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## LABOUR, ECONOMICS AND ANIMAL WELFARE

### **ASSESSING ANIMAL WELFARE IN A DAIRY CATTLE HERD WITH AN AUTOMATIC MILKING SYSTEM**

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#### Introduction

In general there is an increased focus on animal welfare in dairy farms, and it is expected that animal welfare will be an important aspect for public accept of automatic milking systems (AMS) as a production system. Furthermore, experiences from previous studies indicate that there is a large variation between herds in general, regarding animal welfare, due to the effect of interactions between production system and management (Sandøe et al. 1997).

AMS offers the dairy farmer the possibility to increase productivity, but the daily management routines also need to change dramatically (Lind et al. 2000). Also the daily life of the cow is changed from fixed daily milking periods, to a system designed to cater voluntary variation between cows in milking frequency and milking time. It is therefore difficult to know potentials and limitations with regard to animal welfare in dairy herds with AMS.

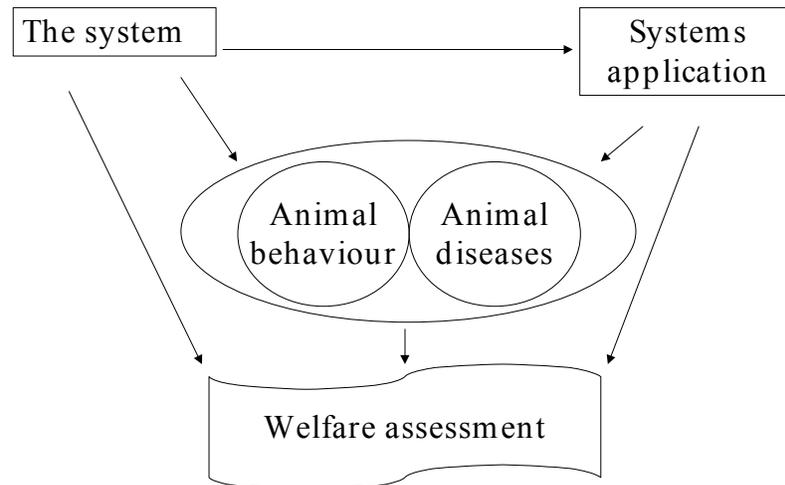
Thus, there is a need for developing a welfare assessment system as a decision support tool in AMS herds. The aim of this paper is to present a concept for assessing animal welfare in an AMS-dairy herd, and to discuss the potentials and limitations of the idea as a decision support tool for the dairy farmer.

#### Sources of Information

A general concept for assessing animal welfare at farm level has been developed at the Danish Institute of Agricultural Sciences, as a decision support tool for the farmer (Sørensen et al. 2001; Rousing et al. 2001, Bonde et al. 2001). It is imperative for the assessment of animal welfare, that a certain agreement on the meaning of animal welfare has been reached. Different approaches for assessing animal welfare at farm level have been developed often with quite different purposes (Johnsen et al. 2001). Our aim is to develop a decision support tool, and in our concept animal welfare should mirror that positive and negative experiences matter, from the animals point of view, as proposed by Simonsen (1996). The experiences of the animals cannot be measured directly. They have to be assessed indirectly. Two kinds of information may be relevant: 1) Information about the system and how it is managed and 2) information on how animals respond to the way they are kept and the way they are treated. Each source of information can be subdivided into four sources of information: the system, systems application,

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animal behavior and animal diseases as shown in Fig. 1. The system and systems application provide information on risk factors for welfare problems. Direct measures on the animals provide information on the animals response to the environment. In an on-farm situation all four data sources provide valuable information in the assessment of animal welfare at farm level.



**Fig. 1. Sources for assessing animal welfare on an animal farm (Sørensen et al 2001).**

### Requests to a Welfare Indicator

A welfare assessment system consists of a range of welfare indicators. A welfare indicator suitable for inclusion in an operational welfare assessment system should have the following qualities:

- A basis in scientific knowledge
- The ability to reflect development over time
- Realistic measurability on the type of farm in question
- The capability to offer decision support to the farmer.

Aggregating welfare indicators into a welfare assessment protocol calls for a systematic procedure, which is described by Rousing et al. (2001). Three steps are suggested:

1. All suggested indicators should be thoroughly evaluated for their independent relevance to animal welfare.
2. Considering that we have information on all the indicators on the list except for the indicator in question, we can evaluate the marginal increase in information adding this indicator to the list. For example; observation of abnormal getting up behavior in cows may be supplemented or replaced by clinical registration of skin lesions. However, behavioral

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observations might be important information when investigating the probable cause of skin lesions.

3. The feasibility of the suggested indicators for on-farm studies (investigate each of the indicators for suitability for on-farm studies) are important. This evaluation relates to time and costs when carrying out registrations or tests. Selection of an indicator depends on whether information is already routinely available or the information can be obtained as a supplement to ordinary consultations by e.g. veterinarians or husbandry advisors. This third step regards developing methods and tests for use on farms.

A protocol describing a full set of indicators for assessing animal welfare on an AMS-dairy farm is developed (Hindhede et al. 2002). Each indicator is described in terms of independent value, marginal value and suitability for on-farm use. The protocol documents the current measures included in a welfare assessment system. It is also a research tool for developing operational assessment systems with different resource demands.

Behavior measurements are included in the operational welfare assessment system. The behavior performed by the animals in the housing systems is compared to known descriptions of normal behavior patterns (behavior normally used to attain functional goals). In this way, behavior measurements and behavior tests, can reveal whether the animals are adapted to the production system or whether the animals show any signs of strain. Behavior studies are conducted 6 times during a year, focusing on: man-animal relationship, behavior at/in AMU, getting up behavior, resting behavior, social behavior, diurnal behavior pattern and usage of the stable.

Disease can be regarded as an important welfare indicator, because it is in many cases associated with negative experiences such as pain, discomfort or distress. The disorders, which have the greatest impact on welfare, are either acute disease processes, causing suffering or long-term progressive conditions involving chronic pain. One indicator in a welfare assessment, at farm level, may be the prevalence and intensity of certain health problems in the herd. A protocol for systematic clinical examination is developed, focussing on important welfare aspects. As a supplement to these important indicators for disease, incidence and death are included. Welfare indicators based on regular clinical examinations are measured 4 times a year focussing on: hoof and leg disorders, lameness, skin lesions, udder infections, body condition, and clinical diseases.

The welfare of farm animals is affected by the production system itself as well as the way the individual farmer applies the system. Knowledge on how system and management might affect the animals, can be included in a welfare assessment system and provide information of risk of welfare problems, as well as causal factors. Any strategy requiring system and management routines to be recorded will have certain limits and pitfalls. Although different aspects of these indicators have been studied under experimental conditions, there is still considerable ignorance of the effect on welfare of a number of minor features in different housing systems. Furthermore, interactions between different factors are currently poorly understood. The marginal welfare information value is typically low, so there is still a need for a strategy that focuses directly on the livestock response. Most system indicators and some management indicators are reasonable

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easy to define and measure, whereas several management indicators are difficult to assess but nevertheless have a serious impact on animal welfare. Surveying housing system and housing equipment as well as interviews with the farmer seem to be relevant methods of measurement.

### The Welfare Assessment Report

The result of a welfare assessment can be presented to the farmer as a welfare assessment report. How to construct such a report is described and discussed by Bonde et al. (2001). A welfare assessment system may provide three types of information to the farmer depending on the aim of the assessment. That is: to give an overview, to give an evaluation, and to give a full documentation

Often a welfare report will include all three types of information, all though different weights will be given to the three elements. The relevant weighing depends on the purpose and potential application of the welfare assessment.

The overview should give the farmer a clear picture of the actual welfare status of the farm. This is a prerequisite when determining the priority of animal welfare considerations in a whole farm framework. The overview may be presented using an indexed or graded score as suggested by Capdeville and Veissier (2001). Alternatively, it might consist of a short summary of the finding of the welfare assessment (Sørensen et al 2001).

The farmer often requests the evaluation and interpretation of the welfare on the farm. This evaluation may rely on a comparison with results from similar production systems, with previous results from the herd, or predefined goals set by the farmers. Recommended guidelines may be available for some indicators, (for example the length and width of cow cubicles) and therefore be relevant as a reference for evaluation.

Documentation is important for linking the conclusion and evaluation to the exact measurements on the farm. In order to accept that the conclusions are based on farm specific circumstances, the farmer needs documentation in terms of familiar recordings from the farm. All results may be printed in the report or at least the results indicating welfare problems in the herd.

### The role of Welfare Assessments in a Decision Support Framework

It is useful to distinguish between decisions made at the operational level (day to day management), tactical planning during the coming year or season, and strategic planning, which may involve major investments.

Operational management in terms of daily routines, often has a considerable effect on animal welfare. Operational management might often be changed or modified with a relatively little change in input and with relatively small impact on other aspects on the farm.

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Tactical management in terms of plans for replacement and reproduction management can influence animal welfare, but will typically also have major impacts on effects on productivity and production level in an AMS dairy herd. An example of a tactical change, which influences animal welfare and production, is a change from zero grazing to a pasture period in the summer. It may be necessary to collect cows for milking several times a day from pasture, which will increase the time queuing for milking.

Strategic management, e.g. to increase the herd size and invest in a second or third AMU, can have a major impact on animal welfare. Since such decisions will influence the whole farm economy and environmental impacts, it is important to analyze the consequences on this type of actions for all stakeholders on an animal farm. Suggestions for a procedure for this activity are given by Sørensen et al. (2001).

After a data-recording period, a full welfare assessment report is presented for the farmer. Based on this report operational management changes are discussed. It is suggested that the farmer uses the information from annual reports as input for a strategy planning process, when having received information from a 2-3 year period as input for a strategic planning process. In this process it is necessary to balance the effects of animal welfare in different alternative plans with the impact on economy, environmental impact and product quality and food safety (Sørensen et al. 2001).

### Welfare Assessment Reports as a Source for Communication with the Society

A welfare assessment report will provide the farmer with information for evaluating the current level of animal welfare at his/her farm and further support him in deciding on any necessary management changes. In food production the farmers will continuously participate in a dialog with consumers and politicians on the animal welfare issues. Welfare assessment reports may have a role to play in this dialog. Welfare assessment reports describe different aspects in relations to animal welfare, which can be useful information also to the public. On the other hand welfare assessment reports can also be used in communicating the possibilities or problems encountered when changing certain production procedures. This could be of particular interest for a new and unknown production method as AMS. A representative sample of welfare assessment reports could be seen as a source of communication between AMS-farmers, the dairies and the society.

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### References

- Bonde, M., Rousing, T., & Sørensen, J.T. 2001. Structure of the welfare assessment report for communication with farmers. *Acta Agric. Scand. Anim. Sci. Suppl.* 30 58-62.
- Capdeville, J & Vissier, 2001. A method for assessing welfare in loose housed dairy cows at farm level focusing on animal observations. *Acta Agric. Scand. Anim. Sci. Suppl.* 30 62-68.
- Hindhede, J., Rousing, T, Fossing, C & Sørensen, J.T. 2002. A protocol for assessing animal welfare in an automatic milking system. Deleverables No 23 in the EU-project: Implication of the introduction of automatic milking on dairy farms. (in press)
- Johnsen, P.F., Johannesson, T. & Sandøe, P. 2001. Assessment of farm animal welfare at herd level: many goals, many methods. *Acta Agric. Scand. Anim. Sci. Suppl.* 30 26-33.
- Lind, O, Ipema, de Koning, Mottram, T.T. & Hermann, H.J. 2000. Automatic milking: reality, challenges and opportunities. In: *Robotic milking - Proceedings of the international symposium held in Lelystad the Netherlands 17-19 August 2000*. Wageningen Pers. 19-31.
- Rousing, T., Bonde, M. & Sørensen, J.T. 2000. Indicators for the assessment of animal welfare in a dairy cattle herd with a cubicle housing system. In: *Improving health and welfare in animal production* (ed. Blokhuis, H.J., Ekkel E.D. & Wechsler, B.) EAAP publication No 102, 37-44
- Rousing, T., Bonde, M. & Sørensen, J.T. 2001. Aggregating welfare indicators into an operational welfare assessment system: A bottom up approach. *Acta Agric. Scand. Anim. Sci. Suppl.* 30 53-58.
- Sandøe, P., L. Munksgaard, N.P. Bådsgård, & K.H. Jensen, 1997. How to manage the management factor – assessing animal welfare at the farm level. In: *Livestock farming systems – more than food production*. EAAP Publication No. 89. Proceedings of the fourth international symposium on the livestock farming systems, Foulum, Denmark 22-23 August 1996, Sørensen, J.T. (editor), Wageningen Pers, Wageningen. 221-230.
- Simonsen, H.B. 1996. Assessment of animal welfare by a holistic approach: behaviour, health and measured opinion. *Acta Agric. Scand., Sect. A, Anim. Sci. Suppl.* 27. 91-96.
- Sørensen, J.T., Sandøe, P. & Halberg, N. 2001. Animal welfare as one among several values to be considered at farm level: The idea of an ethical account for livestock farming. *Acta Agric. Scand. Anim. Sci. Suppl.* 30 11-16.

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