

## **The use of animal-based health and welfare parameters – what is it all about?**

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### **Introduction**

Organic farming is characterized by several goals that are expressed in daily practices and in standards. Some of the important goals for organic production systems are naturalness, harmony on all levels of production, local recycling of resources, and the principle of precaution (Anonymous, 2002). For organic herds, good animal welfare is an explicit goal, and this includes that the overall goal for the organic farming systems regarding naturalness and harmony in the herd are met by giving the animals possibilities to perform natural behavior and achieve harmony within the group. Freedom for the animals to make as many choices as possible should be respected (Vaarst et al., 2004; Verhoog et al., 2002 & 2004). The production system is not sustainable if animals show evidence of pain, disease, or distress as a result of an inadequate system or disharmony between the animals and the system. Therefore it is of crucial importance to be able to assess and evaluate the animals' response to the system.

This need is not only relevant for organic systems. Public concern about farm animal welfare has steadily grown during recent years. In this context, welfare assessment has many roles such as identifying current welfare problems, checking farm assurance and legislative requirements have been met, indicating risk factors leading to a welfare problem, testing the efficacy of interventions, formulating a product information/labelling system, or research tool for evaluating and comparing production systems, environments, management systems, animal genotype etc. (Whay, 2007).

Improvements in animal welfare may be achieved through (1) assessment of animal welfare, (2) identification of risk factors potentially leading to welfare problems and (3), interventions in response to the risk factors. In order to see whether the improvements have worked, it is furthermore important to be able to measure or assess the improvements and see if it has worked. In this process the animal based parameters help us to identify the animal's response to the system, and therefore also the potential problems in this system.

It is the aim of this presentation to give an overview over concepts of welfare assessments, and animal based parameters, and present the ideas in the project Welfare Quality in order to create a background for understanding and discussing the use of animal based parameters in the current ANIPLAN project.

### **The rationale of on-farm welfare assessment**

Operational on-farm welfare assessment tools must involve measures that at the same time are

- 1) valid and reliable,
- 2) easily operated by trained people, and require limited time.

Animal welfare refers to the state of an animal and it relates to the animal's feelings as well as to its bodily state (e.g. Broom, 1996, Duncan, 1996). Traditionally, farm animal welfare

assessment has focused on the measurement of resources provided to the animal such as housing and design criteria (Bartussek, 2001, Bracke et al., 2002). The use of such indirect resource-based criteria (figure I) is attractive because their measurement is mostly quick, easy and reliable. Other husbandry aspects that affect animal welfare are management practices and the human-animal relationship; their measurement is often less easy. However, the provision of good management and environmental resources does not necessarily result in a high standard of welfare. As shown in figure I, direct animal-related parameters such as health or behaviour can be taken as indicators of the animals' feelings and as measures of the bodily state. Welfare assessment should therefore primarily be based on such animal-related parameters. It is however challenging, to select and develop reliable and at the same time feasible measures for on-farm assessment protocols; this will be further discussed below. In practice, resource or management-based parameters may also be included in on-farm assessment protocols when they are closely correlated to animal-related measures and because they can form the basis for the identification of causes of welfare problems.

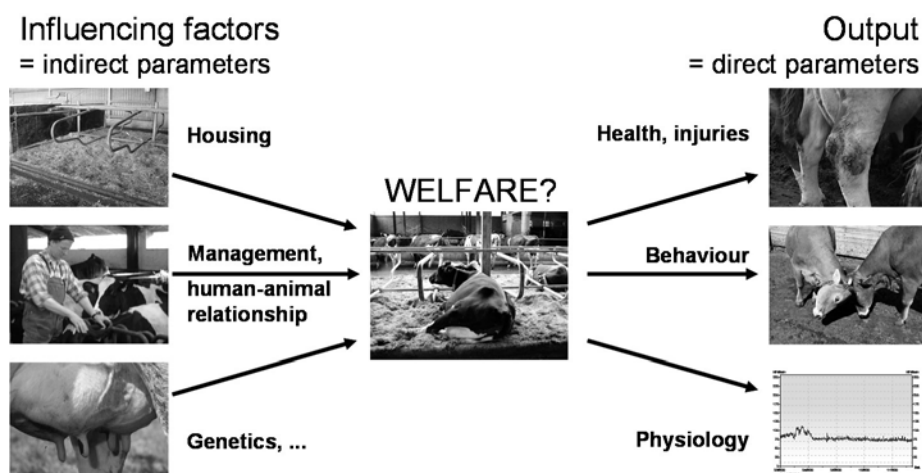


Figure I: Influencing factors and animal-based parameters in relation to the animal's welfare state

Attempts to create an operational welfare assessment protocol primarily relying on animal-related parameters have mainly been made with regard to dairy cows (e.g. Capdeville & Veissier, 2001, Main et al., 2003, Whay et al., 2003a, Whay et al., 2003b). However, considerable efforts are currently made in further developing valid, reliable and feasible systems for several cattle categories.

### Validity and reliability of selected animal-related parameters in cattle

#### Types and features of indicators

Animal-based measures for on-farm welfare assessment can be roughly divided in behaviour and pathological parameters; physiological indicators are mostly not available for feasibility reasons. In Box 1 below, a list is given over some concrete parameters, which can be relevant and are often used for animal welfare assessment.

Pathological parameters
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	Lameness
	Injuries
	Disease incidence
	Body condition
	Cleanliness
Ethological parameters	
	Behaviour around resting
	Agonistic social behaviour
	Abnormal behaviours
	Animal-human relationship
'Other parameters'	
	Positive indicators
	Integrity of the animal

Box 1. Examples of different types of animal based parameters each giving an aspect of the animal's condition and state of well being.

All the parameters chosen should give the best possible estimate of the welfare state within the herd, and therefore certain key characteristics need to be fulfilled. Below in Box 2, three relevant requirements are listed. Besides the overall validity of the measures, i.e. what information they provide about the animal's welfare state, the robustness of the measures with regard to e.g. inter-observer reliability or feasibility will be shortly discussed in the following sections.

- Validity:  
'What does this parameter tell us about the animal's welfare state?'
- Reliability  
e.g. inter-observer reliability: do different observers see the same thing?
- Feasibility  
The practical aspects of doing the recordings, e.g. how easy is it to record, how long time does it take, which equipment is needed?

Box 2. A list of factors that one needs to consider when planning animal welfare assessment including animal based parameters. To make a good basis for taking decisions about improvements in the herd, the parameters should be strong both in validity, reliability and feasibility.

### Animal behaviour disturbances

Disturbances of the behaviour around resting may be associated with insufficient recuperation, frustration, reduced rumination, increased risk for lameness and alterations or injuries regarding hair, skin and joints. The assessment of time budgets such as total duration of lying is not suitable for short-term monitoring systems. However, parameters related to lying down or rising (time needed, frequencies of abnormal, altered or impaired movements) and lying and standing in the cubicles can be quantitatively or qualitatively recorded also during shorter periods using continuous behaviour sampling and/or scan sampling (e.g. Cow Comfort Index; Cook et al., 2004).

In horned cows, the frequency of agonistic social behaviour elements is positively correlated with the occurrence of skin injuries (Menke et al., 1999) and it is likely that also in dehorned cows aggressive interactions result in less obvious lesions such as

hematomas. Although already suggested for (Whay et al., 2003a) or applied in on-farm welfare assessment protocols (Capdeville & Veissier, 2001), relatively little is known about the minimum duration or the time frame of observations in order to get a representative picture of a given farm. Pilot studies in dairy herds have shown that agonistic interactions can be reliably recorded during the first hours after feeding showing the highest inter-day repeatability for this period of the day. However, short-term recordings of social behaviour should be restricted to interactions involving physical contact (Winckler et al., 2002).

Abnormal behaviours can be distinguished in redirected behaviours and stereotypies. In cattle, mainly abnormal oral behaviours such as tongue playing/tongue rolling, sucking at objects or cross-sucking have been described (Scientific Veterinary Committee, 1995). These behaviours occur to a different extent in calves, heifers, dairy cows and fattening cattle. Due to the low incidence, continuous behaviour sampling has to be applied for recording, which reduces feasibility. However due to the fact that the behaviours are linked with oral behaviour and the motivation to feed or suck, it may be possible to check these behaviours during specific periods for example after feeding.

Lameness indicates a painful state and discomfort and is regarded as one of the most serious welfare problems in cattle. It is listed under behaviour related parameters and can be linked to disturbances in the cows' laying down behaviour, but is also clearly linked to animal diseases in terms of claw diseases, and as such, the condition leads to severely changed behaviour in the cow. Whereas the examination of the claws provides detailed information on pathological findings, this procedure is not applicable for routine on-farm assessments. There is a variety of feasible lameness scoring systems which basically rely on gait recording. In general, each animal is assigned a score on a 4 (Breuer et al., 2000) to 9 point scale (Manson & Leaver, 1988) according to gait-related behaviour patterns such as short-striding, difficulty to put weight on limb or difficulty in turning when walking on a hard floor. Locomotion scoring systems revealed significant correlations with claw lesion scores (Winckler & Willen, 2001) or other behavioural measures such as speed, tracking and head position (O'Callaghan et al., 2002). Training and practical experience is important to reach satisfactory inter-observer repeatability (Engel et al., 2003, March et al., in press).

#### Animal health and disease

Other diseases such as mastitis or metabolic disorders are undoubtedly welfare relevant, and will require sophisticated diagnostic effort or long-term data recordings in order to estimate their exact prevalence. Farm records often suffer from insufficient book keeping, mistakes in data collection and transfer or lack of treatment of sick animals. Therefore reliable informations seem to be difficult to obtain in many cases. Nevertheless, since disease parameters are so important the possibility to use (standardized) farm records should be ensured.

In (dairy) cattle, both undernutrition and overnutrition can be regarded as a (potential) welfare problem, since cows which are overconditioned at drying off are more likely to develop cystic ovarian disease and lameness. Severe body condition loss from the dry to near calving period increased the occurrence of retained placenta. In addition, too thin animals may be regarded as welfare relevant per se, since they have obviously not been able to meet their physiological demands and may suffer from prolonged hunger. Body condition scoring (BCS) can be performed using a variety of scales and systems. Inter- and intra-observer reliability has been evaluated for a number of systems (e.g. Ferguson et al., 1994).

Soiled skin and hair may induce itching, reduce skin function with regard to thermoregulatory properties and anti-germal defence and may cause inflammations of the skin. Relationships with mastitis incidence have also been postulated (Valde et al., 1997). Faye & Barnouin (1985) developed a cleanliness index for dairy cattle using a five-point scale in five body areas. Since only from severe soiling (thick >1cm and cohesive soiling) negative effects are to be expected, recording may focus on these two scores.

Skin lesions, injuries and swellings reflect the impact of the surrounding environment on the animal's body (Ekesbo, 1984). Alterations result for example from contact with hard floors, pressure against feed racks or hits against cubicle partitions. The main body areas at risk are the carpal, fetlock, hock and stifle joint, neck/withers, shoulderblade, dewlap, hip and ischial tuberosity. Likewise, infestation with ectoparasites leads to pruritus, pain and reduced welfare depending on the causative organism. Existing scoring systems refer to the different body areas, severity (hairless spots, scabs, wounds) and size of the lesions and swellings, respectively (e.g. Wechsler et al., 2000).

Surgical treatments such as dehorning, tail docking or castration are welfare relevant for various reasons. They cause pain during and after the procedures, may result in reduced function (e.g. increased fly numbers in tail-docked cattle; Eicher et al., 2002) and impair the animal's integrity in general. The percentage of affected animals, time and type of procedure can be used as parameters.

#### Animal-human relationship

The animal's relationship to humans has been shown to have a significant impact on animal health, production and welfare. Approach and avoidance reactions can be used to assess the animal-human relationship in loose housed dairy cows (e.g. Waiblinger et al., 2003). The avoidance distance towards an unknown person in the home environment (e.g. barn/pen) correlated significantly with the milker's behaviour (Waiblinger et al., 2002). However, the reliable assessment of avoidance distance requires a relatively large sample size and thus appears to be less feasible. In tied dairy cattle, measures of animal-human relationship have only been developed in experimental research but there is no experience with on-farm recordings.

#### Potentials for qualitative and positive animal welfare assessment

Whereas most approaches to welfare assessment are based on indicators of reduced welfare, it seems to be promising to put more emphasis on indicators of good welfare in future. Environmental control and positive social relations may be considered as main components of good welfare. It has often been suggested to use social and non-social play as an indicator of a good welfare state since young animals in particular are only motivated to play if their primary needs are satisfied (Lawrence, 1987). In calves, play is mainly expressed as locomotor and social activities as well as activities directed towards the environment. However, playing is only rarely observed in adult animals and therefore probably restricted to an indicator in calves. In adult cattle, affiliative behaviour such as social licking appears to be a promising indicator of long-term positive affective states. Beneficial effects may be expected in terms of reinforcing and stabilising social relationships and because of the rewarding function at least for the receiver (Sato, 1984, Sato et al., 1991).

In addition to quantitative parameters, the qualitative assessment of cattle behaviour for animal welfare assessment purposes has been discussed in recent years (Wemelsfelder et al., 2001). This approach focusses on the judgement of 'body language' and might be helpful to detect states such as 'apathy' or positive affective states which are commonly considered as welfare relevant.

### Towards feasible assessment systems: The EU project Welfare Quality

The decision which parameters and measures are finally included in on-farm welfare assessment protocols depends on various factors such as the purpose, the time available for data recording and the skills and knowledge of the assessors. Up to now, only few monitoring schemes for dairy cattle have been suggested and applied in the on-farm context (e.g. Capdeville & Veissier, 2001, Whay et al., 2003); there are no systems available for other cattle categories such as dairy or veal calves, dairy heifers or beef cattle.

Areas of concern	Criteria referring to 'what characterises good animal welfare?'	Measures
Good feeding	Absence of prolonged hunger	BCS
	Absence of prolonged thirst	<i>Water supply</i>
Good housing	Comfort around resting	Cleanliness, time needed to lie down...
	Ease of movement	<i>Tethering</i>
Good health	Absence of injuries	Lameness, integument alterations
	Absence of diseases	Clinical examination, herd records
	Absence of pain induced by management procedures	<i>Dehorning, tail docking</i>
Appropriate behaviour	Expression of social behaviours	Frequency of agonistic behaviours
	Expression of other behaviours	Qualitative behaviour assessment
	Good human-animal relationship	Avoidance distance barn/feed rack
	Absence of general fear	?

Table 1. In the European project Welfare Quality, measures for good animal welfare are chosen partly on basis of considerations of how they refer to the criteria and characteristics of good animal welfare, e.g. the five freedoms.

It is one of the goals of the EU project Welfare Quality ([www.welfarequality.net](http://www.welfarequality.net)) to develop feasible monitoring systems to assess the welfare of cattle, pigs and chickens. 12 areas of concern such as 'absence of injuries' or 'expression of social behaviours' have been identified, that should be covered in the assessment of welfare. At present, numerous potential measures are being evaluated or newly developed with regard to validity, reliability and feasibility. A full monitoring scheme is expected to be tested in practice on commercial farms (dairy, veal, beef cattle) in several EU countries in 2007. The main objectives of the final monitoring system are to give advice back to the farmer and/or the veterinarian and to inform consumers about the welfare status of the animals from which they buy products. This project also addresses in a comprehensive way the integration of information by means of a multicriteria evaluation of animal welfare.

### Conclusions and future perspectives: on-farm welfare assessment in relation to herd health and welfare planning

On-farm welfare assessment is a necessary tool in order to identify challenges for the animal health and welfare in the organic dairy herd. It will give guidelines to relevant

improvements and make it possible to evaluate the improvements later in order to estimate whether they have been successful. Welfare assessment systems therefore play a relevant and indispensable part of herd health and welfare plans in the future.

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