out assessment without adequate approved training.
- 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.
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This document presents version 1 of the assessment protocol for cattle. October 1st, 2009

Foreword

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

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

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

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

This report has been edited by Christoph Winckler (Universität für Bodenkultur Wien), Bo Algers (Sveriges Lantbruksuniversitet), Kees van Reenen (Wageningen Universiteit) and Hélène Leruste (Groupe ISA) for the species specific parts. Furthermore Isabelle Veissier (Institut National de la Recherche Agronomique) and Linda Keeling (Sveriges Lantbruksuniversitet) edited the introductory parts of the document, and the English edit was carried out by Andy Butterworth (University of Bristol). Isabelle Veissier also contributed to the development of the calculation systems. Gwen van Overbeke and Vere Bedaux (NEN, Netherlands Standardization Institute) supported the writing and editing of the protocol.

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

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

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Introduction

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Glossary

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

1 Scope

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

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

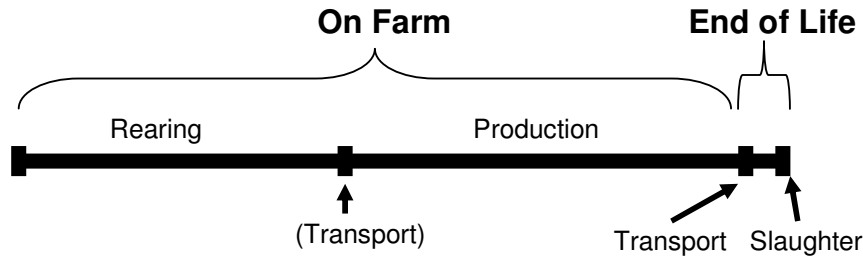


Figure 1 Schematic reproduction of the different periods in the life of production animals. These are not necessarily all covered in the protocol.

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

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

This is also shown in Table 1.

	Rearing	Producing	End of life
Fattening cattle			
Dairy cows			
Veal calves			

Included in cattle protocol Not included in protocol

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

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

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

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

2 Legal aspects

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

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

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

⁵ <http://eur-lex.europa.eu>

3 Terms and definitions

Advisor

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

NOTE This is distinct from the assessor

Animal unit

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

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

Animal unit manager

Person responsible for an animal unit

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

Animal-based measure

Measure that is taken directly from the animal

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

Assessment protocol

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

Assessor

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

Dairy cows (*Bos taurus*)

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

Fattening cattle (*Bos taurus*)

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

Heifer (*Bos taurus*)

Female cow that has not yet calved

Management-based measure

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

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

Overall assessment of welfare

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

Resource-based measure

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

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

Transport unit

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

Veal calf (*Bos taurus*)

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

Welfare category

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

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

Welfare criterion

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

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

Welfare measure

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

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

Welfare principle

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

Welfare Quality[®] protocol

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

NOTE The protocols also specify how the data will be collected

Welfare score

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

4 Background Welfare Quality® protocols

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

4.1 Overall structure of the project

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

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

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

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

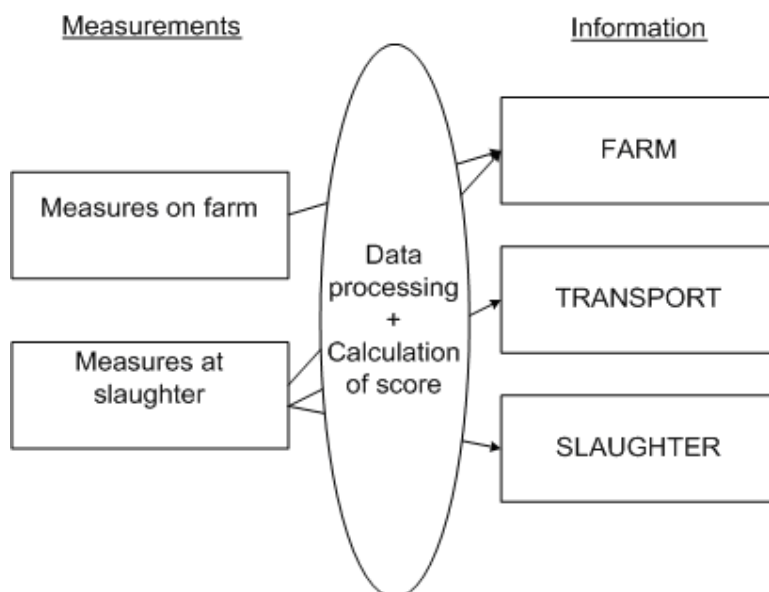


Figure 2 The different sources of information in Welfare Quality®. It is outside the scope of this document, but potential use of the output generated includes information provided to consumers, advisors and retailers.

4.2 Basic principles

4.2.1 Introduction

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

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

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

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

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

4.2.2 Defining welfare principles and criteria

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

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

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

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

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

More detailed definitions of welfare criteria are described below.

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

4.2.3 Measures developed to check criteria

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

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

4.2.4 Calculation of scores

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

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

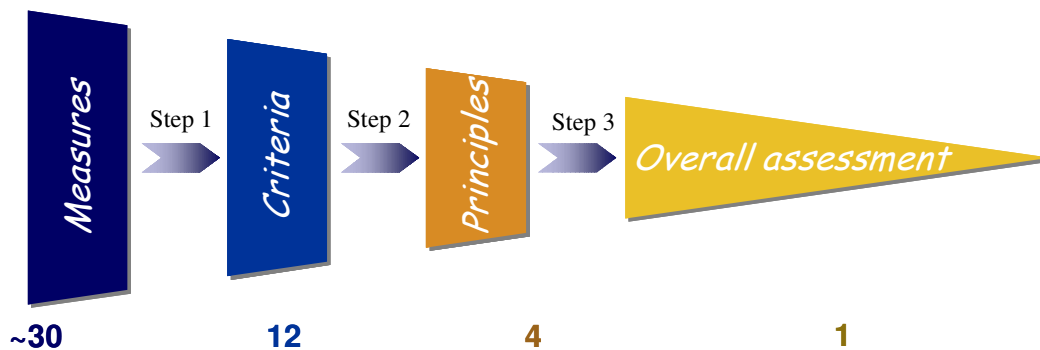


Figure 3 Bottom-up approach for integrating the data on the different measures to an overall assessment of the animal unit.

Calculation of criterion-scores

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

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

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

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

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

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

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

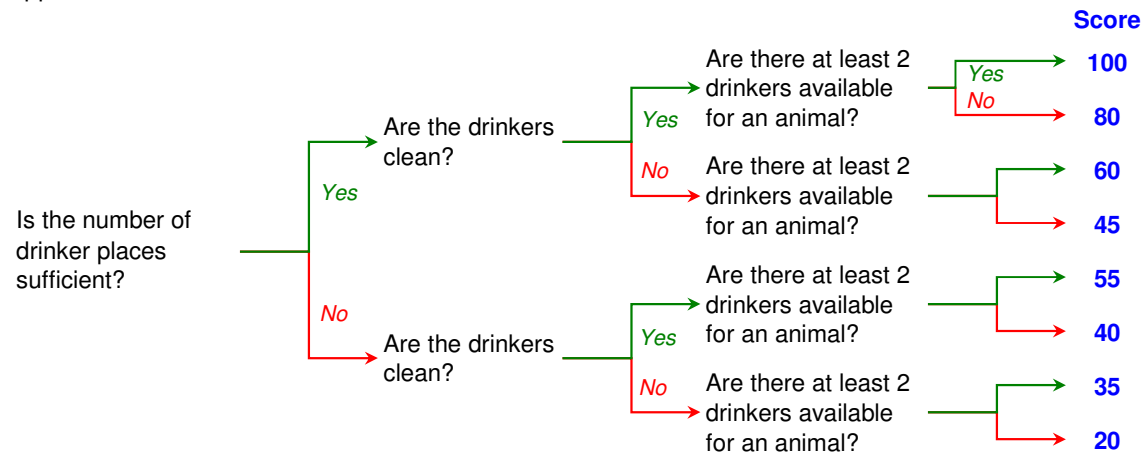
This exercise showed that experts do not in general follow a linear reasoning, e.g. for a given disorder a 10 % increase does not yield the same decrement in expert scores at the bottom of the [0,100] scale (where most animals get this disorder) than at the top of the scale (when most animals are normal).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

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

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

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

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



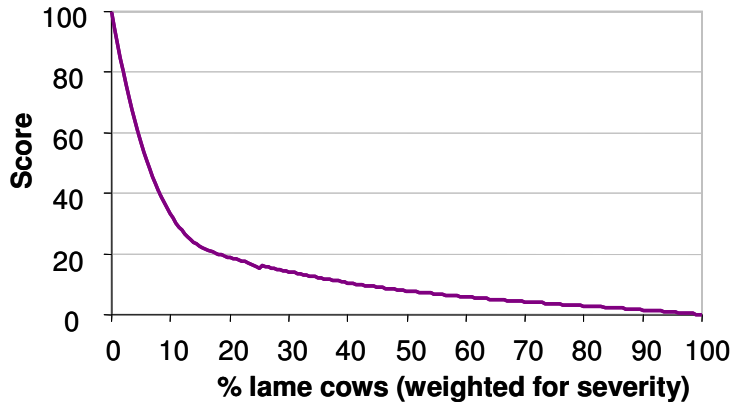
Explanation box 2: Weighted sum and I-spline functions as applied to lameness in dairy cows

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

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

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

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



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

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

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

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

Calculation of principle-scores from criterion-scores

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

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

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

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

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

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

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

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

Assignment of animal units to the welfare categories

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

Four welfare categories were distinguished to meet stakeholders’ requirements:

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

Enhanced: the welfare of animals is good.

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

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

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

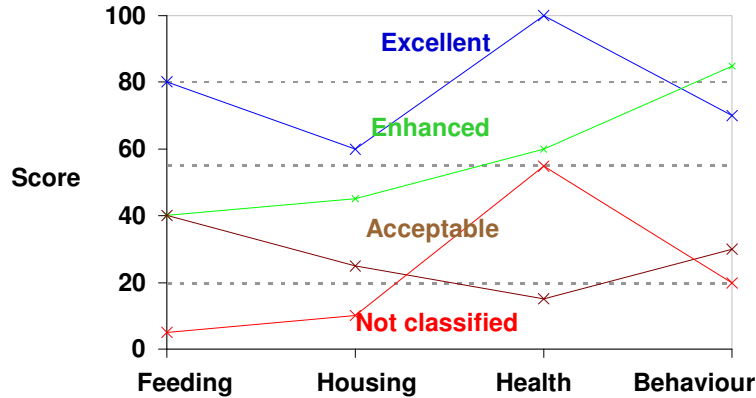


Figure 4 Examples of farms in the four welfare categories.

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

Final comments

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

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

5 Welfare Quality[®] applied to fattening cattle

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

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

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

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

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

5.1 Collection of data for fattening cattle on farm

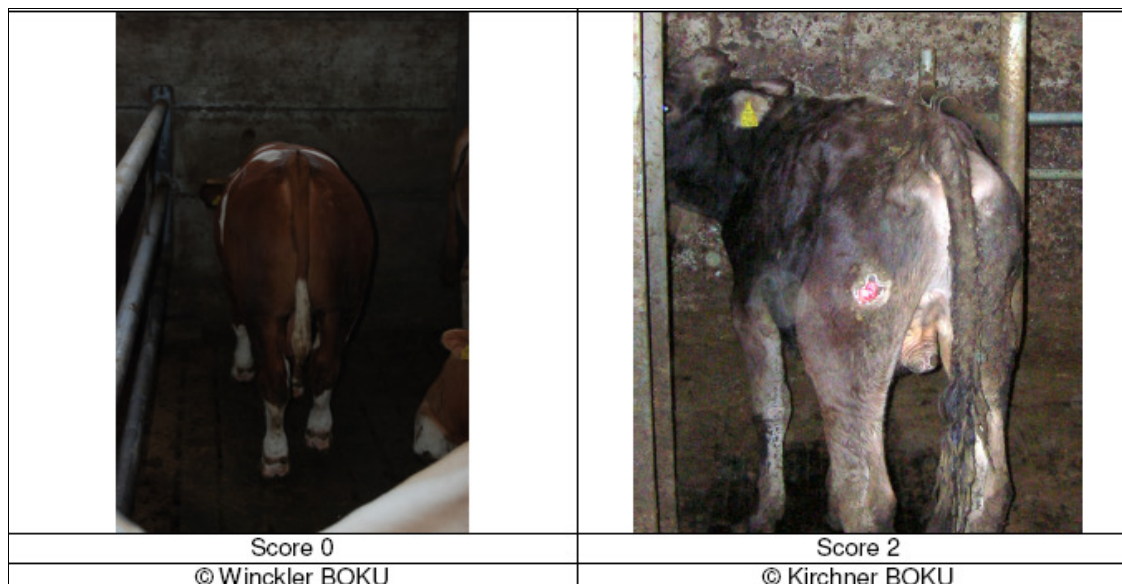
	Welfare Criteria		Measures
Good feeding	1	Absence of prolonged hunger	Body condition score
	2	Absence of prolonged thirst	Water provision, cleanliness of water points, number of animals using the water points
Good housing	3	Comfort around resting	Time needed to lie down, cleanliness of the animals
	4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

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

5.1.1 Good feeding

5.1.1.1 Absence of prolonged hunger






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



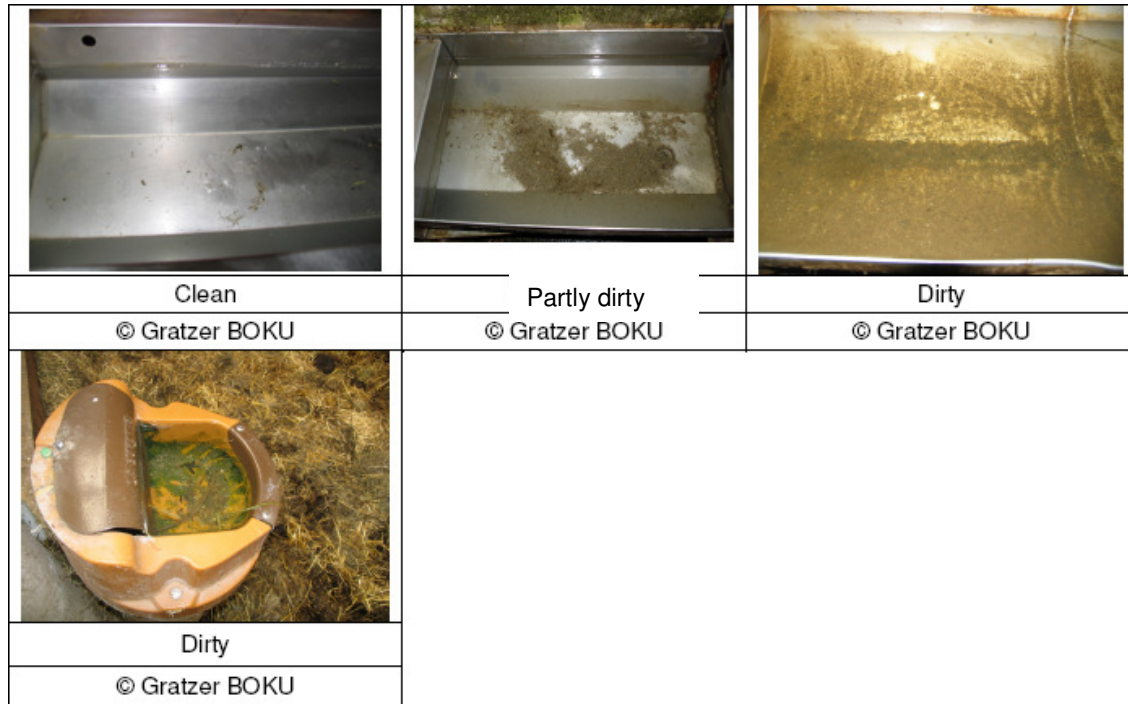
5.1.1.2 Absence of prolonged thirst

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

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

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

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



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

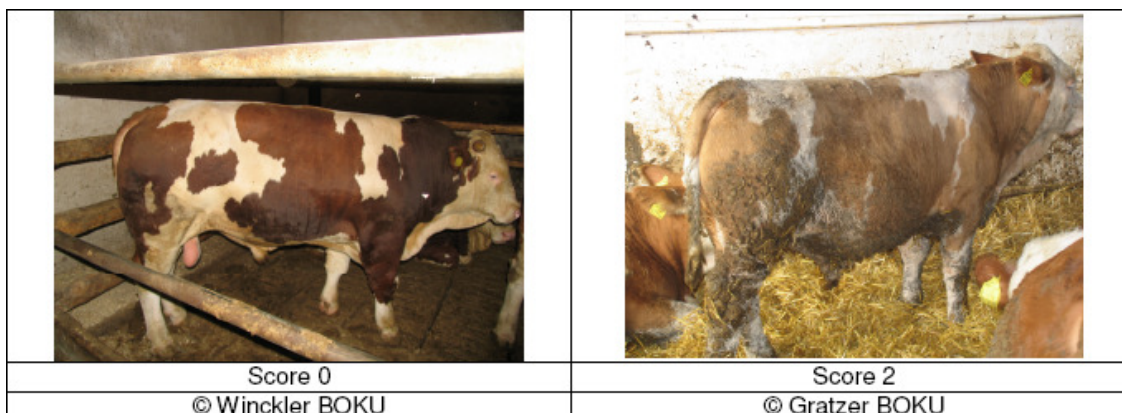
5.1.2 Good housing

5.1.2.1 Comfort around resting

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

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

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



5.1.2.2 Thermal comfort
As yet, no measure is developed

5.1.2.3 Ease of movement

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

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

5.1.3 Good health

5.1.3.1 Absence of injuries

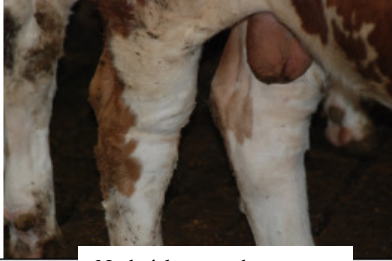
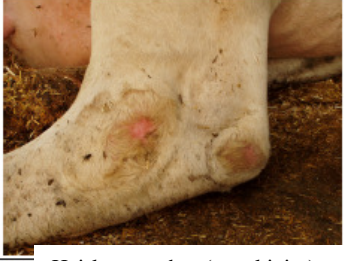

<i>Title</i>	Lameness
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	Lameness describes an abnormality of movement and is most evident when the animal (and so the legs) is in motion. It is caused by reduced ability to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

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

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

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



a) hairless spots

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

b) lesions

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

c) swellings

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

5.1.3.2 Absence of disease

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

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

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



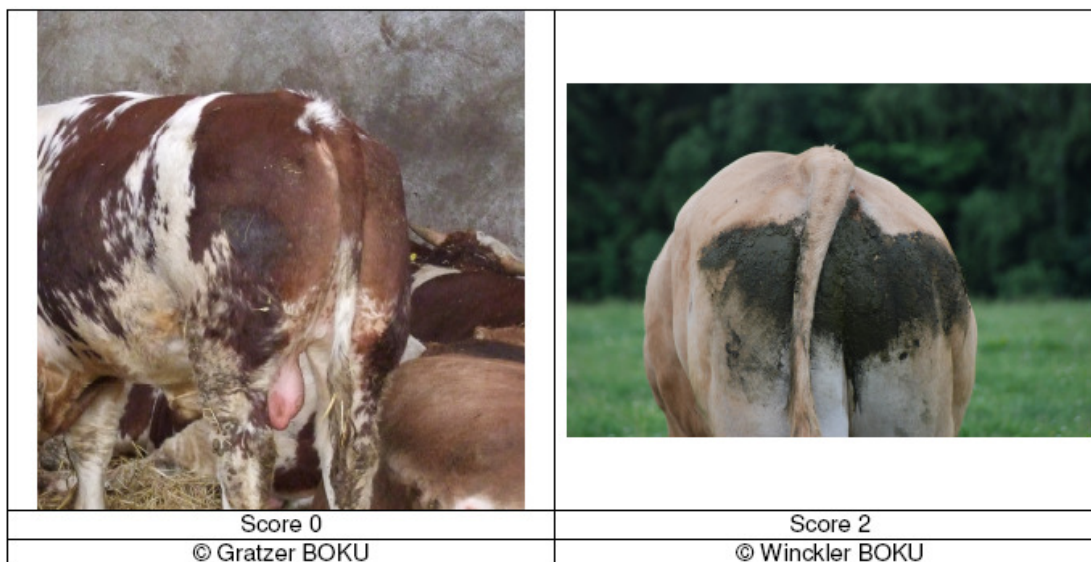
<i>Title</i>	Ocular discharge
<i>Scope</i>	Animal-based measure: Fattening cattle
<i>Sample size</i>	Sample size according to § 5.1.5
<i>Method description</i>	<p>Ocular discharge is defined as clearly visible flow/discharge (wet or dry) from the eye, at least 3 cm long.</p> <p>The animal is observed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



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

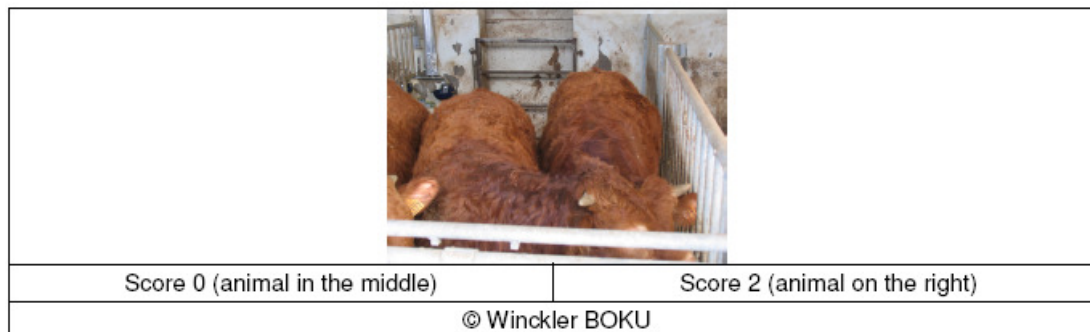
<i>description</i>	<p>laboured breathing. Expiration is visibly supported by the muscles of the trunk, often accompanied by a pronounced sound. Breathing rate may only be slightly increased.</p> <p>The animal is observed but must not be touched. Animals are scored with regard to the criteria for hampered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

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



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

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



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

5.1.3.3 Absence of pain induced by management procedures

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

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

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

5.1.4 Appropriate behaviour

5.1.4.1 Expression of social behaviours

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

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

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

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

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

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

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

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

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

5.1.4.2 Expression of other behaviours

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

5.1.4.3 Good human–animal relationship

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

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

5.1.4.4 Positive emotional state

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

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

5.1.5 Sampling and practical information

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

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

	Parameter	Sample size	Time needed approximately

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

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

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

Selecting animals/pens for assessment

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

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

Herd size	Number of animals to score (suggestion A)	If suggestion A is not feasible
30	30	30
40	30	30
50	33	30
60	37	32
70	41	35
80	44	37
90	47	39
100	49	40
110	52	42
120	54	43
130	55	45
140	57	46
150	59	47
160	60	48
170	62	48
180	63	49
190	64	50
200	65	51
210	66	51
220	67	52
230	68	52
240	69	53
250	70	53
260	70	54
270	71	54
280	72	54
290	72	55
300	73	55

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

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

5.2 Calculation of scores for fattening cattle on farm

5.2.1 Criterion scores

5.2.1.1 Absence of prolonged hunger

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

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

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

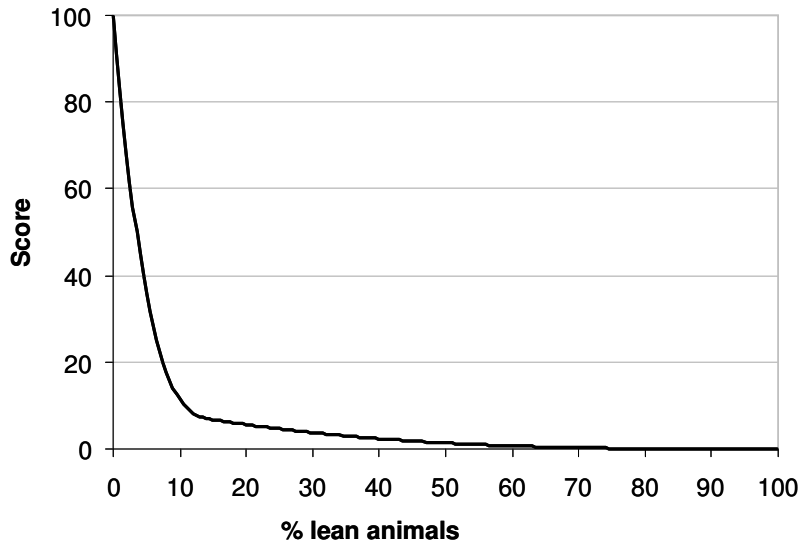


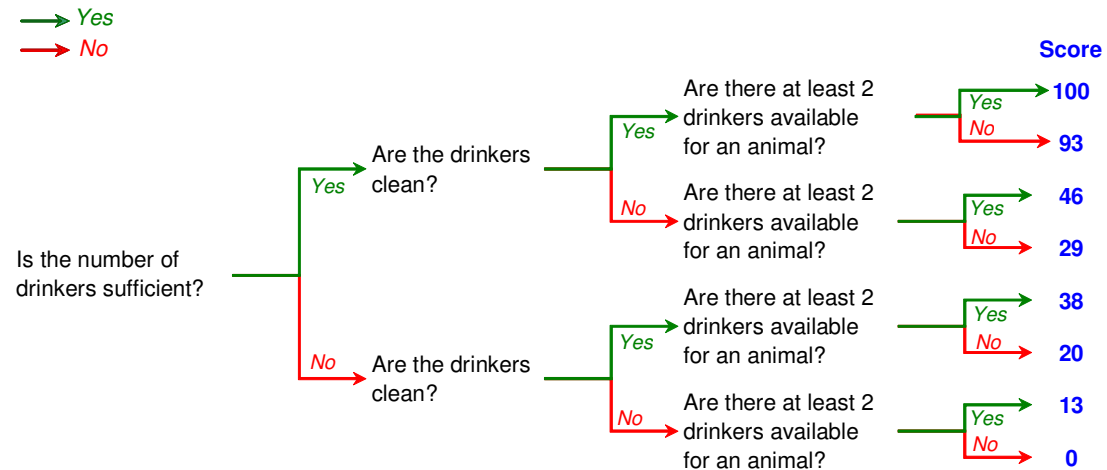
Figure 5 Calculation of scores for absence of hunger according to %very lean animals.

5.2.1.2 Absence of prolonged thirst

For each group of animals three aspects are considered:

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

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



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

5.2.1.3 Comfort around resting

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

Partial score for ease of lying down

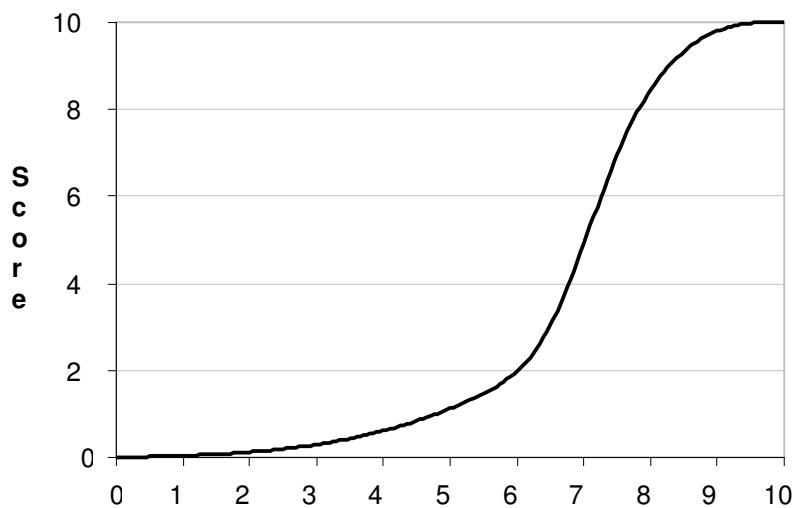
Let t be the average time to lie down in seconds and I_t the index for ease of lying down:

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

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

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

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



Index derived from average time to lie down or lying intentions

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

Partial score for cleanliness of animals:

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

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

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

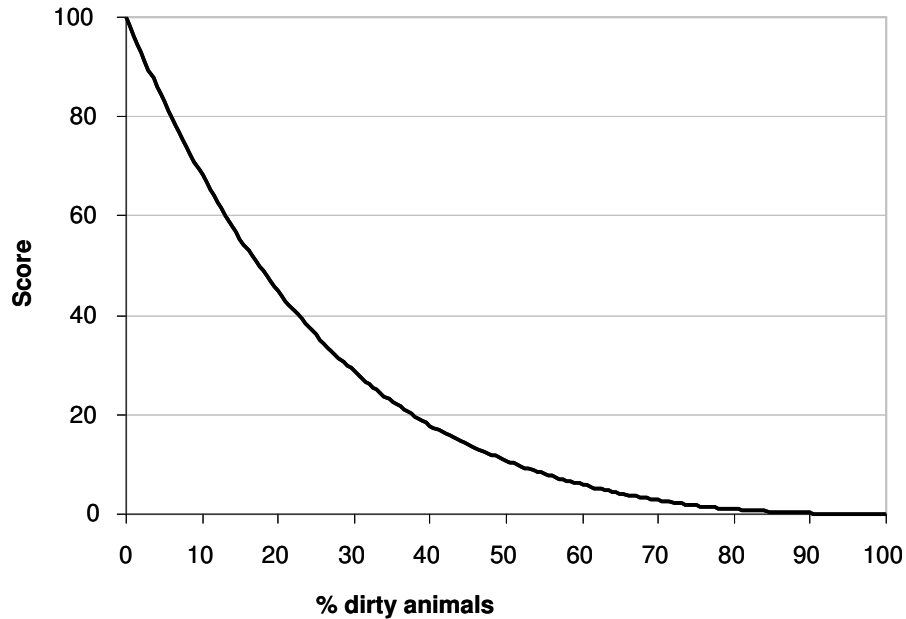


Figure 7 Calculation of scores for cleanliness according to the % of dirty animals.

Score for comfort around resting

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

5.2.1.4 Thermal comfort

As yet this criterion is not assessed for fattening cattle.

5.2.1.5 Ease of movement

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

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

Then:

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

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

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

The following index is calculated:

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

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

If animals do not have access to an outdoor run then

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

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

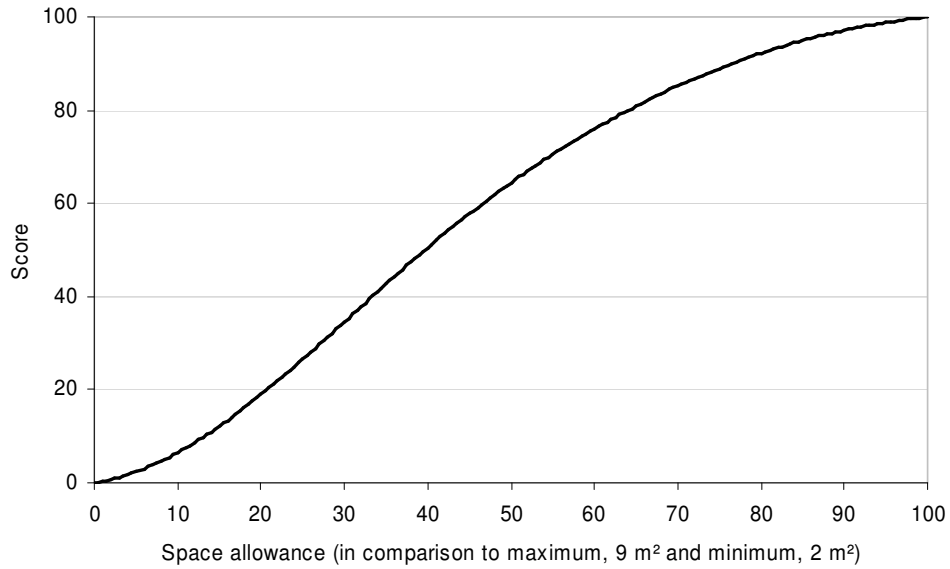


Figure 8 Calculation of scores for ease of movement according to space allowance, when animals do not have access to an outdoor run.

If animals have access to an outdoor run then

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

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

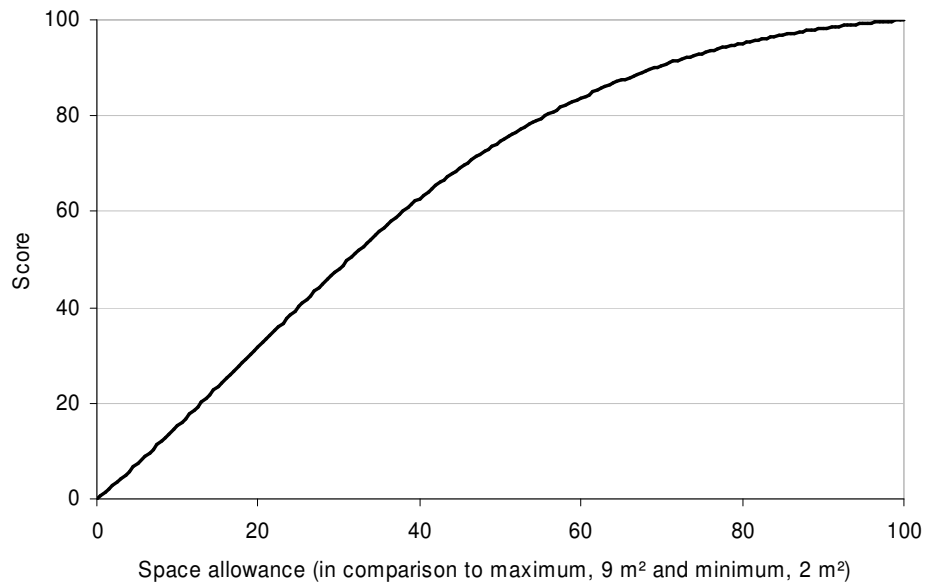


Figure 9 Calculation of scores for ease of movement according to space allowance, when animals have access to an outdoor run.

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

5.2.1.6 Absence of injuries

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

Partial score for integument alterations

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

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

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

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

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

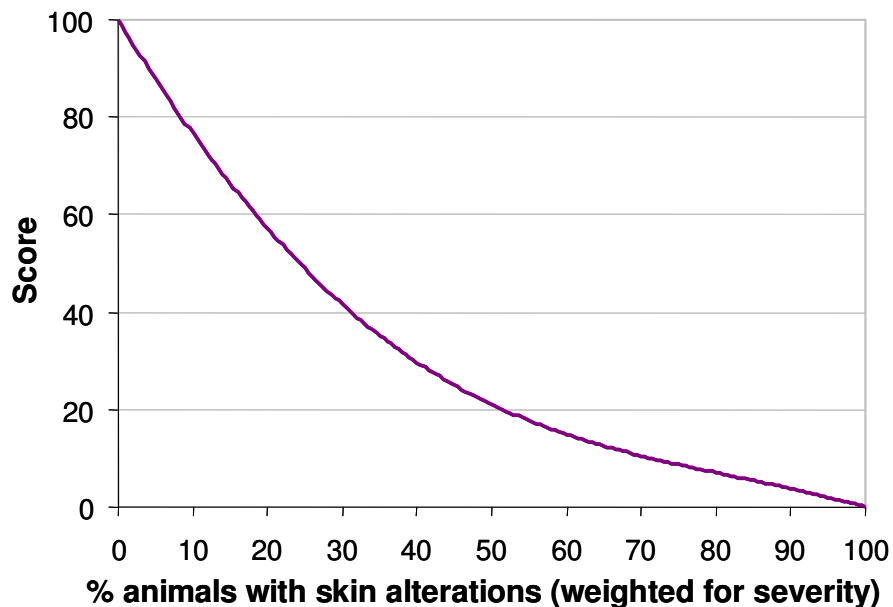


Figure 10 Calculation of the partial score for integument alterations according to the % animals affected by mild alterations and % animals affected by severe ones (weights: 0.2 for mild and 1 for severe alterations).

Partial score for lameness

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

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

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

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

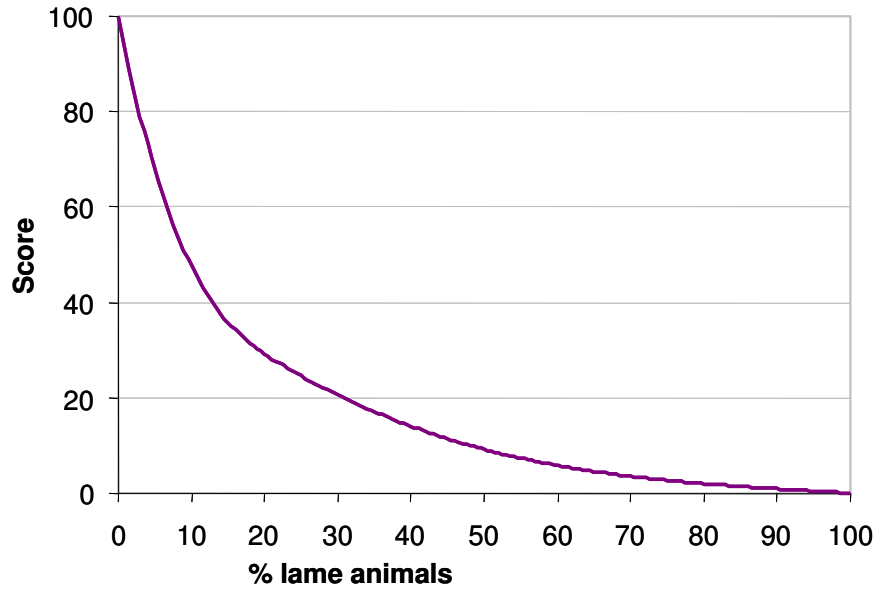


Figure 11 Calculation of the partial score for lameness according to the % lame animals.

Score for absence of injuries

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

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

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

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

5.2.1.7 Absence of disease

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

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

Symptoms are grouped by areas

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

total number of area = 4

The severity of problems is estimated per area:

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

An index is calculated as:

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

where 4 is the number of areas.

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

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

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

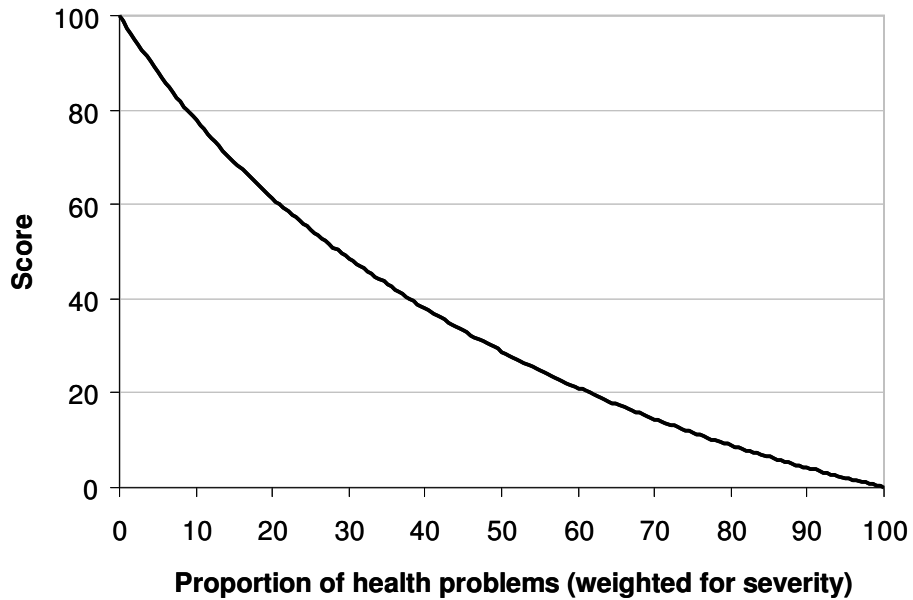
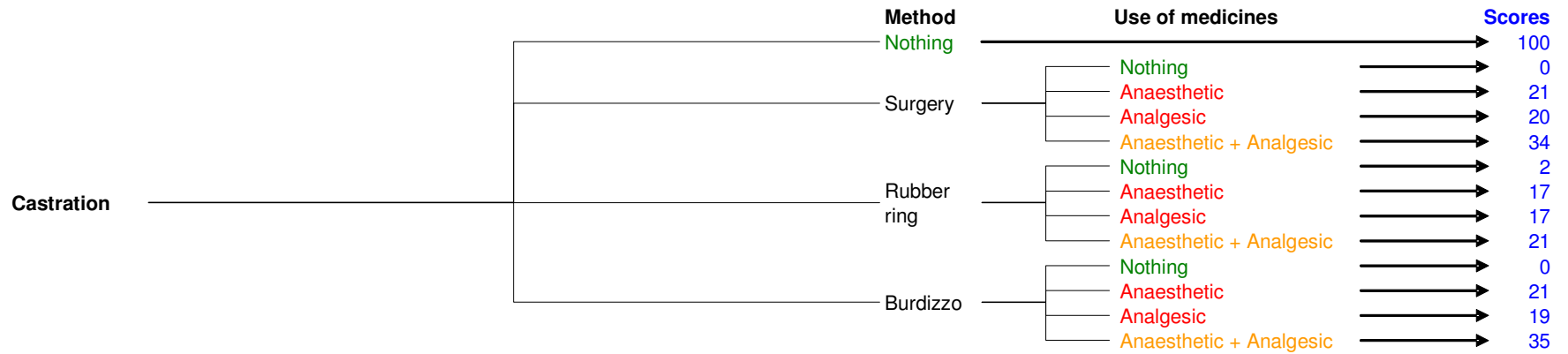
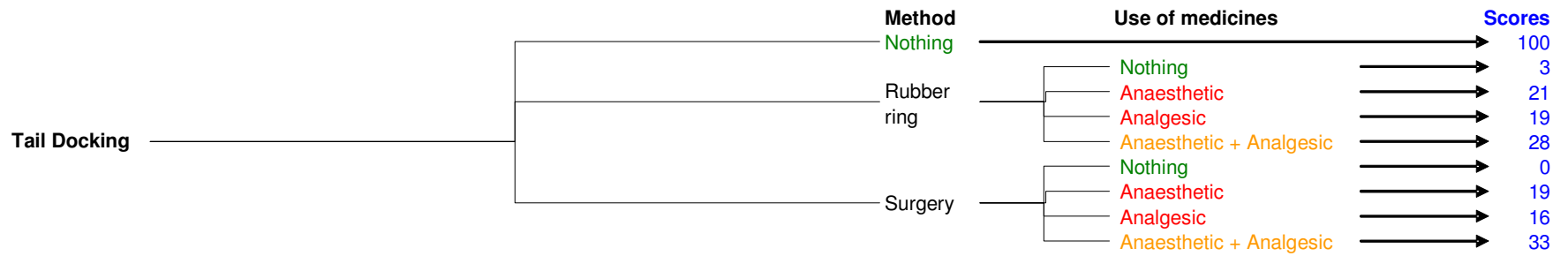
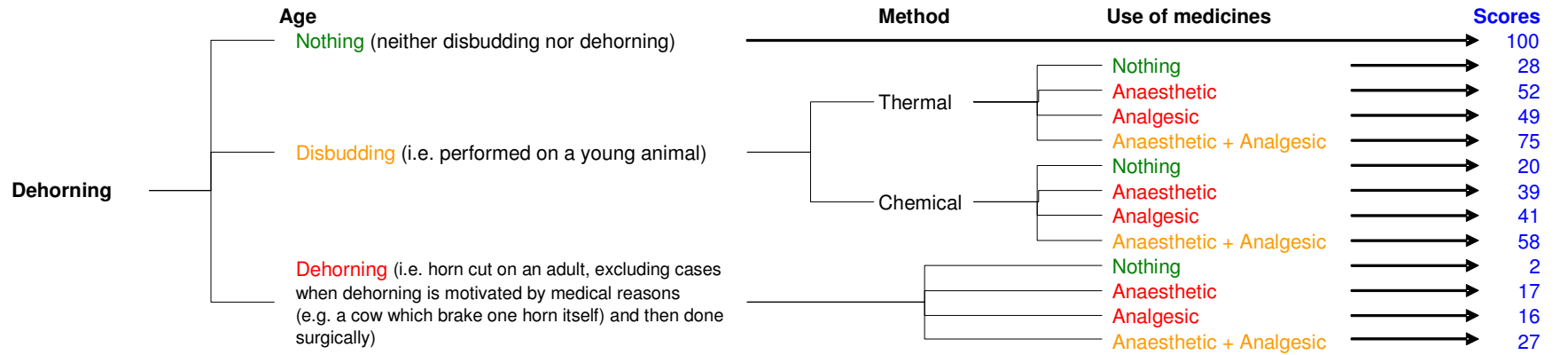


Figure 12 Calculation of scores for absence of diseases according to the proportion of areas for which symptoms are above the warning or the alarm threshold (weights: 0.33 for warnings and 1 for alarms).

5.2.1.8 Absence of pain induced by management procedures

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

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



5.2.1.9 Expression of social behaviours

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

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

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

Else:

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

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

- If $y_1 \leq 0.5$

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

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

- If $0.5 < y_1 \leq 1.5$

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

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

- If $1.5 < y_1 \leq 3$

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

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

- If $3 < y_1 \leq 8$

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

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

- If $8 < y_1$

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

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

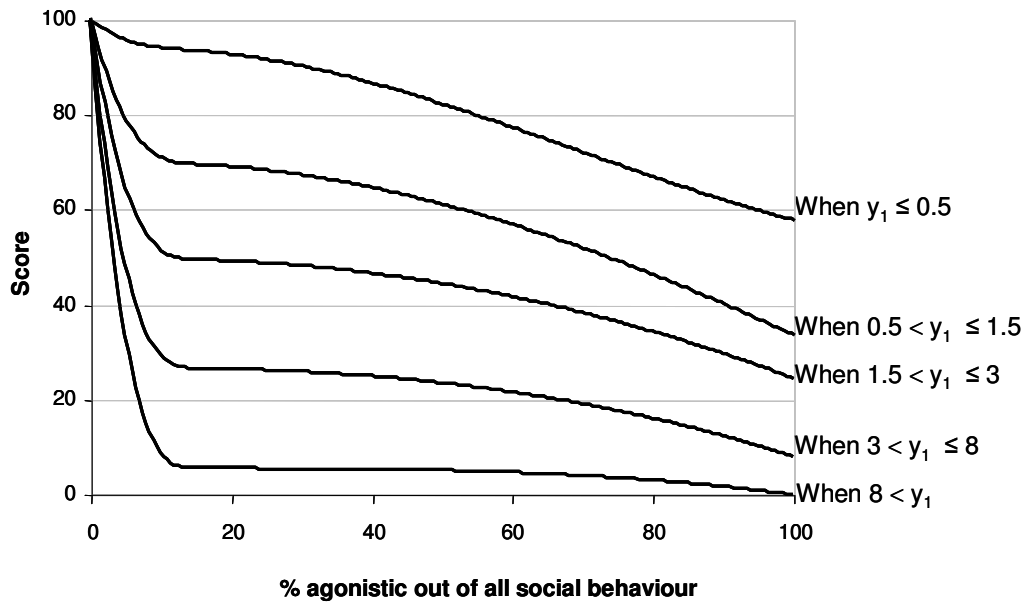


Figure 13 Calculation of scores for the expression of social behaviour according to the frequency of agonistic behaviours (y_1) and their proportion out of all social behaviours.

5.2.1.10 Expression of other behaviours

We consider two cases:

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

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

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

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

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

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

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

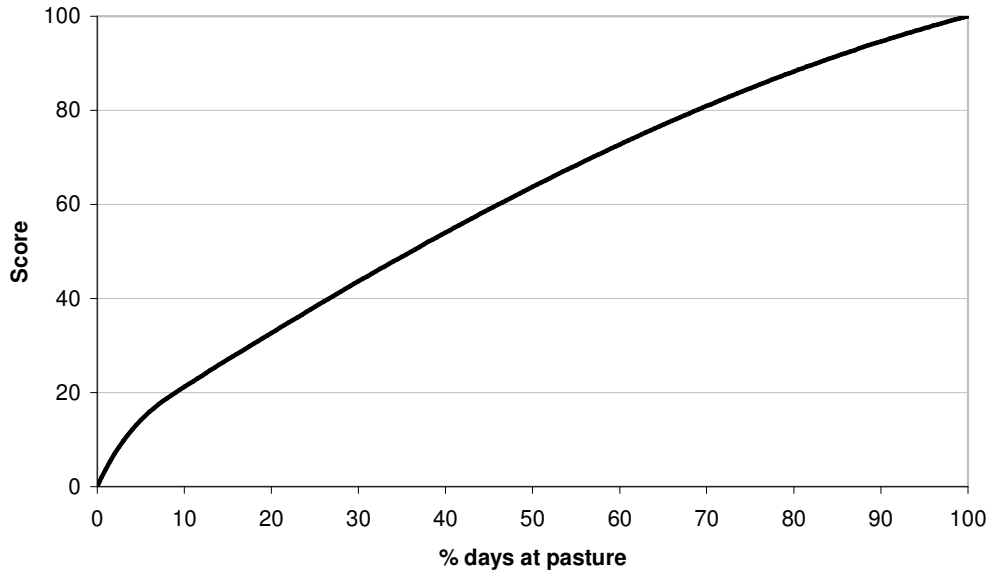


Figure 14 Calculation of scores for the expression of other behaviours according to the proportion of days per year when animals are at pasture, when they did not have access to pasture before fattening.

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

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

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

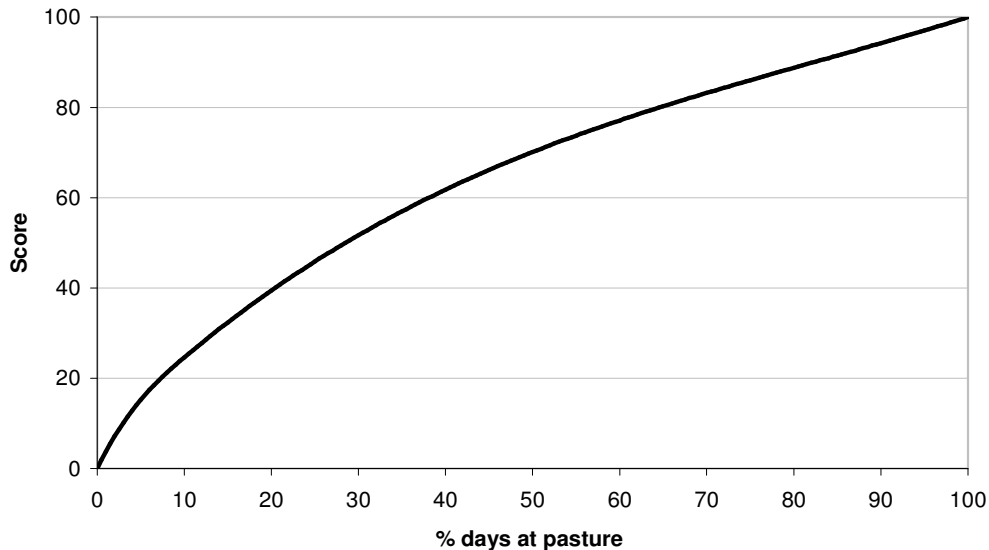


Figure 15 Calculation of scores for the expression of other behaviours according to the proportion of days per year when animals are at pasture, when they had access to pasture before fattening.

5.2.1.11 Good human-animal relationship

The following percentages of animals are taken into account:

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

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

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

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

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

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

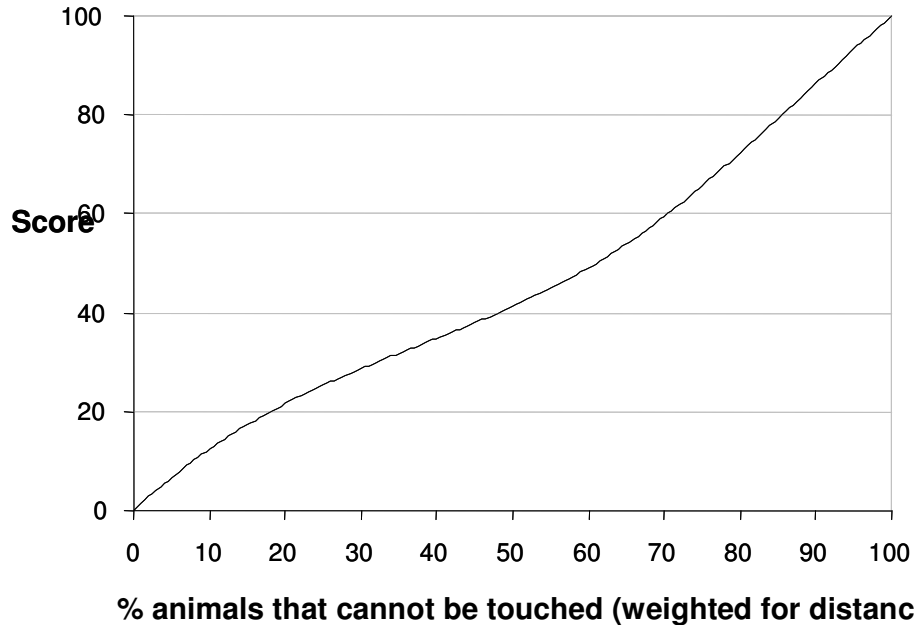


Figure 16 Calculation of scores for good human-animal relationship according to the proportion of animals that cannot be touched (weight: 0.2, 0.6 and 1 for animals being approached by less than 0.5 m, less than 1 m, or more than 1 m)

5.2.1.12 Positive emotional state

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

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

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

The weights w_k of the various terms are:

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

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

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

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

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

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

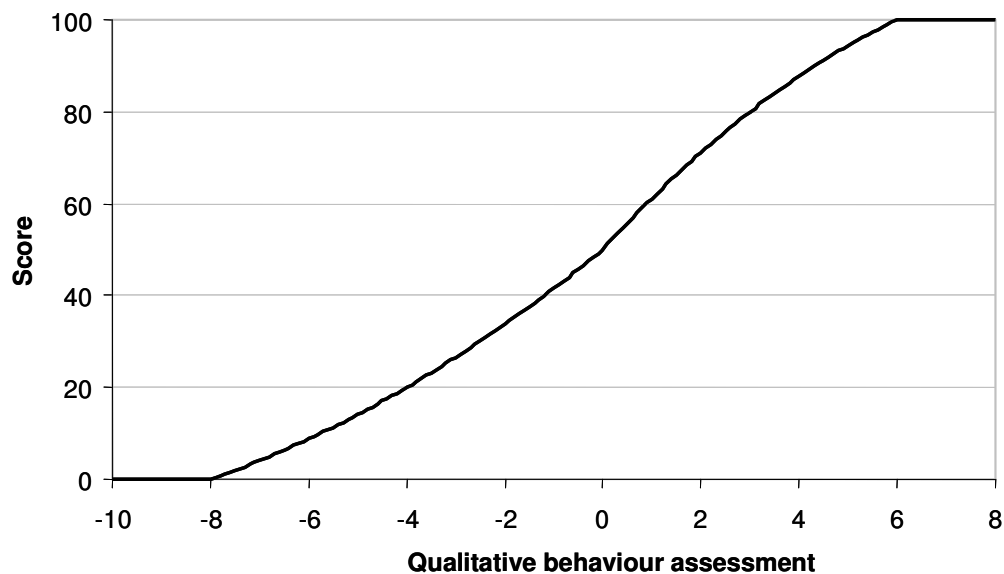


Figure 17 Calculation of scores for positive emotional state according to the values the farm obtained for the various terms used in qualitative Behaviour Assessment (combined in a weighted sum).

5.2.2 Principle scores

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

Principle Good feeding

μ_1	μ_2
0.08	0.26

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

Principle Good housing

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

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

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

Principle Good health

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

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

Principle Appropriate behaviour

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5.2.3 Overall assessment

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

5.3 Collection of data for fattening cattle at slaughterhouse

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

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

5.3.1 Good feeding

5.3.1.1 Absence of prolonged hunger

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

5.3.1.2 Absence of prolonged thirst

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

5.3.2 Good housing

5.3.2.1 Comfort around resting

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

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

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

5.3.2.2 Thermal comfort

This criterion is not applied in this situation.

5.3.2.3 Ease of movement

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

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

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

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

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

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

5.3.3 Good health

5.3.3.1 Absence of injuries

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

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

5.3.3.2 Absence of disease

This criterion is not applied in this situation.

5.3.3.3 Absence of pain induced by management procedures

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

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

5.3.4 Appropriate behaviour

5.3.4.1 Expression of social behaviours

This criterion is not applied in this situation.

5.3.4.2 Expression of other behaviours

This criterion is not applied in this situation.

5.3.4.3 Good human-animal relationship

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

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

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

5.3.4.4 Absence of fearfulness

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

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

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

5.3.5 Sampling and practical information

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

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

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

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

Selecting fattening cattle for assessment

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

Sample sizes for monitoring of unloading and driving into lairage

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

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

Presumptions:

- The examples concern monitoring of Unloading and Driving into lairage

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

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

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

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

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

5.4 Calculation of scores for fattening cattle at slaughterhouse

Not included in the protocol at the moment.

6 Welfare Quality[®] applied to dairy cows

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

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

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

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

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

6.1 Collection of data for dairy cows on farm

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

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

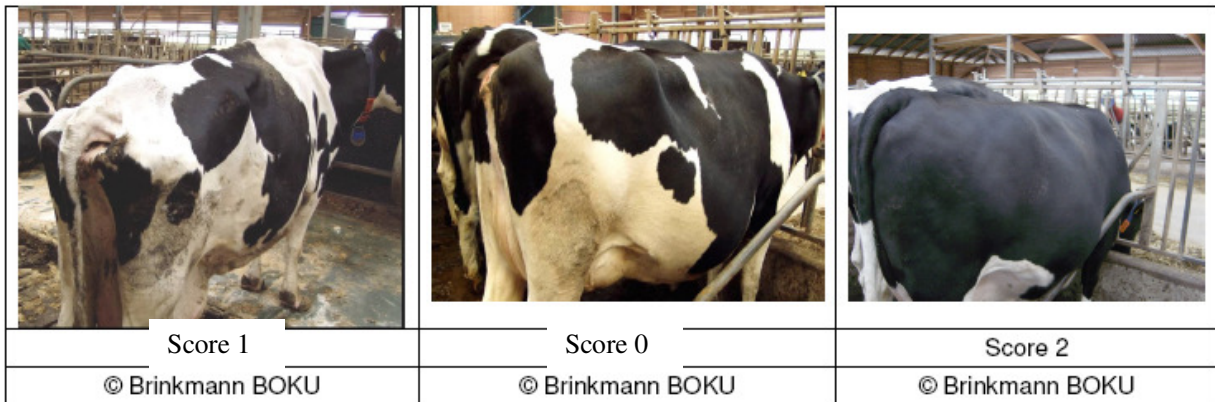
6.1.1 Good feeding

6.1.1.1 Absence of prolonged hunger




<i>Title</i>	Body condition score																										
<i>Scope</i>	Animal-based measure: Dairy cows																										
<i>Sample size</i>	Sample size according § 6.1.5																										
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers if they are kept together with dairy cows.</p> <p>View the animal from behind and from the side in the loin and tail head area and assess the animals' body condition. Animals must not be touched but only observed. Animals are scored as follows, with regard to 4 criteria and according to breed (see photographic illustration):</p> <p>Descriptors for indicators in dairy breeds:</p> <table border="1"> <thead> <tr> <th><i>Body Region</i></th> <th><i>Very lean</i></th> <th><i>Very fat</i></th> </tr> </thead> <tbody> <tr> <td>Cavity around tail head</td> <td> <ul style="list-style-type: none"> Deep cavity around tail head </td> <td> <ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present </td> </tr> <tr> <td>Loin</td> <td> <ul style="list-style-type: none"> Deep depression between backbone and hipbones (tuber coxae) </td> <td> <ul style="list-style-type: none"> Convex between backbone and hipbones (tuber coxae) </td> </tr> <tr> <td>Vertebrae</td> <td> <ul style="list-style-type: none"> Ends of transverse processes sharp </td> <td> <ul style="list-style-type: none"> Transverse processes not discernible </td> </tr> <tr> <td>Tail head, hipbones, spine and ribs</td> <td> <ul style="list-style-type: none"> Tail head, hipbones (tuber coxae), spine and ribs prominent </td> <td> <ul style="list-style-type: none"> Outlines of fat patches visible under skin </td> </tr> </tbody> </table> <p>Descriptors for indicators in dual purpose breeds:</p> <table border="1"> <thead> <tr> <th><i>Body Region</i></th> <th><i>Very lean</i></th> <th><i>Very fat</i></th> </tr> </thead> <tbody> <tr> <td>Cavity around tail head</td> <td> <ul style="list-style-type: none"> Cavity around tail head </td> <td> <ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present </td> </tr> <tr> <td>Loin</td> <td> <ul style="list-style-type: none"> Visible depression between </td> <td> <ul style="list-style-type: none"> Convex between backbone and </td> </tr> </tbody> </table>			<i>Body Region</i>	<i>Very lean</i>	<i>Very fat</i>	Cavity around tail head	<ul style="list-style-type: none"> Deep cavity around tail head 	<ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present 	Loin	<ul style="list-style-type: none"> Deep depression between backbone and hipbones (tuber coxae) 	<ul style="list-style-type: none"> Convex between backbone and hipbones (tuber coxae) 	Vertebrae	<ul style="list-style-type: none"> Ends of transverse processes sharp 	<ul style="list-style-type: none"> Transverse processes not discernible 	Tail head, hipbones, spine and ribs	<ul style="list-style-type: none"> Tail head, hipbones (tuber coxae), spine and ribs prominent 	<ul style="list-style-type: none"> Outlines of fat patches visible under skin 	<i>Body Region</i>	<i>Very lean</i>	<i>Very fat</i>	Cavity around tail head	<ul style="list-style-type: none"> Cavity around tail head 	<ul style="list-style-type: none"> Tail head cavity full and folds of fatty tissue present 	Loin	<ul style="list-style-type: none"> Visible depression between 	<ul style="list-style-type: none"> Convex between backbone and
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	<p>Vertebrae</p> <p>Tail head, hipbones, spine and ribs</p> <p>Individual level: 0 – Regular body condition 1 – Very lean: indicators for ‘very lean’ present in at least three body regions 2 – Very fat: indicators for ‘very fat’ present in at least three body regions</p>	<p>backbone and hipbones (tuber coxae)</p> <ul style="list-style-type: none"> • Ends of transverse processes distinguishable • Tail head, hipbones (tuber coxae), spine and ribs visible 	<p>hipbones (tuber coxae)</p> <ul style="list-style-type: none"> • Transverse processes not discernible • Outlines of fat patches visible under skin
<i>Classification</i>	<p>Herd level: Percentage of very lean cows (i.e. score 1)</p>		
<i>Optional additional information</i>	<p>As yet, for the calculation of scores, only very lean animals are taken into account. However, for advisory purposes information on very fat animals (risk for metabolic disorders and calving difficulties etc.) may be useful.</p>		

Body condition - Dairy breeds

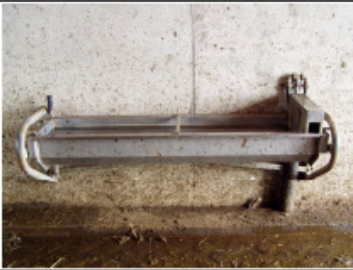




Body condition - Dual purpose breeds

		
Score 1	Score 0	Score 2
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6.1.1.2 Absence of prolonged thirst

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

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

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

		
clean	Partly dirty	Dirty
© Gratzler BOKU	© Gratzler BOKU	© Gratzler BOKU
		
Dirty		
© Gratzler BOKU		

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

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

6.1.2 Good housing

6.1.2.1 Comfort around resting

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


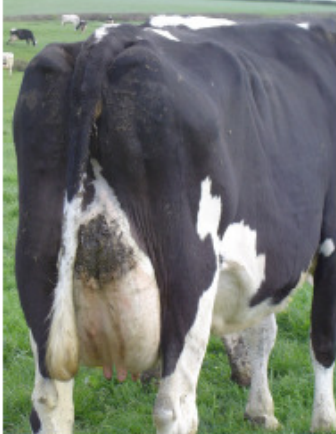
<i>Title</i>	Animals colliding with housing equipment during lying down
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according § 6.1.5
<i>Method description</i>	<p>This measure applies to lactating cows as well as to dry cows and pregnant heifers if kept with lactating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

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

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

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



Cleanliness of udder

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

Cleanliness of hindquarter

	
Score 0 © Brinkmann BOKU	Score 2 © March BOKU

Cleanliness of lower hindleg

	
Score 0 © Leach UNIVBristol	Score 2 © UNIVBristol

6.1.2.2 Thermal comfort
As yet, no measure is developed.

6.1.2.3 Ease of movement

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

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

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

6.1.3 Good health

6.1.3.1 Absence of injuries

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

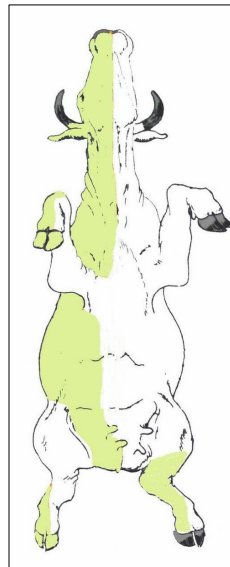
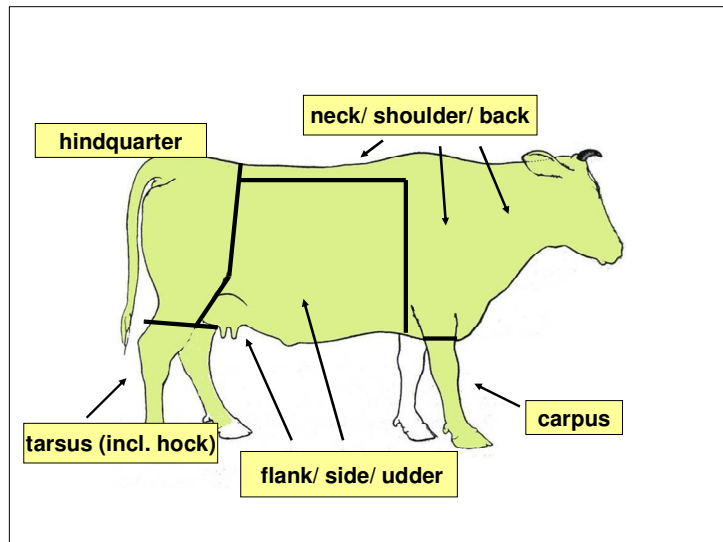
<i>Classification</i>	Herd level: Percentage of not lame animals (score 0) Percentage of moderately lame animals (score 1) Percentage of severely lame animals (score 2)
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<i>Title</i>	Lameness (tied animals)
<i>Scope</i>	Animal-based measure: Dairy cows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

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

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

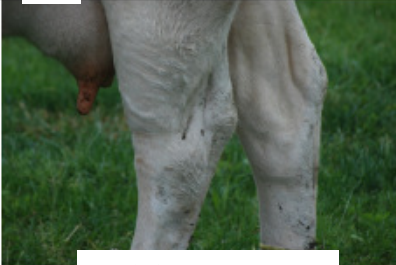


From a distance not exceeding 2 m, five body regions on one side of the focal animal have to be examined with regard to the criteria listed above.



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

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

a) hairless spots

		
No hairless patch	Hairless patch (tarsal joint)	Hairless patch (carpel joint)
© Winckler BOKU	© Brinkmann BOKU	© Brinkmann BOKU

b) lesions



c) swellings



6.1.3.2 Absence of disease

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

Title	Nasal discharge
Scope	Animal-based measure: Dairy cows

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

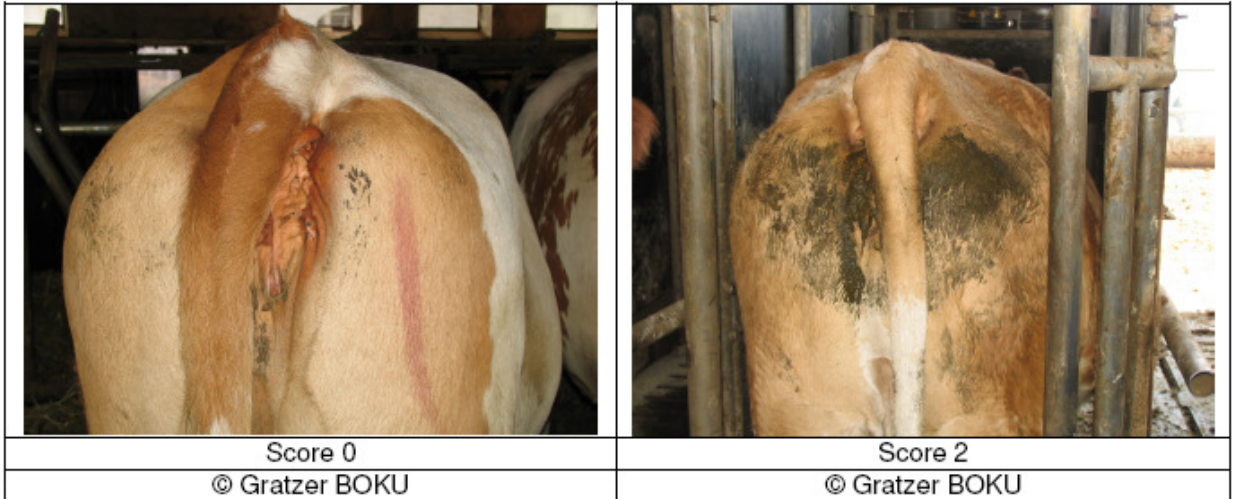


<i>Title</i>	Ocular discharge
<i>Scope</i>	Animal-based measure: Dairy cows
<i>Sample size</i>	Sample size according to § 6.1.5
<i>Method description</i>	<p>This measure applies to all dairy cows (lactating and dry) and to pregnant heifers, if kept together with dairy cows.</p> <p>Ocular discharge is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

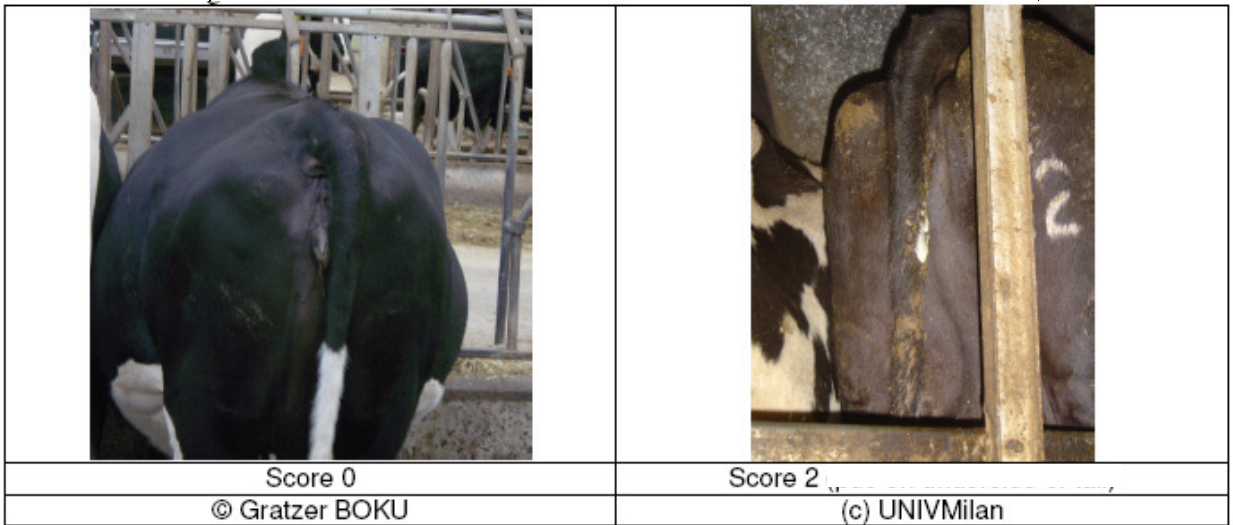
	
Score 0 © BOKU	Score 2 © Leach UNIVBristol

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

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



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



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

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

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

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

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

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

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

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

6.1.4 Appropriate behaviour

6.1.4.1 Expression of social behaviours

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

of the behaviours listed below.

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

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

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

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

6.1.4.2 Expression of other behaviours

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

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

6.1.4.3 Good human–animal relationship

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

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

6.1.4.4 Positive emotional state

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

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

6.1.5 Sampling and practical information

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

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

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

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

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

Selecting dairy cows for assessment

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

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

Herd size	Number of animals to score (suggestion A)	If A is not feasible
30	30	30
40	30	30
50	33	30
60	37	32
70	41	35
80	44	37
90	47	39
100	49	40
110	52	42
120	54	43
130	55	45
140	57	46
150	59	47
160	60	48
170	62	48
180	63	49
190	64	50
200	65	51
210	66	51
220	67	52
230	68	52
240	69	53
250	70	53
260	70	54

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

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

6.2 Calculation of scores for dairy cows on farm

6.2.1 Criterion-scores

6.2.1.1 Absence of prolonged hunger

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

Let $I = 100 - \%$ of very lean cows,

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

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

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

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

knot	80
a when $I < \text{knot}$	0
a when $I > \text{knot}$	-2961.3146422677
b when $I < \text{knot}$	0.2216596254
b when $I > \text{knot}$	111.2709595652
c when $I < \text{knot}$	-0.0027707453
c when $I > \text{knot}$	-1.3908870043
d when $I < \text{knot}$	0.0000592709
d when $I > \text{knot}$	0.0058430887

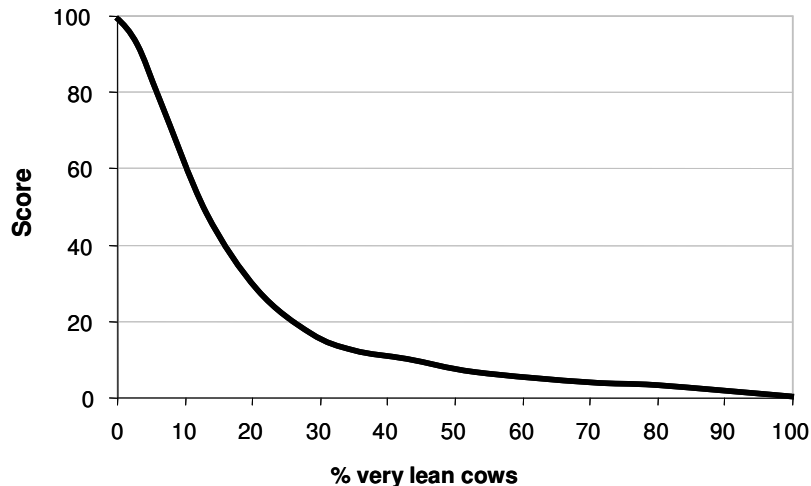


Figure 18 Calculation of the score for absence of prolonged hunger according to the percentage of very lean cows in the herd.

6.2.1.2 Absence of prolonged thirst

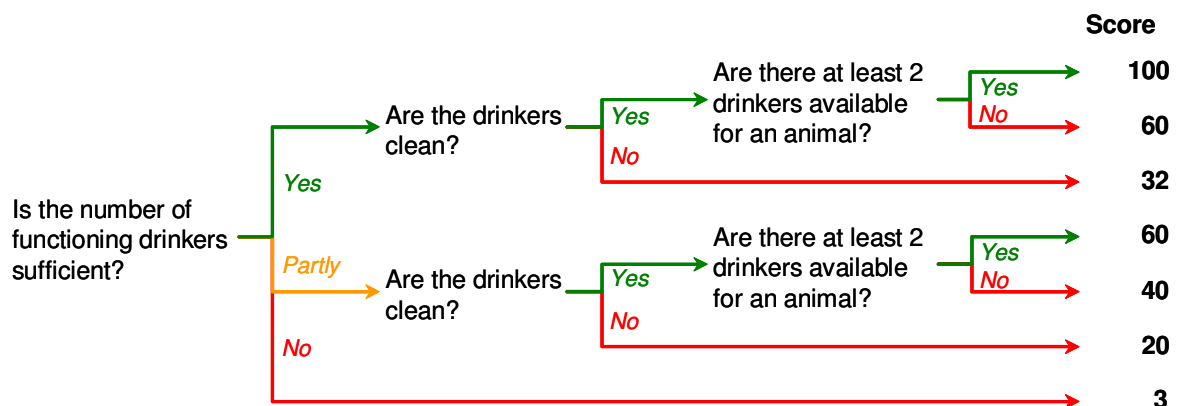
For each group of animals three aspects are considered:

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

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

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

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



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

6.2.1.3 Comfort around resting

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

Table 14 Limits between welfare categories on each measure.

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

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

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

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

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

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

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

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

Let I be the index for the comfort around resting:

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

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

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

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

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

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

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

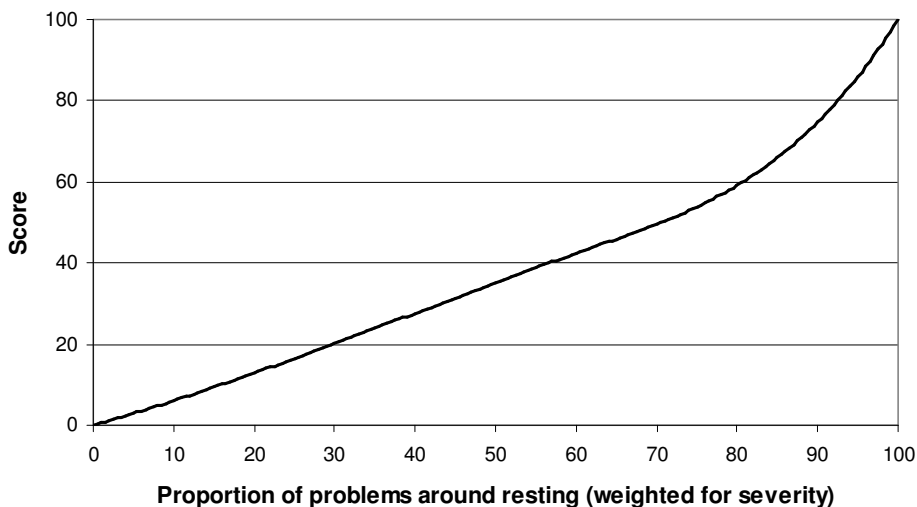


Figure 19 Calculation of the score for comfort around resting according to the number of moderate and serious problems on behaviour around resting and cleanliness of the cows (weights: 0.44 for moderate problems and 1 for serious problems..)

6.2.1.4.1 Thermal comfort

As yet this criterion is not assessed for dairy cows.

6.2.1.5 Ease of movement

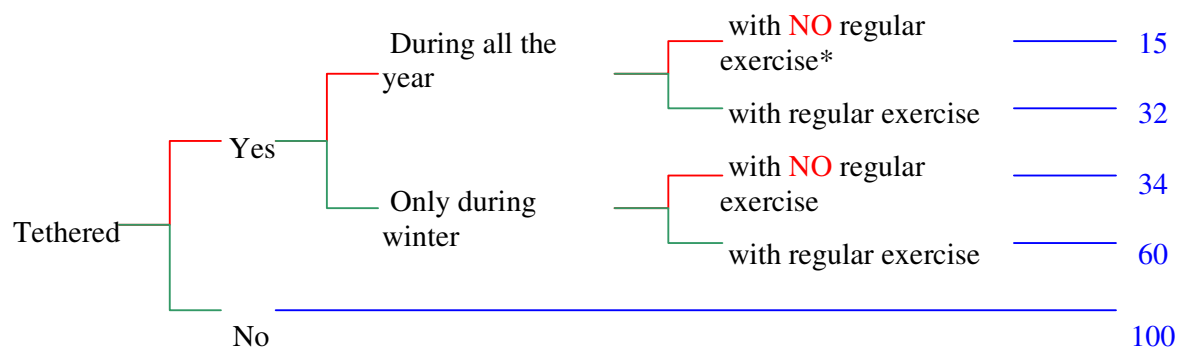
The score for ease of movement is attributed according to the number of days per year and hours per day cows are able to move freely (i.e. not tethered).

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

At year level a cow is considered:

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

The following scores are attributed to each of these possibilities:



6.2.1.6 Absence of injuries

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

Partial score for integument alterations

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

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

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

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

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

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

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

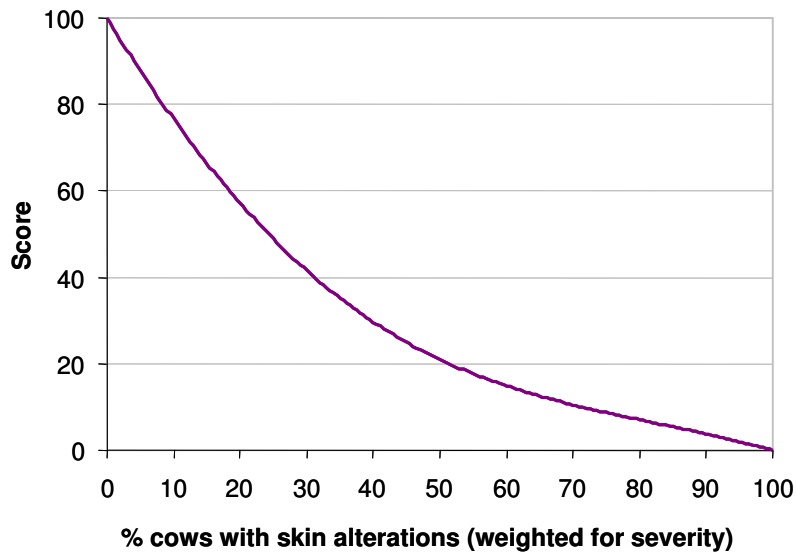


Figure 20 Calculation of the partial score for integument alterations according to the % animals affected by mild alterations and % animals affected by severe ones (weights: 0.2 for mild and 1 for severe alterations).

Partial score for lameness

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

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

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

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

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

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

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

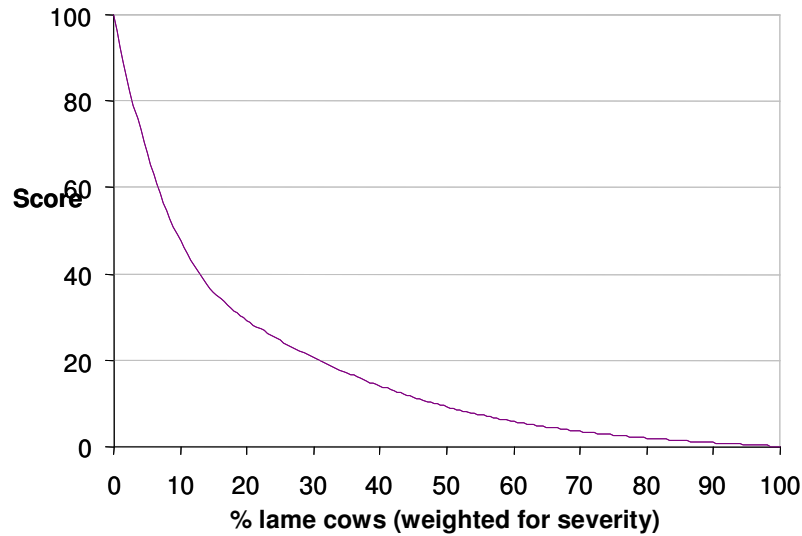


Figure 21 Calculation of the partial score for lameness according to the % animals moderately lame and the % animals severely lame (weights: 0.29 for moderate and 1 for severe lameness).

Score for absence of injuries

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

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

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

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

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

6.2.1.7 Absence of disease

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

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

Table 16 Warning and alarm thresholds for each symptom.

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

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

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

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

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

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

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

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

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

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

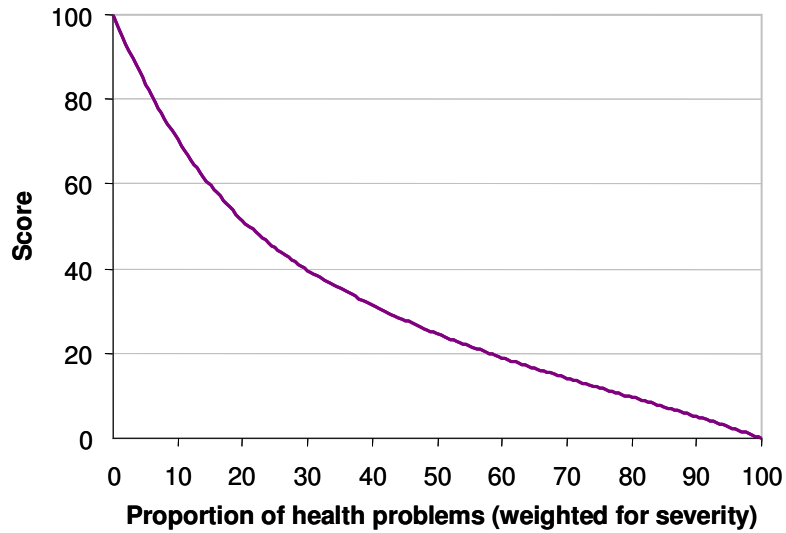


Figure 22 Calculation of scores for absence of diseases according to the proportion of symptoms for which incidence is above warning or alarm thresholds (weights: 0.33 for warning and 1 for alarm).

6.2.1.8 Absence of pain induced by management procedures

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

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

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

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

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

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

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

6.2.1.9 Expression of social behaviours

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

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

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

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

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

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

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

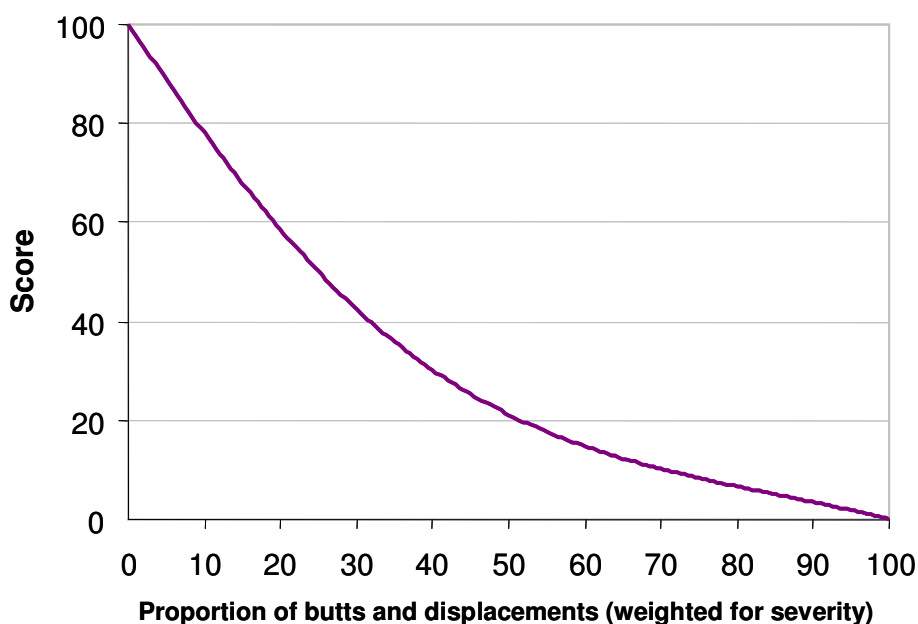


Figure 25 Calculation of scores for the expression of social behaviour according to the frequency of head butts and displacements (weight: 0.36 for butts and 1 for displacements) and in comparison to an extreme situation with 1.6 butts and 3.4 displacements.

6.2.1.10 Expression of other behaviours

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

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

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

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

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

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

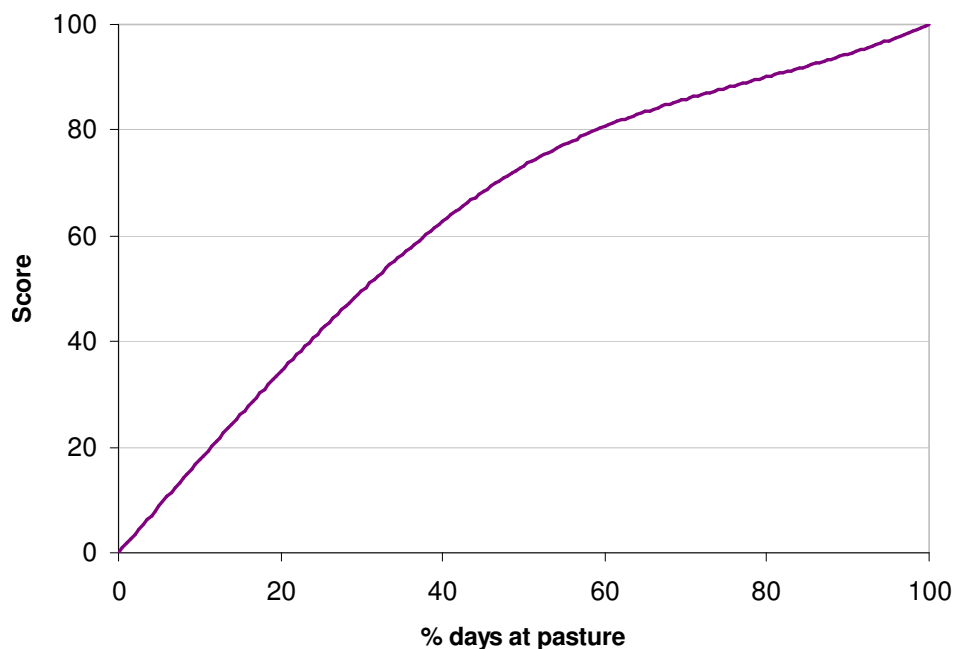


Figure 26 Calculation of scores for the expression of other behaviours according to the proportion of days per year spent at pasture.

6.2.1.11 Good human-animal relationship

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

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

- 26 for animals that cannot be approached as closely as 100 cm (AD > 100).

This sum is computed into an index that varies from 0 (worst situation) to 100 (best situation):

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

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

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

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

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

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

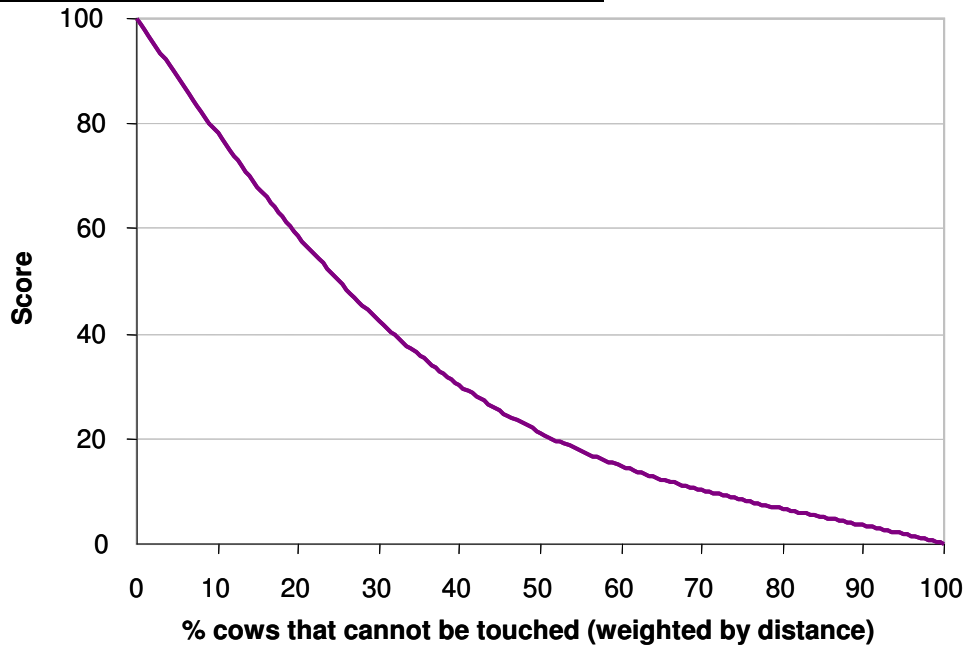


Figure 27 Calculation of scores for good human-animal relationship according to the proportion of animals that cannot be touched (weight: 0.12, 0.42 and 1 for animals with approach distances less than 50 cm, less than 100 cm, or more than 100 cm)

6.2.1.12 Positive emotional state

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

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

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

The weights of the various terms in this sum are:

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

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

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

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

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

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

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

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

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

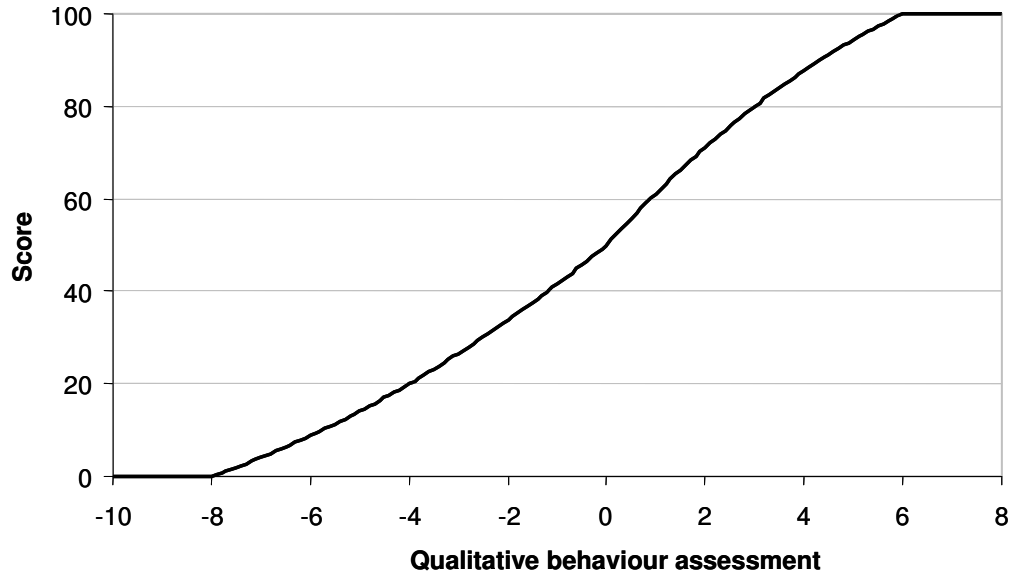


Figure 28 Calculation of scores for positive emotional state according to the values the farm obtained for the various terms used in qualitative Behaviour Assessment (combined in a weighted sum).

6.2.2 Principle scores

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

Principle Good feeding

μ_1	μ_2
0.12	0.27

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

Principle Good housing

μ_3	μ_4	μ_5
0.15	0.11	0.12

μ_{34}	μ_{35}	μ_{45}
0.34	0.43	0.37

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

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

Principle Good health

μ_6	μ_7	μ_8
0.11	0.24	0.13

μ_{67}	μ_{68}	μ_{78}
0.42	0.24	0.24

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

Principle Appropriate behaviour

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

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

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

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

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

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

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

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

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

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

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

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

6.2.3 Overall assessment

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

6.3 Collection of data for dairy cows at slaughterhouse

As yet, this is not included in the protocol.

6.4 Calculation of scores for dairy cows at slaughterhouse

As yet, this is not included in the protocol.

Annex A: Guidelines for visit to the animal unit

Fattening cattle

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

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

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

Dairy

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

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

Calves

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

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

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

Annex B: Recording sheets (RS)

B1. Recording Sheets for fattening cattle on farm

Audit Protocol Instruction: Fattening cattle on farm

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

1) Avoidance distance at the feeding place

Avoidance distance at the feeding place

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

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

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

2) Qualitative Behaviour Assessment

Visual Analogue Scale VAS for Qualitative Behaviour Assessment in Fattening cattle

NAME: _____

Date: _____

Time of day: _____

Farm: _____

Housing unit: _____

No. of animals in unit: _____

Breed: _____

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

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

Active Min. _____ Max.

Relaxed Min. _____ Max.

Fearful Min. _____ Max.

Agitated Min. _____ Max.

Calm Min. _____ Max.

Content Min. _____ Max.

Indifferent Min. _____ Max.

Frustrated Min. _____ Max.

Friendly Min. _____ Max.

Bored Min. _____ Max.

Playful Min. _____ Max.

Page:

Assessor:

Date:

Farm:

Page: _____

Assessor: _____

Date: _____

Farm: _____

Positively occupied Min. _____ Max. _____

Lively Min. _____ Max. _____

Inquisitive Min. _____ Max. _____

Irritable Min. _____ Max. _____

Calmless/
Uneasy Min. _____ Max. _____

Sociable Min. _____ Max. _____

Apathetic Min. _____ Max. _____

Happy Min. _____ Max. _____

Distressed Min. _____ Max. _____

General comments or observations:

3) Behavioural observations

Time needed for lying down

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

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

Observation of social behaviour (agonistic/cohesive)/coughing

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

Observation of social behaviour (agonistic/cohesive)/coughing

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

4) Clinical scoring

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

1: n = not visible

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

5) Resources checklist

Farm-ID: Date: Assessor:

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

6) Management questionnaire

Farm: _____

Date: _____ Assessor: _____

Management questionnaire – fattening cattle

Tick NA if question not appropriate to housing system

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

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

B2. Recording Sheets for fattening cattle at slaughter

Not included within the protocol at the moment.

B3. Recording Sheets for dairy cattle on farm

Audit Protocol Instruction: Dairy cattle on farm

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

1) Avoidance distance at the feeding place

Avoidance distance at the feeding place

group/pen	collar no.	ear tag no.	test 1	test 2 (retest)	remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

Page: _____

Observer: _____

Date: _____

Farm: _____

2) Qualitative Behaviour Assessment

Visual Analogue Scale VAS for Qualitative Behaviour Assessment in Dairy cattle

Page:

NAME: _____

Date: _____

Time of day: _____

Farm: _____

Housing unit: _____

No. of animals in unit: _____

Breed: _____

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

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

Active Min. _____ Max.

Relaxed Min. _____ Max.

Fearful Min. _____ Max.

Agitated Min. _____ Max.

Calm Min. _____ Max.

Content Min. _____ Max.

Indifferent Min. _____ Max.

Frustrated Min. _____ Max.

Friendly Min. _____ Max.

Bored Min. _____ Max.

Playful Min. _____ Max.

Assessor:

Date:

Farm:

3) Behaviour observations

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

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

PAGE

OBSERVER:

DATE:

FARMER:

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

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

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

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

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

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

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

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

4) Clinical scoring

Loose housed dairy cattle

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

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

Dairy cattle in tie stalls

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

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

5) Resources checklist

Loose housed dairy cattle

Farm-ID: Date: Assessor:

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

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

Dairy cattle in tie stalls:

Farm-ID: Date: Assessor:

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

6) Management questionnaire

Farm: _____ Date: _____ Assessor: _____

Management questionnaire – dairy cattle

Tick NA if question not appropriate to housing system

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

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

B4. Recording Sheet for dairy cattle at slaughter

Not included within the protocol at the moment

B5. Recording Sheets for veal calves on farm

Not included within the protocol at the moment

B6. Recording Sheets for veal calves at slaughter

Post mortem observation: Abomasum

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

No.	Pyloric area			Torus pylorus
	lesion present ¹	Lesion size		lesion present ¹
		1*	2*	3*
1				
2				
3				
4				
5				
6				
7				
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No.	Pyloric area			Torus pylorus
	lesion present ¹	Lesion size		lesion present ¹
		1*	2*	3*
31				
32				
33				
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¹: indicate presence (1) or absence (0)
 *: indicate the number of lesions as 0, 1, 2, 3 or 4 (=4 and more)

Post mortem observation: Lungs

No. calf	No.	pneumonia ²			pleuritis present ¹
		none 0	minimum 1	mild 2	
	1				
	2				
	3				
	4				
	5				
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	32				

		pneumonia ²				pleuritis
No. calf	No.	none 0	minimum 1	mild 2	severe 3	present ¹
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
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No. calf	No.	pneumonia ²				pleuritis
		none 0	minimum 1	mild 2	severe 3	present ¹
	67					
	68					
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	71					
	72					
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	75					
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	99					
	100					

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

²: tick the corresponding box

Annex C: Contributors to Welfare Quality®

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

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Colophon

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