

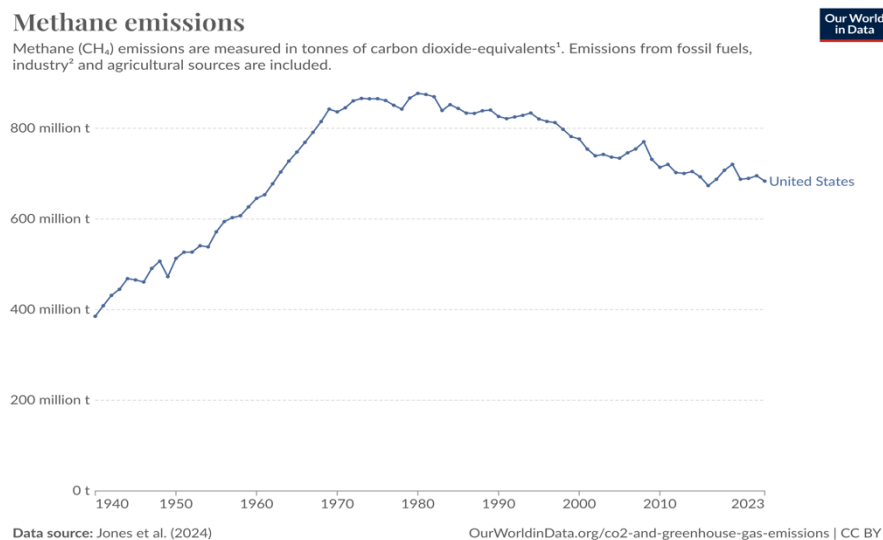
## Workshop #5: Final Paper

### Abstract

One of the biggest current contributors to methane (CH<sub>4</sub>) emissions is the raising of cattle and other livestock. In 2022, The United States was recorded to have produced a total of 10.49 billion tonnes of carbon-dioxide equivalents in methane (Jones et al., 2024). Out of all contributors to methane production, livestock is by far the worst. One of the industries at the forefront of this issue is beef. With the demand of beef being so large – and only growing – climate experts are pushing for mitigation efforts within the industry at large. However, despite these efforts, they are faced with a competing interest – that of profitability. The biggest producers of meat are more concerned with the affordability and economic value of sustainable solutions. In turn, the solution to this conflict must be one that meets the interests of both parties. One method that accomplishes this is the Return on Sustainability Investment (ROSI) model, which is designed to reduce the risk of companies and investors when it comes to changing out practices and strategies in favor of more sustainable ones. In short, ROSI focuses on four pillars: 1) quantifying the risk, 2) assessing the best strategies, 2) identifying the benefits, and 4) monetizing those benefits (NYU Stern CSB, n.d.). This paper focuses on identifying the most effective mitigation strategy associated with methane emissions from cattle, as well as analyzing the ROSI-model and its economic – and climate-preserving -- potential.

### Methane emissions

Figure 1



1. **Carbon dioxide equivalents (CO<sub>2</sub>eq):** Carbon dioxide is the most important greenhouse gas, but not the only one. To capture all greenhouse gas emissions, researchers express them in "carbon dioxide equivalents" (CO<sub>2</sub>eq). This takes all greenhouse gases into account, not just CO<sub>2</sub>. To express all greenhouse gases in carbon dioxide equivalents (CO<sub>2</sub>eq), each one is weighted by its global warming potential (GWP) value. GWP measures the amount of warming a gas creates compared to CO<sub>2</sub>. CO<sub>2</sub> is given a GWP value of one. If a gas had a GWP of 10 then one kilogram of that gas would generate ten times the warming effect as one kilogram of CO<sub>2</sub>. Carbon dioxide equivalents are calculated for each gas by multiplying the mass of emissions of a specific greenhouse gas by its GWP factor. This warming can be stated over different timescales. To calculate CO<sub>2</sub>eq over 100 years, we'd multiply each gas by its GWP over a 100-year timescale (GWP100). Total greenhouse gas emissions – measured in CO<sub>2</sub>eq – are then calculated by summing each gas' CO<sub>2</sub>eq value.

2. **Fossil emissions:** Fossil emissions measure the quantity of carbon dioxide (CO<sub>2</sub>) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO<sub>2</sub> includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

Figure 1 is a line graph that represents the amount of methane emissions (measured in tonnes of carbon-dioxide equivalents) between the years 1940 and 2023 (Jones et al., 2024). One noticeable trend is the intense spike in emissions from 1940 to around 1970 or so. From that point forward, it is clear to see that emissions have remained above 600 million tonnes. Though emissions have fluctuated throughout the years, they remain at an all-time dangerous high. These emissions have driven concerns about the agriculture industry, including beef production.

### **Production Indicators**

The U.S. Department of Agriculture’s (USDA) Economic Research Service (ERS) maintains a dataset on production indicators for all livestock areas. For cattle in particular, these numbers are extremely high, and on the rise. The data provided by USDA-ERS indicates that, from 2023 to 2024, the number of cattle being prepared for the market was on the rise (USDA-ERS, 2024). Additionally, these numbers indicate that industries are expecting an increase in demand within the approaching months (USDA-ERS, 2024). These findings confirm what most would assume – the demand for beef is not going to magically disappear. This makes the need for finding sustainable cattle-raising strategies more pressing.

### **Identifying competing interests**

When it comes to sustainability, especially that of huge markets like meat, there are quite a few factors and points of view to consider. Environmentally friendly industry practices have a few main opponents – the companies themselves, their investors, and the other relevant “pro-beef” lobbyists.

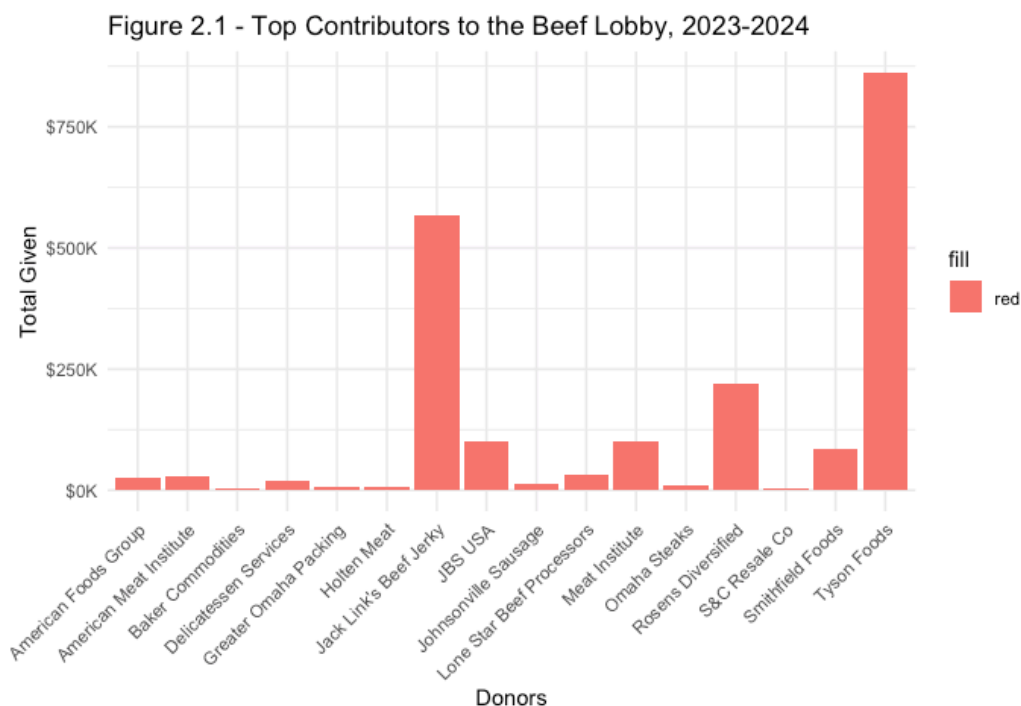


Figure 2.1 represents the top sixteen donors to the meat processing & products lobby between 2023 and 2024. Most of these donors only contributed under \$250k, but the top two donors gave significantly more. Tyson Foods, a production company that supplies just about 20% of the total meat & poultry in the United States, is responsible for contributing \$862,400 to the meat processing lobby (Tyson Foods, n.d., & Center for Responsive Politics, n.d.). The next largest donor, Jack Link's Beef Jerky, contributed exactly \$567,225 to the lobby. OpenSecrets – an online database for lobbying data – can differentiate how much each donor contributed to Democrats, Republicans, and groups that lean either conservative or liberal. Tyson Foods gave overwhelmingly more to Republicans than Democrats between 2023 and 2024 (Center for Responsive Politics, n.d.). Additionally, they gave nearly all their donations to conservative groups, leaving just under \$4,000 to liberal groups (Center for Responsive Politics, n.d.).

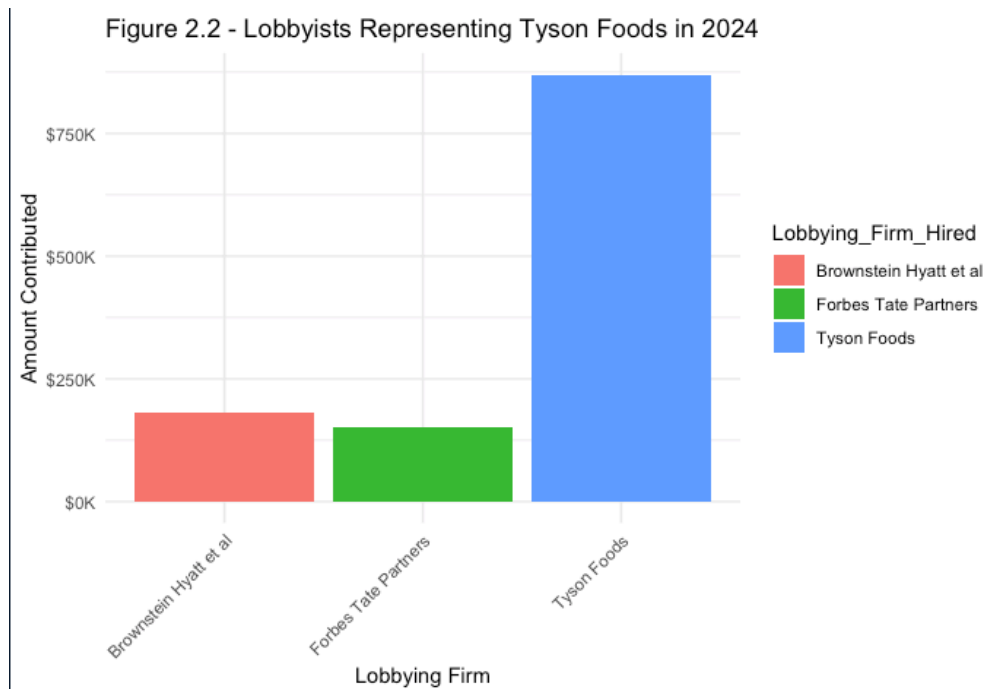


Figure 2.2 represents the top lobbyists representing Tyson Foods in 2024. It's worth noting that most of Tyson Foods' lobbying efforts are internal, with a couple outside firms. From this, it can be determined just how much money is being circulated and concentrated toward lobbying efforts. Once again, these efforts are largely in the interest of Republicans and conservative groups. There is no doubt that this data represents a bias within the meat production industry – largely, these donors are giving to Republicans and conservative groups. Historically, Republicans and conservatives have not backed sustainability and efforts related to climate change. Many extremists even go so far as to say that climate change is a hoax and is not worth any legislative efforts. Comparatively, Democrats and liberal groups support sustainability efforts and are major proponents of battling climate change.

There are other actors involved representing the opposite interest. These actors are pro-sustainability interest groups and organizations. Groups like Project Drawdown are an excellent example. Project Drawdown is a solutions-oriented organization that focuses on reducing industrial impact on emissions and climate change. One of Project Drawdown's large-scale

solutions within the meat production industry is improved cattle feed. According to their analyses, the implementation of improved cattle feed as an industry-wide practice could reduce methane emissions from .11 to .63 gigatons in 2030, and .24 – 1.42 gigatons in 2050 (Project Drawdown, n.d.). These analyses not only include methods of integration, but also financial models, market-related data, and adoptable scenarios for grazing and feedlot changes (Project Drawdown, n.d.). Organizations like Project Drawdown are on the frontlines of the battle for more sustainable industry practices.

There are other organizations, like the Environmental Defense Fund (EDF), that offer more monetarily than others. In the year 2023, the EDF contributed a total of \$1,119,500 toward the Environment industry in lobbying contributions (Center for Responsive Politics, n.d.). These are the actors pushing for industry-wide change and political activism in the interest of climate change. Notably, the industries themselves tend to push back against these efforts to some degree, in the interest of profit or production.

### **Research Question**

How can we balance consumer demand for beef with the increasing necessity for climate-conscious industry practices?

### **Hypotheses**

H1: A reduction in methane emissions requires dietary mitigation and alternate grazing research to identify the most economically efficient paths to sustainable beef.

H2: The most productive mitigation solutions will follow ROSI-based models designed to lower the economic costs of investing in sustainable practices.

### **Analysis**

Exploratory data points toward dietary mitigation as a reliable method of reducing methane emissions from cattle and other livestock. However, “dietary mitigation” in and of itself is a broad solution. There are multiple dietary choices that are involved in this solution, such as an increase in essential oils, organic material, probiotics, and more (Prathap et al., 2021). It takes a lot of experimentation and data collection to determine which materials are the most beneficial for cattle. As one would assume, these processes are time-consuming and expensive. Some of the most reliable dietary mitigation strategies involves the use of plant secondary metabolites (PSMs) and anti-methanogenic compounds (Prathap et al., 2021). Even so, each material that is studied has shown to have both advantages and disadvantages.

While there is evidence to support health concerns regarding livestock when it comes to PSMs. However, as mentioned previously, the data is mixed. Other research has pointed to PSMs as helpful in reducing the risk of issues with gastrointestinal parasitism (Lileikis et al., 2023). PSMs are also more widely accepted among the concerned public due to their “natural origin” (Lileikis et al., 2023). This could mean that marketing PSMs to production companies as a feed alternative (an important factor to consider with dietary mitigation) would be much easier. Exploratory and

experimental data in dietary mitigation justifies the inferences made in H1, as the data has demonstrated a heavy emphasis on dietary mitigation as the more reliable strategy, as opposed to changes in land use. While strategies like this look good at face value, the data points to many potential negatives. Finding alternate methods of land use could be viewed as less marketable for companies themselves, as these processes can be extremely expensive. Additionally, changes in land use for livestock (especially cattle) undoubtedly results in the reduction of natural grasslands that are not destroyed by human activity. Dietary mitigation appears to be a bipartisan solution, as it has the potential to improve the lives and performance of smallholder farmers (Project Drawdown, n.d.). Additionally, dietary mitigation has a high potential of improving net profits and reducing the burdens of up-front costs within the industry at large (Project Drawdown, n.d.)

Returns on investment and industry marketability are issues attributable to H2. Being able to establish reliable data and evidence is a daunting task in itself – proposing these changes within industries is a different story. Since production companies are motivated by profit, shareholders, and efficiency, experts must be prepared to argue why these solutions benefit their interests. One of the potential solutions to this issue has been identified by New York University's Stern School of Business as the Return on Sustainability Investment (ROSI) model.

Figure 3

### Return on Sustainability Investment (ROSI™) Framework

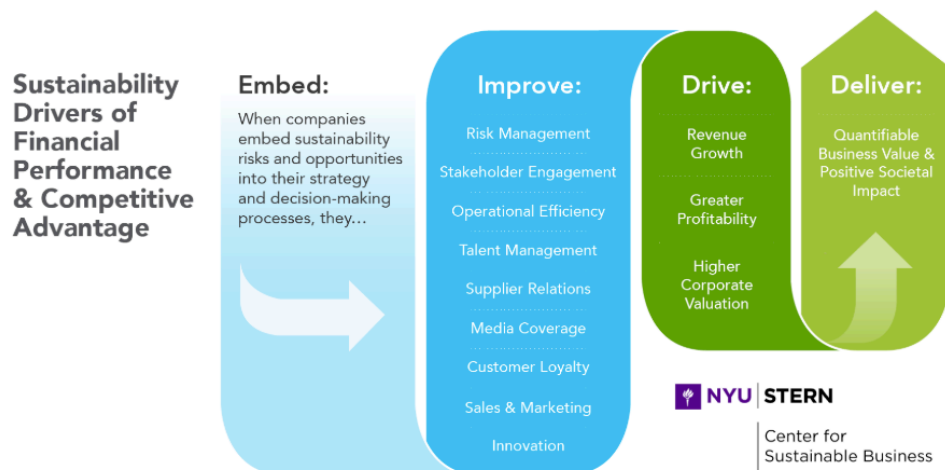


Figure 3 represents a framework developed by NYU Stern to display the goals of the ROSI model. This model was developed by Stern to mobilize companies and help them understand the monetary benefits that sustainable, climate-friendly solutions can offer. One of the main drives here is revenue growth – these solutions must be *profitable* for both the companies and their shareholders and stakeholders (NYU Stern, n.d.). Revenue growth as a goal can also enhance performance investment, which can improve the public image of production companies. As the framework mentions, enhancing positive social reception is a huge benefit that the ROSI model can provide to companies (NYU Stern, n.d.). Obviously, this process involves a multitude of things, such as improved marketing strategies.

## The Sustainable Market Share Index

The Sustainable Market Share Index™ (SMSI) is an economic metric designed by NYU Stern to help demonstrate the consequences of sustainable investment on market value. According to reports from NYU Stern, products in circulation that were marketed as “sustainable” now possess a market share of 18.5% -- a share that has improved greatly within the last decade (Kronthal-Sacco & Whelan, 2024). Additionally, findings from data support the claim that the availability of products marketed as “sustainable” is highly correlated with product shares (Kronthal-Sacco & Whelan, 2024). These trends appear to be growing – which should be attractive for production companies. When it comes to cattle, the SMSI can be applied to materials used in dietary mitigation, such as PSMs. These materials, if marketed as “sustainable”, could provide monetary benefits to the companies that manufacture cattle feed as well as those that raise the cattle.

One of the concerns related to sustainability marketing is the ability to reach multiple demographics. Producers and manufacturers are generally fearful of not being able to make their products marketable to as many people as possible as opposed to a specific demographic. These concerns are not unfounded – research has demonstrated that sustainable products are most attractive to higher income, college-educated, urban, millennial-aged consumers (Kronthal-Sacco & Whelan, 2024). However, research surrounding the SMSI helps mitigate these concerns. Data collected by NYU Stern demonstrates that baby boomers, gen-Xers, and middle-income communities still make up a significant portion of product sales (Kronthal-Sacco & Whelan, 2024).

## Case Study – Nespresso

One of the other concerns related to the ROSI model is pleasing shareholders and stakeholders. Not only does NYU Stern’s ROSI database contain information on the SMSI, but it also stores case studies related to sustainable investment conducted by experts. Case studies can be particularly helpful, as they can demonstrate the direct benefits – and challenges – related to the marketing of sustainable products. One case study focused on Nespresso – a popular coffee company – worked to address these concerns.

Coffee and cattle are both natural resources. They each require extraction, labor, and reliable production strategies. Both industries have an intense impact on the environment. Nespresso identified this issue and began working toward sustainable production in the early 2000s (Fink & Whelan, 2016). By 2013, Nespresso reached their goal of reducing their carbon footprint by 20% and demonstrated efficient use of new technologies and machines (Fink & Whelan, 2016). Following this accomplishment, Nespresso made multiple other gains in risk management and innovation (Fink & Whelan, 2016). Clearly, the returns on sustainable practices will differ by company – more case studies within the beef industry are necessary to understand the impacts within it. However, though hard conclusions cannot be directly made, this case study lays an impressive foundation for groundwork. One implication of this case study that could be applied to the beef industry is the utilization of non-traditional partners (Fink & Whelan, 2016). However, these partners must benefit from the relationship in some tangible way. To address this,

Nespresso proposed win-win solutions such as increased income and productivity (Fink & Whelan, 2016).

There are a couple takeaways from this case study. First, efforts in sustainability made huge payoffs for Nespresso. They are now a leader in sustainable marketing, and though they do not always reach their quotas and goals, Nespresso has gained the flexibility to learn from their shortcomings (Fink & Whelan, 2016). These strategies are imperative for the success of beef producers. Since beef is a high-demand product – just like coffee – their operations involve a lot of stakeholders. Pleasing these stakeholders can offer monetary returns and make sustainability a more attractive option to them financially.

## **Conclusion**

The available data provides support for H1 – dietary mitigation and alternate grazing practices have received a lot of justification by policy and sustainability experts. However, research suggests that further contributions must emphasize the utmost accuracy. Research on alternate feeding is mixed – there are studies that identify positives and negatives for each alternative. More research is necessary to identify the marketable viability of these materials. The available data does offer support for H2 as well, with some caveats. The ROSI model has history and accuracy to back it up, but more research is needed, specifically within the beef industry. Most of the ROSI database focuses on a variety of products but contains little information on livestock-related industries. The research surrounding ROSI is justified enough to apply to these industries. However, once again, the data must be the most accurate possible.

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