

Welfare Assessment of Dairy Cows at Farm Level

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Abstract. The welfare assessment of dairy cows based on animal-linked parameters is a relatively new feature in Romania. The aim of this study was to assess the welfare of dairy cows kept in free housing and in tie-stalls, by comparing the degree in which the needs of these animals are fulfilled in both rearing systems. During the study a total number of 285 dairy cows were assessed in 10 farms, using the Welfare Quality® assessment protocol, based mostly on animal-linked parameters. According to this protocol, the scores awarded for the parameters were computed in scores for 12 welfare criteria, then in scores for four welfare principles and finally each farm was assigned to one of the possible welfare categories. The statistical descriptors calculated allow the comparison between the results obtained in the farms with different housing systems. At the criteria level 31.66% of the scores were 'unacceptable' (63.15% of which in the tie-stall farms) and only 13.33% and 10% were 'enhanced' and 'excellent', respectively. At the welfare principle level, 62.5% of the 'unacceptable' scores were awarded to tie-stall farms and the only 'excellent' score was obtained by a free-stall farm. In the final classification, eight of the 10 farms were found 'unacceptable'. The welfare of the cows was 'acceptable' in one tie-stall farm and 'enhanced' in a single free-stall farm, respectively. Apart from the identification of the welfare problems in the assessed farms, the protocol shows the domains where improving of animal welfare is easy to achieve by cost effective interventions.

Keywords: Welfare Quality®, tie-stall, free-stall, good feeding, good housing, good health, appropriate behaviour

INTRODUCTION

The welfare of dairy cows represents nowadays a subject of larger interest than strictly scientific research. The particularities of rearing and genetic selection of the modern dairy cow increase the risks of a wide range of specific welfare problems (Fregonesi, 1999). The requirement of a dairy product warranty for the consumer makes it necessary to demonstrate the high welfare degree of the milk-producing animals, on top of proving the hygienic quality of the specific product. Johnsen et al. (2001) stated as goals for welfare assessment at herd level the following: the certification of welfare in individual farms; the certification of welfare for a group of farmers; the evaluation of housing systems; the diagnosis of welfare problems and the providing of advice to the farmer. Thus, welfare assessment at herd level may have more than one goal, but it practically serves the interests of the farmer within the present dairy industry. Many researchers recognize the importance of animal-based measures in farm

animals' welfare assessment (Phillips, 1993; Signoret, 1983; Webster and Main, 2003). The Welfare Quality assessment protocols (for three farm animal species) are the result of a project funded by the European Union, which was in place between 2004 and 2009, with the collaboration of 44 research institutes and universities from 13 European and four Latin American countries. The research project focused on the integration of animal welfare in the food-chain quality, on the provision of European standards in animal welfare assessment at farm level and on the development of information systems and practical strategies to increase the welfare of farm animals (Welfare Quality Consortium, 2009). The major innovation of this protocol lies in the selection of parameters that are mainly based on behaviour, such as the responses of the animals to their environment. Many authors (Broom, 1996; Capdeville and Veiser, 2001) emphasise the importance of this type of direct assessment. On the other hand, the effect of different housing systems and management practices upon the welfare of dairy cows cannot be contested. Even so, because the Welfare Quality assessment protocol classifies the farms in the end of the assessment while beginning with the evaluation of the individual animal, it can be used in different housing systems and allows comparison between such systems.

MATERIALS AND METHODS

During the study 10 dairy farms were visited once, five with loose housing and five with tie stalls. A total number of 285 milked cows were evaluated; their number in each farm was established according to the instructions of the assessment protocol. The farms housed between 16 and 70 cows; the prevalent breeds were Holstein and Romanian spotted cattle.

The research has been carried out between April and July 2011. The grazing season was chosen as research period because on-pasture evaluation of the cows was needed in the farms where the cows had access to pasture (two farms with loose housing and one with tie-stalls). Table 1 presents data about the management and resources of the 10 assessed farms.

Tab.1.

Descriptive data regarding the studied dairy farms

Farm	Barn type	Feeding	Manure removal	Milking	Bedding type	Loafing/resting area
1	Open*	Mechanic	Mechanic	Parlour	Mats	Cubicles
2	Closed	Mechanic	Mechanic	SM	Woodchips	Cubicles
3	Closed	Mechanic*	Manual	Manual	Straw	Common space
4	Closed	Mechanic*	Mechanic	Parlour	Straw	Cubicles
5	Open*	Mechanic	Mechanic	Parlour	Mats	Cubicles
6	Closed	Manual	Manual	SM	Straw	Short bed
7	Closed	Manual	Manual	Manual	Straw	Medium bed
8	Closed	Manual	Manual	SM	Straw	Medium bed
9	Closed	Mechanic	Mechanic	SM	Sawdust	Medium bed
10	Open*	Mechanic	Mechanic	Parlour	Sawdust	Short bed

Open* - the absence of at least one wall; Mechanic* - with access to pasture; SM – stall milking

The cows were evaluated according to the Welfare Quality® assessment protocol for dairy cows. Data collection was made according to the instructions of the protocol. The majority of the parameters were recorded directly, at animal and at herd level; a few measures regarded the resources and management of the farm and the housing conditions (Tab. 2). Because the measure of thermal comfort was not developed by the protocol, the momentary

temperature was recorded and scored as follows: 0 – temperatures within the thermal comfort zone for dairy cows (10-14 C°); 1 – temperatures outside the thermal comfort zone but within the thermal neutrality for dairy cows (0-16 C°, excluding the 10-14 C° interval); 2 – temperatures outside the thermal neutrality (below 0 or above 16 C°).

Tab. 2.

The principles, criteria and parameters of the Welfare Quality® assessment protocol for dairy cows

Welfare principles	Welfare criteria	Assessed parameters
1. Good feeding	1. Absence of prolonged hunger	Body condition score
	2. Absence of prolonged thirst	Water provision; cleanliness of water points; water flow; functioning of water points
2. Good housing	3. Comfort around resting	Time needed to lay down; animals colliding with housing equipment during lying down; animals lying partly or completely outside the lying area; cleanliness of udders, flank/upper legs, lower legs
	4. Thermal comfort	As yet, no measure is developed. For the study the momentary temperature was recorded
	5. Ease of movement	Presence of tethering; access to outdoor loafing area or pasture
3. Good health	6. Absence of injuries	Lameness; integument alterations
	7. Absence of disease	Coughing; nasal discharge; ocular discharge; hampered respiration; diarrhoea; vulvae discharge; milk somatic cell count; mortality; dystocia; downer cows
	8. Absence of induced pain	Disbudding/dehorning; tail docking
4. Appropriate behaviour	9. Expression of social behaviours	Agonistic behaviours – assessed by observation of head butts; displacements; chasing; fighting; chasing-up
	10. Expression of other behaviours	Access to pasture
	11. Human-animal relationship	Avoidance distance
	12. Positive emotional state	Qualitative behaviour assessment – by observation of the cows' 'body language' regarding 20 behavioural terms (active, relaxed, fearful, agitated, calm, content, indifferent, frustrated, friendly, bored, playful, positively occupied, lively, inquisitive, irritable, uneasy, sociable, apathetic, happy, distressed)

During data recording, scores are awarded for each parameter, and then criteria scores are calculated. In the next step, the criteria scores are computed to obtain principle scores. At the welfare criteria and welfare principle level the scores can range from zero (meaning the worst possible situation, where the welfare of the animals cannot be poorer) to 100 (for the best situation). The criteria and principle scores can be transformed to qualitative classes: the threshold for 'excellent' is set at 80 points, for 'enhanced' at 55 and for 'acceptable' at 20 points. Scores below 20 are considered 'not classified', being unacceptable. According to the scores for the four welfare principles, the farm is classified in one of the four possible welfare categories named above. For the calculation of the scores and the final classification of the

farms the Welfare Quality® software was used. Then descriptive statistical parameters were calculated for the free-stall and tie-stall farms, respectively, in order to compare these different housing systems.

RESULTS AND DISCUSSION

The scores obtained by the 10 assessed dairy farms for each of the 12 welfare criteria are shown in Table 3.

Tab. 3.

Welfare criteria scores for the assessed dairy cow farms

Welfare criteria	Assessed farms									
	Loose housing					Tie-stall farms				
	1	2	3	4	5	6	7	8	9	10
1 Absence of prolonged hunger	12.5	53.7	30.9	85.0	53.7	12.5	85.0	68.0	34.6	16.4
2 Absence of prolonged thirst	3.0	3.0	3.0	85.0	3.0	3.0	3.0	60.0	3.0	25.0
3 Comfort around resting	63.5	53.8	53.8	22.0	22.0	18.7	80.2	45.2	22.0	18.7
4 Thermal comfort	14.0	30.0	68.0	68.0	14.0	14.0	30.0	30.0	14.0	14.0
5 Ease of movement	75.0	95.0	95.0	75.0	75.0	15.0	34.0	34.0	15.0	15.0
6 Absence of injuries	20.2	47.7	40.8	69.3	18.0	48.8	51.5	44.6	50.1	41.2
7 Absence of disease	56.7	50.2	33.4	85.0	54.4	64.7	86.1	56.7	24.6	30.2
8 Absence of management induced pain	41.0	15.0	15.0	41.0	15.0	100.0	100.0	15.0	100.0	100.0
9. Expression of social behaviours	49.9	49.9	79.9	79.9	21.0	0.0	10.0	10.0	0.0	0.0
10. Expression of other behaviours	0.0	28.5	75.0	0.0	0.0	7.2	19.4	24.1	0.0	0.0
11. Good human-animal relationship	38.1	46.5	27.1	30.8	40.3	57.8	57.5	28.1	51.9	51.1
12. Positive emotional state	43.0	53.1	48.5	51.8	42.7	17.0	39.7	35.6	25.7	51.6

It can be observed that the criteria 'Absence of prolonged thirst' and 'Expression of other behaviours' obtained the lowest scores. The importance of the unlimited access of dairy cows to sufficient quantity of good quality drinking water was demonstrated by different researches (Lagger et al., 2000; LeJeune et al., 2001; Little et al., 1984), but is not respected by the majority of the farmers. Prolonged thirst is considered to have more detrimental effects on the dairy cows' welfare and health than prolonged hunger (Welfare Quality Consortium, 2009); this is why thirst is more important than hunger in calculation of the 'Good feeding' principle (Tab. 4).

The criteria 'Expression of other behaviours' and 'Ease of movement' were assessed based on the access of the cows on pasture and in outside paddocks, respectively. The highest scores were obtained in farms 2, 3 and 8, where the cows are grazing in the warm season and also have access to outside loafing area (farms 2 and 3). In tie-stall farms the scores are lower. Permanent tethering of cows can lead to changes in their normal behavioural patterns, decreased frequency of all social and investigative manifestations and a higher risk for abnormal behaviours (Krohn, 1994). The positive effect of pasturing on dairy cows is

recognized in the literature. Grazing and outdoor exercise prevent and reduce the incidence of lameness (Singh et al., 1993), increase the resistance of the immune system (Rinehart, 2009), improve the quality of behavioural parameters as natural behaviours can be performed (Krohn, 1994; O'Connell et al., 1989), stimulate the reproductive function and increase the welfare degree of the cows (Boyle et al., 2008).

The majority of excellent scores were obtained in the tie-stall farms for the criterion 'Absence of pain induced by management practices', because tail docking and cow dehorning is not practiced in these farms.

The 'Absence of injuries' criterion investigates lameness and cutaneous alterations in the assessed cows. The prevalence of severe cutaneous alterations (lesions) was relatively low (12.63%). In another study ruled in Romania, Popescu et al. (2010) reported a slightly higher prevalence (14.38%) of skin lesions in dairy cows housed in confinement during the winter and at the pasture in the warm season, in 52 small farms in the North-East of Transylvania. In our study 8 farms obtained acceptable scores at the criterion 'Absence of injuries' and one farm had unacceptable score not because the frequency of the skin lesions but due to the high number of cows being lame. The overall prevalence of lame cows in this study was of 34.39% (98 cows). There are authors (Phillips and Schofield, 1994) who consider that the differences in lameness incidence and severity in different farms are linked rather with hereditary factors and farm practices, than with the housing conditions. Other researchers (Raven, 1985) stated that improper quality of flooring and bed surfaces affect the hoof health of the dairy cows, especially in cubicle systems. The productive performance of the cows also influences the health of their feet, the milk producing tissues being suspected to compete the cheratogene hoof elements for structural proteins (Fregonesi, 1999). Rowlands et al. (1983) concluded that a comfortable resting surface can reduce the stress produced by lameness in dairy cows. Also the usage and cleanliness of proper bedding materials seems to limit the incidence of hoof horn and heel erosion (Blowey, 1994; Whay, 2002), solear ulcers (Rowlands et al., 1983) and of the general discomfort of the cows (Singh et al., 1993). Hoof trimming and hoof care plays an important role in lameness reduction in dairy herds, alongside with the access on pasture, at least during the summer. As Haskell et al. (2006) reported, lameness prevalence can be twice more in farms with 'zero-grazing' systems, compared to farms where the cows have access to pasture.

For the criterion 'Absence of diseases' no 'unacceptable' score was awarded. Mortality and dystocia seems to have a low frequency in the investigated farms, according to the declarations of the farmers. The most frequently observed disease symptom was diarrhoea, especially in the farms 3 and 9. The causes can be infectious (BVD-MD, paratuberculosis, salmonellosis, clostridiosis, etc), parasitic (coccidiosis, ostertagiosis, trichostrongylosis), internal diseases (uremia, chronic peritonitis, congestive heart failure, copper deficiency secondary to molybden deficiency or selenium deficiency in the grass), toxic (intoxication with heavy metals, organophosphoric substances, salt, several plants, mycotoxicosis) or nutritional (abrupt changes in the diet, digestive overload, excess of concentrate feed, etc). Unfortunately, as long as the milk production is not affected, the farmers usually do not pay any attention to this condition of the cows.

Regarding the behavioural assessment of the dairy cows the agonistic behaviours were recorded (as 'Expression of social behaviours'), the access to pasture was noted (as 'Expression of other behaviours'), the flight distance was investigated (for the criterion 'Good human- animal relationship') and a qualitative behaviour assessment was made at group level (for the criterion 'Positive emotional state'). In the tie-stall farms the observation of agonistic behaviours and of the cows' emotional state is difficult because the movements and

expression of behavioural responses are limited in tethered animals. For the criterion 'Good human-animal relationship', the majority of the farms obtained acceptable scores and two of the tie-stall farms had 'enhanced' results. Previous studies proved that in the extensive and tethered rearing systems of dairy cows the stockmanship is better than in intensive housing conditions (Popescu et al., 2009) because of the lower number of animals and frequent intervention of humans (feeding, watering, milking, barn cleaning and so on). Popescu et al. (2010) concluded in a study made in 52 small dairy cattle farms (5-20 animals/farm) a low frequency of fear manifestations of the cows towards the observer (14.59%). In this study both farms that obtained 'enhanced' scores for this criterion used tie-stall housing. In table 3 it can be observed that two other tie stall farms had scores close to the threshold value of 55 points, close to the limit to pass in the enhanced category. The scores in the free-stall farms were much lower (Tab. 3). Scientific studies demonstrated that when cows show fear towards their handler not only their behaviour and welfare are affected (Waiblinger et al., 2006) but also their productions and immune response (Bertenshaw and Rowlinson 2009). This way a good human-animal relationship can be considered one of the indicators of 'positive health' (Leeb et al., 2004) or 'appropriate behaviour' in our case (Welfare Quality Consortium, 2009).

In order to compare the two housing types used in the assessed farms, the mean vales of the criteria scores were evaluated (Tab. 4). It can be observed that for the criteria 'Thermal comfort', 'Expression of social behaviours', 'Expression of other behaviours' and 'Positive emotional state' the mean scores are higher for the free-stall farms. For the criteria 'Absence of injuries', 'Absence of diseases', 'Absence of pain induced by management practices' and 'Good human-animal relationship', the mean scores are better in the tie-stall farms.

Tab. 4.

Descriptive statistic parameters of the criteria scores for the assessed farms with two different housing types

Welfare criteria	Loose housing				Tie-stall farms			
	M	St dev	Min	Max	M	St dev	Min	Max
1. Absence of prolonged hunger	47.16	27.31	12.5	85	43.3	32.00	12.5	100
2. Absence of prolonged thirst	19.4	36.67	3	100	18.8	24.92	3	60
3. Comfort around resting	43.02	19.59	22	63.5	44.36	25.36	18.7	80.2
4. Thermal comfort	38.8	27.44	14	68	20.4	8.76	14	30
5. Ease of movement	83	10.95	75	95	22.6	10.41	15	34
6. Absence of injuries	39.2	21.16	18	69.3	47.24	4.25	41.2	51.5
7. Absence of disease	55.94	18.63	33.4	100	52.46	25.35	24.6	86.1
8. Absence of management induced pain	25.4	14.24	15	41	83	38.01	15	100
9. Expression of social behaviours	56.12	24.71	21	100	4	5.48	0	100
10. Expression of other behaviours	20.7	32.77	0	46.5	10.14	11.12	0	24.1
11. Good human-animal relationship	36.56	7.711	27.1	46.5	49.28	12.24	28.1	57.8
12. Positive emotional state	47.82	4.84	42.7	53.1	34.72	14.64	17	55.6

M – mean, St dev – standard deviation, Min – minimum, Max - maximum

Based on the scores obtained by each farm for the welfare criteria, scores for the four welfare principles were calculated and the final classification of the farms was made (Tab 5). The global analysis of the principle scores shows that there were more 'unacceptable' scores in the tie-stall barns than in the farms with loose housing, where the majority of the scores were 'acceptable'. At the final classification, the cows in a single farm with loose housing were

found to have enhanced welfare and in only one tie-stall farm their welfare was 'acceptable', in the remaining 8 farms the conditions were 'unacceptable'.

Tab. 5.

The principle scores obtained by the 10 assessed farms and their final classification

Welfare principle	The scores of the assessed farms									
	Loose housing					Tie-stall farms				
	1	2	3	4	5	6	7	8	9	10
Good feeding	4.1	9.7	7.0	95.0	14.6	4.7	14.6	64.8	6.8	31.8
Good housing	53.6	69.1	69.1	69.1	35.2	17.8	49.7	37.8	17.4	14.4
Good health	47.0	29.5	22.4	60.3	14.0	57.2	76.8	29.2	37.2	42.3
Appropriate behaviour	26.4	39.0	41.3	22.6	16.5	9.8	17.8	28.8	16.5	16.0
Classification of the farm	UA	UA	UA	E	UA	UA	UA	A	UA	UA

UA – unacceptable, A – acceptable, E – enhanced; Ex - excellent

CONCLUSIONS

Following this study, it can be concluded that the welfare of dairy cows is 'unacceptable' in the majority of the assessed farms. The improper resources and management practices in the farms led to the major welfare problems of the cows: inadequate water provision, permanent housing without access to pasture and outdoor exercise and limitation of movement possibilities and natural behaviour of the animals in tie-stall farms. The most concerning problem is the inadequate water provision because the installation of additional drinkers and water sources implies expenses for the farmer. The access of the cows to pasture and to outside daily exercise is easier and cheaper to realise and it should be considered by every dairy farm, irrespective of the housing system used.

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