

# Feed Efficiency



**FARMING**  
connect  
cyswllt  
**FFERMIO**

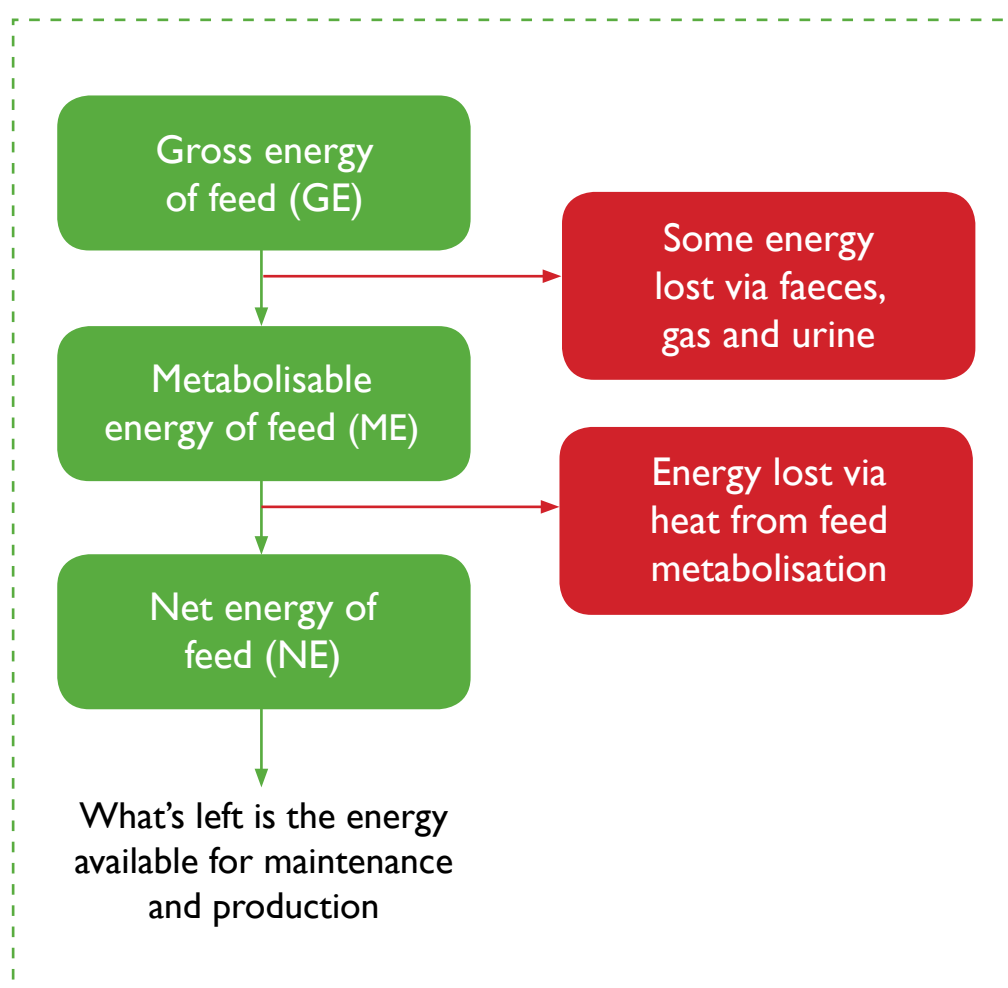
**08456 000 813**

## WHY IS IT IMPORTANT?

Meat and milk production may be increased by selecting animals that use their feed more efficiently and in so doing, also meet climate change objectives for lower methane emissions. Feed efficiency (FE) of ruminants is going to be an essential area to focus on in the future.

## WHAT IS IT?

Feed efficiency is a trait for how well an animal uses the energy from feed for production – essentially, how well the gross energy (GE) of a feed is converted into net energy (NE) - see Box 1. Current research is trying to improve the energy conversion of feed in the animal, primarily through the animal's genetic potential for feed efficiency (FE). Feed efficiency is commonly measured in terms of residual feed intake, (RFI) so an animal that has a high FE will have a low RFI. Recent research has demonstrated that low RFI beef heifers for example, take in 6% less feed than high RFI heifers - they simply have a greater digestive ability. Further research needs to be completed to investigate if this is linked to the microbial population in the rumen.



Residual feed intake is difficult to measure on-farm as the dry matter intake (DMI) of each animal must be accurately assessed. Therefore a proxy measure must be developed that can be used in practice, whether that's a genetic estimated breeding value (GEBV) or a phenotypic trait.

## Genetic traits:

- The genetics of FE in the animal have been examined based on the evidence that FE is affected by the digestive ability of an animal. Through analysis of 4,900 cows in three different countries, heritability for RFI is estimated at around 0.17. At present, it appears that RFI is a relatively stable trait and so would be an appropriate trait to include in a breeding programme. With the development of genomic selection based on single nucleotide polymorphism (SNP) markers related to FE, selection for the trait can be strengthened in practice.
- A current five-year Innovate-UK funded project is working to develop estimated breeding values for Stabiliser cattle based on net feed efficiency. To be able to establish net FE the project involves accurately measuring feed intake and live weight gain in individual cattle.

## Phenotypic traits:

- Ruminants require the microbial population in the rumen to help breakdown their natural diet. Researchers believe that some microbiomes may be more efficient than others, indeed a recent study found that digestive ability accounted for up to 31% of RFI variation in dairy cattle when fed a high fibre diet, but had no effect in high starch diets. Studies have also found that the microbial profile of the rumen is associated with RFI in beef cattle. Other variables, which can also affect the ruminal microbiome, including host age, species, health and antibiotic use need to be taken into consideration.
- Within the rumen there is a subset of microorganisms that produce methane, called methanogens. Methane production is associated with inefficiency, as its production in the rumen requires energy. Thus, more energy efficient animals emit 20-26% less methane than their inefficient counterparts. It has been demonstrated that inefficient cattle have a less diverse population of methanogens.

Finally, researchers are working to develop an easy to use phenotypic tool to identify feed efficient animals. Such work has focused around biomarkers, emissions and behaviours e.g. heifers with higher FE are shown to feed for a longer period of time. Ideally, research should look at such phenotypic traits and relate these back to the biology of FE in the animal. *Work in IBERS, Aberystwyth University is doing just this.* The project is looking to evaluate existing ways of estimating intake in sheep and relating increasing levels of intake back to the rumen microbiome. Research in FE has so far primarily focused on cattle, and so the study at IBERS is much needed for the sheep industry.

In conclusion, feed Efficiency EBV's are still a little way off being a reality for farmers to base their stock selection on in practice but making selection for FE more attainable at farm level would make it easier to include feed efficiency as a breeding objective in ruminant systems.

