TECHNICAL NOTE

SusCatt - Increasing productivity, resource efficiency and product quality to increase the economic competitiveness of forage and grazing based cattle production systems

Selecting for Efficiency in Pasture-Based Dairying

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Challenge

Pasture-based dairying relies on effective conversion of grazed herbage into milk while cows maintain body condition, health and fertility. These systems have very different priorities compared with typical intensive, yield driven dairy production. How do farmers identify the best cows (and bulls) to breed herd replacement from, when most published selection criteria focus on more intensive systems – even those suggested for spring calving herds?

Objective

This study investigated the scope to improve forage-conversion efficiency by considering variation between individual cows in pasture-based herds. By closely monitoring cows on three UK pasture-based dairy systems, we considered how farmers could select for positive traits within these sustainable production systems.

Farm and Cow Selection

Three organic dairy farms in the Southern Midlands joined the study, based on the following:

1. Spring-calving
2. Pasture-based (at least 85% forage in diet)
3. 30 or more second and/or third lactation cows

Each farmer randomly selected 23 second/third lactation cows, aiming for a range of ages, breeds, size and productivity.

RumiWatch Halters

Selected cows were fitted with RumiWatch halters (Itin+HOCH, Switzerland) - to record grazing and ruminating behaviour and

Dairy cow wearing a RumiWatch halter, Photo: Gillian Butler

estimate dry-matter intake (DMI). These halters have high-tech, pressure-based recording systems, validated to log real-time eating, ruminating and drinking activity in-field over days and weeks. The cows at each farm wore the halters for two weeks at three key times in 2018, covering early (E; <100 days in milk / DIM), mid (M; >101 and <200 DIM) and late (L; >201 DIM) lactation.

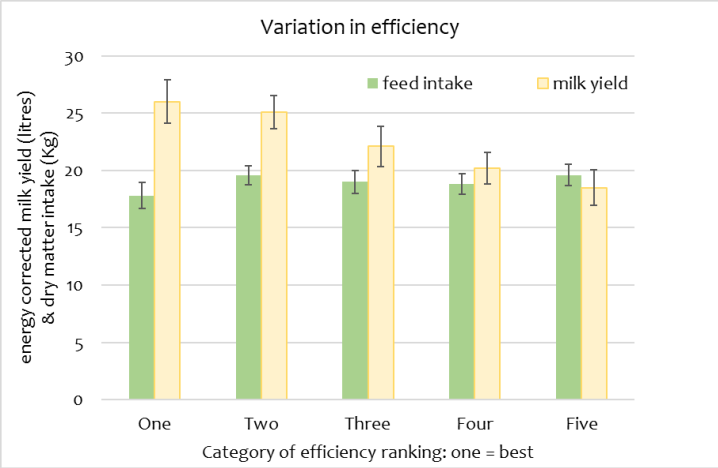
During each period of data logging, we also recorded milk yield and composition (protein and fat content). These were used to standard- ize output as 'energy corrected milk yield' (or ECMY, based on 3.5% fat and 3.2% protein) to allow fair comparison between cows producing milk of different composition.

Variation in cow performance

While comparing records from the different farms provides insight into the impact of subtle differences in management, the main

aim of this study was to gain a greater understanding about feed conversion, gleaned from looking at variation in production efficiency between individual cows under similar management.

Records from all 3 farms were used to calculate production efficiency for all monitored cow, based on estimated dry matter intake (kg) for each litre of EC milk they produced. Cows were ranked and considered in 5 groups (each with 27-31 records); the most efficient with the lowest score as Group One, declining to the least efficient as Group Five. Grouping the cows by efficiency allows us to consider other factors that might be linked to their efficiency category.



Mean feed dry matter intakes (green) and energy corrected milk yield (yellow) (±sem) for groups of cows ranked according to production efficiency.

The chart shows average feed consumption (green bars) and adjusted milk yields (yellow bars) for the 5 efficiency groups. Since the standard calculation for ECMY is based on a relatively low-fat content, the adjusted yield for cows producing high butter fat milk are boosted disproportionately, so it is perhaps not surprising that milk fat content was greatest for Group One cows and lowest for Group Five.

The key message from this study is the extent of variation existing even under comparable management, indicating the potential to breed more efficient cows – bearing in mind other necessary traits for pasture-based dairying. Comparing the 2 extremes: the least efficient cows (in Group Five) ate 9% more yet produced 40% less EC milk than cows in Group One, working out at 1.14 kg of grazing plus supplement for every litre of milk produced, compared with only 0.72 kg for the most efficient cows in Group One. However, it is particularly relevant to note that production efficiency did not always follow milk yield, so selecting solely on milk, or solids, yield will not necessarily breed from the most efficient cows.

Ideally, we ought to identify superior cows in early lactation before they are inseminated, so it would be useful if early production efficiency is a reliable indication of overall 'breeding value'. Unfortunately, due to missing records, those collected here for early lactation did not reliably indicate the best overall cows. On the other hand, we did see consistency for cows at the other end of the scale – there appears to be scope to use early lactation records to identify cows to avoid for breeding replacement heifers.

Although the nuances of eating behaviour were measured by the RumiWatch halters, their links to production efficiency are difficult to distill. Cows in Group One had the lowest intakes - they appeared to spend less time eating and ruminating with the fewest 'chews per bolus' – yet still produced the most milk. This indicates we need a better understanding of how eating behaviour impacts an individual cow's abilities to convert forage to milk.

Conclusion

The study showed certain individual cows on pasture-based farms are consistently more efficient than average through lactation and could be selected for breeding replacements to maintain and improve grazing conversion efficiency within the system. While this is true, the participant farmers (and many others) have already adapted genotypes best suited to their systems and are ahead of the research in many ways. While the results support farmer decision-making, dairy science research needs to catch up.

Imprint

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