Beef's intersection with ESG Metrics

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Abstract

Environmental, social and governance (ESG) metrics are increasingly important to businesses for evaluating their performance in non-financial indicators to investors. Currently, the largest intersection of the beef industry with ESG metrics is related to the area of greenhouse gas emissions (GHG) reporting and goals and targets. Many companies that sell beef products have made public commitments to reduce Scope 3 GHG emissions, which includes GHG emissions from all inputs, including emissions associated with the raising of cattle for beef. Currently, there is a gap between company commitments and the U.S. beef supply's ability to document and mitigate greenhouse gas emissions from cattle production. Research filling these gaps, including improving models used for reporting and finding practical and scalable solutions to mitigate enteric methane emissions is a key focus of Colorado State University' AgNext. Animal health and veterinary medicine is a key part of maintaining and achieving ESG metrics outcome goals, as lower rates of morbidity and mortality can lower resource inputs and GHG emissions per pound of beef produced. Additionally, animal health and well-being are fundamental components of the social license to operate for beef supply chains, thus bovine veterinarians can play a key role in ESG metrics related to beef production.

Key words: ESG, sustainability, greenhouse gas emissions, beef, climate change

Introduction

Sustainability issues, such as climate change and animal welfare, are increasingly important to society at large and the beef industry. As a result, companies are increasingly documenting and reporting environmental, social and governance (ESG) metrics. ESG metrics are widely varied including the topics of human resources, risk management, energy usage, and greenhouse gas (GHG) emissions. GHG emissions reporting for companies is often inclusive of all three scopes of emissions (Table 1).

Emissions are also typically reported as carbon dioxide equivalents (CO_2e) using 100-year global warming potential values (GWP100) for different GHGs as each gas can have different radiative forcings and atmospheric lifetimes (Table 2). For companies with beef cattle production in their supply chains, such as quick service restaurant brands, Scope 3 emissions reporting includes the emissions associated with raising cattle. Emissions associated with raising cattle include emissions associated with feed production, grazing lands management, manure emissions, and enteric methane emissions. Currently, we understand these emissions typically through life cycle assessment modeling that is often a snapshot in time and often not specific to individual operations. Additionally, tracing GHG emissions through supply chains to capture how production practices influence emissions and thus the ability to track progress in reducing emissions, is difficult. While some efforts exist (e.g., UpLook from Elanco, Low Carbon Beef, Sustell from DSM), most beef cattle operations do not have thorough knowledge of their GHG emissions.

Table 1: Greenhouse gas emissions classified by their scope as defined by the GHG Protocol.[1]

Item	Description
Scope 1	GHG emissions that are directly emitted from the company's own operations.
Scope 2	GHG emissions that result from purchased energy inputs used to run the company's operations.
Scope 3	GHG emissions that come from inputs and ancillary activities related to a company's business operations. For example, for a quick service restaurant serving beef products, this would include all GHG emissions associated with the raising of cattle.

Table 2: Main greenhouse gas emissions, their atmospheric lifetime, warming potential, and relative importance with regard to U.S. beef cattle production.

Greenhouse gas	Atmospheric lifetime, years[2]	100-year global warming potential[2]	Rank of importance to U.S. beef cattle production[3]
Carbon dioxide	300-1000	1	3
Methane	11.8	27.2 (biogenic), 29.8 (fossil)	1
Nitrous oxide	109	273	2

Beef's GHG emissions

The GHG emissions associated with U.S. beef were comprehensively assessed by Rotz et al.[3] and provide an overview of the emissions profile of beef. This work incorporated data from regional surveys of cow-calf, stocker, finishing and dairy operations across the United States. Dairy production was included as the impacts of beef coming from both steers derived from the industry and cull dairy animals was included in the partial life cycle assessment. This work can be considered a partial life cycle assessment as it was inclusive of all impacts of beef cattle production from feed, inputs such as fertilizer and energy used on beef farms and ranches, and emissions from the cattle and their manure through finishing operations; however, the assessment did not include the impacts of packing, processing, retail/restaurants and the consumer.

One of the key findings of Rotz et al. was that enteric methane emissions make up the majority of beef GHG emissions, making up 56% of the 243 Tg of CO2e emitted annually. The second largest category of GHG emissions (24%) was nitrous oxide emissions coming from land whether pasture, rangelands, or croplands. GHG emission from manure were relatively minor (< 6%).[3]

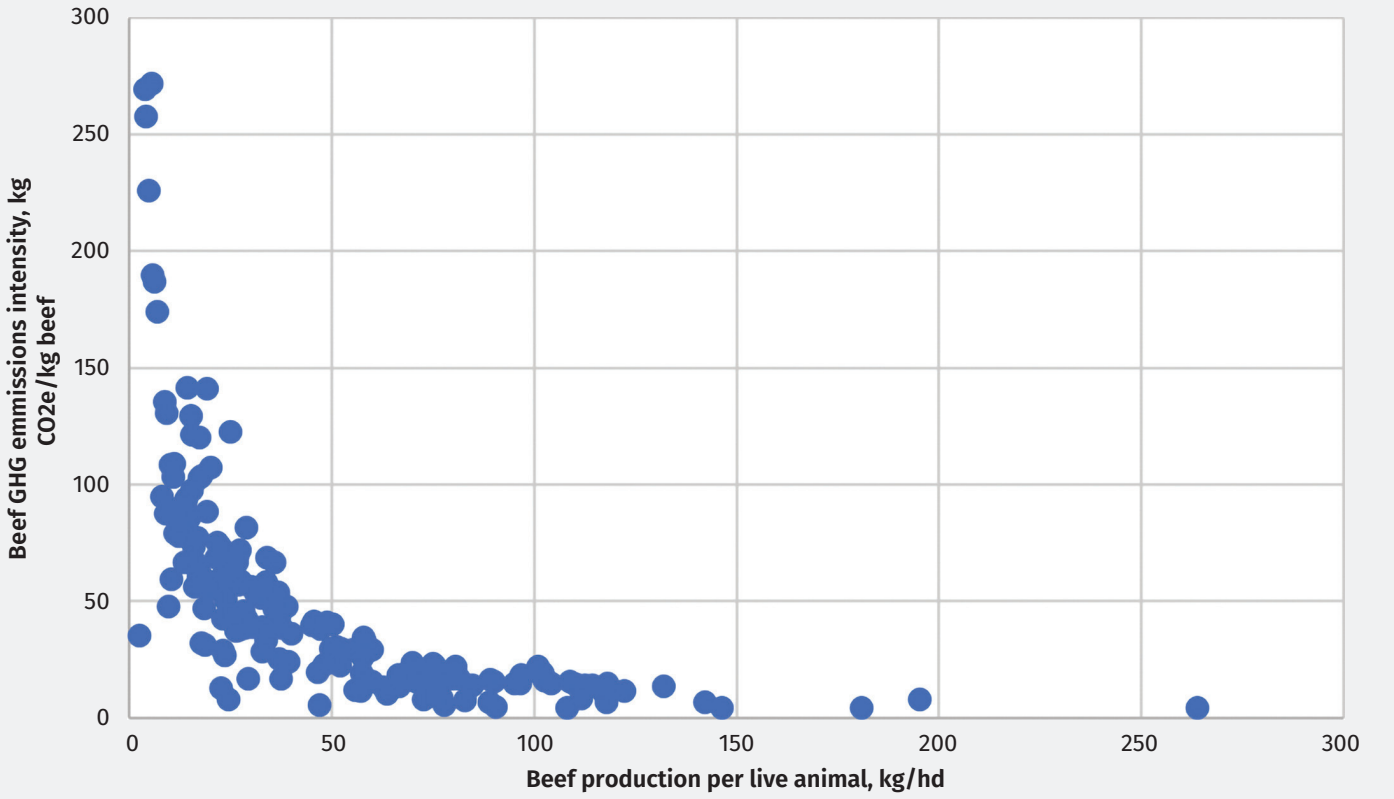
The prevalence of methane emissions in beef's emissions profile presents an opportunity for beef to lower its contribution to warming impacts in the near term due to methane's short atmospheric lifetime. Reductions of methane emissions from U.S. beef cattle by 20-30% over the next few decades should lead to a cessation of the warming contribution of industry. Reductions beyond this amount can help to reverse past warming contributions.[4]

GHG emissions can be expressed and mitigated either in absolute terms (e.g., U.S. beef cattle production emits 243 Tg CO2e/year), or as an intensity or footprint where emissions are divided by production. For example, the U.S. average GHG emissions intensity was 21.3 kg CO2e/kg of carcass weight.

Emissions intensity can reflect inherent characteristics of a production system (e.g., soil type leading to more or less nitrous oxide emissions) and the efficiency of the production system. For beef systems, generally as more beef is produced per live animal within a herd, the GHG emissions intensity of the system will decrease. The relationship between productivity and GHG emissions intensity can be observed in UN FAO data for countries in 2020 (Figure 1).

Nations with increased production per animal generally have lower GHG emissions intensities. Importantly, production per live animal does not only account for animal's slaughtered and their carcass weights, but is also inclusive of whole herd efficiency, meaning nations with poorer reproductive performance or slower growing animals will likely have more cattle relative to beef production. In this way, the influence of herd health and management on GHG emissions intensity can be apparent. Veterinary medicine can strongly influence the efficiency and emissions intensity of beef systems and lower overall resource requirements through better herd health and performance. Evidence of the impact of animal health on GHG emissions intensity can be demonstrated by the work of Mostert[6] who observed that GHG emissions intensity from dairy cattle increased 2.3% per case of subclinical ketosis, 6.2% per case of clinical mastitis, 4.3% per case of white line disease in Dutch dairy systems.

Figure 1: Relationship between beef production per head (x-axis; kg beef carcass weight produced per animal within the country) and beef emissions intensity (y-axis; enteric and manure GHG emissions per kg of beef carcass weight) in 2020.[5]



Conclusion

Environmental, social and governance metrics are becoming increasingly important for companies to track and report. For those companies with beef production in their supply chain, the key ESG metric that beef contributes to is GHG emissions. While assessments of beef production's GHG emissions exist for the U.S. and some are attempting to assess emissions by operation, most cattle producers in the U.S. do not know their GHG emissions. While that lack of specificity represents an opportunity (filling this knowledge gap may create value for producers), lacking specifics also does not mean we collectively do not understand how to lower GHG emissions from beef production today. Decreasing GHG emissions intensity of beef production can be achieved by further improving the efficiency of production, especially at the whole herd level via increasing beef produced per live animal. Veterinarian medicine plays a critical role in improving efficiency and lowering the GHG emissions intensity of beef production. A more thorough understanding of this relationship from bovine practitioners should advance beef's progress in ESG and veterinarians are trusted and influential individuals within the industry.

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