

Briefing 1186

Sheep and climate change

Summary

Sheep convert and concentrate nutrients not suitable for human needs into valuable foodstuffs from difficult-to-exploit land but this means they will have a relatively high carbon cost per unit of product. Sheep have a significant role in delivering environmental goods and services as well as enhancing the value of pastures as carbon sinks. An environmental accounting model that values these issues alongside the GHG cost of production is needed. Efficiency improvements necessary include increasing the longevity and fertility of breeding stock and the feed efficiency of slaughter stock.

This paper is summarised from *Chapter 6: "The climate change challenge for UK sheep production 2010 and beyond"* The Royal Agricultural College and Rumenco 100 Club Annual Fellowship in Beef and Sheep by Nick Allen Sector Director, EBLEX. Further chapters are summarised in other papers. The full report is at:

http://www.eblex.org.uk/documents/content/publications/p_cp_rac_sheep_report_281010.pdf

Introduction

Meat production is regularly in the firing line when it comes to discussions of climate change and a sustainable food supply for an ever-growing world human population. Livestock products do have a "cost" in greenhouse gas (GHG) terms, principally through the production of methane and nitrous oxide in farming systems and through land use change.

There is no doubt that ruminant meats have a relatively expensive CO₂ equivalent cost of production relative to other foods. However, it makes use of poorer land where there is little or no sensible alternative use for food production other than by ruminants. The environmental and preservation of sensitive landscapes benefits should not be ignored.

EBLEX has commissioned a Life Cycle Analysis (LCA) of English lamb production to identify where producers can reduce overall GHG production. The opportunity for technical improvements is large.

Managing the GHG cost of English lamb production

The English sheep industry is large, complex and highly inter-dependent, both of itself and with other farming enterprises.

National GHG emission and energy consumption benchmarks have been established for the main types of sheep production which, in turn, have been used to calculate overall 2008 baselines for industry emissions and energy use against which to plan future reductions.

Emissions are measured in carbon dioxide equivalents that take into account the methane and nitrous oxide emissions as well as CO₂ – called Global Warming Potential (GWP)100. With primary energy use taken into account, English lamb production is estimated to be generating a GWP100 of around 14.6kg of CO₂ equivalent GHG emissions per kilogram of meat.

Table 6.1: Managing the GHG cost of English Lamb

	UK Beef	UK Lamb	Pork	Chicken	Potato
GWP t CO ₂ Eq	13.89	14.64	6.5	3.1	0.11
Primary energy use GJ/t	31.28	22.02	18	9.7	3.1

These calculations highlight that GWP tends to increase with extensification both because more animals are required to produce each tonne of meat, and lower quality forages tend to generate higher methane emissions. Government and industry in England are working together to put in place a “Greenhouse Gas Action Plan” which will coordinate the activities in all sectors of the industry and report progress.

Recent progress

Steady improvements in sheep production efficiency have taken place over the past decade, with 5% fewer lambs required to produce each tonne of meat in 2008 than in 1998. This, and the reduction in the national flock and slaughter numbers over the past 10 years, has been an important factor. But it is the increase in efficiency which represents the sustainable option the industry needs to embrace moving forward.

Current emissions position

Reporting the current position is a problem because the measurement systems in place for the nationally are crude. The Intergovernmental Panel on Climate Change (IPCC) has three levels of reporting – Tiers, 1, 2 and 3 – which become progressively more tuned into the region and systems being used in agriculture. At present, the UK inventory uses Tier 1 information which means that all sheep will have the same GHG cost regardless of system, age or feed. This approach gives a basic estimate of GHG production for the UK but is no use at all for farm business managers.

To galvanise ownership of the GHG problem across the agricultural industry, business level carbon audits will be needed. The industry and Government recognise this and have work in place to develop what is needed, but this will be several years away. In the meantime, a number of consultancy companies have developed their own carbon calculators which allow enterprise, or business, carbon calculations to be done. In the livestock sector, dairy processing companies are leading the way, with some beef retailers following suit. Armed with a business-specific report, managers can then implement new approaches to reduce the carbon costs of production in a verifiable way.

It is vital to appreciate that hill sheep, in particular, are converting and concentrating nutrients not suitable for human needs into valuable foodstuffs from difficult-to-exploit land resources. This means they will have a relatively high carbon cost per unit of product, but they will be using resources which are pretty much impossible to exploit in any other way. This is extremely relevant when world demand for food is increasing while productive land is in decline.

In the UK sheep have a significant role in delivering environmental goods and services like biodiversity, habitat management and landscape character, as well as enhancing the value of pastures as carbon sinks. An environmental accounting model that values these issues alongside the GHG cost of production is needed to make sure livestock managers have a fully balanced report of their farming system. We need to account for the benefits as well as costs.

Efficiency improvement opportunities

1. Increasing the longevity of breeding stock – so the costs of their non-productive rearing phase are spread over a greater weight of meat produced
2. Increasing the fertility efficiency of breeding stock – so they produce more slaughter stock and a greater weight of meat in their productive lives

3. Increasing the feed efficiency of slaughter stock – so they produce more meat per unit of input.

Other environmental impacts

Landscape management

Even though the relative indigestibility of their herbage creates GHG emission challenges, maintaining sufficient grazing livestock on the English hills and uplands is essential if their open character is to be maintained and the encroachment of bracken and woody scrub is to be avoided.

Sheep production is important too in maintaining the traditional small hedge-bounded field structure that characterises much of northern and western England.

Carbon sequestration

Regular grazing of appropriately managed grassland and the steady return of nutrients to the soil in faeces and urine accelerates its natural cycle of growth and decay. This has been shown to improve the capture of CO₂ through photosynthesis and its incorporation into soil organic matter. In this way grazed sheep play a valuable role in increasing carbon capture and storage, especially in permanent pastures where lack of cultivation minimises carbon release through oxidation.

Fertiliser use

Over the past 10 years overall nitrogen, phosphate and potash applications to grassland in England and Wales went down by more than half. Sheep production stands out as the lowest user of artificial fertilisers on grass. The progressive introduction of higher sugar ryegrasses, clovers and other more efficient forage species into grassland swards offers the opportunity to reduce this use of energy and potential pollutant even further, as does the better utilisation of farmyard manure.

Nutrient management and planning

The fact that 80% of livestock farmers out-winter their sheep reduces the nutrient management and planning challenge they pose when it comes to storing and applying manures produced from housed stock.

Where housing occurs, the challenge is further reduced by the widespread use of straw bedding in winter sheep, leading to the majority of animal waste produced as farmyard manure rather than slurry. This also provides a valuable way of processing and recycling the organic matter in straw. Nevertheless, there remains the potential to make greater use of farmyard manure and minimise the risk it can pose to water and air quality by better planned applications.

Water usage and quality

Water quality is perhaps a more significant concern for many grazing livestock farmers, especially those situated in important river catchments. Working closely with Natural England and other specialists, considerable work is already underway in improving river quality through catchment-sensitive farming practices – including, most significantly, excluding livestock from access to key rivers.

Alan Spedding, 04 December 2010

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