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Net Zero by 2050: Is Dairy Processing Ready? An Evaluation of the Top Dairy Companies' Emissions Reduction Goals

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Dairy products are nutrient-dense foods that provide high-quality protein and calcium, but their production also generates notable environmental impacts. In the United States, the dairy sector accounts for roughly 1.9% of total greenhouse gas (GHG) emissions (Thoma et al., 2013). Although modest in relative terms, these emissions draw disproportionate scrutiny because of the visibility of animal agriculture in sustainability debates. The challenge is increasingly global as international climate commitments call for reductions across food systems (Herrero et al., 2013). For US dairy, cutting emissions is not just about responding to domestic pressures but also about staying competitive in global markets and showing leadership in sustainability. To address these demands, the Innovation Center for U.S. Dairy launched the Net Zero Initiative (NZI) in 2020, aiming to achieve GHG neutrality by 2050 (Innovation Center for U.S. Dairy, 2023). Many leading dairy processors and related stakeholders have joined the NZI commitment, pledging to cut emissions and adopt long-term sustainable practices.

The US dairy processing sector, with over 1,200 processing plants handling about 2.3 million metric tons of milk annually, plays a key role in the industry's transition toward sustainability (Innovation Center for U.S. Dairy, 2024). While processing itself accounts for only a relatively small share of total GHG emissions, the sector is highly concentrated. In 2022, the top two firms (Dairy Farmers of America and Land O'Lakes) handled over 34% of the US milk supply (Berk, 2023). This level of consolidation, combined with the processors' central position between farmers and end markets, gives them substantial influence over supply chain practices. Beyond reducing their own operational footprint, processors are positioned to drive sustainability efforts upstream among producers and downstream among distribution and consumption.

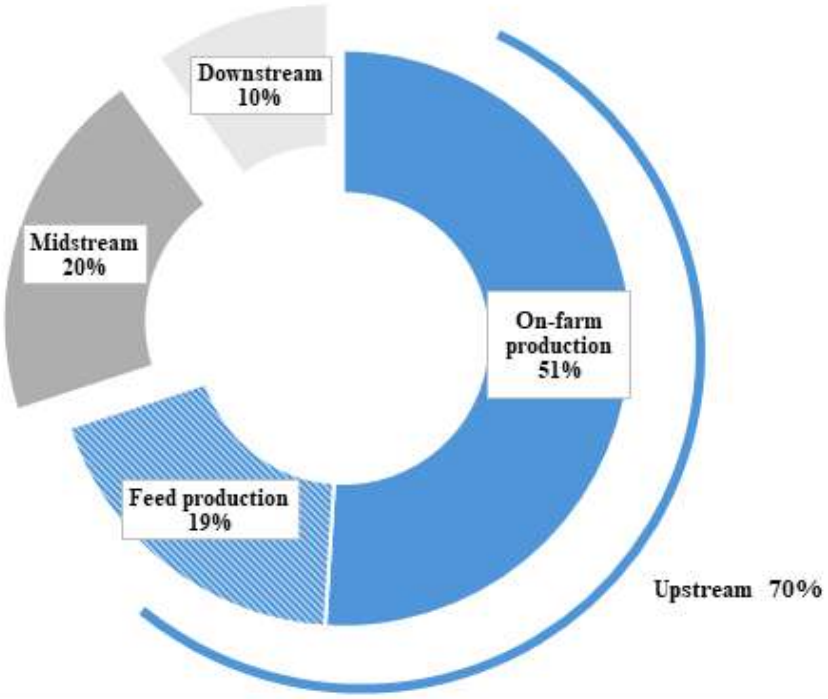
Despite this potential, climate-related commitments among US dairy processors vary widely in scope, ambition, and transparency. Companies differ in the specificity of their reduction targets, the scope of emissions covered, the metrics used, the strategies employed to reduce emissions, and the implementation timelines. Such heterogeneity raises a key question: How are US dairy processors working toward net zero, and in what ways do their approaches differ?

This article presents a systematic review of GHG reduction strategies among the top 100 US dairy processors. We examine publicly available data on their climate pledges, including the types of emissions addressed, reduction metrics, timelines, baseline years, and the level of transparency in reporting. We also identify the strategies companies employ to achieve reductions, from farm-level interventions to packaging and logistics innovations. By evaluating these elements, we assess the extent to which current corporate commitments align with the broader goals of the NZI. Our findings reveal wide variation across firms, highlighting both opportunities for leadership and the structural and informational gaps that may hinder collective progress toward NZI.

The Net Zero Context in Dairy Supply Chains

Comprehensive assessments of GHG emissions across the entire dairy supply chain remain limited, but life-cycle analyses provide useful benchmarks. Thoma et al. (2013) estimate that each kilogram of milk consumed in the US generates approximately 2.05 kg of CO_2-equivalent emissions. As shown in Figure 1, roughly 70% of emissions occur upstream, with 51% from milk production and 19% from feed production. These emissions are mainly methane from enteric fermentation and manure management as well as nitrous oxide from fertilizer used for feed production (Hristov et al., 2013). The remaining emissions, primarily carbon dioxide, are linked to midstream and downstream activities such as processing, transportation, packaging, and product

Figure 1. GHG Emissions Along the US Fluid Milk Supply Chain



Note: GHG emissions include methane, nitrous oxide, carbon dioxide, and other gases.
Source: Data from Thoma et al. (2013).

disposal, which contribute approximately 20% and 10% of total emissions, respectively.

This breakdown mirrors the widely used GHG accounting framework of Scopes 1, 2, and 3 that are central to corporate climate reporting and strategy. Scope 1 includes direct emissions from company-owned sources such as on-site fuel combustion, processing equipment, or vehicles, while Scope 2 covers indirect emissions from purchased electricity, steam, heating, or cooling (US EPA, 2025). For dairy processors, Scopes 1 and 2 typically represent a small share of total emissions and are generally easier to measure and manage (Höber, Rotter, and Friedmann, 2024). Scope 3 emissions include all other indirect emissions across a company's value chain, including feed production, enteric fermentation, manure management, on-farm energy use, packaging, distribution, and post-consumer waste. Since these activities occur outside processors' direct control, Scope 3 is particularly difficult to address (Höber, Rotter, and Friedmann, 2024). This imbalance suggests that achieving the NZI goal will require dairy processors to go beyond operational improvements and engage in supply-chain-wide collaboration to tackle Scope 3 emissions.

Methods and Data

We conducted a systematic review of the climate commitments made by the top 100 US dairy processors in 2024. The list, published annually by Dairy Foods magazine (Berk, 2024), ranks companies by revenue and serves as a proxy for industry impact and market share. Of the firms included, 57% are privately held, 25% operate as cooperatives, 16% are publicly traded, and 2% do not report their ownership status. The top four processors in 2024 were DFA, Land O'Lakes, Saputo, and Nestlé North America. Although the exact share of US milk volume handled by these top 100 firms is not publicly disclosed, they almost certainly account for the majority of national production.

Our assessment relied on publicly available information up to September 2025, including corporate sustainability reports, environmental disclosures, and company websites. Special attention was given to the stated 2050 climate goals and intermediate targets between 2025 and 2050. When formal targets were not disclosed, we also reviewed company blogs and, where possible, contacted companies directly by email. While some responded, many privately held companies declined to share emissions reduction data.

We also reviewed participation in the US Dairy Stewardship Commitment, a voluntary program launched by the Innovation Center for U.S. Dairy to promote sustainability leadership. The program encourages companies to address key areas such as GHG emissions, water use, animal welfare, worker well-being, and community engagement (Innovation Center

for U.S. Dairy, 2023). Although the Stewardship Commitment aligns with the sector's 2050 neutrality goals, it does not require science-based emissions reduction targets, and participation is self-reported without third-party verification.

Finally, to evaluate the scientific rigor of dairy processors' commitments, we examined their participation in the Science-Based Targets initiative (SBTi). Established in 2015, SBTi provides a global framework for setting reduction goals aligned with climate science and the Paris Agreement (SBTi, 2025a). It applies across all sectors, including dairy, and requires companies to set measurable, time-bound targets to reduce Scopes 1, 2, and 3 emissions, including those associated with forestry, land use, and agriculture (FLAG). As of 2024, over 7,000 companies worldwide have committed to SBTi-aligned targets (SBTi, 2025c).

Company Strategies Toward Net Zero: Key Findings

Our review shows both encouraging signs of engagement with NZI and gaps that limit accountability and comparability. In the remainder of this section, we focus on five key dimensions of company commitments: long-term pledges, intermediate targets, emission metrics, implementation timelines, and reduction tools. Company names are used when necessary to illustrate specific approaches with pertinent context. This framework allows us to assess both the breadth of commitments and the gaps that may limit the sector's ability to achieve NZI. Additionally, we plot in Figures 2 and 3 the reduction targets for the companies that have explicitly set intermediate reduction targets before the goal of net zero by 2050.

High Percentage of Net-Zero Commitment

Long-term net-zero pledges serve as a cornerstone of corporate climate ambition, signaling alignment with industry-wide and global decarbonization goals. Among the top 100 processors, 42 have publicly pledged to achieve net zero by 2050, either via their own goals or by adopting the U.S. Dairy Stewardship Commitment. An additional three companies are affiliated with the Innovation Center but do not reference net-zero goals or the Stewardship Commitment in publicly available materials.

According to the Innovation Center for U.S. Dairy (2025), the 39 companies that have adopted the Stewardship Commitment together account for 77% of US fluid milk processing. However, only 29 of these 39 companies appear in the 2024 Dairy Foods top 100 list (Berk, 2024). Our review identified 13 additional top 100 processors that are not listed as Stewardship Commitment participants but have made their own net-zero pledges. This suggests that the overall share of milk volume covered by net-zero commitments and pledges most likely exceeds 77% given the industry's high level of concentration.

Despite broad coverage, not all firms have committed to NZI. Notably, a few processors among the top 20 have made no such pledge in publicly available documents. This variation highlights both the progress made and the gaps that still prevent the sector from advancing toward a fully unified approach.

Lack of Intermediate Emission Reduction Targets

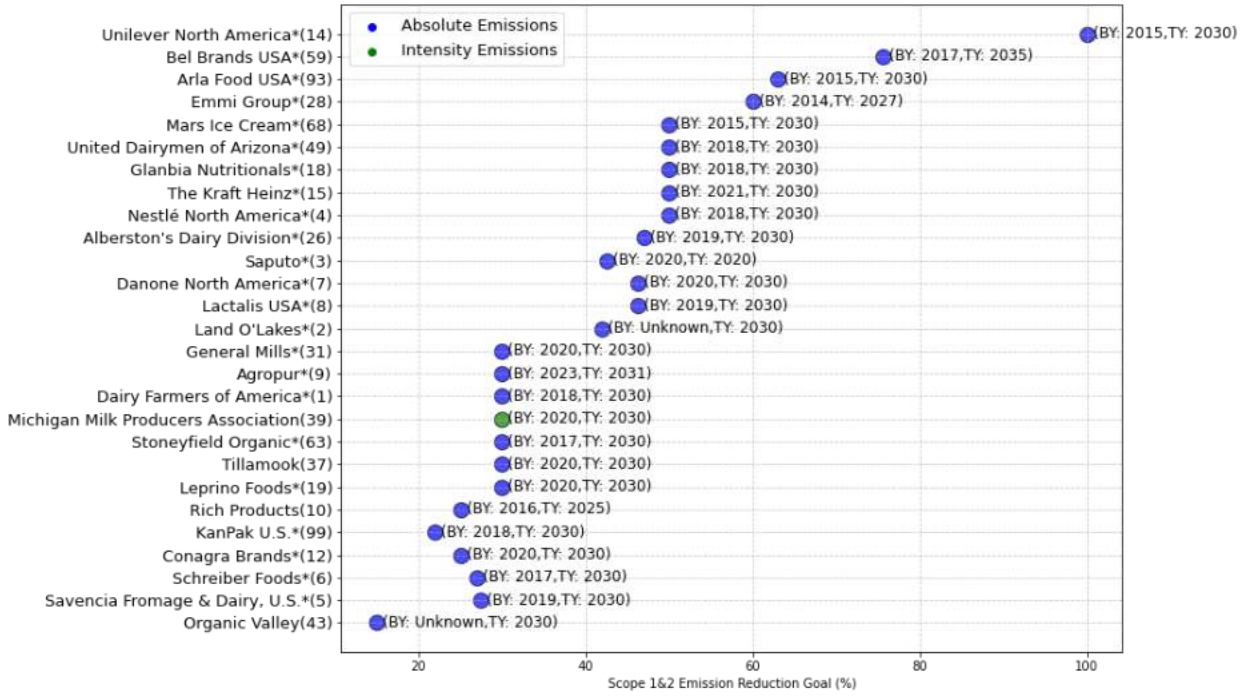
Intermediate goals between 2025 and 2050 are essential for demonstrating credible progress toward NZI, yet dairy processors vary widely in the scope and specificity of these commitments. Among the top 100 processors, only 25 have set intermediate targets that cover all three scopes of emissions, and more than half of these are in the top 20. Encouragingly, 22 of the 25 companies have obtained validation from SBTi, and 10 of those 22 have incorporated the FLAG guidance specific to land-use and agriculture.

In contrast, many firms adopt narrower target approaches. Some disclose only Scope 1 and 2 goals, while others report solely on Scope 3 goals. A few firms report only operational emissions or set targets that extend no further than 2025. At the same time, several large processors from the top 20 list have not established any public pre-2050 commitments. This uneven approach means that even firms with net-zero pledges may lack a transparent roadmap for achieving them.

Level and Metrics of Intermediate Emission Reduction Targets Differ

Companies also differ in how they measure progress toward emission reductions and in the ambition of their goals. Targets are commonly expressed in two ways: absolute or intensity based. Absolute targets track the total volume of GHGs emitted over time, reflecting a company's overall climate impact regardless of size or output. Intensity targets measure emissions per unit of output, such as per liter of milk or per kilogram of cheese. While absolute targets are more directly aligned with global climate goals, intensity targets are useful for tracking efficiency gains, particularly for growing firms. For example, US milk output has increased by 53% since 1990, while enteric fermentation emissions per unit of milk have declined by 26% (Munch, 2023). This decoupling of growth and emissions demonstrates that efficiency gains and climate action can go hand in hand. Among processors with intermediate targets, nearly all report absolute percentage reductions for Scopes 1 and 2, while intensity-based measures are more common for Scope 3. A small number of companies report both types of targets.

Figure 2. Scopes 1 and 2 Intermediate Emission Reduction Goal (%) for US Dairy Processors



Notes: Organic Valley, DFA, KanPak, Agropur, General Mills, Tillamook, MMPA, Stonyfield Organic, Nestlé, and Kraft Heinz report combined Scope 1–3 targets; we assume equal reductions across scopes for comparability. Nestlé North America, Savencia, Danone North America, Lactalis USA, and Emmi Group are subsidiaries of global firms and do not disclose US-specific emissions, so parent company data is used. * indicates SBTi-validated targets. BY = baseline year; TY = target year. Company rankings from Dairy Foods Top 100 (Berk, 2024) are shown in parentheses.

Source: Data collected by the authors based on publicly available information as of September 2025.

Ambition levels also vary considerably. As shown in Figure 2, some firms set relatively modest Scope 1 and 2 goals (around 15%), while others pledge to eliminate operational emissions. Most companies are expected to achieve a 25%–50% reduction by 2030. Figure 3 shows that Scope 3 targets are generally less ambitious, with most firms aiming for reductions of 20%–30% by 2030. While modest, sectoral models suggest that such reductions are technically achievable through current technologies and improved farm practices (Gerber et al., 2013). A few companies go further; for example, Nestlé has pledged to reduce Scope 3 emissions by 50% by 2030, and Danone reports both FLAG and non-FLAG Scope 3 targets.

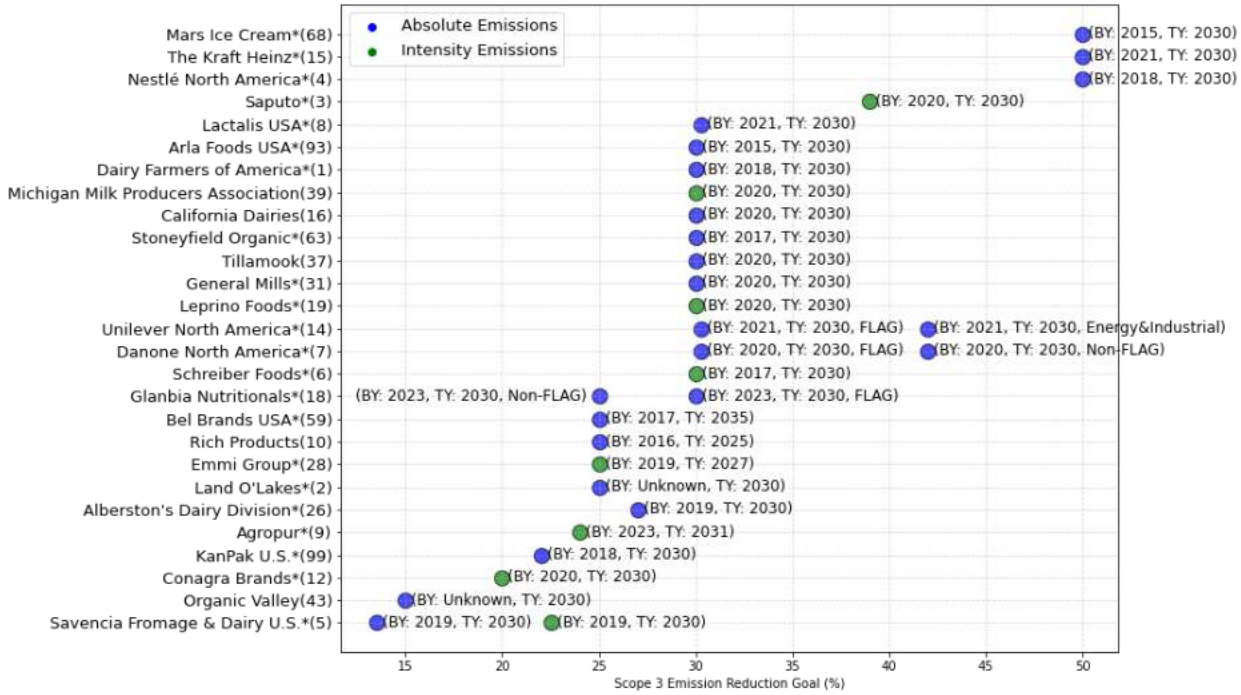
These patterns reveal substantial variations in both the ambition and the metrics of intermediate goals, complicating comparisons across firms and raising uncertainty about whether current commitments are sufficient to keep the sector on track with long-term NZI objectives. Additionally, Figures 2 and 3 suggest that ambition is not necessarily correlated with company size. Instead, publicly traded firms, which face greater scrutiny from investors and regulators, tend to adopt more ambitious targets than privately held companies or cooperatives. This suggests that ownership structure and external accountability may play a stronger role than company size alone in shaping climate commitments.

Heterogeneity in Implementation Timeline

Dairy processors also vary in the baseline years used to set intermediate emission reduction targets. As shown in Figures 2 and 3, the baseline years range from 2015 to 2021, and many firms failed to disclose one at all. The most common choices are 2020 and 2018, followed by 2017, 2019, and 2021. A few companies adopted earlier baselines such as 2015. This variation complicates direct comparisons between firms, as earlier baselines require longer-term tracking and may reflect more ambitious timelines.

Target years also differ across companies, with most ranging from 2030 to 2035 and a few extending slightly beyond or still developing their goals. Some firms stand out with earlier and more ambitious targets, such as 2025 or 2027. However, the majority cluster around 2030 as a common target year, suggesting it may be emerging as a de facto industry standard that reflects both corporate strategies and stakeholder expectations.

Figure 3. Scope 3 Intermediate Emission Reduction Goal (%) for US Dairy Processors



Notes: Organic Valley, DFA, KanPak, Agropur, General Mills, Tillamook, MMPA, Stonyfield Organic, Nestlé, and Kraft Heinz report combined Scope 1–3 targets; we assume equal reductions across scopes for comparability. Nestlé North America, Savencia, Danone North America, Lactalis USA, and Emmi Group are subsidiaries of global firms and do not disclose US-specific emissions, so parent company data is used. * indicates SBTi-validated targets. BY = baseline year; TY = target year; FLAG = Forestry, Land Use, and Agriculture under SBTi. Company rankings from Dairy Foods Top 100 (Berk, 2024) are shown in parentheses.

Source: Data collected by the authors based on publicly available information as of September 2025.

Variations in Scope 1 and 2 Emission Reduction Tools

To reduce Scope 1 and 2 emissions, dairy processors rely on a combination of operational improvements and technological upgrades. Common strategies include enhancing manufacturing efficiency, modernizing transportation fleets, adopting renewable energy, implementing more sustainable operational practices, and siting facilities strategically. For example, some regional processors prioritize sourcing milk within a short-mile radius of their plants to reduce transportation-related emissions and maintain closer oversight of their supply chains.

A major focus for many processors is cutting emissions from energy-intensive operations, particularly thermal processing of raw milk (Milani, Nutter and Thoma, 2011). Processors are improving plant-level energy performance and sourcing cleaner energy to address this challenge. Land O'Lakes, for instance, has implemented renewable energy solutions at several facilities. Many also report investments in energy-efficiency upgrades, including LED lighting retrofits and light-sensor installations, which cut emissions while lowering operational costs.

One notable example of innovation in clean energy is a partnership between the Michigan Milk Producers Association (MPPA, ranked 39th) and a distillery to build the world's lowest carbon-intensity ethanol plant. This facility, expected to open in 2025, will convert whey, a dairy byproduct, into ultra-low-carbon ethanol. The project is anticipated to cut the carbon footprint of milk processed at one of MMPA's facilities by 5%.

Processors with retail components are also targeting refrigeration systems, a key source of GHG emissions in food retail. Meijer (ranked 70th), for instance, has enhanced energy efficiency and reduced refrigerant leakage through system improvements. Similarly, Albertsons' Dairy Division (ranked 26th) has adopted low-climate-impact refrigerants in more than 90 stores, significantly reducing emissions from cooling and storage.

Variations in Scope 3 Emission Reduction Tools

Because most Scope 3 emissions occur at the farm level, dairy processors are employing a variety of strategies to address these upstream impacts. Key focus areas include enteric methane reduction through feed additives or dietary changes, improved manure handling

and nutrient management, and enhanced on-farm energy efficiency. Many operations are also investing in regenerative agriculture practices, such as cover cropping and reduced tillage, to improve soil health and carbon sequestration. Additionally, the use of dairy biodigesters that capture methane from manure, along with innovative technologies such as digital monitoring tools, offers promising pathways to reduce emissions at scale.

Some dairy processors are already advancing Scope 3 reduction strategies across the supply chain. For example, Albertsons is implementing supplier engagement programs that incentivize improved farm-level practices, DFA is investing in regenerative agriculture, and Danone is focusing on feed improvements and manure management. Others are targeting emissions through packaging and logistics innovations. Albertsons is also working to ensure its top suppliers set science-based targets by 2026. These actions reflect a growing recognition that climate leadership must extend from farm to shelf. At the same time, the diversity of approaches suggests opportunities for innovation and collective learning across the industry.

A key framework supporting these efforts is the National Dairy FARM Program (Farmers Assuring Responsible Management), developed by the National Milk Producers Federation in partnership with Dairy Management Inc. The program establishes science-based standards across several critical areas. Notably, the Environmental Stewardship module aligns closely with industry-wide sustainability goals and supports processors in addressing Scope 3 emissions and supplier engagement expectations. Offered as a suite of voluntary assurance modules for US dairy producers, the FARM Program helps benchmark on-farm performance and identify opportunities for efficiency improvements (National Dairy FARM Program, 2022). Our review suggests that 36 of the top 100 dairy processors currently participate in the FARM program.

Looking Ahead: Are We on Track for Net Zero?

As the dairy processing sector looks toward its 2050 net-zero goal, a key question remains: Is current progress sufficient? Our review highlights both encouraging progress and gaps in how US dairy processors are approaching the NZI. Of the top 100 processors, 42 have publicly committed to net zero by 2050, signaling board recognition of the sector's responsibility to reduce its climate footprint. Yet long-term ambition is not consistently matched by near-term action. Only 25 have disclosed explicit intermediate targets covering all three emission scopes. Among those reporting Scope 3 targets, most aim for reductions of 20%–30% by 2030. If the remaining firms adopted similar goals, the sector could collectively achieve a 20%–30% reduction in GHG emissions by 2030. An encouraging aspect is that via discussions with industry experts, indications are that many non-reporting companies are taking internal steps toward the NZI, even if those efforts remain unpublished.

While we believe that reaching net zero by 2050 is achievable, several significant challenges remain. The first is the variation in baseline and target years, which complicates any sector-wide assessment of progress. Without greater consistency, comparisons across firms remain difficult, and collective performance is hard to measure. Differences in the use of absolute versus intensity-based metrics further obscure progress, as intensity improvements may mask rising absolute emissions in a growing industry.

Second, many pledges lack detailed implementation roadmaps, particularly in addressing Scope 3 emissions. Because most processors do not own the farms that supply milk, they depend on supplier engagement, long-term relationships, and incentive-based strategies to reduce emissions. While collaborative models are generally more effective than top-down mandates in enabling on-farm change (Neethirajan, 2024), their success can be limited by information asymmetries and the fragmented nature of the supply chain, which includes many small, independent farms. Legitimacy theory suggests companies may adopt net-zero targets to satisfy stakeholder expectations, but without clear roadmaps or interim goals, such commitments risk being viewed as symbolic (Suchman, 1995). Moreover, as the IPCC notes, non-CO_2 agricultural emissions may only be reduced by 50% by 2050, making offsets necessary to address residual emissions (Beauchemin et al., 2025).

Third, while 2030 is widely recognized as a near-term milestone, the absence of further midterm targets around 2040 leaves a gap that could enable companies to delay significant reductions until the final decade before 2050. Such targets are not just planning tools; they signal whether companies are prioritizing early action or deferring meaningful progress towards 2050 (Costa et al., 2022). Despite this, there are encouraging signs of momentum. For example, a few companies have committed to reaching net-zero emissions by 2039 or 2040.

As consumer-facing businesses, dairy processors are uniquely positioned to interpret and respond to growing demand for environmentally friendly products. By translating these market signals into actionable guidance for suppliers, they can accelerate the adoption of low-carbon practices on farms where economic profitability remains a primary barrier (Hand et al., 2024). Incentive mechanisms such as premiums for low-emission milk, co-investment in sustainability projects, and long-term contracts can both reduce emissions and strengthen trust across the supply chain (Rao and Shenoy, 2023).

The next 5 years are critical for translating climate pledges into measurable action. To support this

transition, the dairy industry could benefit from adopting a standardized framework and involving more dairy processors to make progress comparable and measurable. Greater consistency in goals is especially important because achieving net zero will require coordinated efforts that extend beyond individual companies. Such coordination depends not only on corporate ambition, but also on cross-sector collaboration and supportive policy environments. Ultimately, these conditions will enable processors to embed sustainability into the core of procurement, innovation, and supply chain governance, ensuring that climate commitments translate into meaningful outcomes.

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