Farming for 1.5°

Independent inquiry on farming and climate change in Scotland

Impact of livestock disease on greenhouse gas emissions

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INTRODUCTION

Almost all disease episodes increase the emissions per kg of production.

Disease adds to the carbon cost of production at several levels. Reduced food conversion efficiency, reduced growth rate, reduced milk yield are all linked to a range of endemic diseases and parasitic infections. Pathogens which reduce life expectancy, increase mortality or depress reproductive efficiency through infertility, abortions and still-births also have a heavy carbon cost.

There are exceptions; animals can in some circumstances maintain performance when infection is localised or transient. Perhaps in these circumstances there is a performance dip but the depression in performance is at a level that the sensitivity of conventional efficiency indicators or carbon auditing is unable to quantify an impact.

However generalised clinical disease conditions carry a quantifiable carbon cost. Sub-clinical disease has also been shown to reduce carbon efficiency.

Disease management, control or eradication can contribute to climate change targets at two levels - reducing the carbon intensity of production and also the reduction of GHG emissions from the livestock sector. Both effects in some cases act in unison, however perversely in some cases the two impacts conflict.

CARBON INTENSITY OF PRODUCTION

Carbon cost per unit of Production

Effective disease management will reduce the carbon intensity of production which can be quantified through carbon auditing tools which define the kg of carbon per kg of product. At herd or flock level the carbon intensity of production tracks key performance indicators and often aligns with economic performance.

The carbon impact of several diseases has been quantified; BVD, Johne's disease, virus pneumonia, mastitis and in sheep enzootic abortion, sheep scab, and parasitic gastroenteritis are examples. Work by ADAS based on the management or control of key bovine diseases indicates that emissions from the national herd can be reduced by 10% through elevating the national herd health status.

Recent survey and workshop activity has scoped the use of a syndromic approach to drive system efficiency based on an investigative phase which identifies both disease and system factors.

Syndromes can offer more significant carbon efficiency gains than the control or management of an individual disease. Performance gains can be built into a new sustainable platform with a whole system approach which is focused on the key flock or herd pathogens but also includes any required intervention on environmental, nutritional and genetic factors.

In summary the carbon intensity of production [carbon footprint] can be significantly reduced through the implementation of health management or control strategies.

Flock and herd managers working with farm vets may choose to focus on specific diseases or in some cases syndromes depending on the performance on farm and their targets.

The two reports on Livestock GHG diseases commissioned by DEFRA and Scottish Government list the diseases which have the most significant impact on carbon efficiency. Those reports at present provide a benchmark for ghg disease management.

Diseases that reduce total emissions.

As we move closer to 2045 and the net zero target the reduction of total emissions will become the priority and will drive management and disease control strategies. The farming community, technical advisors and marketing bodies have focused on carbon foot-printing [the carbon intensity of production] as a tool to improve on farm efficiency and as a marketing aid. It is not the same as reducing total emissions.

Diseases fall into two categories, the first category are those that reduce the carbon intensity of production and also reduce total emissions. These diseases impact on production through depressing growth rates, reducing food conversion efficiency, and reducing the longevity of breeding stock.

These features may increase the number of days to first parturition, increase the number of days to slaughter, reduce slaughter weights, increase the feed required per unit of production, and require the rearing of more replacement breeding females.

Examples of diseases with this profile are parasitic gastroenteritis, sheep scab, lung worm in cattle, Johne's disease in cattle and sheep, virus pneumonia, BVD, IBR, many of the iceberg diseases of sheep [MV, OPA, CLA]

Controlling or managing this group of diseases reduces total emissions. Their management has a direct impact on the level of enteric emissions and in the emissions related to the production cycle.

The second category of diseases reduce the carbon intensity of production but increases total emissions. This group includes some of the diseases which when controlled have the biggest impact in reducing the carbon footprint [carbon intensity of production] of production.

When effective disease management across this group is implemented the impact is to improve reproductive efficiency and/ or to significantly reduce mortality; in so doing the carbon efficiency of breeding animals improves significantly and the population rises. That population increase drives up total emissions.

Examples of this group of diseases are- Enzootic abortion of ewes, toxoplasma, neospora, listeria, campylobacter and a wide range of common neonatal diseases including cryptosporidia.

Clearly the efficiency gains that can be captured by the effective control of both reproductive and neonatal disease should not be ignored but to avoid increases in total emissions requires a change in mindset at farm level.

Output level must become the key management driver not the size of the breeding herd or flock. If output is maintained at the historical level efficiency gains can be matched by modest reductions of breeding flocks or herds with real cost savings and a reduction of total emissions. It is not an easy concept to sell.

This group of diseases therefore has an indirect impact on total emissions as reduction in total emissions is only achieved by reducing the numbers of breeding females.

Reducing total emissions will be an increasing priority for the industry. It will require all flocks and herds to be involved in a standardised disease management package to deliver a critical mass to deliver emission change. There are other synergies generated by a national approach, for example the risk of trading is reduced and securing health status on farm becomes less challenging.

The choice of diseases for a national control programme, and the management strategy, will be constrained by the sensitivity and specificity of diagnostics and or the availability of effective vaccines. On-going work involving the Moredun Research Institute, its SEFARI partners and LHS aims to map out potential GHG disease management/control options that might be suitable candidates for a national programme to reduce total emissions.

It is likely that disease or conditions which reduce emissions in a direct manner will be the core of any programme. If the control or management of a disease improves animal welfare, eases trade or reduces antimicrobial use it is likely to be a more attractive candidate; however the baseline of a national control strategy is that it is effective, affordable, measurable, and viable across a range of systems.

Disease management at a national level has the potential to achieve the projected 10% reduction of livestock GHG emissions and through that level of carbon efficiency lift economic performance across sectors.

FURTHER READING

1. https://www.climatexchange.org.uk/media/2031/livestock_health_and_ghg.pdf
2. https://www.cielivestock.co.uk/wp-content/uploads/2020/09/CIEL-Net-Zero-Carbon-UK-Livestock_2020_Interactive.pdf
3. https://www.theccc.org.uk/publication/land-use-policies-for-a-net-zero-uk/
4. https://www.wwf.org.uk/sites/default/files/2019-12/WWF%20Net%20Zero%20and%20Farming.pdf
5. https://www.researchgate.net/publication/336583240_Healthy_livestock_produce_sustainable_food_-_how_do_we_quantify_the_impacts_of_cattle_health_on_industry_sustainability
6. https://www.msd-animal-health-hub.co.uk/TimeToVaccinate