Rumen fill scoring for monitoring health in dairy cows

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Rumen fill scoring for monitoring health in dairy cows

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- Rumen fill scoring (RFS) is a basic, visual evaluation technique to monitor feed intake and energy balance in dairy cows.
- Low RFS scores are linked to negative energy balance in transition cows – when the cow is using more energy than she can take in.
- Negative energy balance can lead to various metabolic diseases and causes poor fertility, so catching it early and preventing progression is invaluable.
- Precision technology in the form of 3D cameras may eliminate the subjective nature of RFS and make it a more accurate and efficient tool.

Rumen fill scoring does what it says on the tin – it is a visual scoring system to assess how full the rumen is, defined as the total amount of liquid and dry matter (kg) in the rumen. This score reflects dry matter intake (DMI), ration composition, digestion and rate of passage. It's useful for identifying problems with feed intake that might be indicative of a variety of diseases. Fill scoring can also be indicative of the cow's appetite which declines before calving and so may be used as a rough indicator of delivery in the absence of disease.

How to do it

To assess rumen fill, use the left-hand side of the cow behind the last rib, under the transverse processes of the spine and in front of the hook bone (Figure 1). It may be possible to feel a slightly firmer area which indicates the fibre mat of the rumen – sitting atop the liquid portion - sometimes with a small cap of gas on top (indicated by a softer area). The rumen fill score reflects intakes in the past 2–6 hours and targets are different depending on the physiological status of the cow (Figure 2).

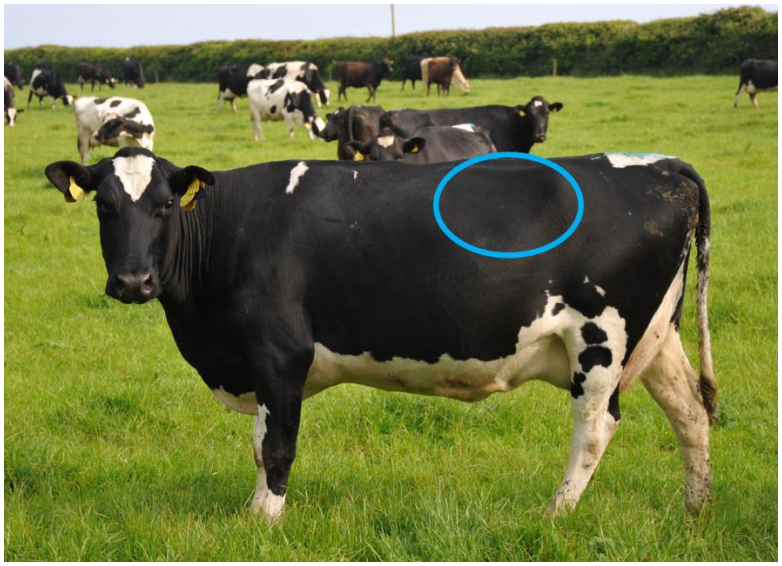
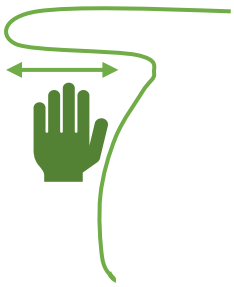


Figure 1: Photograph of a cow showing the target region for evaluation when scoring rumen fill.

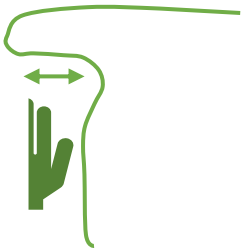
Scoring is on a scale of 1 to 5, with 1 indicating that the cow has not eaten recently and 5 suggesting that the cow has eaten plenty in the last 2-6 hours (Figure 2). RFS of 1 or 2 is cause for concern, especially over a prolonged period (2-3 days), they suggest that the cow is not ingesting enough food which may be due to a variety of factors that need to be addressed (Figure 2). It is important to note that target RFS scores vary depending on the status of the animal, for example, lactating cows should aim for 3.0 and dry cows, 4.0 (Figure 2). In dry cows, the heavily pregnant uterus occupies more space in the abdomen leading to increased distention.

Score 1



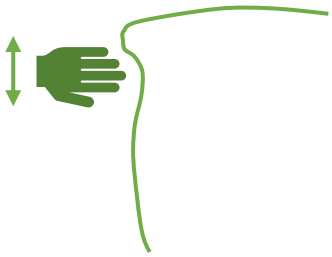
Deep dip more than one hands width. The skin curves under the vertebrae one hands width. Hollow shape is rectangular, indicating that the cow has not eaten in the last 24 hours.

Score 2



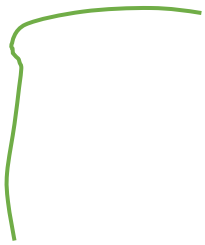
Dip in the flank approx. one hands width deep and space under vertebrae is approx. half a hand's width. Hollow shape is triangular. Seen in 1st week after calving, but otherwise signifies a problem.

Score 3



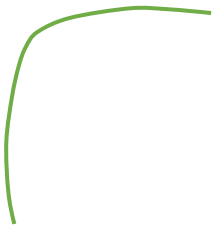
Slight, visible dip in the flank, small dip under the vertebrae approx. 1 hand's width before bulging out slightly. Correct score for milking cows.

Score 4



No dip visible, slight bulge under vertebrae and moving downwards. Correct score for cows at the end of lactation and dry cows, also minimum score for pre-calving.

Score 5



Flank is flat or bulging and curves outwards beneath the vertebrae. Skin may be tight over the belly and there is no visible transition between the flank and ribs, seen in dry cows.

Figure 2: Diagrammatic representation of rumen fill scoring, adapted from AHDB.

What can rumen fill tell us?

Recent studies suggest that changes in feed intake can be monitored using RFS which in turn is useful in early disease detection, particularly for metabolic problems caused by negative energy balance (NEB).

Negative energy balance frequently occurs during the transition period (the time just prior to and just after calving) when energy demands are high but DMI is low. In NEB, the cow is expending more energy than she can take in – a particularly common problem for high yielding cows. This, in turn, contributes to fertility issues, particularly the resumption of normal ovarian activity, so it is important to maintain energy balance to ensure good fertility, health and optimal productivity. Feed intake is the ideal measurement for monitoring energy status; however, it is also time-consuming and impractical to assess each individual cow every day. Metabolic profiling via a blood sample is also a good alternative for monitoring purposes and can provide a plethora of additional information but can be costly and takes time to generate results. Enter rumen fill scoring – studies suggest that RFS is strongly associated with feed intake and can easily be rolled into daily checks when cows are entering or leaving the parlour. RFS must be measured at the same time of day to determine changes in DMI and subsequently energy balance. Studies investigating the relationship between RFS and important blood metabolites in energy balance have found a strong link, particularly in the close-up dry period. Further work has established that there is a connection between RFS and energy status post-partum and subsequent conception at first AI. The lower the rumen fill score and/or the longer it remained low, the more likely the animal was to have NEB post-partum. The same may be said about conception at first AI, as those with poor rumen fill and NEB did not resume their reproductive cycle normally.

A recent study funded by Farming Connect investigated the link between a variety of parameters and the health of dairy calves. The study found a tendency for calves from dams with a rumen fill score of 3 or less 1-week prepartum to have slower average daily gains (ADG) when compared to those with an RFS of 5. Analysis of immune cells in blood taken from these calves also suggests that this may have had a negative effect on their immune system.

The main issue with rumen fill scoring is its subjective nature – there will naturally be variations depending on who scores the animal. Precision livestock technologies are one area of development that can assist in moving away from the subjectivity of

traditional RFS. Systems have already been developed to 3D image cattle as they enter milking parlours and have even been mounted inside automated milking system (AMS) stations. Cameras can take highly accurate measurements of individual cows over time and link these to their EID tags. Early systems have been developed to assess cattle body condition scores, body weight, predicted carcass characteristics and assess standing positions and gaits to detect lameness. These systems have been demonstrated to be more accurate than 2D visual analysis as they can assess the concavity of a cow's body which would be well suited to rumen fill scoring. Whilst there is no direct scientific evidence on the use of image analysis technology in rumen fill scoring, it should be noted that Centria University of Applied Sciences in Finland through EU funding provided by the AFarCloud project has developed a system to scan and assess rumen fill. This system analyses what they call the "hunger groove" (see figure 1) of cattle on entering an AMS block to be milked/fed. This methodology could remove the labour cost and subjectivity associated with RFS as well as providing an accurate catalogue of previous scores to compare to. This would enable the user to develop individual, normalised values for each cow quickly and easily and allow detection of more subtle changes.

Summary

Rumen fill scoring is a basic but useful tool that has the potential to provide information about the cow's physiological status, appetite and feed composition. Low rumen fill scores are often seen in transition cows when DMI is reduced. Very low RFS or low scores for an extended period are linked to negative energy balance – when the cow is using more energy than she can take in. Negative energy balance can lead to a variety of metabolic problems and fertility issues, so catching this early and preventing progression is a valuable strategy. There is also the suggestion that RFS could be linked to calf health, with a study finding that low RFS in the dam can result in poor ADG and immune status in the calf. There is great potential for precision technology in the form of 3D cameras to eliminate the subjectivity and time-consuming nature of RFS, whilst providing highly accurate information. Mounted in the parlour or automatic milking system, these cameras can also monitor BCS and lameness, proving a holistic approach to cow health.