Professional paper | DOI 10.63356/agrores.2025.023

Manual locomotion scoring systems for lameness detection in dairy cows

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Abstract

In the intensive milk production on dairy farms, there are a number of production problems. One of them is the high prevalence of lame cows. The economic losses owing to lameness range from 27.0 to 62.0$ in average per cow. There are a lot of different reasons for economic losses due to lameness and hoofs problems, and they can be divided into two main groups: direct (reproductive problems, less milk production) and indirect (veterinary treatments, early culling) costs. Numerous advanced disorders that affect cows' hooves can cause lameness. Timely detection of cows with a lower degree of lameness can prevent more severe stages and improve the welfare of the cows. There are several ways of detecting lameness, which can be direct and indirect methods. The objective of this paper was to describe and compare some of the manual locomotion scoring systems. All systems use ordinal or continuous types of scale and observed different gait (abduction or adduction, asymmetric gait, short step) and posture traits (arched back, hip hick, head bob). The most used manual locomotion scoring system is based on asymmetric gait, of the unbalanced weight distribution and arched back. Incorporating lameness assessment into daily farm routines requires additional commitment from farmers. This includes training, additional time and persistence, which often makes them less acceptable to farmers. Early detection of the onset of lameness can shorten treatment time, reduce treatment costs and increase animal welfare.

Key words: lameness, detection, methods, locomotion scoring systems, dairy cows

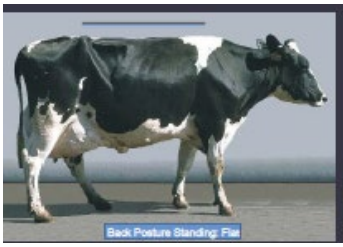
INTRODUCTION

Intensive milk production has a numerous problem, one of them is the high prevalence of lame cows. Depending of authors, prevalence of lame cows ranges between 13 to 55% (Barker et al., 2010; Clarkson et al., 1996; Cook et al., 2016; Shearer, 2010; Von Keyserlingk et al., 2012; Weaver et al., 2005). Along with mastitis and reproductive problems, lameness belongs to the most common problems that occur at dairy farms (Alban, 1995; Barkema et al., 1994; Clarkson et al., 1996; Wells et al., 1993). Lameness is defined as either an inability to use the limbs in an effective way or as dysfunctional use of the extremities. Lameness has a negative effect on dairy herd performance and farm profitability because it has been associated with a negative effect on milk yield (Archer et al., 2010; Green et al., 2002), on reproductive performance (Walker et al., 2010), and it also increases the risk of culling (Booth et al., 2004). Besides that, lameness has a negative impact on the welfare of cows, which is undesirable in modern production. Numerous advanced disorders that affect cows' hooves can cause lameness. Timely detection of cows with a lower degree of lameness can prevent more severe stages and improve the welfare of the cows. There are several ways of detecting lameness, which can be direct and indirect methods. According to ICAR (*07-05-Functional-Traits-Lameness-Guidelines ICAR*, n.d.) lameness scoring, when applied on a regular basis, allows detection and treatment of lame cows at an early stage of disease. Further, collected data can be used to evaluate the herd's lameness control strategy and provide information for further analyses and research. The objective of this paper was to describe some of the manual locomotion scoring systems.

Manual locomotion scoring systems

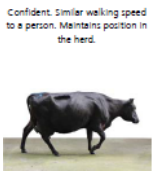
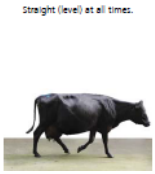
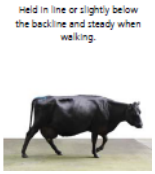
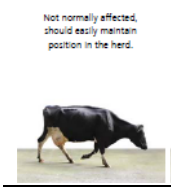
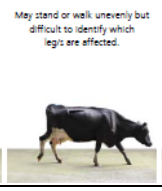
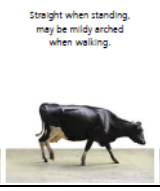
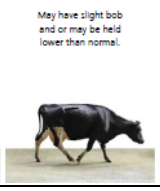
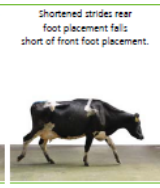
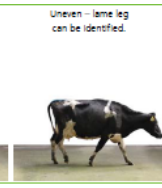
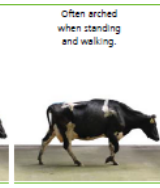
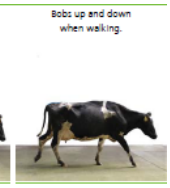
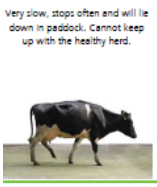
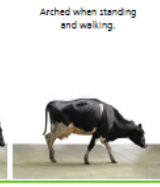
All methods use ordinal or continuous types of scale and observed different gait (abduction or adduction, asymmetric gait, short step) and posture traits (arched back, hip hick, head bob). The most used manual locomotion scoring systems is based on asymmetric gait, of the unbalanced weight distribution and arched back. To assess lameness in this way, it is necessary to observe certain parts of the body during the animal's movement and assess which point rank that movement belongs to. Some authors used a 2-point scale (Groehn et al., 1992), a 4-point scale (Cook, 2003; Vokey et al., 2001), a 5-point scale (Thomsen et al., 2008) or a 13-point scale (Offinger et al., 2013). Manual locomotion scoring, although very useful, is labour-intensive and physically demanding, especially on large dairy farms (Leach et al., 2010). The most used locomotion scoring system is a 5-point scale, which is presented in Table 1. (*07-05-Functional-Traits-Lameness-Guidelines ICAR*, n.d.; Sprecher et al., 1997).

Table 1. Manual locomotion scoring with a 5-point scale (1 to 5) (*07-05-Functional-Traits-Lameness-Guidelines ICAR*, n.d.; Sprecher et al., 1997)

STANDING	WALKING	LOCOMOTION SCORE	TREATMENT
		**1 (Normal)** Stands and walks normally with a level back. Makes long confident strides.	**None** Monitor to ensure cows do not progress.
		**2 (Mildly Lame)** Stands with flat back, but arches when walks. Gait is slightly abnormal.	**None** Monitor to ensure cows do not progress.
		**3 (Moderately Lame)** Stands and walks with an arched back and short strides with one or more legs. Slight sinking of dew-claws in limb opposite to the affected limb may be evident.	**Treat Now** These cows need to be pulled into the chute, trimmed and treated as soon as possible and monitored.
		**4 (Lame)** Arched back standing and walking. Favoring one or more limbs but can still bear some weight on them. Sinking of the dew-claws is evident in the limb opposite to the affected limb.	**Treat and Observe** Treat these cows ASAP. Once treated, observe closely for needs to re-treat.
		**5 (Severely Lame)** Pronounced arching of back. Reluctant to move, with almost complete weight transfer off the affected limb.	**Treat and Observe** Treat these cows ASAP. Once treated, observe closely for needs to re-treat.

In this method, the greatest attention is focused on the position of the backline (while standing or walking) and the distribution of body weight on the legs. It was described even 4 ratings for lame cows with different stages of lameness (mildly, moderately, lame, severely lame), and just one rate for healthy cow. For these methods is need to have some previous education and praxis, because is a little bit demanding.

Table 2. Manual locomotion scoring with a 4-point scale (0 to 3) *(lameness scoring poster dairynz.co.nz*)

Walking speed	Stride	Weight bearing	Backline	Head	Locomotion score	Treatment
					**0 (Walks evenly)**	**No action required** No action required – this cow is normal
					**1 (Walks unevenly)**	**Minor action required** Record and keep an eye on her – some cows normally walk unevenly.
					**2 (Lame)**	**Action required** This cow is lame and needs to be reported, drafted and examined within 48 hours
					**3 (Very lame)**	**Urgent action required** This cow is very lame and needs urgent attention. Draft and examine as soon as possible.

The 4-point manual locomotion scoring system presented in Table 2. is suitably for farmers with less experience in scoring lameness. Comparably to the 5-point scale describe in Table 1. this method has less categories of lama cows, lame and very lame (score 2 and 3), while score 1 is focused on uneven walk, with some interruptions in movements. These interruptions can be seen in uneven stride and rhythm, backline can be a mildly arched when walking. Furthermore, this 4-point scale besides looking on the position of the backline and the distribution of body weight on the legs, focused also on the walking speed and rhythm, length of the stride, and position and movement of the head.

The scoring of animals should be on a flat, firm, and non-slippery surface on which the cows are expected to walk normally or familiar to. While cows are walking, animals should be seen from the side. Animals should be randomly chosen, from the farm. The best time for scoring lameness is after milking. The environmental conditions should be as calm as possible to allow cows to walk as they would normally. For early detection of hoof health problems, it is recommended to score cows weekly or every two weeks. If it is not possible, at least once a month.

CONCLUSION

Incorporating lameness assessment into daily farm routines requires additional commitment from farmers. This includes training, additional time and persistence, which often makes them less acceptable to farmers. Early detection of the onset of lameness can shorten treatment time, reduce treatment costs and increase animal welfare

ACKNOWLEDGEMENT

Supported by the Faculty of Agrobiotechnology Sciences Osijek, Croatia, Project for Fitness Potential of Animals in Economically Sustainable Agricultural Production; Project for Ecologically and Economically Sustainable Animal Production.

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