DIFFERENT APPROACHES TO ASSESS THE WELFARE OF DAIRY COWS WITH SOME RESULTS IN SERBIA

Hristov S.*[1], Stanković B.[1], Ostojić-Andrić D.[2]

[1]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080, Belgrade – Zemun, Serbia
[2]Institute for Animal Husbandry, Autoput 16, 11080, Belgrade – Zemun, Serbia
*Corresponding author: hristovs@agrif.bg.ac.rs

Abstract

In this paper, different methodologies for assessing the welfare of dairy cows, such as Animal Needs Index, system of welfare indicators, system of behaviour indicators and the Welfare Quality® assessment protocol for cattle were discussed. Also, the results of the usage of these methodologies in Serbia were analyzed. In the last several years in the country, numerous studies have been conducted about welfare of dairy cattle. State of welfare of dairy cows, on farms with tied and free system estimated by mentioned methodologies was generally acceptable. The major problems in the welfare of cows are insufficient amounts of floor litter, lack of cow access to outdoor runs or pasture, occurrence of lameness, dystocia, downer cow syndrome and mortality, the manifestation of aggression between the animals and improper relationship between stockmen and animals. On the basis of the results, it can be stated that in Serbia only recently enough attention has been paid to monitoring and understanding the current welfare state of dairy cows, which are the first important steps to achieve improvements in practical terms.

Key words: *dairy cows, methodology, welfare*

Introduction

From the very beginning of the scientific considerations of dairy cow welfare it was clear that assessment methodology would be an important and challenging issue. It was recognized that dairy cow welfare can be assessed in many different ways. The approaches to dairy cow welfare assessment include various individual indicators or their combinations. In the studies that have been conducted for many years, scientists have identified a number of dairy cow welfare indicators, adjusted for different purposes in practical terms. Nowadays as results from comprehensive studies there are many systematizations and categorizations of dairy cow welfare indicators. Profound scientific insight into features of the indicators categorizes them into those derived from the animals and those that reflect the state of the animals' environment (Bloom and Fraser, 2007; Hristov et al., 2012a; Hristov et al., 2012b).

For scientific and practical purposes, the easiness of application of the method for assessment of dairy cattle welfare and the quality of the obtained results in terms of their contribution to improve the state of dairy cow welfare are of crucial importance (Rousing et al., 2000; Whay et al., 2003; EFSA, 2009; EFSA, 2012; Hristov et al., 2012b). To improve dairy cow welfare at the population level it is essential to be able to identify farms

with impaired welfare in order to prioritize intervention plans. Among the different components of dairy cow welfare (health, feeding, housing and behaviour), the European Food Safety Authority (EFSA) reported that dairy cows are especially affected by poor health (EFSA, 2009; EFSA, 2012).

Based on this, the aim of the paper was to set out review of different methodologies to assess dairy cow welfare, such as Animal Needs Index (ANI) (Bartussek et al., 2000), system of welfare indicators (Anon., 2011), system of behaviour indicators (Hristov et al., 2010c) and the Welfare Quality® assessment protocol for cattle (Anon., 2009). In addition, the results obtained from the application of these methodologies in Serbia are briefly analyzed.

Dairy cattle welfare assessment methodology

The early days of considering the assessment of farm animal welfare and in that sense the assessment of dairy cow welfare date back to 1964 when the book "Animal Machines" was published by Ruth Harrison. The work of Harrison certainly initiated very important reforms, a better understanding of husbandry conditions for animals and increase of public awareness. In 1965, the UK government commissioned an investigation, led by Professor Roger Brambell, into the welfare of intensively farmed animals, partly in response to concerns raised in Harrison's previously mentioned book. The Brambell's report stated that animals should have the freedom to "stand up, lie down, turn around, groom themselves and stretch their limbs". This short recommendation later became known as Brambell's Five Freedoms. The Five Freedoms were used as the basis for the actions of professional group including veterinarians and have been adopted by representative groups internationally including, for example, the World Organization for Animal Health (OIE, 2013).

The Farm Animal Welfare Council (FAWC) was established by the British Government in July 1979. This body started to list the provisions that should be made for farm animals in five categories, which also became known as the Five Freedoms. The Five Freedoms that animals should have as currently expressed are: 1. freedom from hunger or thirst by ready access to fresh water and a diet to maintain full health and vigour; 2. freedom from discomfort by providing an appropriate environment including shelter and a comfortable resting area; 3. freedom from pain, injury or disease by prevention or rapid diagnosis and treatment; 4. freedom to express normal behaviour by providing sufficient space, proper facilities and company of the animal's own kind; and 5. freedom from fear and distress by ensuring conditions and treatment which avoid mental suffering.

Key concepts and the role of science in the welfare of dairy cattle are described by von Keyserlingk et al. (2009). Comprehensive description of dairy cows welfare indicators are given by Hristov et al. (2012b). In the latter paper only the most important principles, categories, indicators or behavioural systems of the methodologies that are used in our country are presented. The most important issues in dairy cattle welfare that impact the dairy industry today and tomorrow, especially dairy cattle welfare indicators and standards, and the most significant welfare problems, and to illustrate the role of science in addressing these challenges were discussed by Hristov et al. (2012a). Also, dairy cattle welfare standards were described by FAWC (2009) and Hristov et al. (2010a). An excellent review about associations between variables of routine herd data and dairy cattle welfare indicators was provided by de Vries et al. (2011). The influence of rearing conditions on the welfare of dairy cows and milk production is well documented in study by Zlatanović (2009).

The Five Freedoms were later partially or completely used in defining the methodology for the study of the welfare of dairy cows. The first approach was the ANI (Animal Needs Index). The ANI method includes the most important five animal welfare categories as: 1. possibility of movement; 2. possibility of social contacts with other cows; 3. type and quality of floor; 4. lighting and air quality in the accommodation facility; and 5. interaction of stockman with cattle (Bartussek et al., 2000). Basically, ANI almost exclusively uses resource- and management-based measures.

It took many years to define behavioural indicators for dairy cow welfare assessment that included nine complex behavioural systems. Each of these systems included assessment of a large number of behavioural strategies. These are the basic animal behavioural systems: reactivity, ingestion, exploratory behaviour, the kinetic system, behavioural system of associations (social behaviour, group behaviour), the body care system, territoriality, behavioural system of reproduction and behavioural system of rest and sleep (Vučinić, 2006; Broom and Fraser, 2007).

The Welfare Quality® assessment protocol for cattle (Anon., 2009) is a new multidimensional concept for evaluating dairy cow welfare. The four basic principles that are detailed in the protocol and observed through the expression of adequate criteria and indicators are: 1. the principle of provision of food and water to animal; 2. the principle of ensuring adequate housing conditions; 3. the principle of ensuring good health; and 4. the principle of ensuring the appropriate behaviour.

For dairy cattle welfare assessment, standards on farms in our country within the national project "TR 20110: Development and implementation of welfare and biosecurity standards to improve the technology of cattle and pigs production" have been developed. The assessment includes a written plan of welfare protection, management and leadership, competence of stockman, specialist competence, space, microclimate and hygienic conditions of rearing, veterinary and zootechnic practices, health status, satisfaction of animal behaviour needs, some physiological and behavioural indicators, and finally production indicators of welfare (Anon., 2011).

As already pointed out, all the analyzed indicators for assessment of animal welfare can be classified into two groups (Ostojić-Andrić et al., 2013) according to the impact on the status of animal welfare as: 1. indicators derived from the environment (non-animal-based measures); and 2. indicators of the body of animals (animal-based measures). In our country, researchers and stockmen have devoted more attention to non-animal-based measures (Hristov and Relić, 2009). This group of indicators point out the influence of the environment on animal welfare and include: type of animal housing, the degree of freedom of movement, the degree of contact with animals of the same species, the use of litter on floor, microclimate factors that act on an animal and the quantity and quality of offered food and water. In addition, the relationships of stockman to animals, as well as factors of those origins from the animals themselves are included. The relationship of stockman to animals involves the expertise of a certain form of exploitation of animals or some form of livestock production, feelings of stockmen to animals, the ability of stockmen to recognize the change in the status of the animal welfare, understanding and valuing of animal life, etc., (Waiblinger et al., 2006). Factors derived from the animals include genetic predisposition for a certain type of animal production, the use of appropriate animal breeds to certain type of production or other means of exploitation, the exploitation of animals in accordance with sex and age, etc.

The second group of the welfare indicators is measured by physiological, behavioural and production parameters. Physiological indicators include the physiological status of the

organism, the presence or absence of clinically manifest disease, the presence or absence of wounds and injuries, nutritional status, body condition, etc. Behavioural indicators include expression of physiological patterns of behaviour (ingestion of food and water, hygiene of the body, exploratory behaviour, space behaviour, social interactions, reproductive behaviour, rest and sleep, etc.), some changes in the behaviour and pathological form of behaviours. Production indicators include physiological level of production that corresponds to the standard of breed or age and production category, as well as changes in the level of productivity of the animals (Vučinić, 2006; Broom and Fraser, 2007).

Research in our country

In the last several years in our country numerous studies have been conducted regarding welfare of dairy cattle, namely using the methods of ANI (Hristov and Relić, 2009; Zlatanović, 2009; Hristov et al., 2010b; Relić et al., 2010), system of behaviour indicators (Hristov et al., 2010c), system of welfare indicators (Hristov et al., 2011a) and the Welfare Quality® assessment protocol for cattle (Hristov et al., 2011b; Ostojić-Andrić, 2013). Summary of conducted studies regarding welfare of dairy cattle in Serbia is given in Table 1.

In conducted studies (Table 1) different welfare assessment systems have been applied; in the course of the research activities, one national project (Anon. 2011) has been carried out and many papers (Hristov and Relić, 2009; Zlatanović, 2009; Hristov et al., 2010a; Hristov et al., 2010b; Hristov et al., 2010c; Relić et al., 2010; Hristov et al., 2011a; Hristov et al., 2011b), one magister thesis (Zlatanović, 2009) and one doctoral thesis (Ostojić-Andrić, 2013) have been published. Farms that we have so far tested in our country differ in capacity and system of rearing of the animals. Namely, research covered in total 47 farms, 32 farms with tied system and 15 farms with free housing system in the last several years. Investigated farms had different capacities from 12 to 1,250 dairy cows; there were 16 farms with capacity from 10 to 50 lactating cows, 12 farms from 51 to 100 cows, 14 farms from 101 to 500 cows, three farms from 501 to 1,000 cows and two farms with more than 1,000 lactating cows. When it comes to methodology, ANI was used on three farms, the Welfare Quality ® assessment protocol for cattle (2009) was applied to a total of 19 farms and the system of welfare indicators on 11 farms was applied. Simultaneously, ANI and the system of behaviour indicators were applied to a total of eight farms, ANI and system of welfare indicators on two farms, a system of welfare indicators and the Welfare Quality® assessment protocol for cattle to two farms and finally all four methods on two farms.

As mentioned previously, the measures could be categorized into animal-based measures and non-animal-based measures. Therefore, animal-based measures include: observations and measures from the animals made during the welfare assessment on farm, ante- or post-mortem. First of all, these are certain direct indicators (e.g. behaviour, clinical signs of injury or lameness). Some of these are veterinary procedures that can be obtained only by a veterinarian or other authorized person. Further animal-based measures comprise records of animal breeding, milk yield and milk quality, fertility, health, etc., (EFSA, 2012). These indicators may include records of animal-based measures obtained by the use of automated methods (e.g. progesterone in milk samples, locomotion scoring). Assessment of the welfare of dairy cattle using animal-based measurements by direct observations and investigation of farm records were conducted by Whay et al. (2003). Non-animal-based measures are designated as resource- and management-based (EFSA, 2012). These measures involve observations and measures of housing condition provided or of

management used (e.g. cubicle dimensions, quality of bedding and floor surfaces) and inspection of documentation (e.g. food provision strategies, foot care programme).

Table 1. *Summary of conducted study on dairy cattle welfare in Serbia*

Parameters	Number of farms	
Investigated farms	47	
Farms with tied system of rearing	32	
Farms with free system of rearing	15	
Farm capacity		
10 to 50 lactating cows	16	
51 to 100 cows lactating cows	12	
101 to 500 cows	14	
501 to 1000 cows	3	
More than 1001 cows	2	
Used assessment methods		
Welfare Quality ® assessment protocol for cattle	19	
ANI	3	
System of welfare indicators	11	
ANI and the system of behaviour indicators	8	
ANI and system of welfare indicators	2	
System of welfare indicators and the Welfare Quality ® assessment protocol for cattle	2	
All four methods	2	
The emergence of some welfare problems in farms	Number	Percentage
Malnutrition	16	34.04
Lameness	47	100
Mastitis	47	100
Metabolic diseases in cow	21	44.68
Diarrhoea in calves	29	61.70
Respiratory disease in calves	24	51.06
Dystocia	10	21.28
Downer cow syndrome	5	10.64
Mortality	15	31.91
Poor hygiene of floor surface in the stables	24	51.06
Inappropriate relationship between stockmen and animals	10	21.28

The aim of the monitoring of animal welfare indicators is to identify and determine the severity of the problem that endangers or impairs the welfare of the animals. Identification of welfare cow problems was achieved with general clinical examination of animals, special and specific examination of animals, examination of the housing system, handling of animals and the relationship of the dairy farmer to animals. Assessments of the seriousness of the problems that disturb cow welfare should take into account duration of causes and the number of animals for which the well-being is threatened or violated (FAWC, 2009; Hristov and Stanković, 2009; EFSA, 2012).

Applying the mentioned dairy cow welfare assessment methodologies in our country has produced a number of findings. First of all, it can be stated that knowledge relating to the definition and importance of introducing standards of animal welfare at cattle farms in our country do not apply enough or are applied selectively (Hristov et al., 2010a). In our country enough attention has only recently been paid to understanding the welfare problem

in scientific terms, which is the first important step to achieve improvements in practical terms (Hristov and Stanković, 2009; Hristov et al., 2011a). When we define the indicators of cow welfare it is very important to determine the monitoring system (Keeling and Veissiere 2005; Broom and Fraser, 2007; Hristov et al., 2010a).

Although experts and dairy farmers in our country have some knowledge regarding animal welfare, generally it is not sufficient for complete protection of cow welfare (Hristov and Stanković, 2009). They, in addition to scarce knowledge of indicators and standards of animal welfare, tend to have fragmented knowledge of the principles of animal welfare based on the five freedoms. One should always bear in mind that dairy farmers' attitudes and empathy towards animals are associated with animal welfare indicators (Hristov et al., 2010a; Kielland et al., 2010).

The average state of welfare of cows on farms in our country, in tied and loose housing systems, as estimated by ANI, system of behaviour indicators, the Welfare Quality® assessment protocol for cattle and system based on welfare indicators may be regarded as acceptable. The state of welfare of cows on the farm with free rearing system with the possibility of permanent use of outdoor runs is better than the state of welfare of cows in tied system. Loose housing provides significantly greater opportunities to meet the needs of all systems of behaviour of dairy cattle in relation to the tied system. Generally, knowledge that most stockmen possess in our country is inadequate for completely safeguarding the welfare of dairy cattle. Stockmen have many years of experience, but not the desire for additional training. There is a need to familiarize stockmen with ethological needs of the animals and to motivate them to meet those needs (Hristov et al., 2010a; Ostojić-Andrić, 2013).

Rearing conditions often do not correspond to dairy cattle welfare in terms of temperature and relative humidity (Hristov and Stanković, 2009). Maintenance of hygiene of all surfaces in the stables, and in particular the floor surface is not on an appropriate level as well. On the farms with tied system generally minimum standards of welfare are met and the biggest objections concern the inability of cow movement, thus demonstrating lack of other forms of behaviour in which the moving is part. Stockmen attitude towards cows is generally appropriate, but there were failures in usage of certain husbandry procedures due to non applied analgesia and anaesthesia. Due to lack of knowledge, stockmen often do not respond to the appearance of the initial symptoms of disease and veterinary assistance is requested only when the disease has already been manifested. Claw disorders and mastitis are the most important diseases that disrupt the welfare of cows, although metabolic diseases in cow and diarrhoea and respiratory disease in calves occur frequently. The major problems in the welfare of cows are the consequence of insufficient amounts of bedding material, lack of access of cows to outdoor outlets or pasture, occurrence of lameness, dystocia, downer cow syndrome and mortality, the manifestation of aggression between animals and inappropriate relationship between stockmen and animals (Hristov and Stanković, 2009; Hristov et al., 2010b; Relić et al., 2010; Hristov et al., 2011a; Ostojić-Andrić, 2013).

Although it is considered that the cow diet meets the needs at high level, malnutrition can be encountered in the different stages of lactation (Ostojić-Andrić, 2013). One should always bear in mind that as dairy farms become larger and diverge between grass-based and fully housed systems the interest in the welfare of the dairy cow and related environmental issues by consumers and legislators is increasing. These pressures mean that good nutrition and management, which underpins much of dairy cow welfare, are critical (Ostojić-Andrić, 2013; Logue and Sinclayr Mayne, 2014).

In our studies it was found that the protocol for assessment of dairy cattle welfare (2009) provides information about most consequences for cow welfare caused by the action of the major risk factors but which requires no longer observation time (behavioural disorders, thermal discomfort in cows). Also, there is a lack of specificity of some indicators (body condition, skin lesions which may be a consequence of several factors). Given the importance of both the inadequate body condition (malnutrition or too fat), the proportion of cows with normal body condition could be regarded as a more relevant indicator of the state of cow welfare. Age, productivity and genetic potential of animals significantly determine the potential risk and the impact on cow welfare and could also be examined as differential factors (Hristov et al., 2011b; Hristov et al., 2012b; Ostojić-Andrić, 2013).

Conclusion

On the basis of literature data about different approaches to assess the welfare of dairy cows and experience of authors the following can be concluded:

- Serbia has only recently paid enough attention to monitoring and understanding the current welfare state of dairy cows, which are the first important steps to achieve improvements in practical terms.

- The applied multidimensional approaches for assessment of dairy cow welfare are suitable for scientific consideration of the welfare level on farms, so that the methodology which is given therein may be introduced for practical assessment of the dairy cow welfare.

- The applied methodologies can be helpful to detect shortcomings in the protection of the welfare of the cows on the farm and to take action for resolving the problems of the welfare at the appropriate time.

- The results show that there are many opportunities for improving the quality of the welfare of dairy cows, which should be directed mostly to improving the housing conditions of dairy cows in terms of providing adequate space, comfort and hygiene.

- The most important problems of the welfare of cows in Serbia are the consequence of insufficient amounts of bedding material, lack of access of cow to outdoor outlets or pasture, occurrence of lameness, dystocia, downer cow syndrome and mortality, the manifestation of aggression between animals and inappropriate relationship between stockmen and animals.

- Stockmen and experts involved in the breeding and animal health protection should be familiar with cow welfare assessment methodologies, as well as with the parameters, indicators, criteria and principles used in the assessment of cow welfare.

Acknowledgments

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