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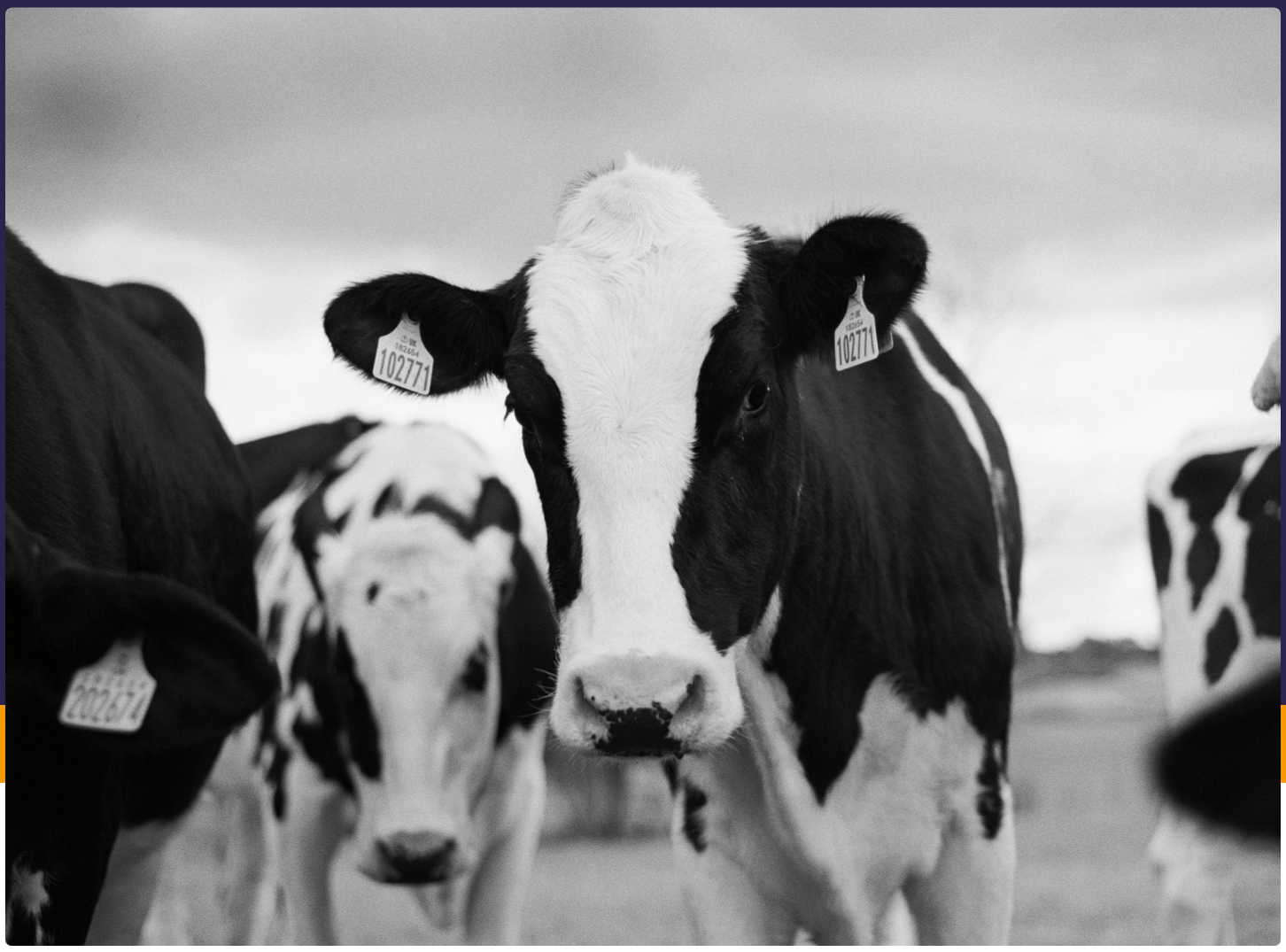
# Supply Chain Insets Will Drive Investment For Adoption Of GHG Reducing Practices In Livestock And Dairy

White Paper



# Abstract

Growing public attention to climate change is leading governments and corporations to set ambitious greenhouse gas reduction commitments. The food and agriculture industry, and the livestock and dairy sector in particular, will be a focus area due to its meaningful greenhouse gas footprint as well as its potential to sequester and mitigate emissions for other industries. With consumer packaged goods companies (CPGs) leading public-facing climate neutral campaigns, reducing absolute and intensity of GHG emissions will be a priority for all supply chain stakeholders. To maintain a competitive edge in domestic products and exports, US producers and suppliers have an opportunity to capitalize on this new economy, driving improved environmental and social outcomes with climate-smart agriculture.

In agriculture, carbon markets are facilitating adoption of on-farm technologies and practices that reduce the GHG footprint of food production. While both compliance and voluntary offset markets are involved in the agriculture sector, we expect a large portion of on-farm interventions to be facilitated by supply chain inset markets–especially interventions that are targeted at reducing Scope 3 emissions associated with product footprints.

While regulators and corporations alike are still developing scalable carbon claim and accounting systems, carbon inset markets will have longevity in agriculture. During this phase, producers can best prepare for this growing opportunity by developing an understanding of what interventions fit their operations and the economics necessary to make a viable business case for practice change.

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# Greenhouse Gas Claims are Proliferating in the Private Sector

In the past decade, the international community has made tangible progress aligning on commitments to fight climate change. The most significant of these commitments, the 2015 Paris Agreement, set an ambition to limit the mean global rise in temperatures to 1.5°C, which would require greenhouse gas emissions to decrease 45% by 2030 and reach net zero by 2050.[1]

Given that most emissions occur in the private sector, governments are experimenting with regulatory tools to drive private sector action on emissions. Some approaches take the form of positive incentives, such as the US Solar Investment Tax credit. Other approaches use market mechanisms, such as the EU and California cap-and-trade carbon markets. With increasing urgency to mitigate emissions, punitive approaches, such as carbon border taxes, are under consideration in the EU to drive abatement solutions across the globe.

In anticipation of changing government regulation around emissions and consumer preferences for environmentally friendly products, major corporations within and adjacent to agriculture have made public emission reduction targets. Moreover, many corporations view investment in environmental initiatives as a potential axis of competition. Companies with strong environmental positioning may better take advantage of government subsidies, receive favorable funding in capital markets, reduce supply chain risk, and win environmentally conscious consumers. Thus, across industries, corporations are increasingly codifying environmental initiatives not only as a regulatory requirement but also as a strategic imperative.

# Livestock and Dairy will be a Focus for GHG Reductions

The food and agriculture sector, which produces 19-29% of global greenhouse gas emissions, is a critical component of the GHG emissions puzzle. Livestock, accounting for nearly two thirds of agricultural emissions, has become a key focus in the climate resiliency conversation.[2] The cattle and dairy industry, which has historically received negative public attention related to animal welfare, antibiotic use, and water pollution, is also now in the public eye because of its meaningful methane emissions. Methane has 80 times the warming power of carbon dioxide over a 20-year timeframe, and therefore has been a particular target of regulation.[3] At COP26 in 2021, a group of over 100 countries signed onto the voluntary Global Methane Pledge to reduce methane emissions 30% by 2030. And in Spring 2023, governments in Denmark and New Zealand, which both have sizable cattle footprints, have started considering taxes on agricultural emissions.

## Figure 1: Scope Emissions

Scope emissions are a classification system to help organizations understand their emissions inventory.

**1** Scope 1 refers to emissions that come from a source the organization directly owns or controls.

**2** Scope 2 refers to the emissions an organization causes indirectly through their energy consumption.

**3** Scope 3 refers to emissions that an organization is indirectly responsible for in its value chain

Production processes, the emissions caused by an end-user when they consume a product, and financed emissions, which result from the activities of a financing recipient are included in Scope 3.

For any given company, Scope 1, 2 and 3 emissions are mutually exclusive. One company's Scope 3 emissions, however, is another company's Scope 1 emissions. Moreover, in supply chains with multiple actors, multiple organizations will account for the Scope 3 emissions from a single source. This form of double counting is an inherent challenge of Scope 3 emissions.

The issue of double counting in Scope 3 emissions makes it difficult to credit changes in emissions to any given organization. This challenge is particularly relevant in agriculture, where supply chains can be long, complex, and opaque. The challenge is further complicated in product markets where crops are processed into multiple ingredients that flow to numerous finished goods manufacturers.

Regulators and international non-governmental organizations are starting to address some of the core challenges related to Scope 3 double counting. For example, the SBTi guidance on Scope 3 reductions requires that an organization pay for an intervention to be able to claim the reduction. While the systems for accounting and enforcing this rule are still in development, this principle is driving the current supply chain programs and GHG mitigation activities for CPGs.

To get ahead of potential emissions-related regulation, many major food companies have made public GHG commitments, ranging from ingredients suppliers such as Cargill, to CPGs such as Nestle, to retailers such as Walmart. Typically, these commitments are categorized by Scope, which refers to the source of emissions [See Figure 1]. Notably, many large corporations have made Scope 3 emissions targets, which refer to the emissions within the corporation's supply chain [See Figure 2]. Additionally, these commitments are absolute contraction targets (commitments to reduce total GHG emissions against a baseline year) as opposed to physical intensity targets (commitments to reduce GHG emissions per unit of product).

Many of the commitments made by these large CPG companies align to the targets set by the Science Based Targets Initiative (SBTi), a voluntary initiative started by the United Nations Global Compact, World Resources Institute, and World Wildlife Fund [See Figure 3]. The pace of emissions reductions that corporations have committed to may have an interim reduction target for 2030, with a longer term commitment to Net Zero by 2050. In Fall 2022, SBTi launched a draft of its sub-sector guidance for the food and agriculture sector, SBTi FLAG. For the 2020-2030 period, the SBTi Flag guidance targets a 3.03% per year absolute contraction target for demand-side actors such as ingredients companies and CPGs. For large beef and dairy producers, the SBTi Flag guidance uses a physical intensity target of 2.40% and 3.10% decrease in tons of CO2 equivalent per ton of fresh weight, respectively. [4]

### Figure 2: GHG Reduction Commitments of Selected Agrifood Corporates as of Feb 2022.[5]

| Company | Scope 1 and 2 | Scope 3 |
|---|---|---|
| **AB InBev** | 35% by 2025 | 25% per beverage by 2025 |
| **Bunge** | 25% by 2030 | 12.3% by 2030 |
| **Campbell Soup Company** | 42% by 2030 | 25% by 2030 |
| **Cargill** | 10% by 2025 | 30% per ton of product sold by 2030 |
| **Conagra Brands** | 25% by 2030 | 20% per ton of material sourced |
| **Dairy Farmers of America** | 30% by 2030 | 30% by 2030 |
| **Danone** | 47.2% by 2030 | 42% by 2030 |
| **Fresh Del Monte** | 27.5% by 2030 | 12.3% by 2030 |
| **General Mills** | 30% by 2030 | 30% by 2030 |
| **Kellogg Company** | 47% by 2030 | 20% by 2030 |
| **Land O'Lakes** | 42% by 2030 | 25% by 2030 |
| **Mars** | 42% by 2025 | 27% by 2025 |
| **McCain Foods** | 52% by 2030 | 31% per ton of finished product by 2030 |
| **McCormick & Company** | 42% by 2030 | 42% by 2030 |
| **Molson Coors** | 50% by 2025 | 20% by 2025 |
| **Mondelez International** | 10% by 2025 | 10% by 2025 |
| **Nestle** | 50% by 20230 | 50% by 2030 |
| **PepsiCo** | 75% by 2030 | 40% by 2030 |
| **The Coca-Cola Company** | 30% by 2030 | 30% by 2030 |
| **The Hershey Company** | 50% by 2030 | 25% by 2030 |
| **The JM Smucker Company** | 28% by 2030 | 22% per unit of sold product by 2030 |
| **Tyson Foods** | 30% by 2030 | 30% per ton of finished meat by 2030 |

The fast-paced absolute contraction targets that CPGs have committed to present a particular challenge for the food and agriculture industry. As CPGs grow their sales, they also grow their GHG footprint–running counter to their absolute contraction targets and complicating the business case for brand growth. Moreover, increasing food volumes is not only a business imperative for CPGs but also a livelihood imperative for a growing global population that will consume 70% more food by 2050.[6]

While shifting diets and reducing food waste are meaningful options to reduce the food industry's GHG footprint, these options will only be a part of the industry's solution. Under the SBTi's FLAG guidance, shifting diets and reducing food waste are each 7.5% of the total modeled reduction goal.[7] Thus, while CPGs have committed to absolute contraction targets, CPGs must focus on driving physical intensity reductions in their supply chain to achieve their goals.

## Figure 3: The Science Based Targets Initiative (SBTi)

The Science Based Targets Initiative promotes best practices on target setting, project development, stakeholder communication, and disclosures for GHG reduction commitments. Importantly, the SBTi helps corporations understand science-based reduction targets that are both scientifically feasible and necessary to limit global temperature rise to 1.5 °C. By the end of 2022 over 4,000 companies representing over a third of the global economy had joined the initiative and committed to set targets through SBTi.[8]

In Fall 2022, the SBTi released a draft of its guidance for the Forest, Land, and Agriculture sector (FLAG), which applies to companies where more than 20% of total emissions come from the land sector. Within the guidance, there are two categories of targets and pathways: the FLAG Sector Approach (absolute contraction) and the Commodity Intensity Pathway (physical intensity convergence).

The FLAG Sector Approach (absolute contraction) is targeted at companies with diversified production lines or companies that are demand-side actors further from direct production. Under this pathway, companies are provided mitigation targets for a variety of measures, including land use change, improved agriculture, shifting diets, reduction of food loss and waste, restoring forests, sustainable forest management, and soil health.

The Commodity Intensity Pathway (physical intensity convergence) is targeted at medium to large scale producers of 11 select commodities for which sufficient data and climate models are available: beef, chicken, dairy, leather, maize, palm oil, pork, rice, soy, wheat, and timber & wood fiber.

Unlike the FLAG Sector Approach, which targets absolute reduction in emissions, the Commodity Intensity pathway aims to reduce per unit intensity of emissions. These commodity pathways are also available at a 26-region resolution to account for regional differences in environment and agricultural production.

Although these are distinct pathways to emissions reductions, they require much of the same interventions, actions, and accounting systems. The two pathways may cause differences in the approach to calculating impact, but both absolute and intensity pathways require primary data and clear scope of acres, products, and ingredients.

# Carbon Markets are Catalyzing GHG Reduction in Livestock and Dairy

While major corporations have made bold emissions claims, most companies are still in the process of charting their decarbonization roadmap. The decarbonization challenges that exist in different industries are unique. In some industries, technology does not exist to reduce emissions or abatement is cost prohibitive. Some industries have more Scope 1 and 2 emissions, while others have more Scope 3 emissions. Generally, companies find it easier to reduce Scope 1 and 2 emissions compared to Scope 3 emissions, which they have limited control over.

One critical GHG reduction opportunity in food and agriculture is supporting on-farm reductions. Across agriculture systems, the scientific community is developing studies to understand technologies and practices that can reduce the GHG impact of production systems. Moreover, the scientific community is increasingly able to quantify the GHG reduction potential of these practices. In beef and dairy, best practices in feed management, cropping systems, manure management, cow health management, and energy and transportation have been identified. Many of these practices, however, add operational complexity, carry high costs, and may not be economically profitable for farmers. Moreover, further research is necessary to better understand the net effect of stacking multiple practices and technologies.

To help farmers make environmentally sustainable technology and practice adoption more economically viable, public and private sector actors have launched agricultural carbon markets, building off existing frameworks and methodologies in the established forestry carbon credit space. These markets work by facilitating payments to farmers in exchange for carbon credits, which are measured and verified claims of the abatement of 1 metric ton of CO2 equivalent. The premise of a carbon market is that the emissions abatement costs are not equal across all actors. Through carbon market mechanisms, corporate actors (such as CPGs) can pay other actors (such as farmers) to implement emissions reducing interventions. With the transaction, buyers can de-risk on-farm interventions while claiming the reduction against their Scope 3 targets.


# Carbon Markets in Livestock and Dairy Will Trend Towards Inset Markets

Today, three types of carbon markets exist: compliance markets, voluntary markets, and inset markets. Compliance markets serve industries where emission volumes are regulated–the most well-known being the Low Carbon Fuel Standard market driven by California's cap and trade market. Voluntary and inset markets both serve private actors that have made emissions goals that are not regulatorily mandated. Today's voluntary markets trade like an offset market, where credit buyers and credit generators need not have a commercial relationship. Meanwhile, in inset markets, corporations intentionally fund emissions reductions in their supply chain, effectively and directly reducing their Scope 3 emissions.

Compliance markets, the first established carbon markets, have some involvement in the beef and dairy sector; however, long term they are unlikely to further develop project protocols for beef and dairy beyond methane digestion. While early carbon markets approved protocols and projects across industries, due to public concerns around credit quality, double counting of credits, and equity between actors, regulatory markets have become more selective on where and how they approve credit generating projects.

## Figure 4: Methane Projects Under the California Low Carbon Fuel Standard

California's LCFS carbon markets have meaningfully increased investment in methane digesters. EPA data shows the number of operational methane digesters in the United States has increased from 149 in 2011 (the year that California's LCFS was launched) to 322 in 2022.[10] In 2021, 36 of 44 newly installed methane digesters nationwide were installed in California.[11]

The compensation provided by LCFS carbon credits and the federal Renewable Fuel Standard (RFS) credit program meaningfully improve the economics of investing in methane digesters. Projects can cost from $400,000 to $5 million to construct, before taking into account ongoing operating costs. Yet, recent estimates show that, given LCFS and RFS credit prices in 2022, each cow on a farm with a digester could generate over $2,800 worth of LCFS and RFS credits each year.[12]

While the inclusion of methane digester projects in the California LCFS has driven investment and new revenue streams to large dairy operations, some food industry actors have expressed concerns about what this flow of GHG credits means for decarbonization efforts within the food industry. Among on-farm GHG reduction projects in dairy, methane digester projects are relatively cost effective and have high scientific certainty with a clear investment case. Given ownership clauses in regulatory offset credits, however, food industry actors are concerned that these credits may be lost opportunities for food actors to register GHG reductions. And given that credit prices in California's LCFS market are driven by fuel pricing and a regulatory cap, food companies will have a hard time competing with fuel companies in funding methane digester projects. In 2023, LCFS credits have ranged from $70 to $80 per metric ton of CO2 equivalent and have seen prices as high as $150-200 per metric ton, much higher than what food companies are able to pay for methane projects today.[13]

Today, most compliance markets focus on trading credits between companies within a regulated sector. For example, in the California cap and trade market, offset credit schemes are focused on renewable fuel solutions under the Low Carbon Fuel Standard. Credit generators in this market must effectively have a pipeline into the California fuel system to qualify. Thus, projects such as livestock manure digesters for biogas production apply, while other projects such as forestry improvement do not apply [See Figure 4]. Given the disparate and widely varied actors in agriculture, establishment of a regulatory cap and trade market in agriculture is unlikely. Under these circumstances, GHG reduction projects in agriculture will fall to voluntary and inset markets driving investments from CPGs directly to producers and suppliers.

Outside of the compliance carbon market space, non-governmental organizations and regulators favor corporate action within supply chains as opposed to voluntary offsets. For example, the SBTi guidance for long-term goals and "net zero" claims is to cut Scope 1, 2 and 3 emissions by >90%–only allowing for the use of voluntary offsets to counterbalance the <10% of residual emissions that cannot be eliminated.[9] Additionally, while there is currently limited regulation and standardization of how CPGs should validate their environmental claims, in response to concerns of greenwashing, regulatory and non-governmental organizations are increasing scrutiny on these claims while bringing environmental and social justice issues to the forefront.

One area of regulatory focus is qualifications for product marketing claims. In May 2023, the European Parliament passed legislation giving it the authority to ban the use of general environmental claims, including terms such as "environmentally friendly" and "climate neutral." The legislation also aims to ban claims that are based solely on offsetting schemes.[14] Meanwhile, in the United States, the Federal Trade Commission (FTC) is in the process of updating its Green Guides, which regulate how marketers should qualify their environmental marketing claims. For the upcoming version of the Green Guides, which were last updated in 2012, the FTC is explicitly considering revising its guidance on whether carbon offsets can be used to validate marketing claims such as "Net Zero" and "Low Carbon."[15]

Another area of regulatory focus is financial and climate related disclosures. In January 2023, the EU finalized its Corporate Sustainability Reporting Directive, which introduced detailed sustainability requirements for EU companies. And in the US, the Security Exchange Commission proposed a draft set of rules to standardize climate disclosures in March 2022. Among these draft rules is a requirement to disclose Scope 3 emissions if they are material to the company or if the company has set a Scope 3 emissions target or goal. These regulatory trends have driven urgency for international bodies to standardize emissions accounting and publish guidelines and best practices to achieve claims.

The GHG Protocol creates accounting and reporting rules for different types of activities that impact an actor's GHG footprint [See Figure 5]. Notably, the GHG Protocol has different accounting rules for interventions that remove GHGs from the atmosphere, termed removals, and interventions that reduce GHG reduce emissions in existing processes, termed avoided emissions.

The distinction between avoided emissions and removals is meaningful because they follow different rules for offset credit generation. Offset credits must adhere to a set of quality principles: no overestimation, additionality, permanence, and no double counting. Compared to removals, determination of additionality and double counting is much more difficult for avoided emissions.

## Figure 5: The GHG Protocol

The GHG Protocol sets guidance on how corporations track, calculate, account, report, and verify GHG emissions. A key goal of the GHG Protocol is to ensure that emissions accounting follows a few key principles: accuracy, completeness, consistency, relevance, and transparency. For example, the GHG Protocol sets verification standards for corporations and third-party auditors to assure reported GHG emissions are accurate. As part of the assurance guidance, the Protocol suggests that third-party verifiers use a ±5% materiality threshold, beyond which a reported quantity or statement would be considered materially misleading.[16] Additionally, when accounting for GHG reduction offsets, the GHG Protocol provides rules around the ownership of reduction credits to prevent double counting.

The GHG Protocol also provides more sub-sector specific guidance on GHG accounting rules, including rules for the agriculture and land use sector. In Fall 2022, the GHG Protocol released a draft version of its guidance for the land use sector, which is expected to be published in 2023. The guidance provides detailed rules on how to account for land carbon stock changes (e.g., biomass carbon, dead organic matter, soil carbon) from land use change (e.g., deforestation, afforestation, wetland conversion, etc.). It also provides new rules on accounting for carbon removals, which includes a requirement that companies have ongoing storage monitoring for carbon sinks and that removals are measured using primary (monitored) data as opposed to secondary (estimated) data and modeled approaches.[17]

For most removal projects the additionality baseline is zero–without the funding of the project, no carbon would be removed from the atmosphere. Establishing a baseline for avoided emissions is much more difficult. Take for example, a fertilizer management program. For any given year, it is difficult to determine what the counterfactual volume of fertilizer a farmer would apply in absence of a carbon market payment. It is also difficult to determine the duration for which the avoided emissions should be credited.

On the double counting front, voluntary markets have poor mechanisms to prevent double claiming. For example, if an energy company were to fund a fertilizer management project on a large-scale corn farm, the project developer would not likely have an ability to prevent all of the downstream actors that use that corn from claiming Scope 3 reductions. Although absolute and intensity calculations present different pathways for reductions accounting, they are still based on the actual emissions avoided and validated from a single point of source (in this example, the farm with the fertilizer reduction program). Both pathways are acceptable, but present different value propositions and scalability for supply chain stakeholders.

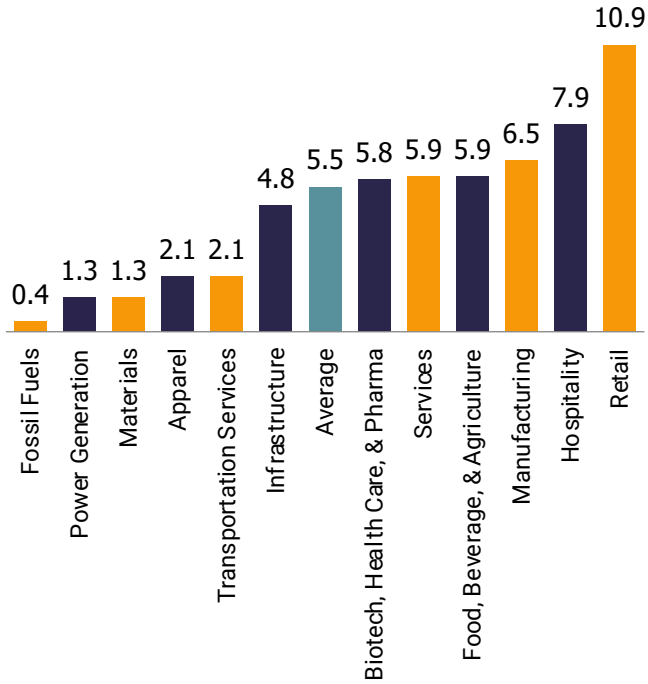
Additionality and double counting challenges for avoided emissions projects are less problematic in inset marketplaces, where the funding actor is seeking to directly reduce their Scope 3 emissions. With insets, project developers do not need to establish an additionality baseline, since the GHG intensity of production is inherently a part of the funders GHG balance sheet. Additionally, with supply chain visibility and coordination, it is possible to reduce double counting issues through inset markets.

Overall, given challenges of fulfilling carbon credit quality criteria in avoided emissions projects, there is potential for further regulation of voluntary avoided emissions credits or market preference for removal credits. Thus, it can be imagined that long term, voluntary carbon markets will focus primarily on removal offset credits, leaving avoided emissions projects to the inset market.

CPGs will fund inset programs to achieve their SBTI commitments, since a significant proportion (estimated at 70-90% of CPG emissions) come from the supply chain.

In 2019, the Carbon Disclosure Project found that in the Food, Beverage, and Agriculture industry, the average ratio of supply chain emissions to direct emissions was 5.9 to 1 [See Figure 6].

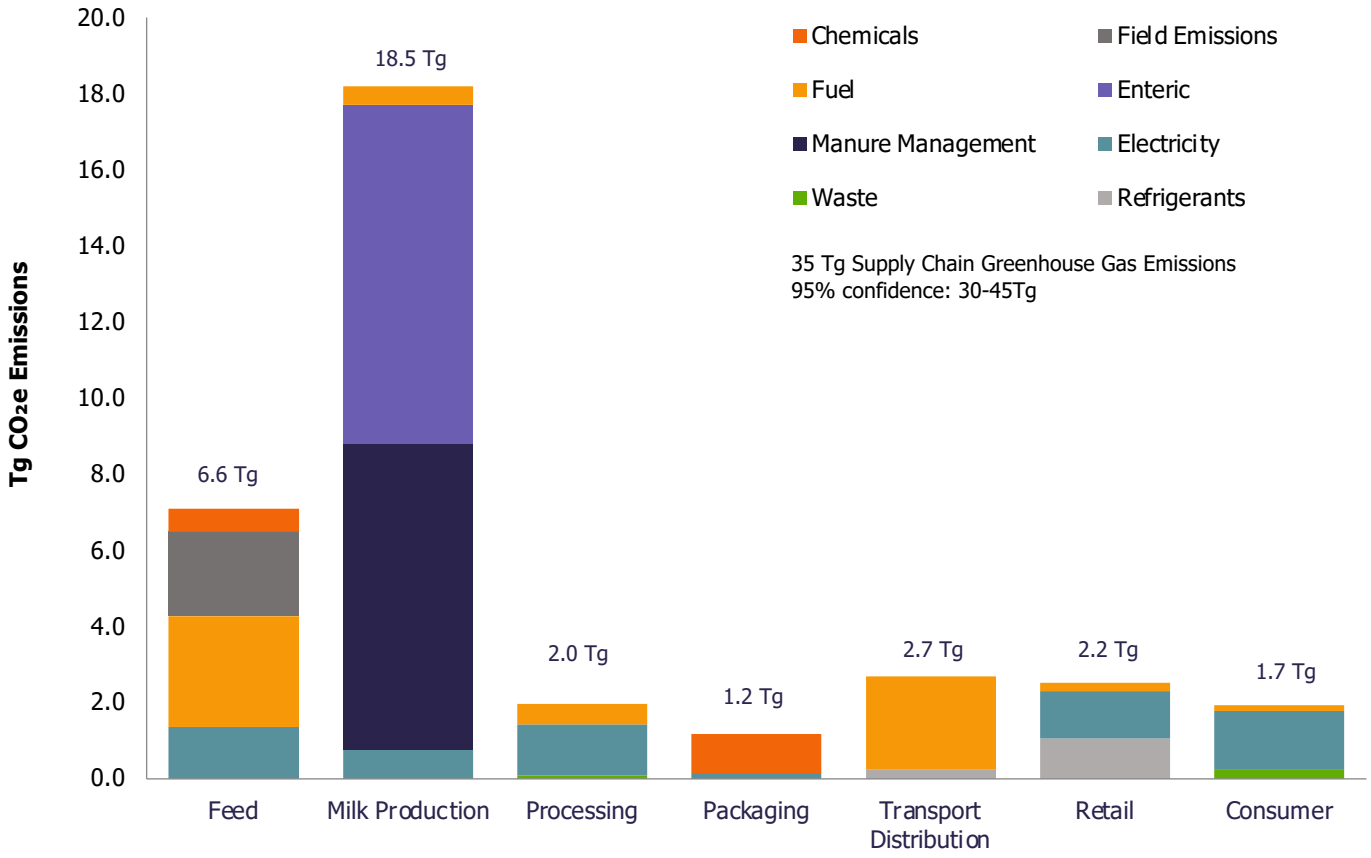
## Figure 6: Ratio of Supply Chain to Direct Emissions (By Sector) [19]



In dairy, a 2008 study found that 72% of GHG emissions occurred pre-farm gate [See Figure 7]. And in beef, a 2013 study found that 80% of GHG emissions produced per unit of beef occurred pre-farm gate. [18]

Today, we're already seeing many CPGs experiment with pilot programs to incentivize producers in their value chains to adopt GHG reducing practices and technologies. For example, in January 2023, Danone launched an initiative to work directly with 58,000 dairy farmers to adopt methane reducing practices and committed to report methane emissions in its financial disclosures. [21] And in March 2023, Tyson launched its Climate Smart Beef program and launched its Brazen Beef brand, the first beef product to receive the USDA's approval for a "climate friendly" claim. [22]

## Figure 7: Dairy GHG Emissions by Supply Chain Stage [20]



# Conclusion

Overall, growing public attention to climate change is driving governments and corporations to set ambitious greenhouse gas reduction commitments. In agriculture, carbon markets will be key to facilitating payments that make adoption of GHG-reducing technologies and practices economically attractive to farmers. Given an evolving regulatory landscape on carbon claims and accounting, supply chain inset markets will likely drive a large portion of on-farm GHG reducing interventions.

Some of the details of how supply chain inset markets will develop are still in development. CPGs are still early in understanding how to operationalize and prioritize their inset investments. Where CPGs focus their inset programs will depend on a variety of factors, including cost effectiveness, operational ease, and scientific certainty of various interventions. In the dairy supply chain, over 60% of farm gate emissions come from two sources: enteric fermentation (35-43%) and CH4 and NO2 from manure (25-33%), suggesting dairy interventions will focus on avoidance solutions for these two sources [See Figure 8]. [23] [24] In beef supply chains, 70% of farm gate emissions are concentrated at cow-calf operations [See Figure 9], which poses a challenge because cow-calf operations are disparate and vary widely. [25]

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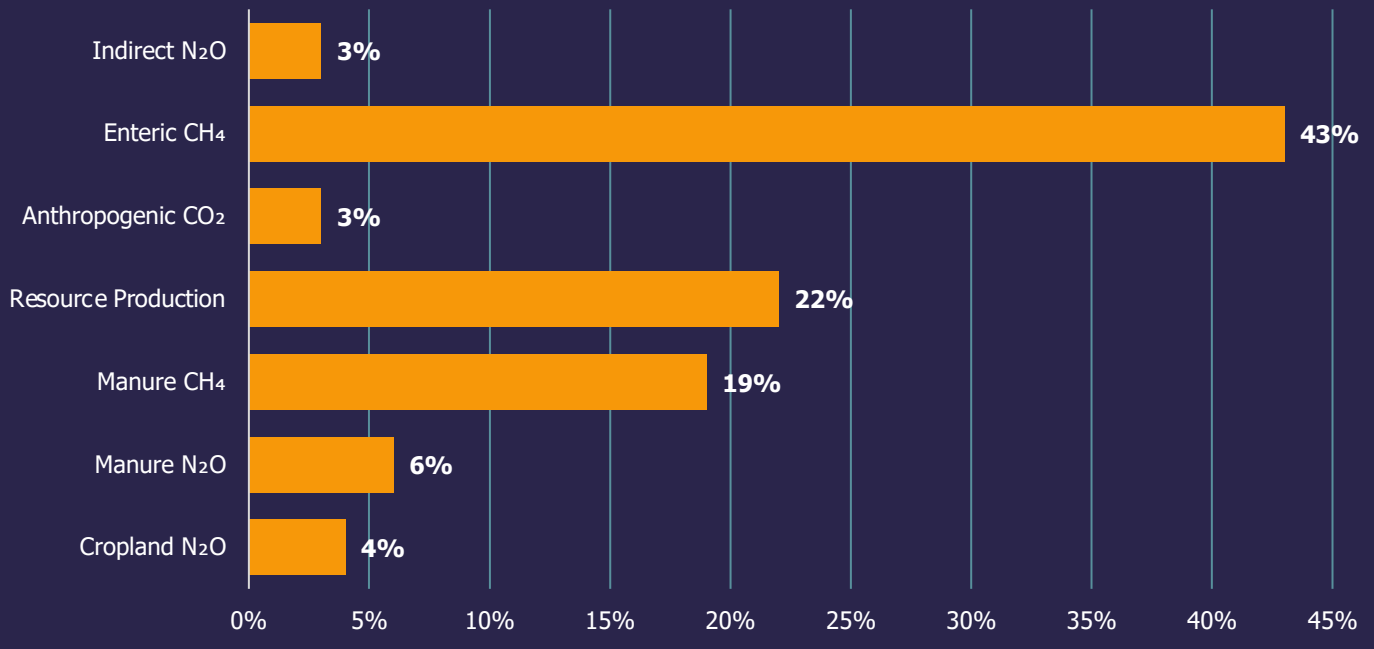
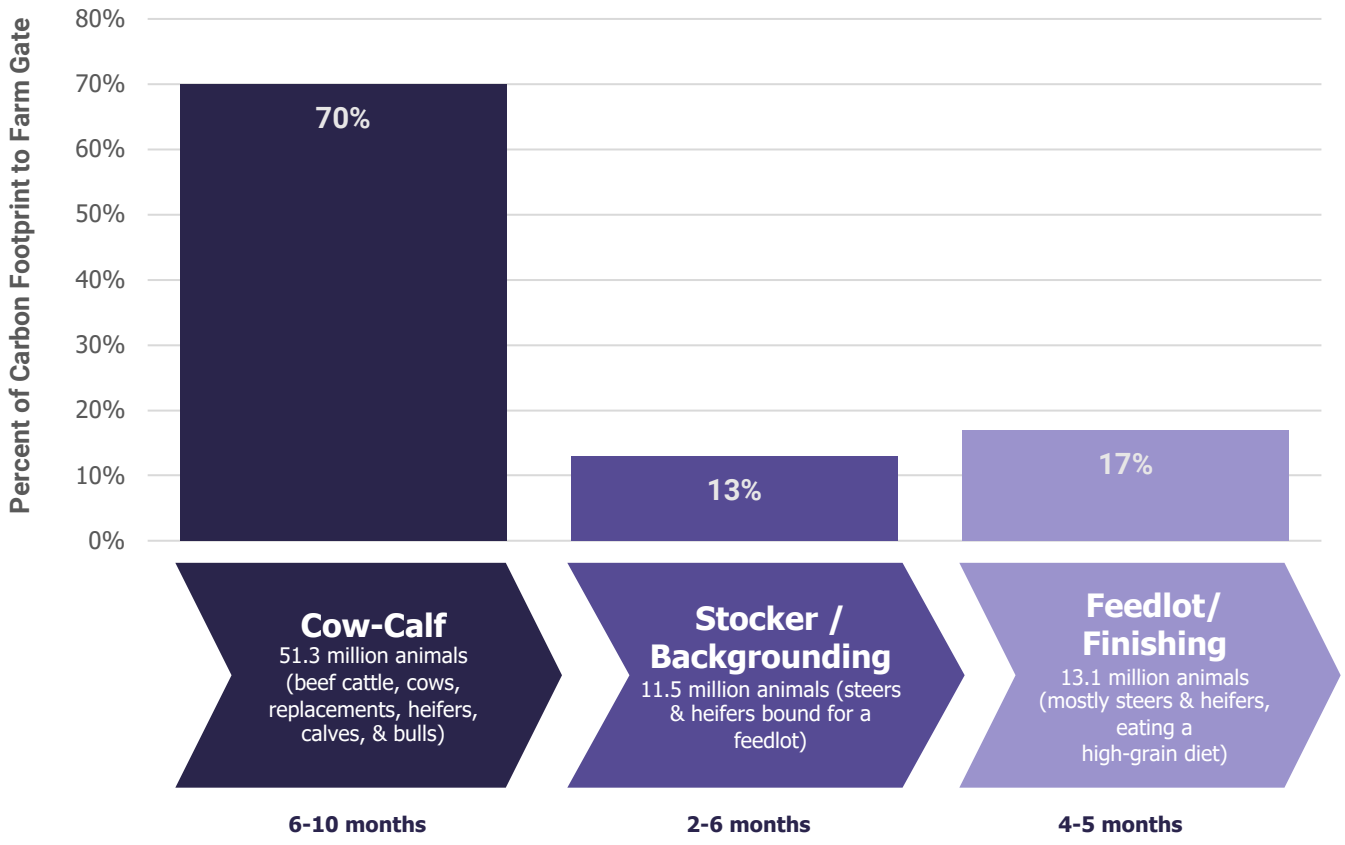
**Figure 8: Distribution of GHG Emissions in US Dairy Farms by Source** [26]



## Figure 9: Distribution of GHG Emissions in US Beef Farms by Source [27]

Average percentage of the carbon footprint to the farm gate (i.e. greenhouse gas emissions generated per pound of beef prior to harvest of the cattle) due to the cow-calf, stocker/backgrounding, and feedlot/finishing phases of beef production and number of animals in each phase, as of January 1, 2015.




On the plus side, feedlots (estimated at 20% of beef supply chain emissions) present a clear and achievable reduction opportunity with enteric-abating feed additives. Additionally, regulators and corporations are still fine-turning carbon claim and carbon market mechanisms such as monitoring, reporting, and verification standards; carbon and claims accounting systems; and supporting technological infrastructure. Still, many core principles of existing supply chain inset markets will have staying power. CPGs recognize that on-farm GHG reducing interventions are not economically viable for farmers today and require additional funding and risk mitigation tools to enact. In addition to financing, facilitation of GHG reduction projects will require new capabilities and capacities alongside technological infrastructure to achieve the levels of assurance required by regulators and CPGs. Beyond climate outcomes, values such as community livelihood, animal health, water, and biodiversity will continue to be valued by CPGs. And finally, carbon market infrastructure will define the market mechanisms for rewarding producers for the positive ecosystem services and social impacts of their production systems.

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The growth of supply chain inset markets represents a meaningful opportunity for producers. To best prepare for this opportunity, producers should gain a clear understanding of how their operations could participate in carbon markets: determining what interventions fit their operations, understanding the data transparency and security requirements of programs, and communicating what public and private support is necessary to make a viable business case for practice change.

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