



*Sveriges lantbruksuniversitet*

Fakulteten för veterinärmedicin och husdjursvetenskap

Institutionen för husdjurens miljö och hälsa

# A comparison of two certification schemes for dairy cow welfare in relation to resource-based, management-based and animal-based measures

Niclas Högberg

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A comparison of two certification schemes for  
dairy cow welfare in relation to resource-based,  
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En jämförelse av två certifieringsprogram för välfärd hos  
mjölkcor gällande användandet av resursbaserade,  
skötselbaserade och djurbaserade välfärdsåått

Niclas Högborg

*Handledare: Linda Keeling, Institutionen för husdjurens miljö och hälsa*

*Examinator: Bo Algers, Institutionen för husdjurens miljö och hälsa*

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## ABSTRACT

Traditionally risk-based measures have been used to assess animal welfare in legislation and certification schemes. With increased knowledge and research, debate today tends to focus on and advocate the use of animal-based measures. However this is not a panacea for welfare and the most sound conclusion should be that assessment of animal welfare needs both. The aim of this thesis is to identify the points that need to be taken into consideration to find the optimal balance in the use of input and outcome measures according to the aim of the assessment and how these should be applied when designing a certification scheme? To answer this, a comparison of the use of resource-based, management-based and animal-based measures in two certification schemes for dairy cow welfare, Freedom Food (UK) and Svenskt Sigill (SWE), was made. To enable the comparison, six general categories regarding welfare were defined (feed, water, health, environment, management and behaviour) and assessment points of the two schemes divided accordingly. Both schemes predominantly use input measures with the exception of a slightly more balanced use of input measures and outcome measures regarding both behaviour and health. There was a tendency of animal-based measures being non-specific, thereby not being valid or reliable.

The conclusion drawn from this thesis is that there are too many parameters that might differ between different certification schemes, e.g. number of assessment visits and assessment time, budget, etc., and therefore a statement of a general approach cannot be made. Instead I describe a number of key points that are important to consider when choosing between and balancing the use of risk-based and animal-based measures: 1) Risk-factors known for impairing welfare should not be allowed. 2) The difficulty to modify some resources, especially those regarding housing, needs to be taken into account. Therefore the use of prior approval is recommended. 3) How long it takes for a change in a risk-based measure to affect the animal-based measure is important, e.g. breeding versus amount of bedding. 4) When the predictive value, i.e. the correlation, to a risk-based measure is high it can replace the animal-based measure. 5) Animal-based measures used must be valid, repeatable and feasible. 6) To consider the use of automated assessment of animal-based measures to make them feasible. 7) That animal-based measures are necessary for benchmarking and the implementation of threshold levels.



## SAMMANFATTNING

Traditionellt har riskbaserade mått använts för att bedöma djurvelfärd i lagstiftning och certifieringssystem. Med en ökad kunskap och forskning så tenderar diskussionen idag att fokusera och förespråka användandet av djurbaserade välfärdsått. Detta är dock inte en universallösning för djurvelfärd, utan den mest sunda slutsatsen borde vara att bedömning av djurvelfärd behöver båda. Målet med detta examensarbete är att identifiera de frågor som måste beaktas för att finna den optimala balansen mellan användandet av riskbaserade och djurbaserade mått för målet med bedömningen. Om detta är möjligt, hur ska detta tillämpas när man utformar ett certifieringsprogram? För att svara på detta gjordes en jämförelse mellan två certifieringsprogram för välfärd hos mjölkkor, Freedom Food (UK) och Svenskt Sigill (SE), gällande användningen av resursbaserade, managementbaserade och djurbaserade mått. För att möjliggöra jämförelsen definierades sex generella kategorier gällande djurvelfärd (foder, vatten, hälsa, miljö, management och beteende) och kontrollpunkterna för de två programmen delades in därefter. Båda programmen använder sig främst av resursbaserade och managementbaserade mått med undantaget av en något mer balanserad användning gällande hälsa och beteende. En tendens som noterades var att djurbaserade mått som användes var ospecifika och därigenom ej pålitliga och användbara.

Slutsatsen från detta examensarbete är att det finns för många parametrar som kan variera mellan olika certifieringsprogram, som antalet besök och besökstiden, budget med mera, och att det därför inte går att uttala sig om ett generellt tillvägagångssätt för att konstruera ett certifieringsprogram. Istället beskriver jag ett antal nyckelfrågor som är viktiga att betrakta när man väljer mellan och balanserar användandet av riskbaserade och djurbaserade mått: 1) Riskfaktorer kända för att försämra välfärden ska inte vara tillåtna. 2) svårigheten att modifiera vissa resurser, speciellt de relaterade till inhysning, måste beaktas. Därför rekommenderas användandet av förprovning. 3) Hur lång tid det tar för en förändring av ett riskbaserat mått att påverka det djurbaserade måttet, till exempel avelstrategi kontra strömmängd. 4) När det predektiva värdet, korrelationen, mellan ett riskbaserat mått är högt så kan det ersätta det djurbaserade måttet. 5) Djurbaserade mått måste vara gilliga, repeterbara och genomförbara. 6) Att överväga användandet av automatiska bedömningssystem gällande djurbaserade mått för att göra dem genomförbara. 7) Djurbaserade mått är nödvändiga för benchmarking och införandet av tröskelvärden.

## **INTRODUCTION**

Traditionally assessment of animal welfare, for example legislation and certification schemes, has been focused on resource-based measures, e.g. space allowance, and management-based measures, e.g. how often cows are milked. Lately researchers have tended to be more focused on animal-based measures, i.e. the actual state of an animal, e.g. lameness. With this new knowledge there is a need to optimize the balance in the use of these in the assessment of welfare, using the knowledge from both fields.

### **Purpose**

The intention with this thesis is to make a comparison of two certification schemes for dairy cows, Svenskt Sigill (SS) and Freedom Food (FF), in regards of the different types of measures that are proposed to be used. How are the schemes designed and are they based on valid research?

The aim is to try to identify the points that need to be taken into consideration to find the optimal balance between the use of input and outcome measures according to the aim of the assessment scheme and how they should be applied when designing a certification scheme?

### **Limitation**

As the thesis is based on a comparison of two certification schemes developed in two different countries and as it is required for farmers in both schemes to follow the legislations of each country no further assessment of the animal welfare legislation will be undertaken unless considered necessary.

## BACKGROUND

The concept of animal welfare is not new and can be traced back to farmers' concern for their animals, though the research field regarding farm animal welfare and animal welfare as a scientific discipline, is often dated back to the mid 1960's and the Brambell report (Appleby et al., 2011). Today a lot of research is carried out regarding the different types of welfare assessment, resource-based, management-based and animal-based measures. With this comes the concern of how to implement and incorporate the different measures in for example legislation and welfare assurance schemes.

### Animal welfare

Animal welfare is not a new concern, animal owners, farmers and veterinarians have had concerns about their animal health during all times and tried to guarantee their health and nutritional needs. Good welfare was mainly defined as absence of pain, disease and injury as well as treatment of this (Appleby et al., 2011).

The field of research that has become known as *animal welfare science* originated from the public's concern about intensive farming and the increased use of laboratory animals. One of the first debate entries regarding this was the publication of *Animal Machines* by Ruth Harrison (1964). It described many of the changes in agriculture that had occurred during the last decades and introduced the term *Factory Farm* (Appleby et al., 2011). In response to the growing public concern the *Brambell committee* (1965) was established by the British Government. Unlike before, they not only focused on health but also raised the attention of the behavioural aspects of welfare. As a result of this many scientist started to focus more on behavioural problems which by tradition was not a topic in traditional veterinary science and animal science education (Rushen et al., 2007, p.1-11).

In 1979 the Farm Animal Welfare Council (FAWC) was established by the British Government. One of the members started to list the provisions that should be made for farm animals in five categories, which also became known as the Five Freedoms: Freedom from Hunger and Thirst, Freedom from Discomfort, Freedom from Pain, Injury or Disease, Freedom to Express Normal Behaviour, Freedom from Fear and Distress. (Council, 1979).

Broom (1986) defined animal welfare as "The welfare of an individual is its state as regards to its attempts to cope with its environment", thus if it is coping easily, coping only with help or not coping. Duncan (1993) means that "Welfare depends on how the animal feels".

The World Organisation of Animal Health (OIE) (2012) defines animal welfare as how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear, and distress. Good animal welfare requires disease prevention and appropriate veterinary treatment, shelter, management and nutrition, humane handling and humane slaughter or killing. Animal welfare refers to the state of the animal; the treatment that an animal receives is covered by other terms such as animal care, animal husbandry, and humane treatment.

### Animal welfare measures

The factors affecting the welfare of an animal are their environment and the resources available, so-called resource-based measurements, and the management routine on the farm, so-called management-based measures. Depending on the characteristics of the animal it will respond to these inputs and the animals response can then be assessed using animal-based measures (EFSA, 2012b).

## **Resource-based and management-based measures**

Examples of resource-based parameters are space allocation, housing facilities and bedding material. Management-based parameters include how often cows are milked, whether or not anaesthetics and analgesics are used in mutilations, breeding strategies etc. (EFSA, 2012b). They may also be referred to as risk-based measures or input-based measures (Algers and Smulders, 2009, p.371-387). These factors can of course sometimes interact, thus influencing the way they act on the animal (EFSA, 2012b). As both resources and management are potential risks for impairing the welfare of animals, I will refer to assessment of these as risk-based measurements.

In Risk Assessment these are described as a hazard, a factor that may impair the welfare of an animal. The European Food Safety Authority (EFSA) defines Risk Assessment as a method to consider different type of factors or risks an animal are exposed to, e.g. housing, nutrition, and management. It provides a basis for appropriate risk analysis, i.e. the assessment, communication and management to reduce, eliminate or prevent the risks that can lead to poor welfare (EFSA, 2012c).

In welfare legislation, resource-based and management-based measures have traditionally been used (EFSA, 2012d), even though they do not guarantee that an animal is healthy and has a high welfare standard. They are appealing though because they tend to be constant and can be measured objectively (Whay et al., 2003).

## **Animal-based measures**

EFSA (2012d) defines animal-based measures, or outcome-based measures, as a response of an animal or an effect on the animal. The response or effect can be measured directly from the animal or indirectly, e.g. from animal records. The intention of the measures may be to assess the degree of impaired functioning associated with injury, disease and malnutrition, to provide information on the animals' needs and affective states, such as hunger, pain and fear, or to assess the physiological, behavioural and immunological changes or effects in response to various challenges.

Important when choosing an animal-based measure is that it has to be fit for the intended purpose, i.e. it needs to be valid (accurate and precise), repeatable (reliable, reproducible and robust) and feasible (practical, economic etc.) (EFSA, 2012d, Main et al., 2007). It is also of importance that the repeatability of a measurement is maximised, for example when used in a certification scheme, by initial training of the assessor (until a minimum is achieved) and then at regular intervals (e.g. annual) (Main et al., 2007).

When data from individual animals are aggregated into herd level and expressed using summary measurements, e.g. proportion or means, and interpreted as predefined threshold levels it is essential that the sample is unbiased and representative in terms of influencing characteristics, e.g. stage of lactation (EFSA, 2012d). The use of animal-based parameters in animal welfare assessments opens for the possibility of using benchmarking for analysing an individual farms' performance by comparison with their peers and thereby identify its strengths and weaknesses (Main et al., 2007). It must be noted that benchmarking only compares a farm to its peers and this will not say anything about the welfare per se.

The Welfare Quality® was a project funded by the European Union with the main objective to develop an integrated, standardised welfare assessment system for cattle, pigs and poultry from farm to slaughter.

Fig 1: The logo of Welfare Quality<sup>®</sup> (WelfareQuality<sup>®</sup>, 2013a).

They defined four animal welfare principles, good housing, good feeding, good health and appropriate behaviour. The assessment schemes emphasises on the use of animal-based measures (WelfareQuality<sup>®</sup>, 2009a)



Fig 2: the welfare principles and criteria's according to the Welfare Quality<sup>®</sup> (2009a).

## Integration of concepts

As mentioned, the factors that affect the welfare of an animal include their physical environment and resources available, resource-based measures, and the management practices of the farm, the management-based measures. These factors can obviously interact and thus influence the way they act on the animal. Depending on its characteristics (breed, sex, age, etc.) the animal will respond to these inputs and the animal's response can be assessed by animal-based measures.

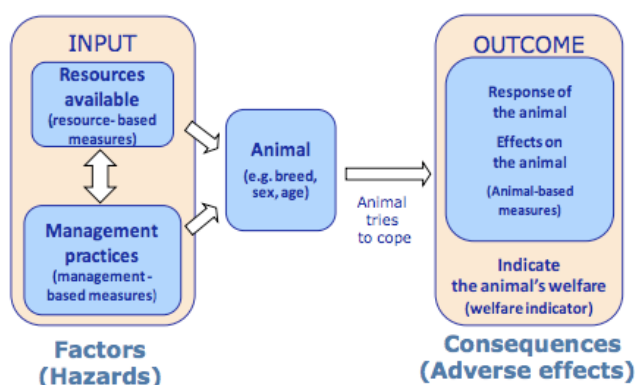


Fig 3: An overview of the integration of concepts (EFSA, 2012b).

## ***The view on resource-based, management-based and animal-based measures***

A common opinion today is that to assess animal welfare you need both risk-based measures and animal-based measures, with differences in when and how to utilise them.

EFSA states that in order to ensure good animal welfare, both reduction of risk, i.e. resource-based and management-based measures, and the assessment of welfare, i.e. animal-based measures, are needed. Furthermore they state that there is a need to consider how to share and combine data when both risk-based and animal-based measures are used (EFSA, 2012b).

The Welfare Quality® project emphasized on animal-based measures, as mentioned earlier, because the welfare of an animal depends on how it experiences the situation. However, relevant resource-based and management-based measures are included (WelfareQuality®, 2009a). They state that their focus on animal-based measures does not mean that it should be the only focus, hence if a specific design characteristics or management procedure is known to impair the welfare it should be prohibited (WelfareQuality®, 2013b).

The Official Report of the Swedish Government (SOU) for a new animal welfare legislation states that to achieve a good animal welfare you need to assess both the animal itself and its environment, i.e. use resource-based, management-based and animal-based measures. It states that a system using animal-based measures cannot replace a risk based system. The intention is to prevent welfare problems before they arise, i.e. to know how to keep and manage animals to achieve a good welfare. Further on the commissioner states that legible provision for space allowance etc. is needed at for example new constructions of stables. Systems using animal-based measures have the potential to increase the welfare, compared to the minimum levels in the legislation, if they are used as a complement. The commissioner also states that they can be used for self-monitoring by farmers, in animal protection controls and risk assessment of farms.

The FAWC (1979) have recommended that animal-based measures should be incorporated into certification schemes because they focus directly on the animals rather than indirectly on the factors that influence the welfare of animals.

## **The balance between resource-based, management-based and animal-based measures**

Assessment of animal welfare, e.g. farm assurance schemes and legislations, mostly focused on resource-based and management-based measures rather than animal-based measures, the welfare state of the animal (Main et al., 2001, SOU 2011:75). There has been an opinion that it is easier to manage a system based on “objective” observations of aspects of provision, i.e. management, resources and records, rather than one based on more “subjective” assessment of the outcome, i.e. animal-based measures (Main et al., 2001). This opinion is at the moment changing and more animal-based measures are now incorporated into assurance schemes and legislation (WelfareQuality®, 2009b, SOU 2011:75). There is some concern that scientist today tends to focus too much on animal-based measures (Bracke, 2007, Algers and Smulders, 2009, p.392). Bracke (2007) means that the use of animal-based measures is not a panacea for on-farm monitoring of animal welfare and means that a consequence can be that systems that generally considered to be poor welfare systems may generate a unacceptably high welfare score. Instead he advocates the use of the most reliable sources for information to formally derive the best possible assessment. A crucial step for this is to reconcile the predicted and measured value in an overall assessment and evaluate the reliability and availability of all parameters.

This raises the question of how to find the optimal balance of the use of resource-based and management-based measures, i.e. risk-based measures, on the one hand and animal-based measures on the other. For example Rushen and de Passillé (Algers and Smulders, 2009, p.396) argue that a potential advantage of well-chosen risk-based measures is that these should prevent welfare problems from occurring. With this in mind there is not always a correlation between risk-based measures chosen to improve welfare and the outcome of these. Main *et al.* (2003b) showed that some risk-based measures, e.g. the use of analgesia, are supported by the result of the animal-based measure in that indicators of pain are apparent when they are not used, while others, e.g. housing systems, are not, in that they are complex because of many factors affecting the outcome, and therefore the outcome could not be predicted. From this example a practical problem with the use of animal-based measures can be seen. For example, the measurement of pain is complex and requires either sophisticated behavioural analyses or samples for physiological analysis, and it is unlikely that they could be used during a routine inspection on a farm (Algers and Smulders, 2009, p.397).

Main (2007) means that animal-based measures should not replace valid resource-based measures, e.g. constructing a measure to assess thirst instead of the more obvious method of assessing water the availability of water. But this resource-based measures of availability of water does not take into account the less competitive animals that will have a risk of not getting a sufficient amount of water even if it is apparently available to them (EFSA, 2012b). However, if there is a strong evidence that a specific resource-based or management-based measure has a negative effect on the welfare it would be appropriate to consider the removal of that factor, as prevention is better than treatment (EFSA, 2012d).

An important aspect to consider is how long it takes for a change in a resource-based or management-based measure to have effect on the animal-based measure, i.e. the welfare state of the animal. This will differ considerably between for example a problem with water supply, where the animal will experience thirst rather quickly, and poor flooring, where the outcome of foot problems will be seen much later comparatively. Likewise, some changes in management to improve welfare can be achieved rapidly in a period of hours or days, but others may take weeks or months, where changes in buildings and genetic selection may take many years. Foot problems might be resolved by removing sharp stones from a pathway or may require flooring modifications so that animals do not slip or a change of cubicle design so that animals do not have to stand in a wet passageway. Sometimes changes can only be achieved over a much longer period of time, e.g. through genetic selection, i.e. selecting cows for improved hoof-horn quality and resistance to lameness (EFSA, 2012d).

The usage of animal-based measures is also limited by the economic aspects, as there is always a pressure to reduce costs by limiting the number of indicators used, the duration and frequency of visits, and the number of animals observed (Algers and Smulders, 2009, p.397).

Rushen and de Passillé (Algers and Smulders, 2009, p.399) argue that, giving the pros and cons for both risk-based and animal-based measures, the most sound conclusion is that assessment of animal welfare needs both. Even though there is a common agreement that both risk-based and animal-based measures are needed it is not yet clear when to choose which when for example designing a certification scheme.

## **Prior approval**

Prior approval is used in Swedish Legislation and means that the authority beforehand reviews if a stable will be built according to the animal welfare legislations. The authority reviews the blueprint regarding measurements, flooring, laying surfaces and resources. In addition technical systems important for the animal protection, e.g. slurry systems, feeding systems, water, ventilation systems, are reviewed. The authority then decides about a prior approval. After construction the building is

inspected to see if the prior approval has been followed. If inaccuracies are found corrections are required before the stable can be used. The reason for why prior approval is used is that the health is strongly dependent of their environment, it becomes essential for the protection of animals that housing systems are designed with a clear consideration for aspects regarding animal protection (SOU 2011:75).

### **Certification schemes**

The aim of voluntary certification schemes is usually to assure the achievement of a certain welfare standard of the animals, but may sometimes also have a goal of improving welfare. There has been an increase these schemes in many countries and the membership is often associated with a marketing claim. They often include basic requirements, such as compliance with welfare legislation, but there are often additional welfare standards that need to be assessed. There is a large degree of interrelationship between certification and legislative systems regarding the applications of on-farm welfare assessment (Main et al., 2003a). In the SOU for a new animal welfare legislation in Sweden, the commissioner mentions the possibility of incorporating industry-driven certification schemes into the public control.

The level of standards set by the certification scheme must, of course, as a minimum include all legislations regarding the stated objectives. With the public appeal for a “high-welfare” there is a need for welfare certification schemes to be perceived as increasing the minimal standards. Therefore a scheme designed to allow any farmer to enter is not likely to impress customers attracted by “high-welfare”. On the other hand too high standards would alienate farmers. To be able to deliver an assurance to the customer there is a demand of compliance from the farmer. They need to fully understand the requirements of the standard. There are also demands on the assessor, to be competent and impartial (Main et al., 2001).

### **Freedom Food**



*Fig 4: Logo of Freedom Food (2013).*

Freedom Food is a farm assurance and food-labelling scheme, developed by the RSPCA, that is focused solely on improving the welfare of farm animals reared for food and covers every stage of a farm animal's life. All farms are inspected once a year by a trained assessor (Freedom Food, 2012)

Dairy production is controlled through the RSPCA welfare standards for dairy cattle (RSPCA, 2012).

### **Svenskt Sigill**



*Fig 5: Logo of Svenskt Sigill (2012).*



Svenskt Sigill is a labelling that helps traders and consumers to choose products that have been produced with concern for the environment and for the animals. The labelling ensures that the production follows the standard IP Sigill. The certification is controlled by an independent part through recurring controls (Svenskt Sigill, 2012).

Dairy production is controlled through IP Sigill Mjölk, a certification scheme including all parts of production, including animal protection. A part of the scheme is Miljöhusensyn (MHS), a self-monitoring tool developed by the Farmers national association in collaboration with the Swedish board of agriculture, for farmers to control that they fulfil Swedish legislation regarding animal protection (Miljöhusensyn, 2012).

## **METHOD**

### **Literature review**

A literature review was made including articles, scientific opinions, i.e. EFSA, and books in the areas of animal welfare, animal welfare measures and certification schemes.

### **Comparison of certification schemes**

Two certification schemes for dairy cows, FF (Freedom Food) and SS (Svenskt Sigill), were compared regarding welfare measurements, i.e. resource-based, measurement-based and animal-based measurements.

As the schemes are designed in different ways a new division was made to be able to compare the two, as seen below. It is also stated why these areas are an important part of welfare assessment and how they may impact the welfare of an animal.

#### ***Feed***

Feed is one of the most basal physiological and behavioural needs of an animal and is therefore one of the most primitive and untiring motivations. An animal can be affected directly from the lack of feed and indirectly when it is unable to carry out behaviours, for example foraging. The behavioural need linked to feed is a complex process that reflects the animals' physiological need to obtain nutrients to maintain good health, reproduction and mental wellbeing (Algers and Smulders, 2009, p.113-131).

Even if the availability of feed is sufficient for survival a low availability can lead to hunger and affect the immune system. In the same way an animal can be affected negatively if the feed is provided in a way that does not fulfil its behavioural needs (Rushen et al., 2007, p.211-228). Webster (Algers and Smulders, 2009) states four criteria necessary to provide a good feed; 1: adequate availability of all essential nutrients, 2: feed with a chemical composition and physical conformation that allows a stable digestion, 3: feed and opportunity of foraging that allows the animal to achieve an oral satisfaction, 4: feed that is free from pollutants. Hence, it is of importance to look at both the physiological and behaviour state of an animal when controlling and reducing risks linked to nutritional status.

#### ***Water***

Thirst is a feeling that arises when dehydrated. Prolonged thirst causes stress and if this becomes protracted or substantial the dehydration can weaken the animal and lead to disease. Thirst can also decrease the feed intake of the animal. Prolonged thirst can emerge when the animal is given water of low quality and if the access is low or if the equipment is insufficient, poorly designed or managed (Algers and Smulders, 2009, p.64). Lactating animals have a great need of water and this will increase

with high temperatures and can increase with disease. If there is no access to water lactating, overheated and diseased animals will be dehydrated faster than other animals (EFSA, 2009).

## **Health**

It is relatively uncontroversial that good health is central to good welfare. Broom (2006) argues that if welfare is the animals attempt to cope with its environment and pathology is one of the effects of environment, then health is a part of welfare. However, a change in an animal's health status is not always connected to an impaired welfare. For example a high somatic cell count may not be a substantial welfare problem when detected, but if steps are not taken it may become so, i.e. developing into a clinical mastitis (EFSA, 2012b). Measures of biological health used by veterinarians and producers generally focus on disease, injury and reproductive problems (Reviewed by von Keyserlingk et al., 2009). These measure have long been recognized as potential indicators of welfare (Reviewed by Rushen et al., 2007, p.15). It is important that there should be a balanced view of the importance of the various components of the welfare of animals. Different scientist may differ in the emphasis of which they place on the importance of health. Ethologists tend to under-emphasise health aspects of welfare and veterinarians tend to under-emphasise behavioural indicators (Broom, 2006).

There are crude measures of health and welfare, e.g. morbidity and mortality, and there are examples of more sensitive early indicators, e.g. gait score (Reviewed by von Keyserlingk et al., 2009). Rushen (2007, p.15) argues that while it may seem obvious that illness or injury affect welfare there are a number of problems in using health measures to assess welfare, e.g. the difficulty in judging the impact on welfare of different sufferings and the difficulty of obtaining reliable and valid information on the occurrence of illness and injury.

There have been different studies trying to grade the impact of illness and injury on welfare. In a study by Main et al (2003c) a group of experts, veterinarians and behaviour experts, was asked to grade the impact on welfare by different health problems. According to the study lameness and discomfort are the most important factors. These results are limited by the experts knowledge and also what they are used to, for example mastitis was valued as less important than lameness, perhaps because many experts consider a high incidence of mastitis to be the norm (Rushen et al., 2007, p.18).

Rushen (2007, p.21-35) lists some of the more common health problems useful for assessing animal welfare. These include: mortality, lameness, mastitis, calving difficulties, illness at calving, bovine respiratory disease, body injuries and gastrointestinal ulcers.

The use of productivity as a method to assess welfare, e.g. milk production, is controversial. Rushen *et al.* (2007, p.38-41) argues that the productivity as an indicator of animal welfare can be useful under some circumstances. For example short-term changes in milk production can be used to assess the animals' response to stressful events. However this does not mean that all variations in milk yield is related to variation in welfare. For example the variation can be affected by welfare-neutral nutritional, genetic and environmental factors.

Decreased reproductive success is sometimes used as a measure of welfare. Many health problems, such as calving difficulties, lameness and metritis, can lead to reproductive failure. Reproductive success may therefore be an indirect measure of these health problems. However, even though decreased reproductive success sometimes can be linked to poor welfare, it cannot be used to assess welfare in practical circumstances. A decreased reproductive success can be due to too many factors that are not related to the welfare state of the animal, for example oestrus detection and insemination strategies (Rushen et al., 2007, p.41-42).

## ***Environment***

The environmental conditions of an animal affect its welfare in several ways, among which housing plays an important role, as animals are subject to their housing environment for the duration of their lives. The reasons for this include: it is difficult and costly to change existing housing conditions, and thus these generally have impact for a long time, and they often set the limitation regarding to the welfare that can be achieved, even when optimising all other factors. Aspects of interest regarding housing include confinement, space allowance, i.e. individual space and social space, enrichment, access to outdoor yards or pasture, structural elements, flooring and bedding, design of equipment and climate (Algers and Smulders, 2009, p.77-99, 142-185, Rushen et al., 2007).

The characteristics of the housing affects the animals chance to perform species-specific behaviour and some features are important to the quality of the animals' life. These include the chance to make choices and decisions, i.e. the controllability regarding the environment. The hygienic state of the environment is also important, for example due to the risk of infectious disease. The management and its interaction with the housing design are of great importance. A good welfare can only be achieved by providing both a hygienic situation and accounting for the animals behavioural needs (Algers and Smulders, 2009, p.82-83).

When comparing housing systems many problems can arise. Different systems succeed or fail because of the details, such in which ways they are managed and specific ways in which they are configured. Housing systems differ in many respects and it can be hard to determine if differences are due to intrinsic aspects or due to factors that can be changed (Rushen et al., 2007, p.143, EFSA, 2012d).

## ***Management***

It is widely recognized that management, supervising and managing animals, affect animal welfare. Together with the opportunity to perform tasks well, stock keepers need a wide range of knowledge to care and manage animals in a good way. Hemsworth and Coleman (Algers and Smulders, 2009, p.133) states that there are three main classes of characteristics that will affect the performance of stock keepers, including, capacity, willingness and opportunity. Capacity includes ability, knowledge, skills, personality etc. Willingness includes motivation, job satisfaction, job status, self-image and attitudes. Whereas opportunity include tools, equipment, materials and supplies, working conditions, organisational policies, time, pay, etc. Together these will all form the performance of the stock person. To improve the management practices, and thereby increase the opportunity of a better animal welfare, selection and training of stockperson are important.

## ***Behaviour***

Behavioural deprivation plays an important role in animal welfare and the risk that farm animals suffer due to the lack of opportunity to perform behaviour that they would normally do is a public concern closely linked to modern husbandry.

The knowledge and observation of animal behaviour can be used to establish both risk-based measures and animal-based measures. Assessment of behaviour can help us identify the types of housing and management that are most likely to affect the welfare. A way to assess alternative housing systems is simply to let the animal choose between them and through this give us information of how to design housing environments that allow the animal to behave in ways that is important to it. The use of behaviour as an animal-based measure can include signs of pain and fear and the occurrence of abnormal behaviour, which can indicate poor welfare (Rushen et al., 2007, p.70-71).

In the welfare principles defined by the Welfare Quality® appropriate behaviour includes four general welfare criteria. These include expression of social behaviours, expression of other behaviour, good human-animal relationship and positive emotional state. Measures relating to these are defined as agonistic behaviours, access to pasture, avoidance distance and qualitative behaviour assessment (Welfare WelfareQuality®, 2009b).

As behaviour is related to several of the other categories described, I will in this part focus on abnormal behaviour.

## Statistical analysis

To examine if the measures used by the certification schemes were evenly distributed regarding resource-based, management-based and animal-based measures a statistical analysis was made. All analysis was performed using Chi-Square tests in Minitab (Minitab 16 Statistical Software (2010). [Computer software]. State College, PA: Minitab, Inc. (www.minitab.com)).

## RESULTS

The usage of risk-based and animal-based measures will be presented for each category; feed, water, health, environment, management and behaviour. Furthermore a table will illustrate the number of resource-based, management based and animal-based and measurements used in each category. The original tables upon which the text and this information is based are included in the appendices.

### Feed

*Table 1. Number of assessments used to assess feed based on assessment type*

Assessment type	Times used in certification scheme	
	Freedom Food	Svenskt Sigill
Resource-based measures	12	11
Management-based measures	7	6
Animal-based measures	5	3

There was no significant difference in the use of resource-based management-based and animal-based measures in the Freedom Food or the Svenskt Sigill certification schemes Chi-Sq = 0,259; DF = 2; P-Value = 0,879.

### Design

Freedom foods uses resource-based measures for trough lengths and requires that they are designed and placed in a hygienic way. Svenskt Sigill doesn't have any specific requirements for this parameters, instead they control it through the keepers Miljöhusen.

FF requires that the set-up is managed in a hygienically way.

Animal-based measures include FF requiring the trough lengths so that animals don't need to compete for food and SS requiring animals to eat in a natural and calm way.

### Feed

FF requires daily access to feed, does not allow protein from mammals or birds and that animals are fed a wholesome diet that contains fibre for rumination. SS requires approved feed manufacturers, the feed to be nutritionally and physiologically composed, 50 % of the feed to be roughage, and does not

allow any animal fat or protein. They also have requirements for by-products from food industries, that the feed should be of hygienic standard, not be mouldy and be protected from chemicals and weather.

Management-based measures used by the FF include control practices for poisonous plants and unsuitable feedstuffs and producers to be in place to prevent introduction and spread of disease through contamination of feeds. They also require the manager to know about and attend to mineral shortage at pasture. SS requires analysis of salmonella and aflatoxin and analysis and recording of roughage

Animal-based measures include FF requiring a healthy body condition score (BCS), in regard to the feed animals should be healthy, and that animals should be ruminating. SS require a normal BCS and good health in relation to feed

### **Management**

Resource-based measures used by FF include the requirement of a general nutrition plan and a specific plan for undernourished and fat animals.

Management-based parameters include reviewing plans twice yearly, recording feedstuffs, planning for changes in BCS and avoiding sudden changes of feed. SS only require recordings of feed.

### **Water**

*Table 3. Number of assessments used to assess water based on assessment type*

Assessment type	Times used in certification scheme	
	Freedom Food	Svenskt Sigill
Resource-based measures	9	4
Management-based measures	1	2
Animal-based measures	0	2

A Chi-square analysis on this table was not possible because the expected values in some of the squares are less than 5. However it is clear that in FF in particular the majority of the measures are resource-based.

### **Design**

Resource-based measures used by FF include trough length, number of drinking bowls, hygiene and that water troughs should not result in wetting/fouling of bedded areas and if possible be accessed from concrete. SS only requires an up-to-date Miljöhusensyn and troughs to be designed hygienically.

Both schemes use management-based measures including regular cleaning and inspection of troughs.

Animal-based measures include SS requiring that animals can drink in a natural and calm way.

## **Water**

Resource-based measures used by FF include continuous access, a flow rate allowing 10 % of the herd to drink at any one time, provision for emergency supply and that provision is made if a natural source is used. SS requires that all animals have access to water at least twice daily.

Animal-based measures used by FF cover that 10 % of the animals could drink at any one time whereas SS cover animals becoming ill from bad water.

## **Health**

*Table 5. Number of assessments used to health feed based on assessment type*

Assessment type	Times used in certification scheme	
	Freedom Food	Svenskt Sigill
Resource-based measures	43	21
Management-based measures	44	25
Animal-based measures	24	15

There was no significant difference in the use of resource-based management-based and animal-based measures in the Freedom Food or the Svenskt Sigill certification schemes Chi-Sq = 0,367; DF = 2; P-Value = 0,832. There was a rather even distribution of resource-based and management-based measures in both FF and SS

## **Veterinary treatment**

For surgical procedures both FF and SS use management-based parameters determining what kind of procedures that are allowed, who may perform them and the use of anaesthetics. FF requires records of anaesthetics use. FF also requires that replacement animals brought in from other sources must be quarantined and/or treated. Both schemes require access to a hospital box, segregation if needed and urgent treatment.

The only animal-based measure used is that according to FF injurious husbandry procedures may not be performed on sick animals

## **Health and welfare plan**

FF requires a general health and welfare plan and a specific plan including production diseases, infectious diseases and injury as a result of housing/husbandry. The herd must be monitored for herd performance in these areas: metabolic disorders, septicaemia, enteritis, problems at calving, repetitive physical injury, respiratory diseases, body condition, lameness and mastitis. Animal-based measures are specified for some health problems which are mentioned later in the sections for each health problem, but are unspecific for the majority of problems. The welfare plan should be reviewed quarterly by a veterinarian and all information regarding the plan must be recorded. SS does not require a general health and welfare plan, but all treatments to prevent, ease or cure illness must be recorded.

### ***Lameness and foot condition***

FF requires a health plan for lameness with threshold levels for herd performance and if a problem with foot condition is identified a foot care plan must be developed. Resource-based measures used include, the requirement of a foot bathing facility and appropriate housing. SS require the farmer to be able to explain a health plan including screening, prevention and treatment.

Management-based measures used include that FF requires pain relief after foot trimming. SS requires at least yearly foot trimming. Both schemes require recording of hoof care.

FF uses both general animal-based measures including status of feet and more specific as bruised soles, laminitis, soft feet and interdigital infections. It also states that there should be a threshold level for lameness. They also require a yearly control of hoofs by a farrier SS uses the amount of animals relieving at least one leg with a threshold level of 5 % of the herd when advice must be sought. They also require that hooves should be regularly controlled.

### ***Mastitis***

FF requires a health plan with threshold levels. They also state that the milking equipment should be hygienic. FF requires measures to prevent factors that make cattle avoid using the milking equipment. SS requires facilities for hand washing in the milking parlour.

In FF management based parameters include record keeping in regard to the health plan and the use of udder tubes hygiene during milking, the use of rubber gloves when needed and milking order. Measures should be taken to encourage the animal to remain standing at least 30 minutes after milking. FF also states that emollient should be used when needed, equipment should be hygienic and properly maintained, and that mastitis should be treated promptly and that the predisposing factors should be corrected. SS states that hygienic actions should be taken by the personnel including clean clothes and the use of gloves when needed, SS requires written instructions for milking routines. Both schemes have control points looking at the general hygiene in the milking parlour, the use of udder cloths and that udders can only be dipped/sprayed after milking.

Animal-based measures used by FF include general cleanliness of the animal during calving, but no specific measures are mentioned, and that udder, teats and flanks should be clean and sore free when entering the parlour. SS also requires that udders and teats should be clean when milked. Both schemes require routine for-milk examinations of all individuals. FF mentions cell count as a specific measure, otherwise both schemes are nonspecific about what measures to use. According to FF the herd should be continually monitored for performance of mastitis and how often animals are milked.

### ***Injury***

FF requires a health plan with threshold levels that should be recorded, while SS states that keepers should be able to explain screening for injury and injury prevention. The use of resource-based parameter does not differ greatly. FF requires that nothing in the environment should cause injury and SS states that floors and surfaces should not cause injury.

Animal based measures used by FF include definition of injuries and requires that the herd is continually monitored for injuries. SS defines injury as an area  $\geq 10 \text{ cm}^2$  of wounds, swelling or inflammation and has a threshold level of 25 % of animals when further advice must be sought.

## **Cleanliness**

FF does not have specific requirements for cleanliness except those mentioned in the mastitis part. SS, in addition to what is mentioned in the mastitis part, requires that the keepers are able to explain how they screen animals regarding cleanliness and what they do to prevent this.

Animal based measures used include herd levels of animals with manure on specified parts of the animal, with a threshold level of 15 % of the herd, when further advice must be sought.

## **Body condition**

FF requires a health plan with threshold levels that should be recorded, while SS states that keepers should be able to explain screening and prevention. The use of resource-based parameter does not differ greatly.

Both schemes uses BCS as animal based measures and SS have a threshold level of 10 % of the herd with a BCS < 2 on a five grade scale when further advice must be sought.

## **Breeding and calving**

FF does not allow routine induction of parturition, embryo transfer and ovum-pick up unless exceptional circumstances, or genetically modified animals. They also require that calving cows and heifers must be inspected at least twice daily and that breeding must be planned in such a way that caesarean section does not become a routine procedure.

SS requires that breeding should favour the health of animals and minimize risks during calving. Breeds with genetical defects are not allowed, the risk of dystocia should be considered when choosing the bull/sperm and time of insemination or mating. Further, Belgian blue or their cross breeds are not allowed.

## **Environment**

*Table 7. Number of assessments used to assess environment based on assessment type*

Assessment type	Times used in certification scheme	
	Freedom Food	Svenskt Sigill
Resource-based measures	55	42
Management-based measures	16	5
Animal-based measures	17	3

There was a significant difference in the use of resource-based management-based and animal-based measures in the Freedom Food or the Svenskt Sigill certification schemes Chi-Sq = 7,402; DF = 2; P-Value = 0,025. Most measures are resource-based but this is especially pronounced in SS which has very few management or animal-based measures to assess the effect of the environment on welfare.

## **Building and pasture**

The resource-based measures used by FF states that animals normally should not be closely constrained and not be tethered, whereas SS requires rebuilding to be for loose housing. According to FF year around housing of cattle is prohibited and permission for restricted access must be sought. SS has regulation for time of pasture access during summer. Resource-based measures regulating the



design of buildings include for FF ceiling height allowing mounting behaviour, the width of passages allowing animals to meet, minimizing of blind alleyways and access to and size of loafing areas. SS requires an up-to-date MHS and that measures are according to legislation and a good environment. Floors must according to FF be slatted or solid concrete, grooved or treated, and slats to be designed to minimize injury to the feet. Whereas SS requires a design to minimize injuries. Equipment, including electrical installations, should according to FF not cause injury or distress. They also state that there should be cow brushes available, a certain ratio depending on herd size, for all animals and that loading ramps should be designed to prevent slipping. SS states that there should be storage facilities for tools. FF requires the use of hygienic materials for internal surfaces and that the design of flushing and slurry systems does not compromise health and welfare. SS requires a good environment for the animals.

The management-based measures used by FF include pasture to be managed for cleanliness, farm tracks to be managed to prevent damage to feet and to ensure welfare on pasture. Key points regarding welfare must be recorded and include total floor area, number of cubicles or bedded area and number of cattle in relation to age, weight, feeding and drinking, and bedding space. SS requires flooring to be managed to minimize risk of injury. FF states the cow brushes should be managed so that they are suitable and accessible, managers should also minimize noise from gates and reduce risk of slipping at loading ramps. Floors should be scraped at least twice daily. SS requires that stables are washed at least yearly and that it's recorded.

Animal-based measures used by SS states that animals should be able to move and lie unhindered.

### ***Straw yard housing***

Resource-based measures used by FF include area of the lying area depending on the size of the animals, presence of horns and size of the herd. SS requires an up-to-date MHS, that measures are according to legislations, and a good environment minimizing the risk of injury. FF requires that the bedding is dry whereas require sufficiently and dry bedding.

Management-based measures include FF requiring management of the bedding and SS requiring management to minimize the risk of injury.

Animal-based measures used by FF include, animals should be able to lie normally and without the risk of getting stepped on or kicked and that they should be able to freely groom themselves, stretch their limbs and rise normally. SS states that animals should be able to move and lie unhindered.

### ***Cubicle housing***

The resource-based measures used by FF include head-space, design for a good positioning in the cubicle to reduce soiling and interference with neighbouring animals. SS requires an up-to-date MHS and that measures are according to legislation as well as a good environment for the animals that minimizes the risk of injury. FF requires that cubicle housing is clean, dry and comfortable, and adequate bedding. SS states that housing is dry and clean, and adequate bedding. Regarding design FF require that cubicles are flexible, the step between bed and dung passage designed to prevent soiling of the bed, encourage a head-first entry slurry and not increase concussion injuries of the soles. Cubicles should allow milking of isolated animals. Both schemes require that the number of cubicles at least correspond to the number of animals.

Management-based measures include FF requiring management of bedding to maximize cow comfort and movement of fouled bedding twice daily and acclimatization of heifers to the system. Whereas SS requires management of the system to minimize the risk of injury.

Animal-based measures used by FF include that animals should be able to stand with all feet in the dry cubicle and a normal rising behaviour. SS states that animals should be able to lie and move unhindered.

### **Calving environment**

FF uses resource-based measures regarding the size of the box, that animals calving must be separated from other livestock other than calving cows, and that there is enough calving space to accommodate the number of cows calving. The space should be fully bedded, designed hygienically, and have facilities for securing animals and milking. SS requires an up-to-date MHS and that measures are according to legislation, good environment for the animals that minimizes the risk of injury.

### **Air**

Resource-based measures used by FF include temperature not being too hot or too cold, and that local chilling of the udder must be prevented, as well as levels for aerial contaminants, humidity, and air space per animal in relation to weight. Effective low velocity ventilation and shelter from the wind must be provided. SS requires aerial contaminations and noise to be kept below, and humidity and temperature within, the legislation levels. A good environment should be provided and there must be a system for emergency ventilation.

Management-based measures used by FF include that provision to minimize fouling of the air when removing slurry.

### **Light**

FF use resource-based measures for assessing luminosity, time of daylight and time of low level lightning as well as for the provision of shade during summer conditions. SS requires access to day light.

## **Management**

*Table 9. Number of assessments used to assess management based on assessment type*

Assessment type	Times used in certification scheme	
	Freedom Food	Svenskt Sigill
Resource-based measures	1	0
Management-based measures	44	2
Animal-based measures	0	0

It was not possible to compare the use of resource-based management-based and animal-based measures in the Freedom Food or the Svenskt Sigill certification schemes because the expected numbers were less than 5 in some of the cells. It is clear that FF has many management-based measures to assess the effect of management on welfare, but SS had very few measures in any category to assess management.

Resource-based measures used by FF include that aerosols or paints used for temporary marking must be non-toxic.

Management-based measures used by FF include managers must ensure that stock-keepers have access to a copy of the RSPCA welfare standards for dairy cattle and that they are familiar with and

understand its content. Freedom Food Ltd must be informed if animals are moved due to an emergency and responsible personnel must be named and recorded. Further on a training-program for stock-keepers must be implemented and recorded. Managers must be able to demonstrate that stock-keepers responsible for stock care have the necessary skills. A plan for emergencies must be implemented, with an emergency action board. Managers must ensure that the health plan is implemented, updated and recorded and keep records of production data and use of medication. Stock-keepers must understand circumstances and times in which cattle are prone to welfare problems, and be able to demonstrate their competence dealing with such. They also need to be aware of welfare requirements during calving, medication, castration and breeding. Stock-keepers must be given the appropriate training for their area of responsibilities. Stock-keepers need to recognise different behaviours, common diseases, have knowledge of good nutrition, BCS, and locomotion scoring, understand the functional anatomy, care and treatment of the foot, teat and udder. They must also be able to demonstrate their competence in handling animals and their proficiency in procedures which might cause suffering. Precautions must be taken to prevent injury and bullying. Regarding handling animals must quietly and firmly and the behaviour characteristics of the cow must be taken into account when handling. Animal-handlers must be trained and understand stress factors and how animals can react to their surroundings. Cattle can only be moved when the area ahead is clear and the space is adequate. Animals must not be rushed, pulled or lifted and sticks and electric goads must not be used. Calving aids must only be used to assist a delivery and before use the animal must be properly examined. Recumbent animals must be examined by a veterinarian before attempting to move the animal and if lifting gears are used, care must be taken. All recumbent animals must be treated without delay and if the prognosis is poor it should be euthanized. All treatments of recumbent animals must be recorded. Bands used for identification can only be used for this purpose and must not impair the welfare of the animal. The marking of animals must be done by a trained operator and avoid unnecessary pain or distress. When equipment is installed that might affect the welfare of the animals, stock-keepers must be able to operate, maintain, recognize signs of malfunction and have the knowledge of action to be carried out in the event of failure. All automatic equipment must be inspected at least once a day, and if a defect is found it must be rectified immediately or measures must be taken to safeguard animals until it is possible. Stock-keepers must inspect housed animals and equipment at least twice daily and record any observations or actions taken. Welfare problems seen must be dealt with appropriately and without delay. Staff must be aware of water resources for use by the fire brigade and ensure the availability of these. Measures used by SS include the requirement of a daily inspection and a written plan of routines regarding this. They also require a written plan for emergencies, such as electrical failure and other severe disruptions.

## Behaviour

*Table 6. Number of assessments used to assess behaviour based on assessment type*

Assessment type	Times used in certification scheme	
	Freedom Food	Svenskt Sigill
Resource-based measures	1	0
Management-based measures	1	0
Animal-based measures	1	0

It was not possible to run a chi- square analysis on this table because of the very low number of measures of any types used to assess the behaviour of the animals. What is noticeable is how few measures there are in general for this category compared to the others.

## ***Abnormal behaviour***

The resource-based measures used by FF include the requirement of a program of modification and enrichment if abnormal behaviour is present.

Management-based measures used by FF include implementing the plan of enrichment, with the help of a veterinary surgeon, until the problem is solved.

The animal-based measures used by FF include observation of repeated rubbing, tongue rolling/aerophagia, bar biting/chewing, pica, eating soil/sand/dirt and urine drinking.

## **DISCUSSION**

As the intention with this thesis was to compare Freedom Food and Svenskt Sigill a number of categories and a new division of the measures was made. The division in to feed, water, health, environment, management and behaviour in the results section will be maintained here in the discussion section of this thesis. The aim was to identify the points that should be taken into consideration to find the optimal balance between risk-based (resource and management-based measures) and animal-based measures when creating a certification scheme. These points will be discussed under the respective categories and then they will be summarised in bullet form at the end of the discussion, ie after the comparison of the two schemes.

### **Feed**

It is of importance to use both risk-based and animal-based measures when assessing nutrition. For example, changes in BCS can be seen after a longer period of time and therefore the problem can be missed using only animal-based measures.

It should be planned and recorded that animals have an adequate access to feed of the right composition and quantity, as it is of importance to minimize the risks of a physiological impact. To meet this, a nutrition plan for animals in different stage of lactation should be used, as the nutritional needs differ (Rushen et al., 2007, p.223-226), as well as for obese and thin animals. Feed analysis including both energy content and mineral deficiencies should be included. It is also of importance to include the access to fibre for stimulation of rumination. By doing this, the incidence of for example metabolic and deficiency problems can be reduced. Subacute rumen acidosis (SARA) is by some regarded as the biggest threat to the welfare of lactating cows and can affect up to 20 % of animals in mid lactation. SARA is hard to diagnose in the field and the most effective way of preventing it is to stimulate feed intake or to assure a steady intake during the whole day (Rushen et al., 2007). This together with the appropriate amount and quality of fibre is enough to stimulate the natural physiology of the rumen (EFSA, 2012a). Hence, it is of importance also to plan the number of feedings.

It is also relevant, through assessment of resources, to facilitate the accessibility of feed and stimulate feed intake. Since risk-based measures cannot guarantee access for low ranked animals, this should be controlled through the number of aggressive behaviours, in connection to feed stations, such as head butt, displacement, chasing, fighting, chasing up (Welfare WelfareQuality®, 2009a). SS states that animals should be able to eat in a calm and natural way which is good, but is a vague phrase that means the measure is neither valid nor repeatable.

BCS is used by both schemes as an animal-based measure to control feed access and is often seen as a measure of welfare because it reflects the access during a longer period of time and the incidence of health problems during peripartum (reviewed by Roche et al., 2009). However, BCS should be seen as a relatively imprecise measure, as there is a genetic variation (Roche et al., 2006) and also a variation

connected to where in the lactation the animal is (Roche et al., 2007). A measure that could be used is the change of BCS over time which would say more about the change of energy balance (Roche et al., 2007). This would however require recurrent visits or that managers keep records.

Hunger, or the physiological state reaching from satiety to starvation, is represented many symptoms including digestive state (gut fill), acute metabolic state to current feeding and long-term metabolic state defined by the overall body condition (Algers and Smulders, 2009). As mentioned BCS can be used as a measurement of feed intake during a longer period of time, but it is also an indicator of health problems during peripartum. However, because animals can suffer from different types of hunger, it cannot be seen as a comprehensive measure. Therefore the certification schemes need to take the metabolic state of the animal into account, through for example feed analysis.

## **Water**

Main (Main et al., 2007) states that it is not negative to use only risk-based parameters to assess water availability and that there is no need to develop animal-based measures for this. I argue against this because resource-based measures cannot guarantee availability for low ranked animals. Therefore it is important to assess behaviour in connection to water troughs. Welfare Quality® (2009b) mentions animal-based measures applicable for this, including head butt, displacement, chasing, fighting and chasing up.

Resource-based measures that can be used include size of troughs and number of drinking bowls, flow rates and how often animals have access to water, where continuous access is preferred, and the hygiene of the water sources. The control of hygiene is important because of the risk of disease and that it can affect the water intake of the animals. Control of water quality can reduce the risk of this.

## **Health**

As mentioned before, health is a broad area, including many aspects of welfare. There are also some problems connected to the reliability of health as a welfare indicator, e.g. judging the impact on welfare of different sufferings and the difficulty of obtaining reliable and valid information on the occurrence of illness and injury. It is therefore important to consider this when choosing parameters, resource and management-based measurements as well as animal-based measurements. When using different specific diagnoses, as in the Freedom Food scheme, it is of importance that they are valid, repeatable and feasible (Main et al., 2007, EFSA, 2012d). Because of this there can be a lack of reliability when using farm records as a measure of welfare.

A written welfare plan regarding the most common health problems causing impaired welfare can improve the control of these parameters. These could include health problems specified by Rushen (2007) mortality, lameness, mastitis, calving difficulties, illness at calving, bovine respiratory disease, body injuries and gastrointestinal ulcers, as well as body condition and cleanliness, provided that measurements stated are valid, repeatable and feasible at farm level. The schemes should include a definition of the diagnosis, e.g. gait scoring used by FF and cleanliness used by SS. Using these opens for the use of threshold levels and benchmarking, and by that further assessment of welfare at the actual farm. It can help farmers by pointing out where there is a problem and thereby be a guidance for where work should be focused. Even if there is no problem within an assessed area, the use of benchmarking over time, can show if there is a negative trend in the herd. In the Welfare Quality assessment system several animal-based measures are used to control the good health. These include absence of injuries, i.e. lameness and integument alternations; absence of disease, i.e. coughing, nasal discharge, ocular discharge, hampered respiration, diarrhoea, vulvar discharge, milk somatic cell count, mortality, dystocia and downer cows (Welfare WelfareQuality®, 2009b). These have a clear

method description and classification and can serve as a model for animal-based measures to be used, as they are valid, repeatable and feasible.

It is of importance to have recurrent control of the welfare plan including the health records, as stated in the FF scheme. By this the farmer is up-to-date with current problems and can get advice for how to proceed.

Even though there are useable animal-based measures for health problems there are benefits combining these with both resource-based and management-based measures. Examples of this include lameness reduction, e.g. foot baths, flooring and bedding, mastitis, e.g. hygiene in milking parlour and stable area, and injuries, e.g. flooring, bedding, cubicle design. Management-based parameters should include pain relief, anaesthesia during surgical procedures and provisions covering qualifications for treatments.

Another procedure closely linked to health is euthanasia. It can be hard to have animal-based measures for when it is necessary, but it is important to have clear procedure plan including trained personnel.

I agree with Broom (2006) arguing for the importance of developing better quantitative methods for measuring the welfare of diseased animals and there is an increasing interest among ethologists to study sickness behaviour.

## **Environment**

As mentioned earlier the environmental conditions can affect the welfare of an animal in several ways, where housing plays an important role, because of the time spent there. As housing systems are complex many factors, such as how a system is managed or the specific way in which it is configured, makes it hard to compare them. For this reason the outcome is uncertain and it can be argued that use of only risk-based measures cannot be regarded as fulfilling a comprehensive assessment. The use of risk-based measures can function as guidance for how a system can be designed and constructed, as this is usually expensive and time consuming. Therefore the concept of prior approval could be used regarding housing. In the same way it is necessary with animal-based measures regarding both health and behaviour, such as foot problems and rising behaviour.

A housing aspect closely linked to behaviour is the access to pasture and if the animals are kept in a loose housing system. Both schemes require access to pasture and regarding loose housing systems FF require it, while SS has the intention to require and only allows rebuilding to new systems to enable it.

The concept of cow comfort is closely connected to housing, regarding both health and behaviour, and the concept should be used more greatly in the assessment. Health measures closely linked to housing systems include those relating to the udder and lameness (Rushen et al., 2007, p.155). These are discussed more closely in the health section. Observations of behaviour are often focused on the resting behaviour of animals, such as lying and rising behaviour and proportion of cows lying down (Rushen et al., 2007, p.158-159). This opens up for the use of benchmarking and threshold levels. Both schemes state that housing systems should be designed to allow animals to perform a natural rising behaviour and to lie in a natural and comfortable way. This is of course a good statement but it cannot be seen as a valid measurement when it does not state how this can be fulfilled. This should also be assessed with animal-based measures.

## **Management**

The management of animals includes a wide range of conditions and will affect the animal welfare. In some aspects it is closely linked to the opportunity to perform tasks, e.g. that buildings and techniques allow the stock keepers and managers to perform a good job. As mentioned earlier the personnel needs

the capacity, i.e. ability, knowledge, skills, personality etc., to care for and manage the animals. Because of this the selection and training of personnel are important. FF has many requirements regarding the knowledge of stock keepers and the requirement of training, whereas SS does not control this to the same extent.

For example it is important that stock keepers and managers understand how their work affects the welfare of animals. Mistakes regarding breeding strategy might affect the welfare for several generations and therefore the understanding and knowledge regarding this is important.

The requirement of training and ability to show knowledge of actions that might impair the welfare should be included in certification schemes.

## **Behaviour**

As mentioned before, behavioural deprivation plays an important role in the welfare of an animal. It is therefore important to assess this, which can be done using both risk-based and animal-based measures. FF assesses abnormal behaviour using both risk-based and animal-based measures, whereas SS only states that animals should have a natural behaviour. The Welfare Quality® project assesses the principle appropriate behaviour which includes expression of social behaviours, expression of other behaviour, good human-animal relationship and positive emotional state. Measures relating to these are defined as agonistic behaviours, access to pasture, avoidance distance and qualitative behaviour assessment (Welfare WelfareQuality®, 2009b). These measures, or equivalent ones, should be included in certification schemes, as the behaviour of the animals needs to be assessed to ensure a good welfare.

Measurements of behaviour mostly focus on detecting negative emotional states of the animal. Unfortunately there is little research regarding assessing and improving the positive emotions in animals (Rushen et al., 2007, p.109-110). It is of importance that animal welfare research focus more on the positive emotional states in the future and that valid measurements are incorporated into future certification schemes.

## **Issues to reflect over when designing a certification scheme**

The aim with this study was to identify the points needed to be taken into consideration when finding an optimal balance between the use of resource-based, management-based and animal-based measures. This will differ depending on the intention of the certification scheme and therefore I have concluded on a series of bullet points to reflect over when designing a certification scheme.

1. *Risk-factors known for impairing welfare* should not be allowed. This viewpoint is well accepted and is commonly seen in certification schemes, but usually lacks a cut-off point. For example bad flooring is a risk factor for lameness, but a slightly bad flooring system can be compensated through management. Because the outcome can vary a greatly a cut off value must be connected with the risk-factors.
2. *The difficulty of modifying certain resources* needs to be taken into account when designing a certification scheme. While some resources are easily modified, the investment costs and the time aspect connected to for example rebuilding and altering stables makes decisions regarding this important, when they will affect animals during a long period of time. Therefore the use of *prior approval* for housing is recommended. A system is already in use in Swedish legislation.
3. *How long does it take for a change in input to affect the state of the animal?* This is closely linked to the two earlier points and will differ greatly depending on the type of input. Changes

in breeding strategy can take several years to carry out while the amount of bedding can be changed instantly. There should be a cut off value for when the time needed to achieve a change is too long and therefore should not be allowed. These levels should be decided on for each certification scheme. Examples of this include Freedom Food stating that “Breeding must be planned in such a way that caesarean section does not become a routine procedure” and Svenskt Sigill stating “Belgian Blue Cattle or their crossbreeds’ may not be held”. Resources that can be changed quickly, such as the amount of bedding, can instead be controlled by an animal-based measure, e.g. cleanliness.

4. *Measures used must be valid, repeatable and feasible.* I have earlier mentioned that animal-based measures must fulfil this but it is also necessary for risk-based measures, which is not always the case even regarding commonly used measure of resources and management. As I mentioned in the section regarding water, it is common to use only resource-based measures, even though these do not ensure the availability of water for low ranked animals.
5. When the *predictive value* of a risk-based measure, i.e. its correlation to a corresponding animal-based measure, is high it can replace the animal-based measure. An example of high correlation is the use of analgesics (Rushen et al., 2007, p.116), given that you can control that it is used. Freedom Food states that “Pain relief must be provided when any procedure performed on the animal is likely to inflict pain during and/or after the procedure” and that procedures must be recorded. Using removal of horns from mature cattle as an example, Freedom Food states that the procedure only can be performed by a veterinarian surgeon. It is necessary to decide the accepted level of a predictive value when designing a certification scheme.
6. When designing a certification scheme the use of *automated assessment* of measurements, especially regarding animal-based measures, to make them feasible should be considered. For example, manual assessment of lameness can be time consuming and therefore could be regarded as unpractical for inclusions in some certification schemes. The implementation of an automated assessment (Chapinal and Tucker, 2012) could solve this.
7. The use of *benchmarking* and *threshold-levels*. There are many reasons why this is important. It is necessary to ensure customers that a certain level of standard is fulfilled. Moreover the use of benchmarking can help farmers by pointing out where there is a problem and thereby be of guidance for where work of improvement should be focused. Even if there is no problem within an assessed category, the use of benchmarking over time, can show if there is a negative trend in the herd. Thereby allowing the farmer to act before it turns in to a problem. In regard to bullet point 2, *the difficulty of modifying certain resources*, the information given from benchmarking can help the farmer to plan for future investments.

There should be a cut-off point connected to the threshold-level, so that if you have a value higher than this you can no longer participate in the certification scheme. They need to be realistic, i.e. a threshold-level of 1 % cannot be set when the actual prevalence is 10 % in all farms. They should also be progressive, i.e. that the levels should decrease over time. This should be stated and farmers informed so that they can work in a proactive way. Different certification schemes may have different cut off points even for the same measure.



## CONCLUSION

When designing a certification scheme for dairy cow welfare it is necessary to cover in a transparent way some general areas that might impair the welfare of the animals. These should include feed, water, health, environment, management and behaviour. When choosing assessment points there is a need to try to find the optimal balance regarding resource-based, management-based and animal-based measures. There is not an evident way doing this, but there are some points that can be of guidance and necessary to consider. These include: 1) *Risk-factors known for impairing welfare*; 2) *The difficulty of modifying certain resources*; 3) *How long it takes for a change in input to affect the state of the animal?*; 4) *Measures used must be valid, repeatable and feasible?*; 5) *The predictive value of a risk-based measure*; 6) *To consider the use of automated assessment*; 7) *The use of benchmarking and threshold-levels*. Within each of these areas different certification schemes may come to different final decisions depending on the aim of just their welfare assessment scheme.

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## APPENDIX

### Feed

	Freedom Food			Svenskt Sigill		
	RBM	MBM	ABM	RBM	MBM	ABM
Set-up						
Trough length	FW 1.13 - Measurement, trough length		FW 1.11 - No competition of feed	Miljöhusesynt		
Design				Miljöhusesynt, 19.1 - Eat in a natural and calm way		19.1 - Eat in a natural and calm way
Hygiene	FW 1.17 - Placement and design	FW 1.16, 1.17 - Managed hygienically				
Feed						
Access	FW 1.3 - Daily access		FW 1.6 - BCS for good health			17.4a - Normal BCS
Animalic feed	FW 1.5 - Avian and mammal protein			19.4e - No animalic protein or fat		
Composition and source	FW 1.2 - Wholesome feed, FW 1.9 - Fiber for rumination		FW 1.2 - Good health, nutritional needs, FW 1.9 - Rumination	19.2 - Approved feed manufacturers, 19.4 - Nutritionally and physiologically composed, 19.8 - 50 % (ts) roughage/pasture		19.4 - Good health

Hygiene	FW: 1.19 - Prevent contamination	19.3b - Bi-products from food industry, 19.4 - Hygienical quality, 19.4a - No mold, 19.5a-c - Protected against chemicals and weather	
Feed analysis		19.6 - Analysis of roughage	19.4b, c, d, 19.6 - Record analysis
Mineral deficiency	FW: 1.14 - Pasture with deficiency	FW: 1.15 - Have knowledge about and attend to	
Contamination	FW: 1.18 - Plan for improper/toxic feed, 1.19 - Plan for contamination	19.4f - Analysis of aflatoxin and salmonella	

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Planning/management

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Nutrition plan	FW 1.1a - Nutrition plan, 1.7 - Plan for malnourished/fat animals	FW: 1.1b - Examine twice yearly, 1.4 - Keep records of feed, 1.7 - Plan changes in BCS, 1.8 - Avoid sudden changes in feed	FW: 1.7 – BCS	19.3a - Record feed
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## Water

	Freedom Food			Svenskt Sigill		
	RBM	MBM	ABM	RBM	MBM	ABM
Set-up						
Trough/water bowls	FW: 3.3 - Trough length, 3.4 - Number of drinking bowls			Miljöhusen, 19.1 - Design and placement		19.1 - Drink in a natural and calm way
Hygiene	FW: 3.5 - Clean 3.6 - Not result in wetting of bedded areas, be accessed from concrete if possible	FW: 3.5 - Kept clean for flowrate		19.1a - Design	19.1a - Cleaning regularly, 19.1c - Inspection regularly	
Water						
Access	FW: 3.1 - Constant access, 3.2 - Flow rate allowing 10% to drink at any one time, 3.7 - supply at pasture, 3.9 - Provision for emergency supply			19.1 - Daily access, 19.1b - Access > twice daily		
Analysis	FW: 3.8 - Advice must be taken if a natural source is used			19.1e - Yearly analysis		19.1d - Disease due to contaminated water



## Health

	Freedom Food			Svenskt Sigill		
	RBM	MBM	ABM	RBM	MBM	ABM
Veterinary treatment						
Surgery		H: 1.0 - Pain relief during painful procedures, must be recorded, 1.23 - Removal of horns only performed by a veterinarian and not as a routine procedure, 1.23.1 - Procedures detrimental to welfare with the purpose of cosmetic enhancement are prohibited.			20.1 - Surgical procedures must be performed by a veterinarias or other competent personell.	
Analgesia	H: 1.0 -1.0 - Pain relief during painful procedures, must be recorded	H: 1.0 - Keep records, 19.1 - Keep records				

Treatment	<p>H: 1.9 - Provision for segregation and care, 1.10 - Provision to segregate and treat ill and injured animals</p> <p>1.11 - In relation to 1.10, veterinary advice must be sought when needed, and if necessary such animals must be humanily killed.</p>	<p>H: 1.10 - Sick or injured animals</p> <p>17.6 - If an animal is ill or in need of special care it should be cared in a way that's appropriate for its need, 17.6a - Ill and injured animals should be treated urgently, 17.6b - The producer must be able show/explain for preparation of hospital boxes</p>
Quarantine	<p>H: 1.12 - Animals brought in from other sources must be quarantined or treated</p>	

Health and welfare plan			
Records	<p>H: 1.2 - Welfare plan: vaccination, parasite control, bio-security and infectious diseases, downer cow, lameness and mastitis</p>	<p>H: 1.1 - Quarterly veterinary visits to review health records and health and welfare management,</p> <p>1.1.1 - 1.1 Should maximise health and welfare, 1.3 - health plan should be reviewed regularly and changed if necessary, 1.4 - Record welfare plan, 1.5 - Record all sudden deaths, euthanizations and disease outbreaks, 1.6 - Record outcome of 1.5</p>	<p>20.2 - All treatments to prevent, ease or cure illness should be recorded, 20.2b - Preparations not prescribed by a veterinarian should be recorded, 20.2c - The medical record should include diagnosis, date, identity, preparation, dosage, length of treatment, qualifying period, veterinarian and staff, 20.2e - Preparations given in feed should be recorded.</p>

Disease control	<p>H: 1.7.1 - Health plan regarding 1.7 for reduction/prevention with a threshold level, 1.8 - If thresholdlevel in 1.7.1 are exceeded consultation must be sought.</p>	<p>H: 1.7.1 - Record level in regard to 1.7</p>	<p>H: 1.7a,b,c - Herd continiously monitored for production diseases, infectious diseases and injury as a result ofhousing/husbandry</p>
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Specific  
sufferings

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Foot problems	H: 1.7.1 - Health plan regarding 1.7 for reduction/prevention with a threshold level, 1.8 - If threshold level in 1.7.1 are exceeded consultation must be sought, 1.18 - Foot care plan, 1.19.1 - If score 3 in 19.1 treatment must include pain relief and appropriate housing, 1.20 - Be able to demonstrate methods of prevention and treatment, 1.21 - Footbathing facility, E: 2.3 - Nothing in the environment that can cause injury or distress that can be avoided.	H: 1.0 - Pain relief after foot trimming, 1.7.1 - Record level in regard to 1.7, H: 1.15 - Close attention to foot status, 1.17 - Feet must be inspected at drying-off, 1.19.1 - Record outcome in regard to 1.19	H: 1.7c - Herd continually monitored for performance of lameness, 1.15 - Foot status, 1.16 - Control of foot status at least yearly by foot trimmer, 1.19 - Mobility control of herd at least twice yearly E: 2.3 - bruised soles, laminitis, soft feet, interdigital infections	17.4 - Keeper should be able to explain for how animals are screened and prevention and how a injured animal is treated, 17.5a be able to show records for hoof care, own records or receipts.	17.5 - Hoof should be trimmed if needed and at least yearly.	17.4a - Amount of animals relieving at least one leg, 17.4 - If ammount of animals in regard to 17.4a exceeds 5 % advice should be sought for further examinations. If deviated, supervision under one year with a new audit. 17.5 - The hoofs should be controlled regularly
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## Mastitis

H: 1.7.1 - Health plan regarding 1.7 for reduction/prevention with a threshold level, 1.8 - If threshold level in 1.7.1 are exceeded consultation must be sought, E: 8.1 - Hygiene standard in parlour	H: 1.7.1 - record level in regard to 1.7, E: 8.5 - Clean when handling teats, 8.5.1 - consideration to use of rubber gloves, 8.9 cows with mastitis, 8.10 - cows with chronic mastitis identified and humanly slaughtered, 8.11 - cell count, clinical mastitis and mastitis tube usage must be monitored and recorded, 8.14 encourage cattle to remain standing 30 min after milking to allow sphincter to close. 8.4 - "multi-use" udder cloths not allowed, 8.4.1 - medicated teat towels used according to manual,	H: 1.7c - Herd continually monitored for performance of mastitis, E: 8.1 - Clean at calving, especially udders and teats, 8.3 - Udder, teats and flanks clean, dry and sore free when entering parlour, 8.6 - Routine for-milk examination, 8.7 - Signs of mastitis, 8.8 - Mastitis rate, 8.11 - Cell count, clinical mastitis, 8.21 - Use of milk robot.	22.1 - hygienic standard in milking parlour, 22.1a - parlour in good condition, 22.1c - no other animals in parlour, 22.1e - good ventilation, 22.1f - sewage hygiene, 22.1g - good lighting, 22.1h - closed doors, 22.4 - parlour designed so that milking can be performed hygienically, 22.6a - facilities for handwash in the parlour,	22.1b - Milking equipment kept hygienic, 22.1d - Pestcontrol, 22.4c - Yearly machine service that should be recorded, 22.6 - Hygienic actions milking personnel, 22.6b - Clean clothes, 22.6c - If sores gloves should be used, 22.7 - Milking should be hygienic. 22.7b - Clean udder clothes for every animal, 22.7c - Regular control of cleaning in automatic systems, 22.7d - Teats dipped/sprayed only after milking, only with allowed products, 22.7e - Instructions for milking routines	22.7a - Udders and teats should be clean when milked, 22.7f - Routine for-milk examination on all individuals
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## Mastitis

8.7 - all cases of mastitis treated promptly, predisposing factors corrected, 8.8 - when rate exceeds target figure, organism involved must be identified, 8.12 - machinery properly maintained, 8.13 - teats dipped/sprayed after milking, 8.13.1 - emollient when teats are, dry, chapped or cracked, 8.15 - measures to reduce mastitis in dry cows, 8.16 machine tested and recorded  $\geq 6$  months, 8.17 - proper application, function and maintenance of milking machine, 8.18 - robotic milking system must be clean and maintained,

Mastitis

8.19 - area around machine must be clean,  
8.23 - Measures in place to prevent factors making cattle avoiding using milking equipment

Injuries

H: 1.7.1 - Health plan regarding 1.7 for reduction/prevention with a threshold level, 1.8 - If threshold level in 1.7.1 are exceeded consultation must be sought, E: 2.3 - Nothing in the environment that can cause injury or distress that can be avoided.

H: 1.7.1 - record level in regard to 1.7.

H: 1.7c - Herd continually monitored for performance of injury as a result of housing/husbandry, e.g. repetitive physical injury, E: 2.3 - Defined as damage severe enough for the formation of granular scar tissue and significantly greater the accidental bumps and scratches. Indicators: neck calluses, knee/hock swellings/calluses, teat/udder injuries, haematomas, abscesses, broken tails and chronic scar tissue.

15.4 - Floors and surfaces designed so there is no risk for injury. 17.4 - Keeper should be able to explain for how animals are screened and prevention and how a injured animal is treated.

17.4a - amount of animals with a total area of  $\geq 10$  square cm with wounds, swelling or inflammation, 17.4b - If amount of animals in regard to 17.4a exceeds 25 % advice should be sought for further examinations. If deviated, supervision under one year with a new audit



## Cleanliness

E: 8.1 - Clean at calving, especially udders and teats, 8.3 - Udder, teats and flanks clean, dry and sore free when entering parlour.

17.4 - keeper should be able to explain for how animals are screened and prevention and how a injured animal is treated.

17.4a - Amount of animals with manure on  $> \frac{1}{3}$  of the udder hindquarter, and flanks in total (counted from the carpal and hook joint, 17.4b - If ammount of animals in regard to 17.4a exceeds 15 % advice should be sought for further examinatings. If deviated, supervision under one year with a new audit, 22.7a - Udders and teats should be clean when milked.

Body condition	H: 1.7.1 - Health plan regarding 1.7 for reduction/prevention with a threshold level, 1.8 - If threshold level in 1.7.1 are exceeded consultation must be sought.	H: 1.7.1 - record level in regard to 1.7.	H: 1.7c - Herd continually monitored for performance of body condition score.	17.4 - keeper should be able to explain for how animals are screened and prevention and how a injured animal is treated.	17.4a - Amount of animals with a BCS < 2 on a 5 grade scale, 17.4b - If amount of animals in regard to 17.4a exceeds 10 % advice should be sought for further examinations. If deviated, supervision under one year with a new audit.
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Breeding/calving

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H: 1.24 - No routine induction of parturition, 1.25.1 - Embryo transfer and ovum pick-up not permitted unless exceptional circumstances, 1.25.2 - Genetically modified and/or cloned animals prohibited	H: 1.24.1 - Breeding planned so caesarean sections not becomes routine, 1.25 - Personnel performing per rectum ultrasound must be trained and have reached a recognised standard. E: 7.8 - Inspection of calving cows/hifers	6.5- Breeding should promote health and minimize dystocia, 6.5a - Genetical defect not allowed, 6.5b - The risk of dystocia should be considered when choosing bull/sperm and the time for mounting/semination, 6.5c - Pure Belgian blue and crossbreeds are not allowed.	6.5b - Heifer mortality and dystocia.
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Euthanasia				
	H: 2.1 - Provisions for prompt, humane slaughter, 2.1.1 - When provisions in 2.1 are not possible, a veterinarian must carry out the procedure, 2.2 - If doubts in procedure, a veterinarian must be advised.	H: 2.1 - Slaughter should be carried out by a named, trained, competent member of staff or a licensed slaughterman	H: 2.3 - If in severe pain that is uncontrollable, the animal must be humanly slaughtered.	17.6c - Slaughter routines with personnel authorized to decide about and slaughter, standards and other contact details.
Medicin				
Handling	H: 1.28 - Labelled and stored in accordance with label instructions, 1.29 - Kept safe from animals, 1.32 - Licensed for use in UK and applied in accordance with UK and EU legislations.	H: 1.31 - A nominated person responsible for management and records for stock control, 1.33 - Personnel administering medicine must be competent to do so	20.4 - Adequate storing, 20.4a - Follow veterinarians instructions for storing, 20.4b - Not contaminate feed or milk.	20.1 - Treatment with medication only by authorized personnel, 20.1a - Drugs should be used according to instructions of veterinarian.

*Environment*

	Freedom Food			Svenskt Sigill		
	RBM	MBM	ABM	RBM	MBM	ABM
Building and pasture						
Tethered animals	E: 4.7 - Not closely confined, 4.8 - Tethered animals not allowed			15.6 - Remodelling and construction for tethered animals not allowed		
Pasture	FW 1.10 - All year housed not allowed. 1.10.2 - Permission for restricted access	E: 1.2 - Pasture managed for cleanlines, 2.5 - Farm tracks managed to prevent damage to feet. FW: 1.10.1 - Ensure that unrestricted access to pasture do not compromise welfare		17.2 - Pasure during summer, 17.2a - Time/day and age, 17.2b - Length grazing season, must be recorded, 17.2c - Vegetation on pasture, 17.2d - May be held inside during bad weather, disease, slaughter and insemination, 17.2e - Exception if dispensation from authorities, 17.3 - Must have access to shelter if kept on pasture year around.		

Design	E: 2.8 - Ceiling height, 2.9 - Passage width, 2.10 - Minimize blind alleyways, 5.1 - Size of loafing area, 5.2 - Provide loafing area	E: 2.1 - Key points relating to welfare must be recorded and amended, 2.2 - Key points must include floor area, number of cubicles/bedded area and number of animals	E: 2.8 - Building height allowing mounting behaviour, 2.9 - Animals should be able to meet	Miljöhusensyn, 15.1 - Order, 15.4 - Good environment	15.3 - Be able to lay and move unhindered
Flooring	E: 2.4 - Concrete floors grooved or treated, 5.3 - Unbedded areas, slatted/concrete, 5.4 - Slats may not injure feet			15.4a - Design for minimizing risk of injury	15.4a - Management for minimized risk of injury
Installations	E: 2.3 - No risk of injury, 2.7 - Electrical installations, 2.12 - Cow brushes, 2.13 - Cow brushes availability, 2.14 - Number of cow brushes, 11.1 - Gates designed for unhindered movement, 11.4 - Loading ramp, 11.5 - Loading ramps designed to prevent slipping.	E: 2.13 - Cow brushes 11.2 - Minimize noise from gates, 11.3 - Noise reduction gates, 11.5 - Prevent slipping from ramps		15.1c - Storage of tools	

Hygiene	E: 2.11 - Hygienic materials for internal surfaces, 5.20 - Design of flushing and slurry system not to compromise health and Welfare.	E: 5.3 - Floors scraped at least twice daily	15.4 - Good environment	15.1a - Stable wash at least yearly, 15.1b - Record stable wash
Straw yard - Lying area				
Measurements	E: 4.1 - Area , 4.2 - Area/animal, 4.5 Area depending on herd size and presence/absence of horns	E: 4.1 - Lay normal, 4.3 - Lay without risk of being trodded or kicked, 4.6 - Sufficient freedom for grooming and lie, freely stretch limbs and to rise	15.3 -Area, 15.3b - Area according to legislations, 15.4 - Good environment, 15.4a - Minimize risk of injury	15.3 - Be able to lay and move unhindered
Surface	E: 4.1 - Dry	E: 4.1 - Maintenance	15.2 - Dry and clean, 15.2c - Adequate bedding, 15.4 - Good environment, 15.4a - Minimize risk of injury	15.4a - Management for minimized risk of injury

Cubicle housing				
Measurements	E: 5.10.1 -Head space, 5.11 - Design for a good position, 5.12 - Design for position and injury	E: 5.9 - Stand with all feet dry, 5.10 - Normal rising behaviour.	15.3 - Area, 15.3b - Area according to legislations, 15.4 -Good environment, 15.4a - Minimize risk of injury	15.3 - Be able to lay and move unhindered
Surface	E: 5.5 - Clean, dry and comfortable, 5.6 - Adequate bedding	E: 5.7 - Bedding, 5.8 - Clean out	15.2 - Dry and clean, 15.2c - Adequate bedding, 15.4 - Good environment, 15.4a - Minimize risk of injury	15.4a - Management for minimized risk of injury
Design	E: 5.13 - Design allowing space sharing, 5.14 - If narrow cubicles, flexible design, 5.16 - Step between cubicle and dung passage, 5.17 - Foot problems because of step, encourage entering head first 5.19 - Milking of isolated animals		15.4 - Good environment	
Numbers	E: 5.15 - At least 1 cubicle per animal		15.3a - At least 1 cubicle per animal	

Introduction hievers	E: 5.18 - Introduction of hievers
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Calving environment		
Measures	E: 7.2 - Area, 7.3 - Kept separated, 7.4 - Enough space for number of calving animals	Miljöhusesynt, 15.4 - Good environment, 15.4a - Minimize risk of injury
Surface	E: 7.1 - Adequate bedding	
Design	E: 7.5 - Hygienic design, 7.6 - Provision for securing cattle, 7.7 - Provision for milking	
Air		
Temperatur	E: 3.1 - Not affect production , 3.2 - Local chilling of udder must be prevented	15.4 - Good environment, 15.4 - Levels



Air quality	E: 3.4 - Not unpleasant for human observer, 3.5 - Relative humidity below 80 %, 3.6 - Adequate air space	E: 3.7 - Avoid air fouling when removing slurry	15.4 - Good environment
Airflow	E: 3.3 -Avoiding draughts, 3.8 - Shelter against wind		15.4 - Good environment, 15.4 - Levels
Emergency ventilation			15.4d - Availability
Light			
Access	E: 6.1 - Adequate for inspection, 6.2 - Access to normal period of day light, 6.3 - Period of low lighting to promote resting behaviour		15.4b - Access to day light
Shelter	E: 3.9 - Access to shade during summer		
Noise			
	11.2 - Effort to reduce noise from gates and catches	11.3 - Effort to reduce noise from gates and catches	

*Management*

	Freedom Food			Svenskt Sigill		
	RBM	MBM	ABM	RBM	MBM	ABM
Managers		M: 2.1 - have access to, are familiar with and understand, RSPCA welfare standards, 2.2 - Emergency removal of animals, 2.3 - of managers must be named and recorded, 2.4 - Training of stock-keepers, 2.5 - Skill of stock-keepers, 2.6 - Emergency plans, 2.6.1 - Emergency action board, 2.7 - Emergency plan, 2.8 - Ensure that the welfare plan is implemented, updated and recorded, 2.9 - Records of production and medication recorded			17.1a Management practices	-

M: 3.1 -  
Knowledge of  
welfare problems,  
3.2 -  
Demonstration of  
knowledge, 3.3 -  
Knowledge of  
welfare  
requirements  
during calving, 3.4  
- Knowledge of  
welfare  
requirements  
during breeding,  
3.5 - Training, 3.6  
- Knowledge of  
anatomy and  
physiology, 3.7 -  
Demonstration of  
handling, 3.8 -  
Demonstration of  
proficiency in  
procedures  
potential to cause  
suffering, 3.10 -  
Prevention to  
cause injury  
through bullying,  
3.11 - Knowledge  
of water sources in  
case of fire

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## Handling

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M: 4.1 - Handle quietly and firmly,  
4.1.1 - Knowledge of behavioural characteristics, 4.2 - Training and knowledge, 4.3 - Loading of animals, 4.4 - Moving of animals, 4.5 - Moving of animals, 4.6 - Sticks not used to hit animals, 4.7 - Electric goads, 4.9 - Calving aids, 4.10 - Calving aid, 4.11 - Veterinarian examination of recumbent animals, 4.12 - Treatment of recumbent animals, 4.13 - Euthanasia of recumbent animals, 4.14 - Recording of handling of recumbent animals

Identification		
		M: 5.1 - Use of neck-, tail- and legbands, 5.2 - Marking of cattle, 5.3 - Aerosols and paints
Equipment		
	M: 6.4 - Automatic equipment regarding ventilation	M: 6.1 - Knowledge, use and demonstration of equipment, 6.2 - Inspection of automatic equipment, 6.3 - Defects of automatic equipment,
Injuries		
		17.7 - Readiness for power brakes
Inspection		
		M: 7.1 - Inspection and recording of animals, 7.2 - Appropriately dealing with welfare problems

*Behaviour*

	Freedom Food			Svenskt Sigill		
	RBM	MBM	ABM	RBM	MBM	ABM
Abnormal behaviour	H: 1.13 - Program of modification and enrichment if problem regarding abnormal mentioned.	H: 1.13 - agreed together with veterinary surgeon and pursued until the problem is solved.	H: 1.13: Repeated rubbing, tounge rolling/aerophagia, bar biting/chewing, pica, eating soil/sand/dirt, urine drinking.			