Planet Tracker

Methane Matters

Measuring the footprint of agriculture's biggest emitters

November 2025

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Executive summary

Meat, dairy and rice companies are key levers to cut methane emissions

Methane has more than 80 times the warming effect of CO_2 over a 20-year period and is responsible for 30% of global warming since the industrial revolution.

Although more than 150 countries have committed to an absolute reduction of 30% in methane emissions by 2030[a] through the Global Methane Pledge (GMP)[b], these emissions are rising due to growing food demand, intensification of livestock production systems and shifts towards higher meat and dairy consumption. Livestock and rice generate about 40% of methane emissions, more than fossil fuels (34%).

This report first calculates the methane footprint and analyses the targets and reduction plans of 52 of the world's largest meat, dairy and rice companies. These companies account for 12% (21.91 Mt CH_4) of total agricultural methane emissions, reflecting the sector's relative fragmentation. However, within this group the ten largest companies are responsible for 68.4% of the total estimated methane footprint. JBS dominates, producing over a quarter of the group's emissions, making it the single biggest agricultural methane polluter globally.

Corporate disclosure of methane emissions is poor

Only seven out of 52 companies provide any reporting on their methane footprint, and most of these cover only their direct (Scope 1) emissions. Almost all agricultural methane emissions occur upstream ("at the farm") rather than within the food companies' own operations. The absence of Scope 3 disclosure means most companies cannot yet measure, manage or reduce their footprint effectively and investors cannot accurately assess the risks associated with these companies.

Only one company has a specific methane target

Only one company in the group, Danone, has adopted a clear, quantified commitment to reduce methane emissions from its fresh milk supply by 30% by 2030. Some of the largest emitters – JBS, Marfrig, Minerva, Mengniu, Josapar and Ebro Foods – have not set meaningful targets, leaving significant gaps in global efforts to cut agricultural methane. Other dairy companies have embedded methane within broader GHG targets.

No company discloses a stand-alone plan to reduce methane emissions

Where companies do have climate plans, these are generally high-level frameworks rather than detailed methane strategies. None has published a stand-alone methane action plan.

Dairy companies are the furthest ahead in identifying abatement levers, with Arla, Fonterra, Danone, Nestlé and FrieslandCampina all quantifying the potential of measures. Yet even here, plans are rarely timebound or linked to clear implementation pathways at the farm level. Meat and rice companies lag further behind, with only a handful having identified any specific levers, and almost none quantifying how these will deliver emissions reductions.

a From a 2020 baseline.

b The Global Methane Pledge is an international initiative launched at COP26. It aims to reduce global methane emissions by at least 30% from 2020 levels by 2030. The pledge, led by the US and the EU, has been endorsed by over 150 countries and targets methane reductions across key sectors such as energy, agriculture, and waste management to help limit global warming to 1.5°C.

Investment in methane abatement should focus on enteric methane and irrigation-based solutions

Several methane emission reduction solutions are being developed in each industry.

Corporate investment is currently skewed towards manure-based solutions, particularly anaerobic digesters. Digesters can capture significant methane but only address a fraction of livestock emissions and risk perversely incentivising herd expansion, thereby increasing enteric methane.

Other solutions trialled by companies face costs, scalability and acceptance challenges. But producers can catalyse the development and maturity of these solutions by committing to support them (and their implementation by farmers) in their targets and plans, which should also help reduce their costs.

At rice companies, irrigation-based solutions such alternate wetting and drying can reduce methane by 37–77% while saving water. Direct seeding and rice straw management are also promising.

Engaging with high methane emitters is urgently needed

Given methane's short atmospheric life (around 12 years) and its high potency in trapping heat, aligning company targets with the GMP pathway is a particularly relevant way for agricultural companies to support global efforts to limit warming in line with the Paris Agreement. Companies that fail to address the methane footprint may be particularly exposed to future transition risks. Currently, the sector is lagging in disclosure and action, but this trend can change quickly.

By raising the bar on disclosure, target setting and abatement planning, financial institutions can protect long-term value by reducing climate, transition, reputational and regulatory risks in global food and agriculture supply chains.

Recommendations for financial institutions

Investors and lenders can encourage meat, dairy and rice companies to take immediate and measurable steps to cut methane by embedding the following expectations into their engagement, lending and investment strategies:

- **Demand full methane disclosure across supply chains.** Companies should measure and report methane emissions across Scope 1 and 3, covering purchased agricultural commodities which is the source of most methane emissions. Transparent disclosure is the foundation for accountability and credible action.
- **Insist on absolute, science-based and third-party verified reduction targets.** Financial institutions should push companies to set stand-alone, quantified methane reduction goals. We recommend that these should be aligned with the GMP (30% reduction by 2030) and aligned with credible external frameworks such as the Science Based Targets initiative (SBTi), including FLAG (Food Land Use and Agriculture) guidance for agricultural supply chains. These should cover the most material sources of methane in each sector: enteric fermentation for beef and dairy, manure management for intensive livestock systems, and water management for rice.
- **Require timebound methane action plans.** Disclosure of clear, farm-level implementation strategies is critical. Investors should call for companies to publish timebound roadmaps identifying the abatement levers to be deployed, their expected contribution to methane reductions, and the timeline for scaling them across global supply chains.
- **Encourage investment in high-impact abatement solutions.** Financial institutions should engage food companies to support and adopt solutions and practices that tackle enteric fermentation (e.g. feed additives, breeding strategies, vaccines) and rice irrigation practices and avoid over-reliance on manure-to-energy projects.
- **Integrate methane into risk assessments and financing decisions.** Methane should be treated as a financially material climate risk, particularly for agricultural producers. Banks, asset managers and insurers can build methane performance metrics into investment decisions and stewardship strategies.
- **Support a just transition for producers.** Investors should encourage companies to work collaboratively with farmers, providing finance, training and technical assistance to implement methane-reducing practices in ways that improve productivity and livelihoods, particularly in regions dominated by smallholders.

Introduction

Financial institutions need to pay attention to methane

Methane is a particularly powerful greenhouse gas (GHG): it has more than 80 times the warming effect of CO_2 over a 20-year period and is responsible for 30% of the global rise in temperature since the industrial revolution.[1] Like CO_2, methane emissions have been steadily growing, which underscores the importance of tackling methane alongside CO_2 – see Figure 1.

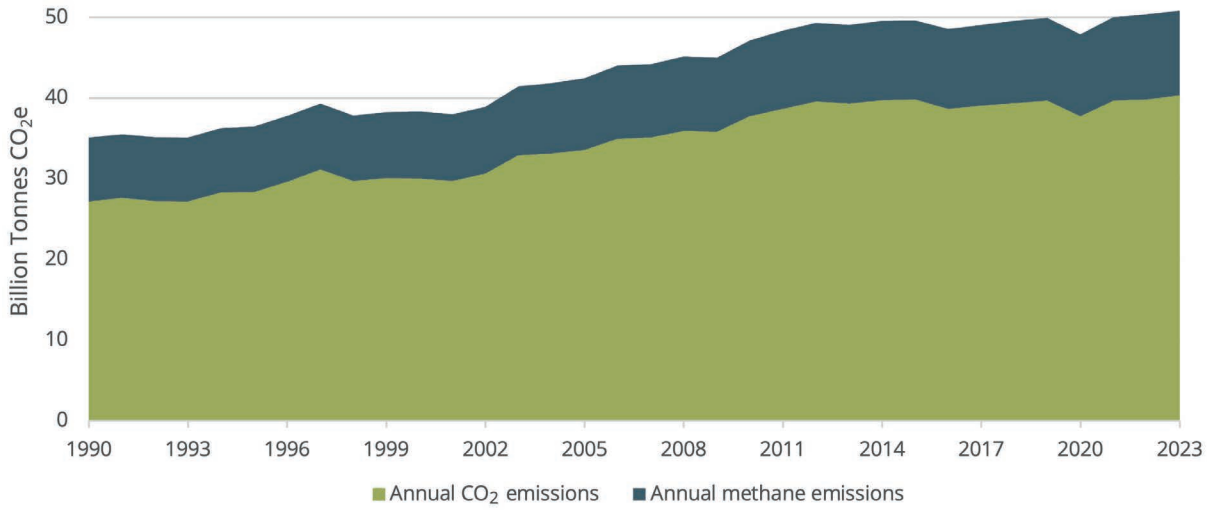


Figure 1: World Methane and CO_2 emissions between 1990 and 2023.
Source: Jones et al. (2024) – with major processing by Our World in Data.[2]

Methane emissions are expected to continue rising, driven by a growing global population, increasing demand for food, the intensification of livestock production systems and dietary shifts towards more meat and dairy consumption.

The Global Methane Pledge (GMP) was launched at COP26 and endorsed by over 150 countries. It commits signatories to work collectively to reduce global anthropogenic methane emissions by 30% by 2030 from 2020 levels. This benchmark, while more ambitious than other reference points such as the IEA's Net Zero Emissions scenario (15–20% by 2030) or UNEP's Global Methane Assessment (25%), reflects the level of reductions that governments have politically committed to and is increasingly used as a reference point for accountability.

For financial institutions, unchecked methane emissions represent both material financial and regulatory risks. Rising scrutiny from governments and the civil society, emerging disclosure requirements such as the EU's Methane Regulation, and methane-specific regulation (if the GMP was translated into national regulations) all create potential financial risks for exposed companies and their financiers.

Instead, due to methane's short atmospheric life (around 12 years), reductions in methane emissions lead more quickly to a decline in atmospheric concentrations. Consequently, accelerated methane mitigation is critical for limiting temperature rise over the medium-term.

Given methane's high potency in trapping heat, aligning company targets with the GMP pathway is therefore a particularly relevant measure of whether corporate action supports global efforts to limit warming in line with the Paris Agreement.

Methane emissions from livestock and rice have a significant climate impact

The global food system is responsible for around a third of total GHG emissions[3] and agriculture is the biggest source of anthropogenic methane emissions, driven particularly by livestock (32% of the total) and rice (8%) production[4] – see Figure 2.

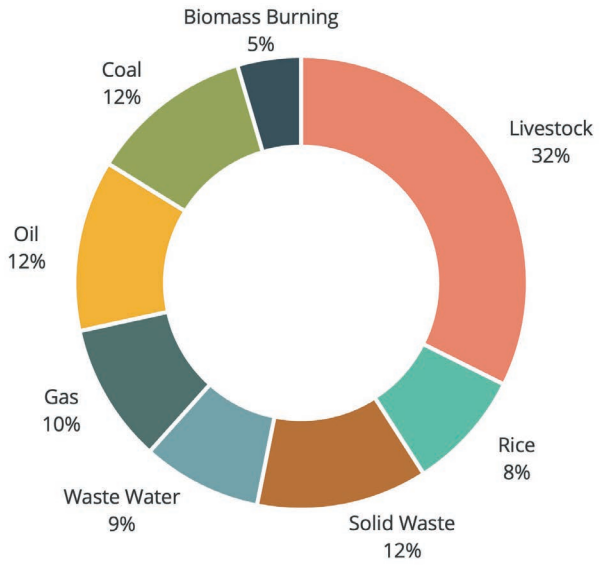


Figure 2: Global anthropogenic methane emissions by source, 2022. Source: United Nations Environment Programme/Climate and Clean Air Coalition (2022). Global Methane Assessment: 2030 Baseline Report.

At the same time, climate change negatively impacts the productivity and resilience of the global food system. Between 1961 and 2006, agricultural yield losses due to droughts and changes in rainfall were estimated at 25%.[5] Climate change has already affected livestock production for meat and dairy, both directly through heat stress affecting animal mortality and productivity, and indirectly through effects on grassland and diseases.

Cutting agricultural methane emissions is therefore a key way of reducing the negative impact that climate change has on food production. As such, it is in the long-term interests of the global food system, from its producers to retailers to investors, to address its methane footprint.

Methane also contributes to harmful ground-level ozone, so reducing these emissions also improves air quality, health outcomes and agricultural production and protects broader ecosystems.[6]

Ruminant livestock are the key drivers of agricultural methane emissions

Over 90% of methane emissions from livestock are produced as a by-product of digestions in ruminant livestock, primarily from beef and dairy cattle.[7] This is also known as enteric fermentation, where the microbes in an animal's digestive systems ferment the feed they have consumed. The remaining methane emissions from livestock are a result of manure management practices.[c]

Overall, beef is the largest source of methane from livestock, accounting for 51% of emissions, followed by dairy cattle (18%) – see Figure 3.

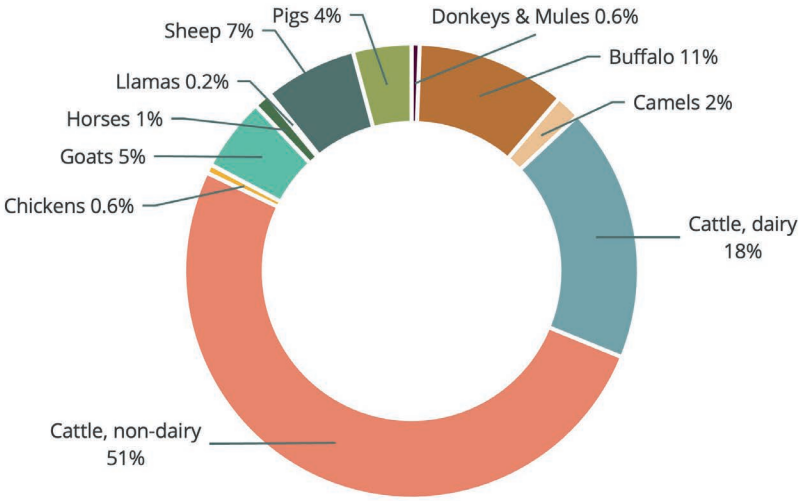


Figure 3: Share of livestock total methane emissions by animal type, 2022.
Source: FAO (2025) Emissions from Livestock.

Rice is a staple crop for half of the global population.[8] 90% of global production takes place in Asia, mainly India and China. Rice accounts for 8% of global methane emissions – see Figure 2. Unlike most crops, rice is typically grown in flooded paddy fields to limit weed growth, which creates anaerobic conditions conducive to methane-producing bacteria. Methane produced in waterlogged soil is mainly emitted to the atmosphere via rice plants, while around 10% of emissions are from gas bubbling directly from soil during early stages of crop growth.[9] Other factors which affect methane emissions from rice fields include soil type and pH, land preparation, rice type/cultivar, and pesticide and fertilizer use.[10]

c Wet manure creates an oxygen-deprived (anaerobic) environment in which methane-producing microorganisms thrive. As a result, 80% of manure-related methane emissions are from wet manure storage systems, particularly common in intensive, large-scale dairy and pork (and to a lesser extent poultry) operations in North America, Europe and parts of Asia and Latin America.

Solutions are being develop to address methane emissions

This report highlights some of the main solutions that have emerged to tackle agricultural methane emissions. These solutions range from high- to low-tech and vary widely in terms of costs, scalability and stage of development. They include:

- increasing animal feed efficiency to reduce methane intensity;
- using feed additives that inhibit methane emissions;
- separating manure solids and liquids;
- manure treatments such as acidification or aeration;
- manure additives; and
- changing rice cultivation practices around irrigation and soil management.[11]

Many solutions for reducing methane emissions have ancillary benefits such as improving yields, reducing water use, and lowering animal feed costs, which increase profitability and improve farmer livelihoods. There is a real opportunity to align climate action in meat, dairy and rice sectors with better outcomes for producers and the food system overall. However, these solutions have seen limited implementation to date, reflecting both the complexity of agricultural value chains and the need for greater coordination across actors.

USD16.5 billion p.a. of investment in methane abatement is needed by 2030

Agriculture, forestry and land use sectors attracted 55% (USD 7.5 billion) of all finance for methane (CH_4) abatement globally in 2022, a positive sign of growing investment momentum. However, total investment will need to more than double (to USD 16.5. billion per annum) by 2030 to achieve emissions reduction in line with limiting temperature rise to below 2°C, according to Climate Policy Initiative's research[12] – see Figure 4.

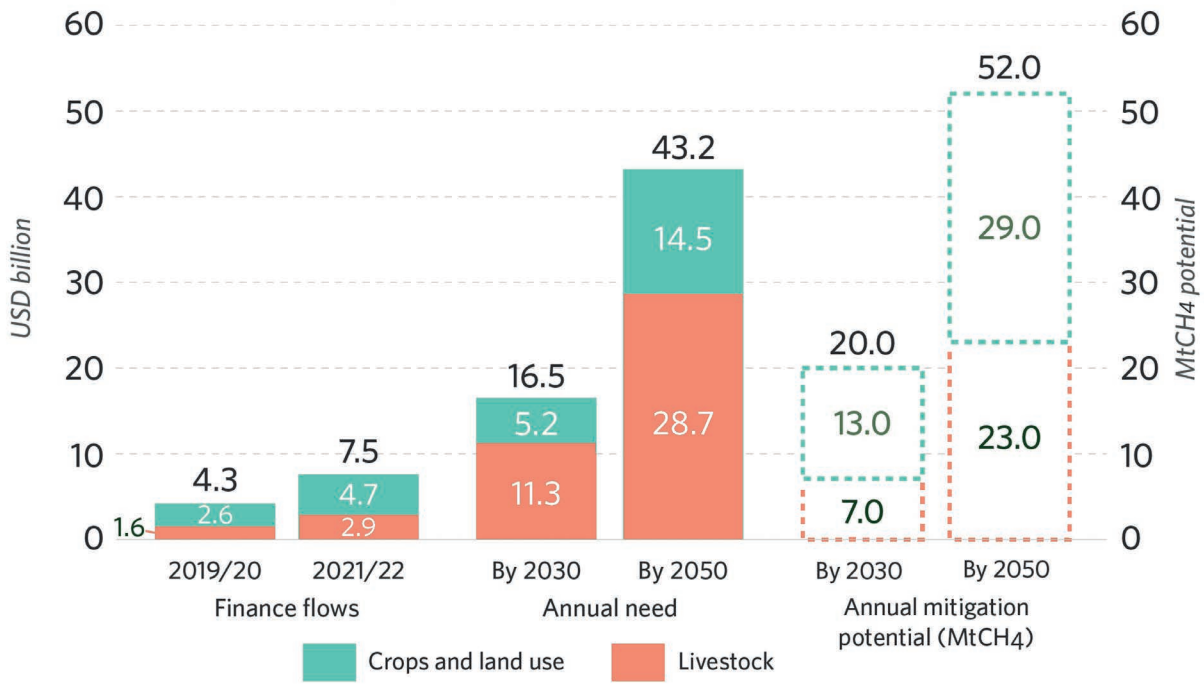


Figure 4: Methane abatement finance to agriculture, forestry and land use sectors compared to future needs and annual mitigation potential. Source: Climate Policy Initiative, Landscape of Methane Abatement Finance 2023 (2023) https://www.climatepolicyinitiative.org/publication/landscape-of-methane-abatement-finance-2023/

Despite livestock making up the majority of agricultural methane emissions, investment in this area lags behind funding for crops and land use – it accounted for just 38% of the combined USD 7.5 billion investment in 2022, but will need to reach 68% of the combined investment need of USD 16.5 billion by 2030. This represents a near 4x increase, from USD 2.9 billion to USD 11.3 billion.

Moreover, Climate Policy Initiative's research found that 85% of spending on methane abatement for livestock for is directed towards manure-to-energy and manure management, which makes up around 10% of methane emissions for these commodities, with the 90% of livestock emissions from enteric fermentation being materially under-addressed. Funding manure-to-energy anaerobic digestors for livestock farming has jumped significantly in recent years and there are real concerns that increased funding and subsidies for this technology may create financial incentives for farmers to increase cattle numbers to grow revenues from the captured energy, pushing up methane emissions from enteric fermentation. Meat and dairy companies will need to radically scale up investment in enteric methane abatement if they are to meaningfully tackle methane emissions.

Assessing methane footprints and reduction targets/plans

This report identifies 52 of the largest meat (beef, pork and poultry), dairy and rice producing companies globally, estimates their agricultural methane emissions footprint and evaluates their methane emissions reduction targets and abatement plans. This follows on from Planet Tracker's 2023 report Hot Money (in partnership with IATP[d] and Changing Markets Foundation) which estimated the methane emissions of 15 of the largest global meat and dairy companies and found that none of these companies were reporting their full Scope 1 and 3 methane footprint.

The companies assessed in this report are key producers and suppliers of meat, dairy and rice and have faced less scrutiny than oil, gas and coal companies in measuring, disclosing and tackling methane emissions. However, action from these agri-food businesses to disclose, set targets and develop action plans will be the critical first step in tackling anthropogenic methane emissions and achieving the GMP targets.

Company selection and classification

The meat, dairy and rice industries are highly fragmented. This report covers 52 of the largest meat, dairy and rice producing and aggregating companies, comprising:

- 23 meat producers with:
  - 9 companies producing beef
  - 15 companies producing pork
  - 12 companies producing poultry
- 14 dairy companies
- 15 rice companies

d Institute for Agriculture and Trade Policy.

Table 1: List of companies analysed in this report.

Company	Commodity	Company	Commodity
Adecoagro	Rice	MHP	Poultry
Anheuser-Busch Inbev	Rice	Perdue Farms	Poultry
Buyung Poetra Sembada Tbk PT	Rice	Wens Foodstuff Group	Poultry
Chaman Lal Setia Exports Ltd	Rice	Minerva Foods	Beef
Ebro Foods	Rice	Vion	Beef
GRM Overseas Ltd	Rice	Cargill	Poultry, Beef
Josapar Joaquim Oliveira SA Participacoes	Rice	Marfrig	Poultry, Beef
Kohinoor Foods Ltd	Rice	Danish Crown	Pork, Beef
LT Foods Ltd	Rice	Groupe Bigard	Pork, Beef
Mishtann Foods Ltd	Rice	New Hope Group	Pork, Beef
Olam Group Ltd	Rice	JBS	Poultry, Pork, Beef
Ricegrowers Limited	Rice	Tyson Foods	Poultry, Pork, Beef
Riceland Foods	Rice	Amul	Dairy
Vietnam Southern Food Corporation JSC	Rice	Arla Foods	Dairy
Wilmar International	Rice	California Dairies, Inc.	Dairy
Aurora Alimentos	Pork	Dairy Farmers of America	Dairy
Dekon Group	Pork	Danone	Dairy
Iowa Select Farms	Pork	Fonterra	Dairy
Muyuan Foodstuff	Pork	FrieslandCampina	Dairy
Seaboard Foods	Pork	Glanbia	Dairy
Triumph Foods	Pork	Groupe Lactalis	Dairy
Vall Companys Group	Pork	Mengniu	Dairy
WH Group	Pork	Müller	Dairy
Zhengbang Group	Pork	Nestle	Dairy
Industrias Bachoco	Poultry	Saputo	Dairy
Koch Foods	Poultry	Yili	Dairy

To develop a list of the largest producers, commodity volume data was collected from company reports where available, and industry publications were used where companies did not disclose these figures themselves. While most producers disclosed volumes separately for each category, rice producers often aggregated rice production with other grains/commodities. In those cases, we excluded the companies from our analysis.

Estimating agricultural methane emissions to address limited disclosure

Only seven out of 52 companies disclose methane emissions

Understanding the distribution and scale of their methane emissions is the first step meat, dairy and rice companies should take to tackle this issue and reduce their climate impact. However, the initial analysis conducted for this report found that corporate methane emissions disclosure across the companies assessed is extremely limited.

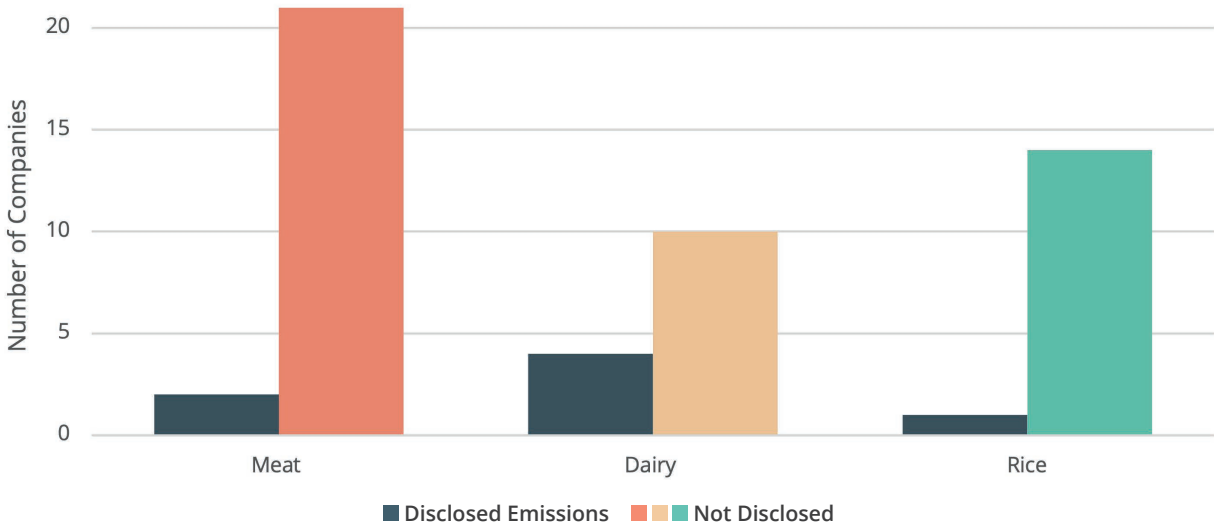


Figure 5: Number of companies that disclose emissions and don't disclose emissions.

Seven out of 52 companies have provided some kind of methane emissions disclosure in their most recent reporting: two of 23 meat companies (Cargill and Tyson Foods), four of 14 dairy companies (Danone, Groupe Lactalis, Nestlé and Saputo) and one of 15 rice companies (Anheuser-Busch Inbev)[e] – see Table 2.

Scope 3 emissions are typically not disclosed

The vast majority of agricultural methane emissions occur at the most upstream stage of the value chain, on farms. For most companies in this report, these emissions fall under Scope 3 rather than Scope 1.[f] Despite this, three of the seven companies who report methane emissions only do so for Scope 1.

e ABInBev is a global brewer that sources rice for some of its brands.

f Scope 3 emissions include all indirect greenhouse gas emissions across a company's value chain, from suppliers through to end use of products. Within this category, *Scope 3 FLAG (Forestry, Land Use and Agriculture) emissions* specifically capture methane and other gases released from agricultural and land-based activities, such as enteric fermentation in livestock, manure management, rice cultivation and land-use change. Unlike general Scope 3 emissions (e.g., from purchased goods, transport or customer use), Scope 3 FLAG isolates the land-related portion of a company's value chain where methane is often the dominant greenhouse gas.

Of the other four companies, only Danone provides a reasonably broad disclosure of its methane emissions (for its fresh milk, representing 70% of their total methane emissions[13]), covering both own production upstream (Scope 1) and farmer-purchased (Scope 3) milk. The remaining three companies provide partial Scope 3 disclosure: Groupe Lactalis reports Scope 3 methane emissions for its US operations only;[14] Nestlé reports methane emissions for its 'ingredients category';[15] and Saputo reports methane emissions for Scope 3 FLAG.[16]

Table 2: Types of emissions each company discloses.

Company	Disclosures
Meat companies	
Cargill	Scope 1 only
Tyson Foods	Scope 1 only
Rice companies	
Anheuser-Busch Inbev	Scope 1 only
Dairy companies	
Danone	fresh milk only (70%), Scope 1 and 3
Groupe Lactalis	US only
Nestlé	ingredients only
Saputo	FLAG emissions

Inconsistent methane disclosure standards

Disclosure is limited in part because methane disclosure emission standards are still evolving. The GHG Protocol provide a starting point for emissions measurement. Guidance on methane emissions have recently been developed by the Dairy Methane Action Alliance, and Danone and Group Lactalis USA are signatories of this initiative. However, similar initiatives do not yet exist for meat and rice.

Inconsistent standards in measuring methane leaves these sectors in a weak position to begin tackling their methane footprint. The absence of disclosure, meanwhile, restricts the ability of their investors and customers to assess the methane risks and hold the company to account in addressing them. Therefore, it is critical that companies support the development of methane measurement and disclosure standards for their portfolio and adopt those standards as soon as they are available.

Our estimates provide a basis for investors to assess company-specific risks

To compensate for the absence of disclosure, this report has modelled methane emissions of the 52 companies considered. The methane emissions for each company were calculated by combining company production volumes and location data with regional average emissions intensity data for each commodity from the FAO's GLEAM 3.0 model for meat and dairy, while the IPCC 6th Assessment methodology was used for rice. For more details of the methodology please see Appendix 2.

While we recognise this approach may not yield precisely accurate results, we are confident the picture gives a solid approximation of the footprints of the 52 companies. From this starting point, further granularity can be provided as company disclosure improves.

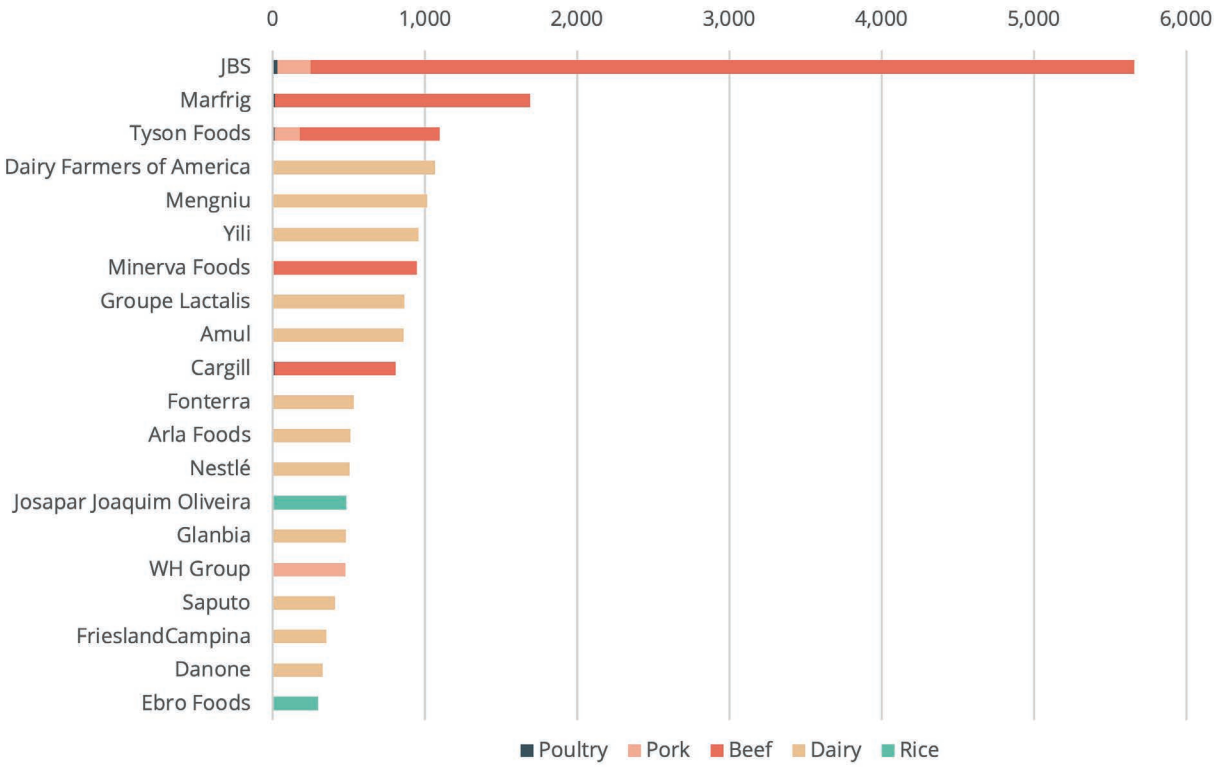


Figure 6: Estimated methane emissions by company and commodity, 2023.
Source: Planet Tracker Analysis 2025. Note: This Figure shows the top 20 emissions producing companies. For a breakdown of companies by each commodity please see the dedicated sections.

Overall emissions are concentrated among big beef and dairy producers

This group of 52 companies is dominated by beef and dairy producing companies, which represent 85% of the total – see Figure 7.

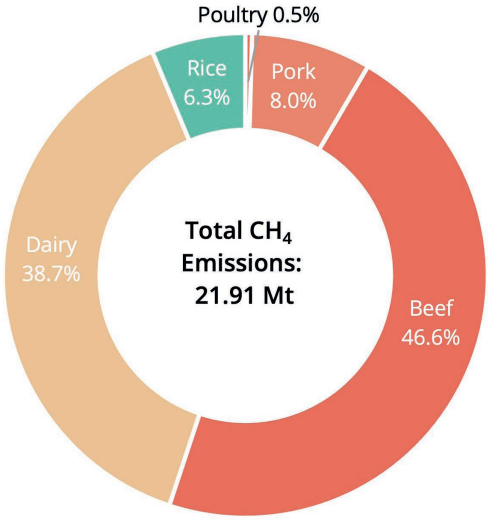


Figure 7: Estimated total company universe methane emissions by commodity, 2023. Source: Planet Tracker Analysis 2025.

Within the 52 companies, the top ten methane emitting companies account for 68.4% of the group's emissions. The top five meat producers – JBS, Marfrig, Tyson Foods, Minerva Foods and Cargill – represent 46.6% of the total group emissions – see Figure 8.

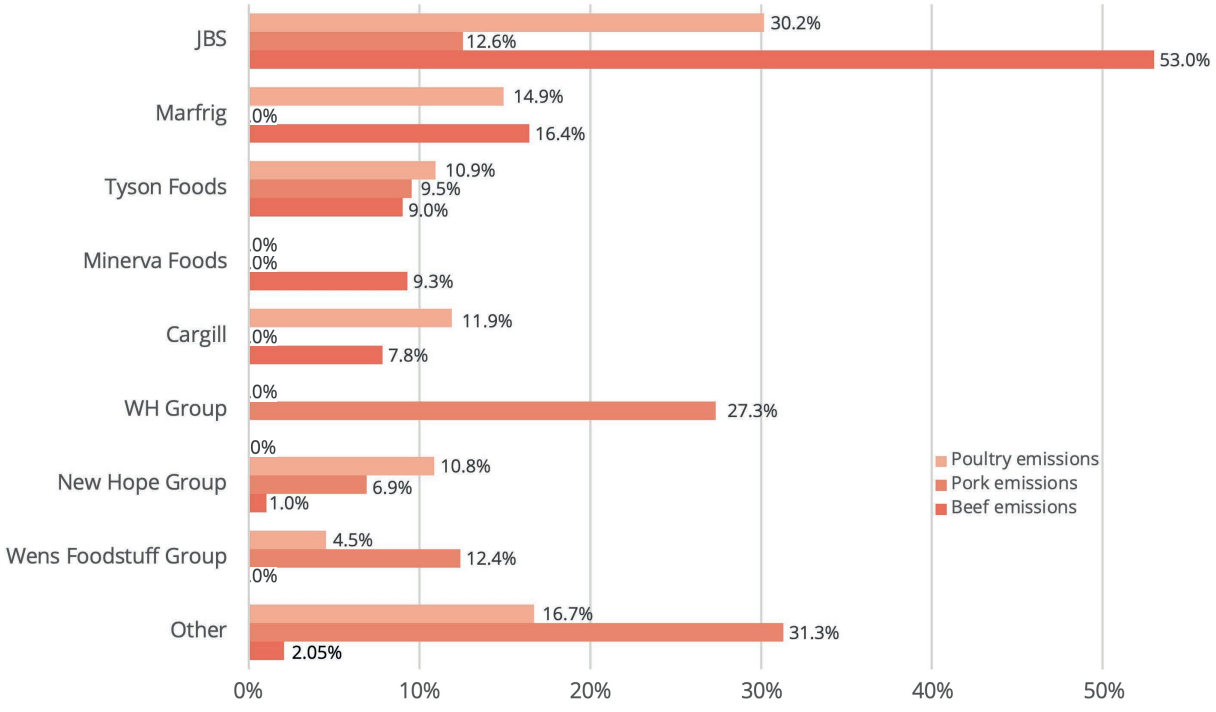


Figure 8: Breakdown of Methane Emissions from Major Meat Companies by Product Type in decreasing order by total emission. Source: Planet Tracker, based on sample of 52 companies.

Five dairy companies make up 21.8% of the group's methane footprint – see Figure 9.

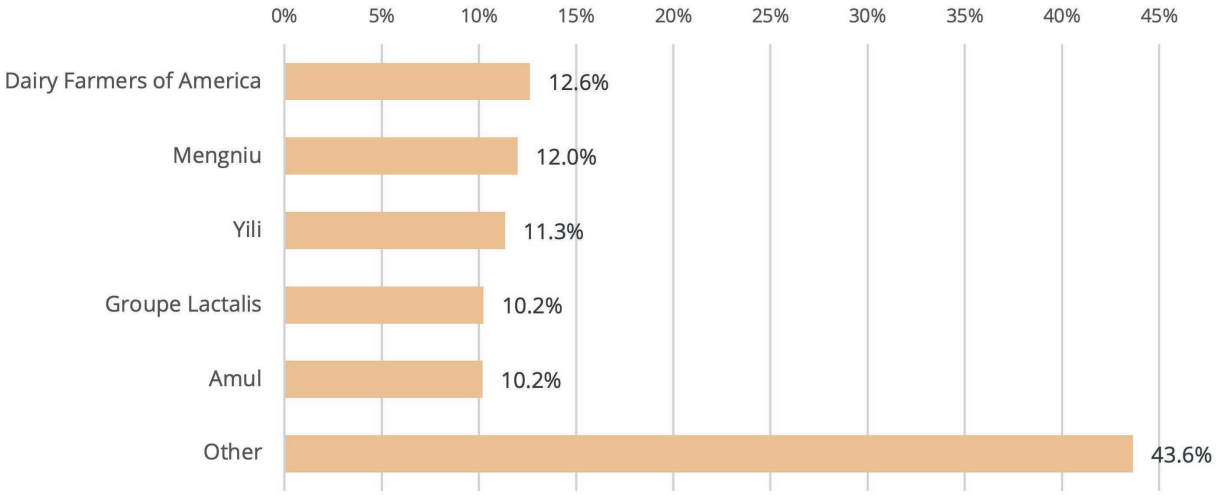


Figure 9: Breakdown of Methane Emissions from Major Dairy Companies.
Source: Planet Tracker, based on sample of 52 companies.

Finally, rice companies make up the balance of 22% of the group's methane footprint – see Figure 10.

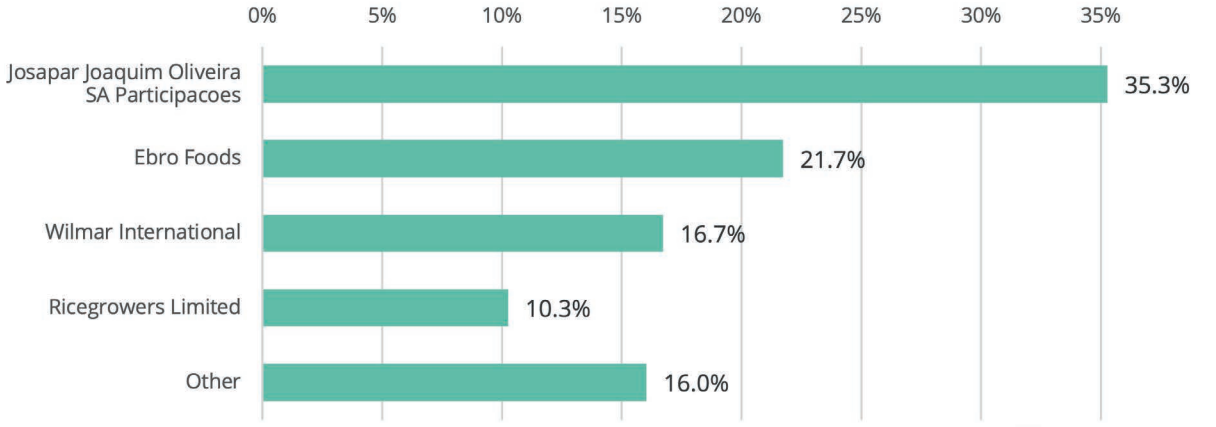


Figure 10: Breakdown of Methane Emissions from Major Rice Companies.
Source: Planet Tracker, based on sample of 52 companies.

Reviewing methane targets

Companies are increasingly setting targets to reduce their GHG emissions, driven by regulatory, investor and consumer pressure. However, targets specifically tackling methane emissions are far-less common, including for meat, dairy and rice companies where methane makes up a material portion of their total GHG footprint. Clearly defined near- and long-term methane emissions reduction targets in line with the Paris Agreement is a critical step meat, dairy and rice companies should take to manage their methane footprint.

Methane target scorecard methodology

This section provides a qualitative assessment of companies' methane and GHG emissions reduction targets using a scorecard approach – see Table 11. Specifically, companies' targets were assessed for:

- The presence of specific near- and long-term methane emissions reduction targets, or broader GHG emissions reduction targets that include methane emissions;
- Whether targets are science-based and verified by a third party, e.g. SBTi;
- Which GHG emission Scopes are covered by the targets;
- Whether targets aim for a reduction in absolute emissions or emissions intensity; and
- The base year and target year in each case.

Only one company has set a clear, specific methane target

While 24 of the 52 companies have set targets that include methane, only one company, Danone, has set a specific target for methane, aiming to reduce methane emissions from fresh milk supply (across Scope 1 and 3) by 30% by 2030. As a result, Danone performs best out of all the companies in the methane target scorecard.

The lack of methane targets is concerning considering the size of their combined methane footprint and reflects the lack of methane disclosure, and potentially limitations in measurement.

Dairy companies lead

Dairy companies perform best as a group in the methane target scorecard, followed by meat companies while rice companies perform worst overall. Besides Danone, 11 out of 14 dairy companies have set near-term GHG targets that incorporate methane emissions, but don't set a specific target for methane emissions.

In comparison, most meat and rice companies have failed to set GHG targets that cover methane emissions. Eight out of the 23 meat companies and four out of 15 rice companies assessed have set near-term GHG emissions targets which include methane emissions.[g] This highlights that many of the world's largest meat and rice players are failing to demonstrate meaningful commitments to reduce their climate impact.

g For the purposes of this assessment, we count companies as "including methane" in their targets if methane is explicitly referenced. A general GHG or CO_2- equivalent target without specific mention of methane is not considered sufficient.

Methane targets are often limited

Seven out of 23 meat companies have set emissions *intensity* targets for Scope 3 GHG emissions. Intensity targets are expressed as the quantum of emissions per unit of production or revenue. As such, the level of absolute emissions could increase during the target period even as the intensity target was met, if the rate of volume or revenue growth outpaced the rate of emission intensity decline.[h] Given projections for growing meat consumption in the coming decade, there is a real risk that these intensity targets will deliver limited or no absolute reduction in emissions.

h Please refer to the section on Meat companies page 24 for a more detailed discussion of the difference between intensity and absolute targets.

From targets to implementation

Companies' GHG and methane targets need to be backed up by transparent, publicly accessible action plans. These plans should identify and quantify specific methane abatement technologies and techniques. For emissions over which the company has direct control, the plan should identify specific, timebound actions. For emissions over which the company does not have direct control, which is mostly the case for companies in this report, the plan should detail the general solutions the company will support their suppliers to implement at the farm level.

This transparency is key for tracking a company's progress and assessing its ability to meet climate targets. Transparent methane action plans can also help identify opportunities for collaboration, which will be essential for scaling solutions, particularly where companies are sourcing from a large number of small and mid-scale producers.

Agricultural methane abatement solutions are still evolving, but there are already several promising emissions techniques covering enteric methane, manure management and rice cultivation – see Table 3. These solutions can also often improve crop and livestock yields, and food security.

Table 3: Methane emission reduction solutions. Source: Planet Tracker, adapted from: Hegde, S., T.D. Searchinger, and M.J. Diaz. 2025. "Opportunities for methane mitigation in agriculture: Technological, economic and regulatory considerations." World Resources Institute. doi.org/10.46830/wrirpt.23.00110

Methane source	Reduction strategies	Technologies and techniques
Enteric methane	Improved livestock efficiency	Improved feed quality and health
		Improved digestibility of crop residues
	Methane inhibition	3-Nitroxypropanol (3-NOP)
		Asparagopsis (Red seaweed)
		Nitrates
		Lipids
		Plant secondary metabolites
		Probiotic supplements
		Methane vaccines
		Genetic approaches (breeding low-methane cows)
	Other emerging solutions	Wearable devices
Manure management	Manure collection and storage interventions	Reduced storage time and frequent removal from barns
		Covering manure storage
		Biofilters
		Solid-liquid separation
	Manure treatment	Aeration
		Anaerobic digestion
		Composting
		Impermeable cover and flare
	Manure additives	Acidification
		Flocculation or coagulation
	Other emerging solutions	Peroxide-based additives, advanced treatments

Rice cultivation	Yield improvements	Yield improvements via breed selection, breeding, or hybrid varieties
	Changes to irrigation management	Alternate wetting and drying
		Mid-season drainage
		Drip irrigation
	Soil management	Off-season ploughing of rice straw
		Biochar amendment
		Direct-seeded rice
	Other emerging solutions	Replacing urea with ammonia-based fertilizers
		Nitrification inhibitors

However, these promising technologies and techniques have seen limited implementation to date, due to either high costs, low availability at scale, or barriers to adoption within fragmented agricultural value chains.[17] These barriers mean that companies' abatement action plans will necessarily entail flexibility to adapt as the most commercially viable and effective solutions become clearer. However, that does not mean companies should take a "wait and see" approach, postponing the creation of action plans until the implementation pathway is clearer. Rather, actions plans should commit them to an active role in encouraging the emergence and adoption of methane abatement solutions.

Anaerobic digestors are emerging as a common methane abatement technology being explored – 12 meat companies and 9 dairy companies report investing in or piloting anaerobic digestion systems that capture methane from manure decomposition to generate biogas or electricity. These technologies can deliver methane reductions of 17% to 85%, depending on system design, scale, and co-digestion with food waste. Their growing popularity reflects policy incentives and subsidies that promote biogas as a renewable energy source, particularly in intensive livestock systems.

However, while anaerobic digestors can mitigate emissions from manure management, they do not address enteric fermentation, the largest source of methane from livestock. Moreover, increased funding for biogas projects can create financial incentives to expand herd sizes in order to maximise manure feedstock for digestors, thereby increasing overall enteric methane emissions. Digestors carry additional risks such as methane leaks, odour, ammonia emissions, and infrastructure impacts from pipelines and waste handling. As a result, digestor projects should be coupled with efforts to improve feed efficiency and curb enteric methane emissions.

Methane-inhibiting feed additives are also emerging as a solution to reducing emissions. The report identifies four major additive types under development or trial across the meat sector: nitrates; secondary plant metabolites; probiotic supplements, and; 3-NOP (traded as Bovaer). A further six additive types are being explored in the dairy sector, including red seaweed (Asparagopsis) and lipid supplements. These additives work by altering the microbial processes in livestock digestion to reduce methane formation.

While early results are promising, there are challenges:

1. Reported methane reductions vary widely – from 3% to over 80%, depending on the additive type, dosage, diet composition, and production system.
2. Products such as Bovaer and SilvAir have shown meaningful emissions reductions in controlled feedlot environments, but their high cost (ranging from $84 to $240 per tonne of CO_2e) limits accessibility for smaller or pasture-based producers.
3. Many additives require precise dosing and controlled feeding systems, restricting their use in extensive or smallholder farming contexts that dominate global livestock production.
4. Several additives face regulatory and consumer acceptance hurdles, while the long-term effects on animal health, productivity, and product quality remain uncertain.

As a result, while feed additives represent one of the most dynamic areas of methane innovation, their scalability and cost-effectiveness are not yet proven.

Rice companies are beginning to integrate multiple methane abatement practices within their production systems which address methane emissions at different stages of cultivation. These typically pair water management techniques such as alternate wetting and drying (AWD) or direct seeding with soil and nutrient management measures, including optimised fertiliser application, organic matter control, and the introduction of low-emission rice varieties.

This integrated approach reflects increasing recognition that no single measure can deliver the scale of methane reduction required across rice systems. Studies suggest that combining AWD with improved nutrient management and varietal changes can reduce methane emissions by up to 50%, while also improving yields and water efficiency.

However, these solutions are largely pilot-focused and geographically limited. Scaling such efforts will require implementation targets, financial incentives for smallholder adoption, and investment in farmer training and monitoring systems. Nonetheless, the move toward combining multiple abatement levers signals that rice companies recognize the need for comprehensive, system-level strategies to tackle methane emissions effectively.

Methane emissions reduction plan key findings

No company discloses a stand-alone plan to reduce methane emissions

None of the 52 companies assessed has published a dedicated methane reduction plan. Where plans exist, they are framed as general GHG or “net-zero” strategies and fold methane into broad carbon commitments without a separate roadmap.

As a result, companies score poorly on the methane plan scorecards.

Investors should be provided with visibility on how near-term methane reduction will be delivered, including: the expected contribution of individual abatement levers (e.g. feed additives, manure management, irrigation changes); the timeline for implementation across their suppliers, and; the logistical and financial support for farmers to adopt and scale the solutions. The absence of implementation plans weakens investor confidence in methane and GHG reduction targets and impairs investors’ ability to assess transition readiness or hold companies to account.

Dairy outperforms on methane plans

Dairy companies lead overall on the methane emissions reduction plan scorecard. Compared with meat and rice, more dairy companies disclose commodity-specific GHG plans and several are beginning to quantify near-term methane levers, but none are sufficiently developed to comprise a tangible plan of action. Five of 14 (Arla, Fonterra, Danone, Nestlé, FrieslandCampina) have disclosed detailed plans linking methane reduction technologies and practices to their short-term GHG targets, specifying contributions from actions such as feed efficiency, manure management/biogas and enteric-methane interventions.

11 of 14 outline some on-farm implementation support, though coverage and timelines are often partial. Companies such as Fonterra, Danone, and Groupe Lactalis stand out for embedding on-farm implementation measures into their climate strategies, through tools like farm environment plans, supplier engagement programmes, farmer training, and financial incentives. Important gaps remain: no dairy company has a specific methane plan, only one (Arla) quantifies any long-term methane pathway. In short, dairy outperforms peers, but the sector's leadership is incremental rather than comprehensive.

More meat and rice companies need to identify methane levers

Both meat and rice companies show limited progress in identifying the specific actions needed to reduce methane emissions. Among the 23 meat companies assessed, only seven disclose any form of methane emissions reduction levers as part of their broader GHG plans. However, none of these have quantified the expected contribution of these measures toward achieving their climate targets, nor provided time-bound implementation plans. The examples that exist, such as improved feed efficiency, anaerobic digestion, or low-methane cattle breeding, are described only at a high level, without clear targets, timelines or investment commitments. This lack of quantification makes it difficult to assess whether these measures are sufficient to meet companies' stated GHG goals.

Out of 15 rice companies, only three, Ricegrowers Limited, Olam Group, and Adecoagro, have identified methane-related mitigation levers such as alternate wetting and drying irrigation, direct drill sowing, and breeding low-emission rice varieties. Yet, as with the meat sector, none quantify the methane reduction potential of these actions or link them to measurable targets.

The remainder of this report analyses the targets and reduction plans of the meat, dairy and rice companies in more depth.

Meat companies

Target summary and scorecard

Global meat production has increased steadily, at 2.6% p.a. since the 1960s (from 70 million tonnes to more than 350 million tonnes today). Much of this growth has been driven by the rapid expansion of poultry production.

Future projections indicate that global meat production will rise by approximately 13% by 2034 (1.2% p.a.), driven largely by population growth and rising incomes in developing regions.[18]

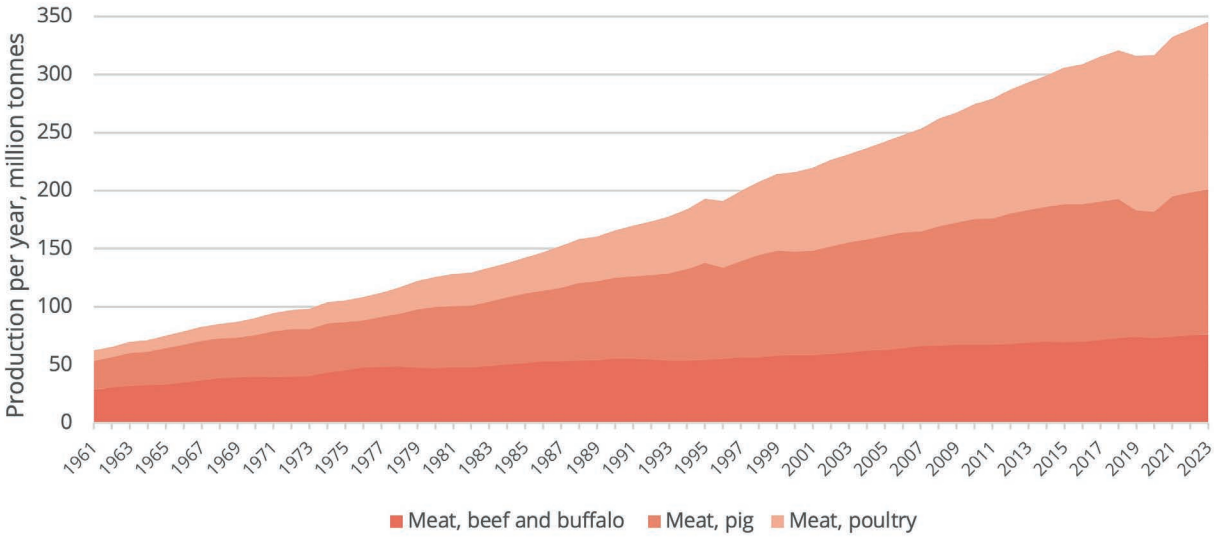


Figure 11: Global meat production per year by type, 1961 to 2022
Source: Food and Agriculture Organization of the United Nations (2024)[19]

None of the 23 meat producing companies analysed in this report have set a separate methane emissions reduction target. Eight out the 23 of the meat producing companies assessed have set near-term GHG emissions targets that include methane emissions, as shown in Table 5.

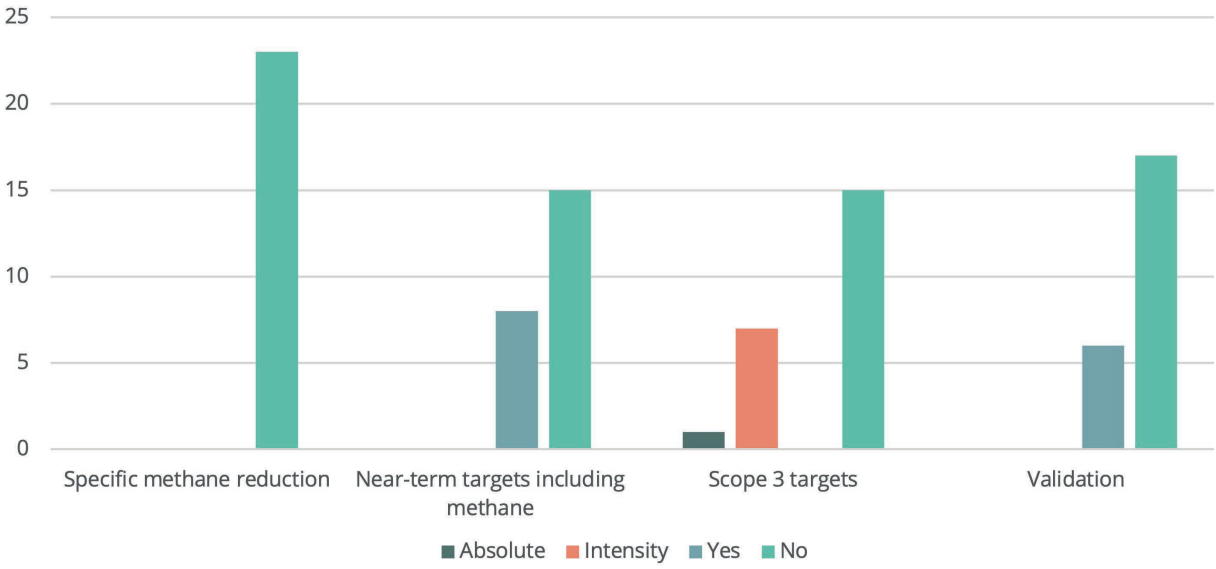


Figure 12: Number of meat companies that implement key target characteristics. Source: Planet Tracker.

Of the eight meat companies that have set targets that cover Scope 3 emissions, all, apart from Vion, aim for a reduction in emissions *intensity*. Alignment to a 1.5˚C pathway requires an absolute reduction in emissions. As discussed earlier, intensity targets risk mis-alignment, and could even result in an absolute increase in emissions if volumes of meat production grow by more than intensity is reducing. For example, if a company were to achieve a 30% reduction in emissions intensity by 2030 but increase production volumes by around 4% per year, its total emissions would actually rise by roughly 4% over the period – see Table 4.

Table 4: Example: How Intensity Targets Can Mask Rising Absolute Emissions.

Annual production growth rate	Approx. total volume increase by 2030 (from 2020)	Intensity change	Resulting change in absolute emissions
0%	0%	–30%	**–30%** (absolute emissions fall)
1%	10%	–30%	**–23%**
2%	22%	–30%	**–15%**
3%	34%	–30%	**–6%**
4%	48%	–30%	**+4%** (absolute emissions rise)
5%	63%	–30%	**+14%** (absolute emissions rise)

The forecasted annual volume growth of 1.2% for the meat industry by 2034 compared to 2024 means that on average emission intensity needs to reduce by at least 7.1% by 2030 for the meat industry just to avoid an increase in absolute emissions.

Table 5 below shows the detailed scorecard for meat companies.

Table 5: Meat company methane targets scorecard summary.
Source: Company reports, Planet Tracker analysis, 2025.

Company	Products	Near-term target set?	Methane coverage	Near-term target scope	Near-term % emissions reduction	Near-term target year	Long-term target	Long-term target year	Score out of 10	Rank
Vion	Beef	SBTi	Includes methane	Scope 1,2 & 3 Non-FLAG absolute	-42%	2030	Net-zero	2050	6.8	1
				Scope 3 FLAG absolute	30.3%					
Tyson Foods	Poultry, Pork, Beef	SBTI	Includes methane	Scope 1&2 absolute, Scope 3 intensity	-30%	2030	Net-zero	2050	4.2	2
WH Group	Pork	✓	Includes methane	Scope 1,2 & 3 intensity	-30%	2030	Net-zero	2050	3.9	3
Danish Crown	Pork, Beef	SBTi	Includes methane	Scope 1&2 absolute	-42%	2030	x	x	3.2	4
				Scope 3 intensity	20%					
Vall Companys Group	Poultry, Pork, Beef	SBTi	Includes methane	Scope 1&2 absolute	-42%	2030	x	x	3.2	4
				Scope 3 Intensity	-31%					
Marfrig	Poultry, Beef	SBTi	Includes methane	Scope 1&2 absolute	-68%	2035	x	x	3.1	6
				Scope 3 intensity	-33%					
JBS	Poultry, Pork, Beef	✓	Includes methane	Scope 1&2 intensity	-30%	2030	Net-zero	2040	3.0	7
Cargill	Poultry, Beef	SBTI	Includes methane	Scope 1&2 absolute	-10%	2025	x	x	2.2	8
				Scope 3 intensity	-30%	2030				
Muyuan Foodstuff	Pork	✓	Includes methane	Scope 1,2 & 3 intensity	-20%	2030	x	x	2	9
Minerva Foods	Beef	✓	Excludes methane	Scope 1&2 intensity	-30%	2030	Net-zero	2035	1.6	10
MHP	Poultry	✓	No Data	No Data	Carbon neutral	2030	x	x	0	11
Dekon Group	Pork	✓	No Data	No Data	-3%	2025	x	x	0	22
Aurora Alimentos	Pork	x	x	x	x	x	x	x	0	22
Groupe Bigard	Pork, Beef	x	x	x	x	x	x	x	0	22
Industrias Bachoco	Poultry	x	x	x	x	x	x	x	0	22
Iowa Select Farms	Pork	x	x	x	x	x	x	x	0	22
Koch Foods	Poultry	x	x	x	x	x	x	x	0	22
New Hope Group	Poultry, Pork, Beef	x	x	x	x	x	x	x	0	22
Perdue Farms	Poultry	x	x	x	x	x	x	x	0	22
Seaboard Foods	Pork	x	x	x	x	x	x	x	0	22
Triumph Foods	Pork	x	x	x	x	x	x	x	0	22
Wens Foodstuff Group	Poultry	x	x	x	x	x	x	x	0	22
Zhengbang Group	Pork	x	x	x	x	x	x	x	0	22

Four meat companies – Vion, WH Group, Tyson Foods and JBS - have made a long-term commitment to reach net zero GHG emissions, including methane emissions while Minerva Foods has also committed to net zero emissions, but this excludes methane.

Six meat companies – Vion, Tyson Foods, Danish Crown, Vall Companys Group, Marfrig and Cargill - have had their targets validated by SBTi. While third party validation does not necessarily result in more rigorous target setting, it indicates companies are willing to increase transparency and strengthen their emissions reduction ambitions.

Target analysis

Vion was assessed as having the strongest GHG emissions targets among the group. It was the only company to set near-term targets that aim for a 30% absolute reduction in Scope 1, 2 and 3 GHG emissions by 2030.[i] While it does not have a stand-alone methane target, methane is incorporated in its GHG target. They have also set a target based on SBTi's FLAG guidance.

The company also aims to achieve net zero emissions across the supply chain by 2045 (ultimately 2050).

JBS performs relatively poorly in the methane target scorecard, with a score of 3. The company has set a target to reduce Scope 1 and 2 GHG emissions (calibrated at 30% intensity reduction by 2030) but does not have a target for Scope 3 emissions.[20] While JBS aims to achieve net-zero GHG emissions across its global operations and value chain by 2040, it also states that *"Whether the company is successful in achieving this very ambitious goal will depend on numerous factors outside of the company's control... Because of these variables, among others, the company may not be able to achieve net zero by 2040."*

Marfrig, the third largest emitter, aims to reduce absolute Scope 1 and 2 emissions by 68% by 2035 from 2019 and to reduce Scope 3 emissions intensity by 33% per animal head finished over the same period.[21]

Minerva Foods has not set a target for its Scope 3 emissions and only includes industrial operations[22] in its Scope 1 and 2 target, excluding confinement farm operations which represent 14% of the Company's total Scope 1 and 2 emissions.

Implementation

Eight out of 23 companies have disclosed some kind of GHG emissions reduction plan. Of those, six companies – Cargill, Marfrig, JBS, Muyuan Foodstuff, WH Group and Vion – disclose a high-level plans for their Scope 1 emissions and supply chains, but do not provide a clear strategy for agricultural methane emissions specifically. In contrast, Minerva Foods, has developed a more targeted commodity-specific plan through its Renove Programme, which focuses on reducing emissions in its beef value chain and could indirectly contribute to methane emissions. Similarly, Danish Crown outlines a high-level plan to reduce farm-level emissions from agriculture; while it does not single out methane, its agricultural focus implies some coverage of this source.

i From a 2021 baseline.

The limited disclosure of action plans results in meat companies scoring poorly overall in the scorecard for emission reduction plans – see Table 6.

Table 6: Meat company methane emissions reduction plans scorecard summary. Source: Company reports, Planet Tracker analysis, 2025.

Company	Methane plan focus score	Short-term emissions reduction levers score	Long-term emissions reduction levers score	On-farm implementation score	Average score out of 10
Minerva Foods	7.5	2.5	0	5	3.8
Danish Crown	5	2.5	0	5	3.1
Cargill	2.5	2.5	0	5	2.5
Marfrig	2.5	2.5	0	5	2.5
JBS	2.5	2.5	0	2.5	1.9
Muyuan Foodstuff	2.5	2.5	0	2.5	1.9
WH Group	2.5	2.5	0	0	1.3
Vion	2.5	0	0	0	0.6
Aurora Alimentos	0	0	0	0	0
Dekon Group	0	0	0	0	0
Groupe Bigard	0	0	0	0	0
Industrias Bachoco	0	0	0	0	0
Iowa Select Farms	0	0	0	0	0
Koch Foods	0	0	0	0	0
MHP	0	0	0	0	0
New Hope Group	0	0	0	0	0
Perdue Farms	0	0	0	0	0
Seaboard Foods	0	0	0	0	0
Triumph Foods	0	0	0	0	0
Tyson Foods	0	0	0	0	0
Vall Companys Group	0	0	0	0	0
Wens Foodstuff Group	0	0	0	0	0
Zhengbang Group	0	0	0	0	0

Seven meat companies have disclosed high-level methane emissions reduction levers as part of their near-term plans. However, none of these companies have quantified the contribution of these levers to achieving those targets, which constrains assessing the credibility of their GHG emissions targets.

12 meat companies disclosed information on specific types of methane abatement solutions they are investing in – Table 6. The seven companies identifying high-level methane reduction levers also have disclosed specific abatement solutions they are investing in. A further 5 companies have also listed some specific solutions, though without an overarching reduction plan. The most common type of solution was anaerobic digestors (eight companies), which are seeing growing popularity Anaerobic digestors break down manure at an accelerated pace and capture the methane generated to produce natural gas or electricity. Please see Appendix 1 for a deeper dive on abatement solutions and case studies for the meat industry.

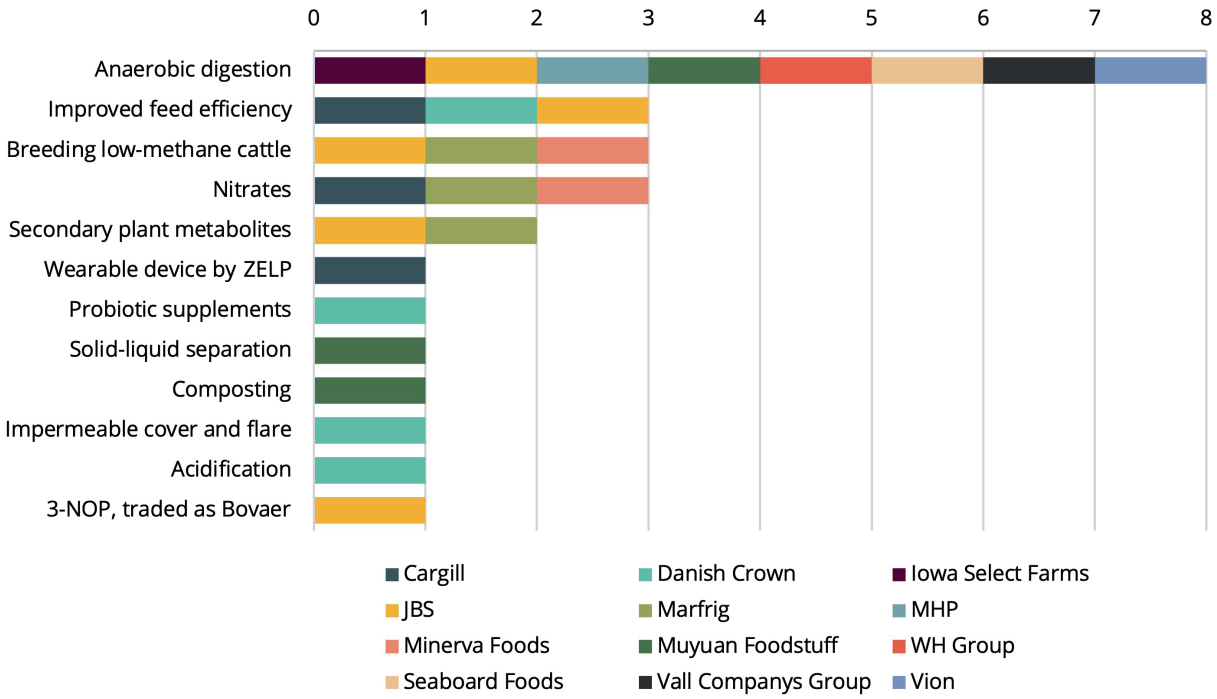


Figure 13: Meat company methane emissions abatement solutions by technology type. Source: Company Reports.

Minerva Foods scores highest among meat companies on the methane emissions reduction scorecard. It outlines a high-level plan (without a timeline) for decarbonising its cattle value chain and promoting low-carbon agriculture through its Renove Programme which focusses on:

- planned pasture management;
- rotational grazing;
- implementation of integrated livestock-forestry systems;
- increased animal productivity;
- lower methane emissions through better genetics; and
- diet to reduce enteric methane.

Minerva Foods also outlines several strategies for engaging farmers through its Renove program, which will be rolled out by 2030 to suppliers that represent 50% of animals purchased. Strategies include:

- training farmers in low-carbon practices;
- enforcing this with on-farm technical teams;
- connecting farmers engaged in low-carbon farming;
- increasing the roll-out of the company's Carbon Neutral seal;
- implementing emissions reduction plans; and
- emissions monitoring and validation tools.

JBS performs poorly overall for its methane emissions reduction plan. The company outlines a high-level plan (without a timeline) to enhance climate resilience in its business and value chains. This includes measures to reduce methane emissions within the areas of animal health and performance (e.g. enteric emissions reductions, feed efficiency and livestock supply chain management) and Circular Economy Solutions (e.g. biogas from agricultural waste). JBS also outlines five initial steps to meet net zero, which has included investing in low-carbon cattle production innovations.[23]

Beside Minerva's farmer engagement, other examples of on-farm implementation include:

- **Danish Crown**'s Climate Track programme provides farmers with feedback on their performance (including manure management and feed composition) and input on key activity areas that can lower their GHG emissions;
- **Cargill**'s Beef MAX™ software platform provides feed formulations that can optimise environmental impacts with sustainability metrics (although it does not disclose farm coverage);
- **Marfrig** has an app to help cattle farmer suppliers in Uruguay to measure and manage their carbon footprint and a Monitoring, Reporting, and Verification (MRV) mechanism for emissions from its cattle suppliers in Brazil, Argentina, Uruguay, and the United States; and
- **JBS** and **Muyuan Foodstuff** provide case studies demonstrating ways in which they support on-farm implementation of methane emissions reduction measures.

Dairy companies

Target summary and scorecard

Global milk production has grown significantly over the past six decades. In 1961, total output was approximately 330 million tonnes, rising to nearly 1 billion tonnes by 2022. Growth accelerated particularly after the early 2000's reflecting expanding dairy herds, and rising demand in developing regions, particularly South and East Asia.

Global milk production is projected to increase by approximately 1.8% p.a., reaching an estimated 1.15 billion tonnes by 2034 – see Figure 14.[24]

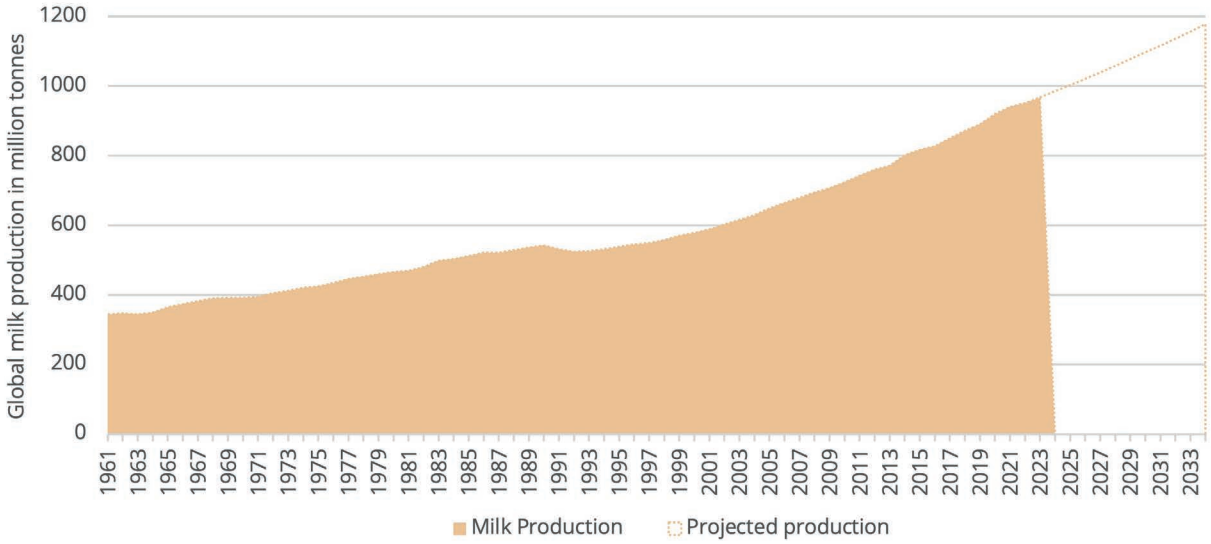


Figure 14: Global milk production in million tonnes.
Source: FAO, 2025 – with major processing by Our World in Data, with minor processing by Planet Tracker.[25]

Dairy companies are beginning to lead the way in setting specific targets for reducing methane emissions, and as a group perform better than the meat and rice companies assessed in the report. 12 out of 14 dairy companies have set near-term GHG targets that cover methane emissions and 10 dairy companies have set long-term climate goals. For an overview of dairy companies' methane target scorecard performance – see Table 7.

Ten out of 14 dairy companies assessed have had their GHG targets validated as science-based by a third party such as SBTi. 7 out of these ten companies have set targets for key Scope 1 and/or 3 FLAG emissions – see Table 7.

Half of the 14 companies have set absolute Scope 3 targets covering their dairy production or supply chains. However, three companies – Fonterra, Arla Foods and Yili – have set intensity-based targets for their Scope 3 emissions, rather than absolute reduction goals – see Table 7.

Table 7: Dairy company methane targets scorecard summary. Source: Company reports, Planet Tracker analysis, 2025.

Company	Near-term target set?	Methane coverage	Near-term target scope	Near-term % emissions reduction	Near-term target year	Long-term target	Long-term target year	Score out of 10	Rank
Danone	SBTi	Methane-specific target	Scope 3 absolute methane	-30%	2030	Net-zero	2050	10	1
			Scope 1&2 absolute	-46.30%					
			Scope 1&3 FLAG absolute	-30.30%					
Müller	SBTi	Includes methane	Scope 1&2 absolute	-50.4%	2032	Net-zero	2050	7.50	2
			Scope 3 FLAG absolute	-36.40%					
Groupe Lactalis	SBTi	Includes methane	Scope 1&2 absolute	-46.2%	2030	Net-zero	2050	7.43	3
			Scope 1 FLAG absolute	33.3%					
			Scope 3 FLAG absolute	30.3%					
Nestlé	SBTi	Includes methane	Scope 1,2 & 3 Non-FLAG absolute	-50.4%	2030	Net-zero	2050	7.35	4
			Scope 3 FLAG absolute	-50%					
FrieslandCampina	SBTI	Includes methane	Scope 1&2 absolute	-42.13%	2030	Net climate-neutral	2050	4.88	5
			Scope 1&3 FLAG absolute	-30.30%					
Dairy Farmers of America	SBTi	Includes methane	Scope 1,2 & 3 absolute	-30%	2030	x	x	4.35	6
Glanbia	SBTI	Includes methane	Scope 1&2 absolute	-50.4%	2030	x	x	4.35	6
			Scope 3 FLAG absolute	-30.30%					
Fonterra	SBTi	Includes methane	Scope 1&2 absolute	-50.4%	2030	Net-zero	2050	4.35	6
			Scope 1&3 FLAG intensity	-30%					
Arla Foods	✓	Includes methane	Scope 1&2 absolute	-63%	2030	Carbon net-zero	2050	4.13	9
			Scope 3 intensity	-30%					
Yili	✓	Includes methane	Scope 3 intensity	-35%	2030	Carbon neutral	2050	3.26	10
Saputo	SBTI	Includes methane	Scope 1&2 absolute	-42.6%	2030	x	x	3.19	11
			Scope 3 intensity	-39.0%					
California Dairies, Inc.	✓	Methane specific target	Methane emissions (Scope not disclosed)	-40%	2030	Carbon Neutral	2050	1.50	12
			Scope 1,2 & 3	-30%					
Amul	✓	No data	No data	-35%	2030	x	x	0	14
Mengniu	x	No target	x	x	x	Carbon neutral	2050	0	14

Dairy companies lead the way for long-term target setting, with nine of the 14 companies committed to net zero or carbon-neutral targets, including methane, by 2050. However, four of the nine companies – Group Lactalis, Danone, Nestlé, and Müller – have quantified their long-term emissions reduction commitments, including specific targets to reduce Scope 1 and/or 3 FLAG emissions.

Target analysis

Danone scored the highest for climate targets out of the 14 dairy companies evaluated and performs best out of all the companies covered in this report, scoring full marks (10 points). It is the one company assessed in this report to have set a clear target for methane and aims to reduce methane emissions from its fresh milk supply (Scope 3) by 30% by 2030,[j] which represents approximately 70% of the company's methane emissions.[26] This is part of the company's broader 2030 GHG emissions targets to reduce absolute Scope 1 and 2 emissions by 46%, absolute Scope 3 non-FLAG emissions by 42% and absolute Scope 1 and 3 FLAG emissions by 30%.

Danone has also committed to reach net zero GHG emissions across its value chain by 2050, which it defines as reducing absolute Scope 1, 2 and 3 GHG by 90% by and absolute Scope 1 and 3 FLAG GHG emissions by 72%.

California Dairies, Inc. has also set a methane- specific target aiming to reduce emissions by 40% by 2030, but the target is vague and lacks the clarity of Danone's so we don't consider it equivalent. It has not disclosed whether this covers Scopes 1 and/or 3 emissions, whether the target is based on an absolute- or intensity-based emissions reduction and has not disclosed a base year against which progress will be measured. This lack of detail makes it challenging to assess the strength of the target or effectively measure the company's progress in reducing emissions. As a result, the company scores poorly overall, as the third worst performing dairy company in the targets scorecard – see Table 7 above.

Müller and **Groupe Lactalis** rank second and third overall respectively for the methane target scorecard. Both companies have set clear absolute Scope 3 FLAG targets for their agricultural supply chains: Müller aims to reduce these emissions by 36% by 2032 from 2022 and Groupe Lactalis has committed to cutting these emissions by 20% by 2030 from 2021.

Both companies have set quantified long-term net zero targets for 2050 aiming to reduce absolute Scope 1, 2 and 3 GHG emissions. Müller's target is to reduce absolute Scope 3 FLAG emissions by 72% through 2050.[k] Groupe Lactalis aims to Scope 1 and 3 FLAG GHG emissions 72% by 2050.[l] However, both companies fall short of setting specific targets to tackle methane emissions.

Mengniu, with the second largest estimated methane emissions of the dairy companies covered in this report, ranks last in the group for target setting. The company aims to be carbon neutral by 2050 but does not disclose a near-term emissions reduction target or specify whether methane emissions are covered. Similarly, **Amul** has set a target to reduce specific carbon emissions by 35% by 2030, but fails to disclose the Scopes covered, whether methane is included, or the base year for measurement. This lack of transparency makes it impossible to assess the scope or ambition of Amul's target, or to track progress against it.

j From a 2020 baseline.
k From a 2022 baseline.
l From a 2019 baseline.

Implementation summary and scorecard

Dairy companies are beginning to set commodity-specific GHG emissions reduction plans, and outperform meat and rice companies assessed in this report. This aligns with dairy companies' relatively strong performance in GHG and methane target setting, indicating that companies are beginning to back up these targets with emissions reduction plans.

Eight out of 14 dairy companies assessed have disclosed a commodity-specific plan to reduce GHG emissions, while one company – Groupe Lactalis – discloses a high-level decarbonisation plan for the business and its supply chain – see Table 8. However, no company has developed a separate plan for tackling methane emissions, which could help companies focus their emissions reduction efforts on this key GHG.

Table 8: Dairy company methane emissions reduction plans scorecard summary. Source: Company reports, Planet Tracker analysis, 2025.

Company	Methane plan focus score	Short-term emissions reduction levers score	Long-term emissions reduction levers score	On-farm implementation score	Average score out of 10
Arla Foods	7.5	7.5	5	5	6.3
Fonterra	7.5	7.5	0	7.5	5.6
Danone	7.5	7.5	0	7.5	5.6
Nestlé	7.5	7.5	0	5	5.0
FrieslandCampina	7.5	7.5	0	5	5.0
Saputo	7.5	2.5	0	5	3.8
Yili	7.5	2.5	0	5	3.8
Mengniu	7.5	0	2.5	5	3.8
Groupe Lactalis	2.5	0	0	7.5	2.5
Glanbia	0	0	0	5	1.3
Dairy Farmers of America	0	2.5	0	0	0.6
California Dairies, Inc.	0	2.5	0	0	0.6
Müller	0	0	0	2.5	0.6
Amul	0	0	0	0	0.0

Five out of 14 dairy companies – Arla Foods, Fonterra, Danone, Nestlé and FrieslandCampina - have identified and quantified near-term specific methane emissions reduction technologies and techniques.

11 out of 14 dairy companies have identified measures to implement emissions reduction measures at the farm level – see Table 8. Seven companies outline measures which cover the majority of their dairy supply, but fall short of full supply chain coverage. Three companies - Fonterra, Danone and Groupe Lactalis - outline explicit measures for implementing methane emissions reduction strategies to the farm level for their full supply chain.

Beyond the methane emissions reduction scorecard, this report found 13 dairy companies disclosing information on 17 types of methane abatement solutions they are investing in – see Figure 15.

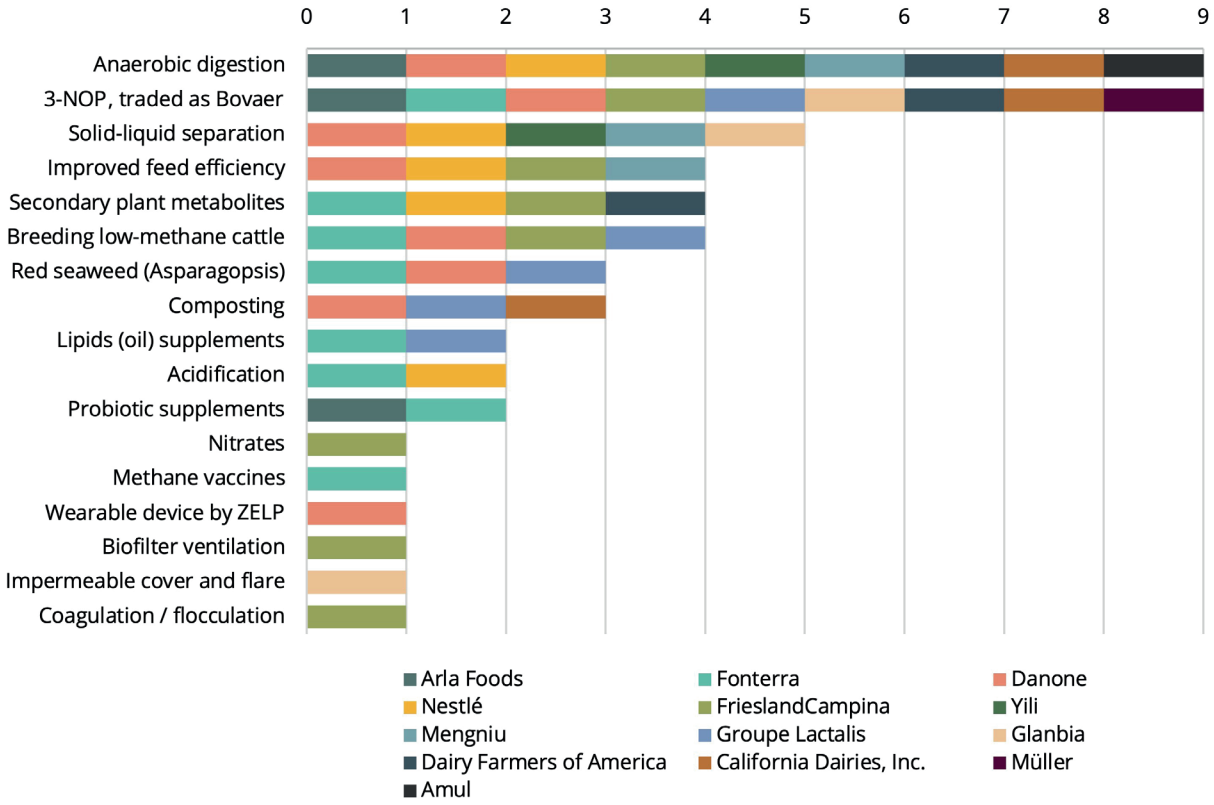


Figure 15: Dairy company methane emissions abatement solutions by technology type.
Source: Company Reports, Planet Tracker Analysis, 2025.

Two solutions stand out as the most popular among the group - anaerobic digestors and the methane inhibiting feed additive Bovaer – with nine companies disclosing that they are investing in each of these solutions.

Anaerobic digestors are also the most common solution type disclosed by meat companies and as highlighted in the previous section this reflects a wider trend in the growing popularity of anaerobic digestors, which capture methane from accelerated manure decomposition to produce natural gas or electricity.

The feed additive Bovaer based on the compound 3-NOP (3-Nitroxypropanol) developed by DSM-Firmenich is being trialled by nine dairy companies as well as meat company JBS (as mentioned in the previous section).

Arla provides a relatively detailed overarching climate plan for its dairy supply chain, identifying methane emissions reduction levers and quantifying their contribution to its near-term GHG emissions target. For methane, this includes: increasing feed efficiency (part of the 'Big 5' levers which will deliver an 8% reduction in CO_2e), manure handling and biogas production (3% reduction in CO_2e), breeding low-methane emissions cattle (3% reduction in CO_2e). Arla is also the only company to quantify long-term methane measures, focusing on feed additives (10% reduction in CO_2e).

Fonterra also provides a detailed overarching climate plan for its New Zealand milk supply chain (90% of the company's milk supply), identifying methane emissions reduction levers and quantifying their contribution to its near-term target. Two of the company's emissions reduction levers relate to methane in particular:

- Innovating new technologies (expected to deliver a 7% reduction in CO_2e intensity) including: methane inhibiting feed additives and probiotics; methane vaccines; non-biological technologies that collect methane post-emission.
- Best practice farming (7% reduction in CO_2e intensity): including manure management improving animal health through herd performance, breeding low methane cattle and improving feed efficiency.

Danone's 2030 Climate Transition Plan outlines three key near-term emissions reduction levers covering methane:

- Herd management and animal feed (0.5 Mt reduction in CO_2e): improving herd well-being and productivity, optimising diet composition to reduce enteric methane emissions, and procuring and growing sustainable animal feed.
- Manure management, soil health for feed and crops, and other energy efficiency levers (0.65 Mt reduction in CO_2e): producing biogas from manure, replacing synthetic fertiliser with manure, employing regenerative practices to improve soil health and introducing energy saving technologies and renewable energy production on farms.
- Methane innovations (0.25 Mt reduction in CO_2e): breakthrough innovations reducing enteric methane emissions, including inhibitors or feed additives.

Danone has outlined tools and some targets for embedding emissions reduction measures across farmer partners and suppliers. This includes a Supplier Engagement Program, which seeks to embed decarbonization goals of at least 30% between 2020 and 2030 into all Danone's supplier contracts (with incentives for meeting these targets). However, they fall short of a full set of timebound targets for emissions reduction solutions across the value chain. Danone also falls short of disclosing a stand-alone plan to reduce methane emissions.

Nestlé provides a relatively detailed overarching climate plan for its dairy and livestock supply chain, identifying methane emissions reduction levers and quantifying their contribution to its near-term target including: cutting the methane produced by animals during digestion through nutrition changes (3.2 Mt reduction in CO_2e) and using biogas digesters to process manures (0.5 Mt reduction in CO_2e).

FrieslandCampina provides a relatively detailed overarching climate plan for its member dairy farmers, identifying and quantifying methane emissions reduction levers including:

- Feed (1.1 Mt reduction in CO_2e), including improving feed efficiency.
- Animal (1.1 Mt reduction in CO_2e) including breeding low-emissions cattle and methane inhibiting feed supplements.
- Housing systems and manure management (1 Mt reduction in CO_2e), including: anaerobic digestion, methanogen inhibition, methane oxidation.[m]

Mengniu has outlined five long-term low-carbon initiatives, including energy efficiency and manure and herd management improvements:

- Improving energy efficiency.
- Optimising manure management.
- Enhancing herd management (reducing cattle cull rates).
- Adjusting feed composition (to reduce carbon emissions during feeding).
- Implementing ecological carbon sequestration projects.

Groupe Lactalis discloses several key overarching strategies for rolling out on-farm emissions reduction practices, including:

- Measuring emissions via the company's Cool Farm Tool.
- Providing climate training for its dairy technicians who support farmers and.
- Providing training, products, equipment and financial incentives to support farmers to implement low-emissions solutions.

However, the company doesn't provide a timebound plan for on-farm implementation of these measures.

More dairy companies will need to develop comprehensive on-farm implementation plans if they are to roll out methane abatement levers they have identified across their dairy suppliers.

m In 2025 FrieslandCampina updated its targets in line with SBTi's FLAG guidance but as of September 2025 has not fully updated its strategy to match this. As its latest annual/sustainability report was released before the change in targets, this analysis has scored the pre-existing strategy.

Rice companies

Target summary and scorecard

None of the 15 rice producing companies analysed in this report have set a specific target to reduce methane emissions. Rice production and its associated emissions are set to increase with rising demand from a growing global population. Table 9 on page 39, provides an overview of rice companies' target scorecard performance.

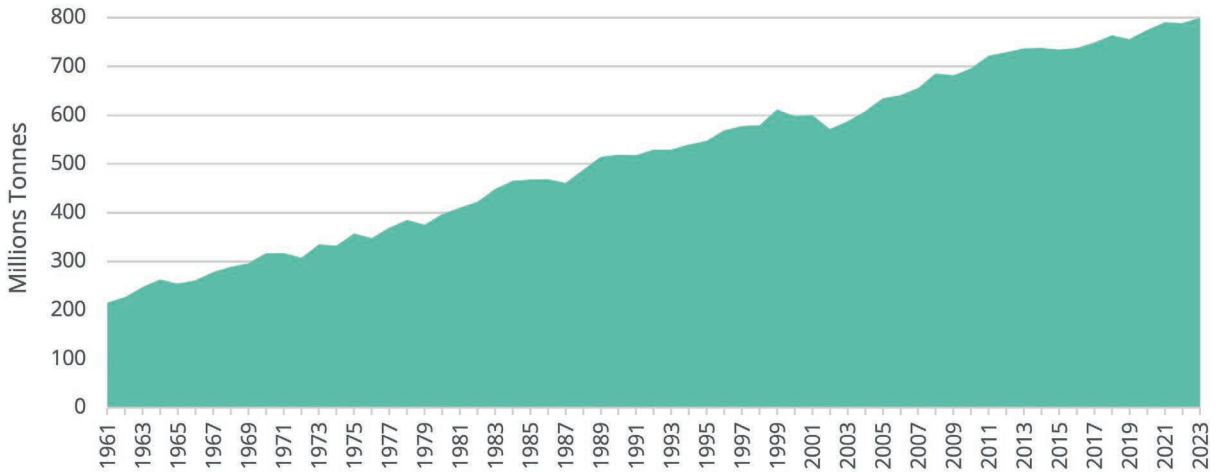


Figure 16: Rice production, 1961 to 2023
Source: Food and Agriculture Organization of the United Nations (2025) – with major processing by Our World in Data.

Table 9: Rice company methane targets scorecard summary.
Source: Company reports, Planet Tracker analysis, 2025.

Company	Near-term target set?	Methane coverage	Near-term target scope	Near-term % emissions reduction	Near-term target year	Long-term target	Long-term target year	Score out of 10	Rank
Wilmar International	SBTi	Includes methane	Scope 1&2 absolute	-50.4%	2032	Net-zero	2050	7.5	1
			Scope 3 FLAG absolute	-36.4%					
Ricegrowers Ltd	SBTi	Includes methane	Scope 1,2 & 3 absolute	-54.6%	2033	Net-zero	2050	7.5	1
			Scope 3 FLAG absolute	-39.4%					
Olam Group Ltd	SBTi	Includes methane	Scope 1,2 & 3 Non-FLAG absolute	-42%	2030	Net-zero	2050	7.3	3
			Scope 1&3 FLAG absolute	-30.2%					
Adecoagro	✓	Includes methane	Scope 1&2 intensity	-20%	2030	x	x	1.8	4
Anheuser-Busch Inbev	x	x	x	x	x	Net-zero	2040	0	15
LT Foods Ltd	x	x	x	x	x	Carbon neutral	2046	0	15
Riceland Foods	x	x	x	x	x	x	x	0	15
Vietnam Southern Food Corporation JSC	x	x	x	x	x	x	x	x	15
Ebro Foods	x	x	x	x	x	x	x	0	15
Josapar Joaquim Oliveira SA Participacoes	x	x	x	x	x	x	x	x	15
Chaman Lal Setia Exports Ltd	x	x	x	x	x	x	x	0	15
GRM Overseas Ltd	x	x	x	x	x	x	x	x	15
Buyung Poetra Sembada Tbk PT	x	x	x	x	x	x	x	0	15
Mishtann Foods Ltd	x	x	x	x	x	x	x	x	15
Kohinoor Foods Ltd	x	x	x	x	x	x	x	0	15

Four companies – Wilmar International, Ricegrower Limited, Olam Group Ltd and Adecoagro – have set near-term GHG emissions reduction targets but none have separate targets for methane. The other 11 companies fail to disclose any near-term GHG targets. Rice producers perform worst as a group in comparison to the meat and dairy companies assessed in this report.

Three out of 15 rice companies have set targets assessed by SBTi – Wilmar International, Ricegrowers Limited and Olam Group Ltd.

Target analysis

Wilmar International and **Ricegrowers Limited** lead the group in target setting. Wilmar International has committed to reducing absolute Scope 1 and 2 GHG emissions by 50% by 2032 from a 2022 base year and reduce absolute Scope 3 GHG emissions by 30% in the same timeframe. The company also aims to reduce absolute Scope 1 and 3 FLAG emissions by 36% by 2032.

Ricegrowers Limited aims to reduce absolute Scope 1, 2 and 3 GHG emissions from energy and industry by 55% by 2033 from a 2023 baseline and reduce Scope 3 FLAG GHG emissions by 39% in the same period.

Both companies have also set targets to achieve net-zero by 2050. Wilmar International aims to achieve a 90% absolute reduction in Scope 1, 2 and 3 emissions and reduce Scope 1 and 3 FLAG emissions by 72% by 2050. Ricegrowers Limited also aims to reduce absolute Scope 1, 2 and 3 GHG emissions from energy and industry by 90% by 2050 from 2023 and reducing Scope 3 FLAG emissions by 72% in the same period.

Olam Group ranks third for its targets, but its group-wide near-term targets are assessed as being 2ºC aligned by SBTi.[n] Olam Agri (the company's rice producing, processing and trading division) has set a target to reduce absolute Scope 1, 2 and 3 energy and industry GHG emissions by 42% by 2030 from a 2022 baseline and reduce absolute Scope 1 and 3 FLAG emissions by 30% over the same period. However, this target has not been assessed by SBTi.

Josapar Joaquim Oliveira SA Participacoes and **Ebro Foods**, the two companies estimated to have the largest methane footprint for rice, have failed to disclose any GHG emissions reduction targets.

Six rice companies have set long-term targets, but three - Wilmar International, Ricegrowers Limited and Olam Group Ltd - have quantified the emissions reductions they aim to achieve. **Anheuser-Busch InBev** and **LT Foods Ltd** have set ambitious long-term goals of reaching net zero by 2040 and climate neutrality by 2046, respectively. However, neither company has outlined near-term targets to support these pledges, making it difficult to assess their credibility or track progress towards their stated long-term ambitions.

n As of June 2025, Olam Group is undergoing a restructure and targets for Olam International and Olam Agri (the company's rice-producing, processing and trading division) were assessed.

Implementation

Four out of 15 rice companies assessed in this report have disclosed GHG emissions reduction plans though none have set a separate plan for methane. Rice companies score poorly overall for this scorecard, which is unsurprising considering none of the rice companies in this report have set separate methane emissions targets – see Table 10.

Table 10: Rice company methane emissions reduction plans scorecard summary. Source: Company reports, Planet Tracker analysis, 2025.

Company	Methane plan focus score	Short-term emissions reduction levers score	Long-term emissions reduction levers score	On-farm implementation score	Average score out of 10
Ricegrowers Limited	7.5	2.5	0	5	3.8
Olam Group Ltd	5	2.5	0	2.5	2.5
Adecoagro	2.5	2.5	0	0	1.3
Wilmar International	2.5	0	0	0	0.6
Anheuser-Busch Inbev	0	0	0	0	0
Riceland Foods	0	0	0	0	0
Vietnam Southern Food Corporation JSC	0	0	0	0	0
Ebro Foods	0	0	0	0	0
LT Foods Ltd	0	0	0	0	0
Josapar Joaquim Oliveira SA Participacoes	0	0	0	0	0
Chaman Lal Setia Exports Ltd	0	0	0	0	0
GRM Overseas Ltd	0	0	0	0	0
Buyung Poetra Sembada Tbk PT	0	0	0	0	0
Mishtann Foods Ltd	0	0	0	0	0
Kohinoor Foods Ltd	0	0	0	0	0

Three out of 15 rice companies – Ricegrowers Limited, Olam Group and Adecoagro - have identified methane emissions reduction levers needed to achieve their near-term GHG targets. However, none of these companies have quantified the contribution that these levers will make towards their GHG targets and no companies have identified long-term emissions reduction levers.

Two rice companies – Ricegrowers Limited and Olam Group – identify on-farm implementation measures for emissions reduction levers.

Beyond the methane emissions reduction scorecard, this report found six rice companies disclosing information on five types of methane abatement solutions they are investing in – see Figure 17. All six disclose projects to scale up AWD techniques. Under these techniques, rice paddies are flooded to a certain depth and then water is allowed to subside naturally. Soil is dried to varying extents, usually for five or more days depending on soil texture and irrigation capacity before fields are flooded again.

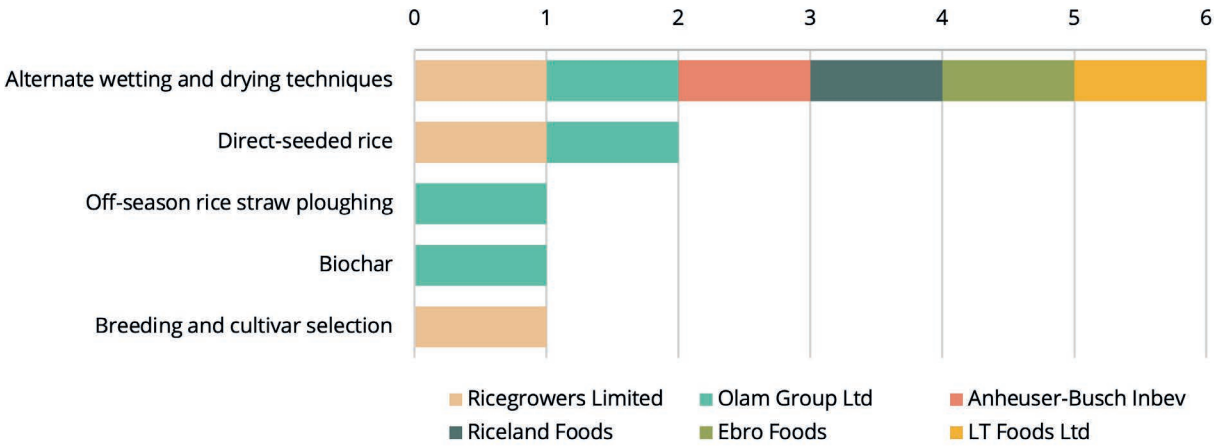


Figure 17: Rice company methane emissions abatement solutions by technology type.
Source: Company Reports, Planet Tracker Analysis, 2025.

Unlike continuous flooding, AWD creates dry periods between irrigations, reducing the overall duration of anaerobic soil conditions and lowering methane emissions. This management practice has successfully reduced CH_4 emissions by 37% – 77% while saving 19% – 30% of irrigation water compared to conventional irrigation.[27]

Ricegrowers Limited was the only company to disclose a commodity-specific plan to reduce GHG emissions from rice for its Australian and International suppliers. It outlines several decarbonisation levers for rice, including: direct drill sowing, AWD irrigation and breeding rice varieties that complement these sowing and irrigation practices. The company also discloses how it is working with rice farmers to implement decarbonisation levers on the ground in the near-term, by:

- implementing supply chain traceability measures to track sowing and irrigation practices in Australia;
- working with international suppliers to gain insights into farming inputs and practices and;
- a plan to develop country-specific low-carbon agriculture guidance.

However, there is no timebound, quantified plan to implement these measures.

Adecoargro discloses a high-level Climate Strategy and GHG Management Program which focus on: renewable energy, regenerative agriculture and 'technology as an ally', but provides limited details for each focus area. Adecoagro also discloses an outline of its low-carbon intensity rice business, including general GHG emissions reduction levers such as using cover crops, a seasonal irrigation schedule (90 days of irrigation which could reduce methane emissions), among other energy efficiency measures.

Wilmar International's Climate Change Mitigation plan does not cover rice farming, but focuses on decarbonising upstream palm oil operations, energy efficiency and recycling of biomass and water in its sugar operations and reducing GHG emissions in its factories.

Olam Group identifies a range of decarbonisation strategies for its commodities but provides little detail on how it will reduce emissions from rice production. The company indicates it will support "better water management practices" for rice and provides the example of the Carbon Offsetting Rice Emissions (CORE) project in India which promotes AWD (which reduces methane emission), and provides farmers with training, climate-sensitive technologies and support for carbon credit accreditation.

Olam Group's CORE project is the single example the company gives for measures it is undertaking to support on-farm implementation of emissions reduction measures for rice and the company does not provide an overarching strategy for on-farm implementation.

More rice companies will need to develop comprehensive on-farm implementation plans if they are to roll out the methane abatement levers they have identified across the rice farms they source from.

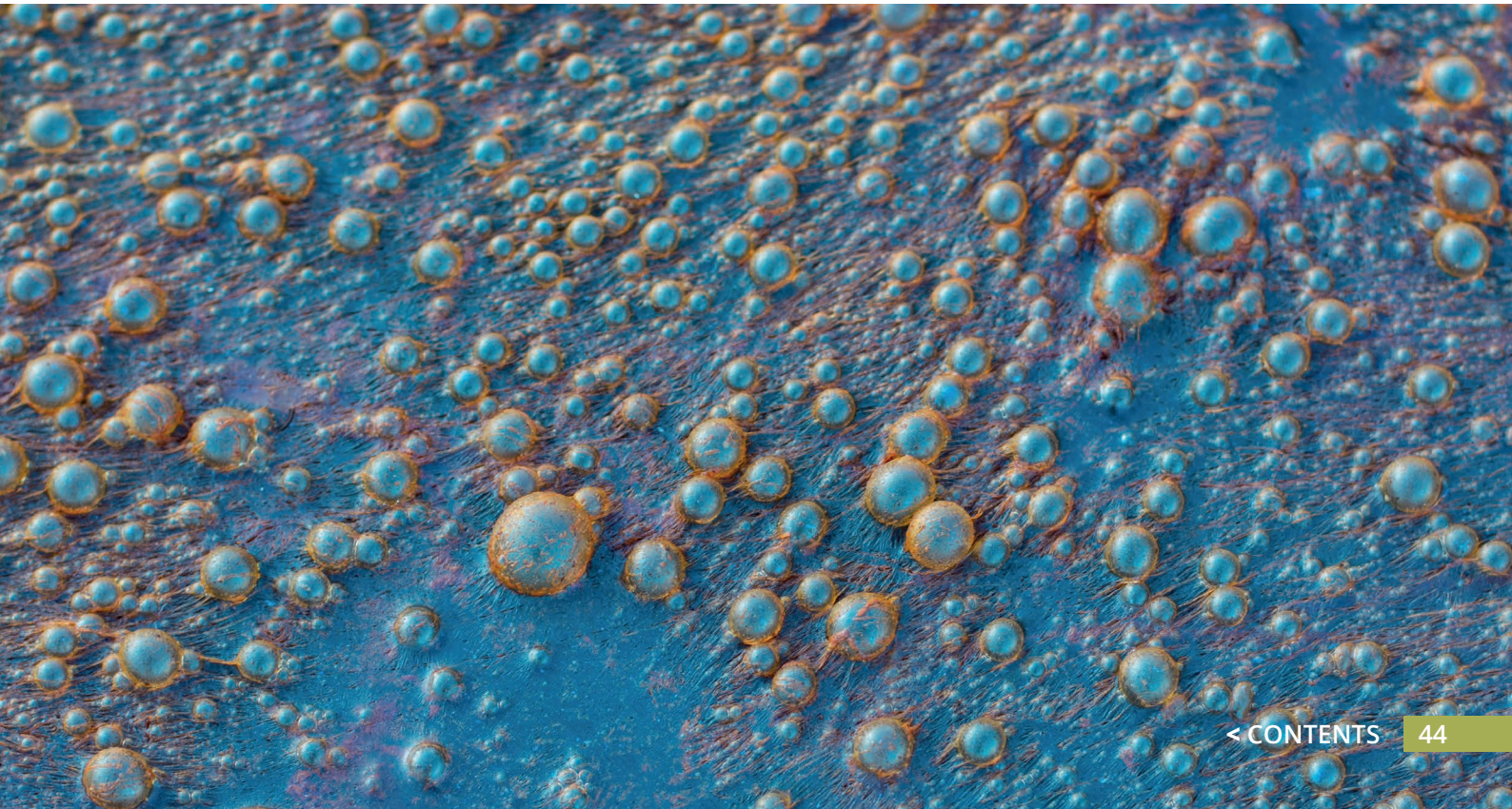
Conclusion

Agricultural methane emissions are one of the most urgent and overlooked challenges in the global climate transition. This report estimates that 52 of the world's largest meat, dairy and rice companies are responsible for 21.91 Mt of methane emissions. Beef and dairy dominate the footprint, yet disclosure remains extremely limited, targets are rare or incomplete, and no company has yet produced a stand-alone methane action plan.

While dairy companies are beginning to lead in setting targets and identifying abatement levers, meat and rice companies lag significantly behind. The largest emitters are failing to take adequate steps. Even where solutions are being trialled, such as anaerobic digestors, feed additives or AWD in rice paddies, investment remains fragmented, poorly quantified, and in some cases risks locking in higher emissions.

The largest players, cited in this report, should lead efforts to meet the Global Methane Pledge and align the food and agriculture sector with the Paris Agreement's 1.5°C pathway. If these companies measure and disclose their methane footprint, set aligned absolute reduction targets, and implement clear timebound action plans, rapid progress is possible.

Financial institutions have a critical role to play in closing the ambition and action gap. By demanding better disclosure, pushing for methane-specific targets, and financing high-impact solutions, investors and lenders can catalyse the shift needed to bring down emissions quickly. Doing so can help mitigate the negative long-term financial consequences for food companies from rising temperatures impairing crop yields and thus food demand. The next five years are decisive. Accelerating methane reductions in meat, dairy and rice production is not only essential for climate stability, but will also deliver co-benefits for food security, public health, ecosystems and farmer livelihoods.



Appendix 1: Methane abatement solutions overview

This appendix details different methane abatement solutions, sorted by methane source and reduction strategies.

Table 11: Methane emission reduction solutions.
Source: Planet Tracker, adapted from: Hegde, S., T.D. Searchinger, and M.J. Diaz. 2025. "Opportunities for methane mitigation in agriculture: Technological, economic and regulatory considerations." World Resources Institute. doi.org/10.46830/wrirpt.23.00110)

Methane Source	Reduction strategies	Technologies and techniques
Enteric methane	Improved livestock efficiency	Improved feed quality and health
		Improved digestibility of crop residues
	Methane inhibition	3-Nitroxypropanol (3-NOP)
		Asparagopsis (Red seaweed)
		Nitrates
		Lipids
		Plant secondary metabolites
		Probiotic supplements
		Methane vaccines
		Genetic approaches (breeding low-methane cows)
	Other emerging solutions	Wearable devices
Manure management	Manure collection and storage interventions	Reduced storage time and frequent removal from barns
		Covering manure storage
		Biofilters
		Solid-liquid separation
	Manure treatment	Aeration
		Anaerobic digestion
		Composting
		Impermeable cover and flare
	Manure additives	Acidification
		Flocculation or coagulation
	Other emerging solutions	Peroxide-based additives, advanced treatments
Rice cultivation	Yield improvements	Yield improvements via breed selection, breeding, or hybrid varieties
	Changes to irrigation management	Alternate wetting and drying
		Mid-season drainage
		Drip irrigation
	Soil management	Off-season ploughing of rice straw
		Biochar amendment
		Direct-seeded rice
	Other emerging solutions	Replacing urea with ammonia-based fertilizers
		Nitrification inhibitors

Enteric methane

Improved feed efficiency: Cargill, Danish Crown and JBS have all invested in feed efficiency studies to understand how shifting to more digestible, low-fiber feeds increase livestock's energy uptake, increasing growth or milk production and reduce methane intensity.

Previous research has shown that improved feed efficiency can reduce methane emissions by 8% - 44%,[28] as well as increasing yields and improving animal health and productivity. However, this measure can be challenging to implement in regions dominated by smallholder farmers that rely heavily on low-quality by-products for feed (such as crop residues). Costs for this solution vary widely depending on the feed type, though it also presents an opportunity to improve feeding practices by sourcing local, low-cost feed via cooperatives or small businesses.

Methane-inhibiting feed additives: Meat companies have disclosed investment in four key types of methane-inhibiting feed additives: nitrates, secondary plant metabolites, probiotic supplements and 3-NOP (3-Nitroxypropanol, traded as Bovaer).

Nitrates

Cargill, Marfrig and Minerva have all disclosed projects trialing the use of SilvAir, a nitrate-based methane-inhibiting feed additive which converts hydrogen produced in ruminant animals' digestive tracts into ammonia, so that hydrogen does not react with carbon to produce methane. SilvAir is currently the only commercially available nitrate for methane emissions reduction developed by Cargill and SilvaTeam. While nitrates have the potential to reduce methane emissions by 11% - 30%,[29] they require careful formulation as high doses are toxic to cattle where nitrate accumulation can be fatal. Nitrates cost around $91/tonne CO_2e for a 15.5% reduction in emissions,[30] making them expensive compared to urea which is commonly used as a source of feed nitrogen. As the methane reduction potential could be relatively low it is hard to compete with urea globally.

FrieslandCampina is the only dairy company trialling SilvAir, a nitrate-based methane-inhibiting feed additive. In FrieslandCampina's project a small number of member dairy farmers with varying rations fed SilvAir to their cows for three months during the barn season. During the pilot program, enteric methane on the participating farms decreased by an average of 3.6%.[31]

Secondary plant metabolites

Marfrig and JBS are both trialing SilvaFeed BX, a tannin-based feed additive also developed by SilvaTeam, which claims to reduce emissions by 17%.[32] Tannins are secondary plant metabolites (along with terpenoids/essential oils, saponins and flavonoids) which have anti-microbial, antioxidant and anti-inflammatory properties that inhibit methane-producing microbes when added to feed. However, there are not enough independent in vivo studies to validate emissions reduction potential of SilvaFeed BX and secondary plant metabolites more generally, which varies widely depending on the compound and while higher doses increase methane mitigation, this also increases costs.

Four dairy companies – Dairy Farmers of America, Fonterra, FieslandCampina and Nestlé – have disclosed projects trialing feed additives based on secondary plant metabolites (terpenoids/ essential oils, saponins, tannins and flavonoids) which have anti-microbial, antioxidant and anti-inflammatory properties that inhibit methane-producing microbes.

Dairy Farmers of America, FieslandCampina and Nestlé have all run small trials with the feed additive Agolin (developed by Altech), a feed additive made from essential oils. Both Nestlé and FrieslandCampina partnered with chocolate producer Barry Callebaut on these trails and FrieslandCampina states that this product can reduce methane emissions by 8%.[33]

Fonterra has invested in the public-private joint venture Agroceutical Products NZ via the AgriZero partnership to develop a methane inhibitor for cattle from a daffodil extract, galanthamine. Following lab trials conducted on artificial rumens, it's estimated the daffodil compound could reduce livestock methane emissions by 30% when consumed as a feed additive. In 2024, Agroceutical Products NZ announced it would be investing up to NZD $4 million to trial the botanical methane-blocker on animals in New Zealand and if successful, accelerate its development as a new emissions-cutting tool for farmers in New Zealand.[34]

There is not enough research into the methane emissions reduction potential of secondary plant metabolites generally, which varies widely depending on the compound. While higher doses increase methane mitigation, this also increases costs, with Agolin costing $56/tonne CO_2e for a 9% reduction.

3-NOP (3-Nitroxypropanol, traded as Bovaer)

JBS has also run trial using Bovaer, a feed additive based on the compound 3-NOP (3-Nitroxypropanol) developed by DSM-Firmenich which inhibits the last step of methane production in cattle and is used in feedlots where the dose can be controlled as it is added to animal feed. DSM-Firmenich claims that this product can reduce emissions in beef cattle by 45%,[35] but concerns have been highlighted about the lack of independent research into Bovaer. This product is also less likely to be used by low-income and small-scale farmers as it does not increase productivity and is relatively expensive at $144/tonne CO_2e for a 30% reduction in methane emissions. Bovaer cannot be used in non-feedlot farms due to the need to control dosage. While Bovaer has been approved for use in over 57 countries, it has also faced consumer backlash over unfounded health concerns.[36]

Probiotic supplements

The use of probiotics supplements to inhibit methane emissions has received growing attention in recent years from researchers, mostly due to their relatively low cost and beneficial impact on animal health. Previous research has shown that probiotic supplements improve animal health and yields, and reduce the need for antibiotics. However, the effectiveness of probiotic supplementation in reducing methane from cattle is unclear. Some studies show that these feed additives have little or no effect on methane production, while others have indicated that probiotics can reduce emissions and that multi-strain probiotic formulas and longer periods of supplementation are more likely to reduce methane emissions.[37] More research is needed to understand the long-term effects of this feed additive solution.

Danish Crown is collaborating on a project developing a novel triple-action feed additive using probiotics, bacteria, viruses and a new compound to reduce methane emissions by 50%,[38] in collaboration with Arla Foods, major Danish universities and research firms. The project introduces probiotic lactic acid bacteria (LAB) that compete for hydrogen in the cow's stomach, leaving less for methane-producing microbes. It also uses certain LAB strains and natural viruses to further limit methane-forming bacteria.

The project will develop a novel "Compound X" that inhibits the enzyme, formed by the methane-forming archaea, which is necessary to change hydrogen into methane. A feed additive with two of the three agents (X and LAB) is expected to be fully developed by the end of the project in 2025, reducing methane formation by up to 40%.

Fonterra has invested in two projects that aim to develop methane-inhibiting probiotic supplements. The first is Kowbucha, which is administrated from birth and can shape the developing cattle microbiome, delivering lasting methane reduction, making it potentially more effective than treating adult animals. Calf trials demonstrated a sustained 20% reduction in methane emissions, persisting past 12 months of age.[39] Kowbucha is being developed in partnership with AgResearch, Massey University, Dairy NZ, Intuit Consulting and the Pastoral Greenhouse Gas Research Consortium and Fonterra hope to expand the trials and with Fonterra suppliers will get first option should the product prove commercially and scientifically viable.

Fonterra has also invested in Hoofprint Biome, via the AgriZero NZ public-private partnership, developing a combination of enzymes and probiotics for ruminant animals which can cut methane emissions by over 80% while increasing milk and meat yields by more than 5%.[40]

Red seaweed (Asparagopsis)

Danone, Fonterra and Groupe Lactalis have disclosed projects trialing feed additives using red seaweed (Asparagopsis) containing compounds like bromoform which can inhibit methane production in cattle's digestive systems. Danone Manifesto Ventures invested in the US-based startup Symbrosia in 2022, which has developed a seaweed-based feed additive, SeaGraze, that it claims could reduce livestock methane emissions by over 80%.[41]

Fonterra began a pilot in partnership with Sea Forest in 2020, using Asparagopsis seaweed as a supplement feed for dairy cows. CSIRO lab trials have shown that Asparagopsis seaweed could reduce enteric methane emissions by over 80%. However, the trial has been paused at of June 2025 and is currently under review.[42]

In 2022, Lactalis US brand Stonyfield joined a research project to identify a local seaweed that could reduce enteric methane emissions when added to dairy cow rations. Several algae with these properties have been identified internationally, however no relevant species is present in the Stonyfield dairy collection area (Northeast USA). In 2022/2023, trials were being carried out with Stonyfield partner farmers. Lactalis stated that this option could reduce Stonyfield's total emissions by about 13% if successful.[43]

While companies are at the early stages of developing red-seaweed, the solutions face some challenges in terms of efficacy and scalability. The number of studies on red seaweed in live cattle is limited and there is a large and unexplained range in the reported methane emissions reduction potential, as demonstrated in the company examples above which range from 13% - 80%. Large-scale seaweed production is not yet financially viable, and the cost might be higher outside of red seaweed's native habitats. There is also some evidence that bromoform can get into milk which would restrict its use in dairy cows as this compound is classified as "probably human carcinogen" by the US Environmental Protection Agency.

Lipids (oil) supplements

Fonterra and Groupe Lactalis have disclosed a project that aim to develop methane-inhibiting lipid (oil) supplements. Lipids (including vegetable oils, fish oil, tallow, distiller's grains with solubles and seeds) inhibit methane-producing microbes in livestock's digestive system and provide an energy source for non-methane-producing microbes, improving feed efficiency and reducing methane emissions.

Fonterra has invested in Biolumic, via AgriZero, to develop a low emissions ryegrass pasture that enhances productivity while reducing methane emissions. Biolumic treats ryegrass seeds with UV light and this innovation is targeting a 2-3% increase in lipid content to reduce methane emissions by over 12%.[44] The company is targeting wide scale use from 2027, with reduced regulatory barriers expected from the light treatment approach which will support faster commercialisation.

Groupe Lactalis is working with the company Valorex to promote flax-rich feed products as part of the Eco Methane Initiative to reduce the herd's GHG emissions as well as reducing animal health and milk production. The company is trialing these products to estimate the potential for methane emissions reduction.

While adding oils to cattle feed is becoming more commonly used to increase energy intake and productivity, they are currently too expensive to be used for methane abatement. Research so far indicates the emissions reduction potential of this solution at 3% - 17% with a cost of $84/ tonne CO_2e for 10% reduction.[45] More research is needed on the effect of different oils on meat and milk quality, with reports that it can reduce digestibility for humans and this solution is also difficult to implement in grazing farming systems.

Breeding low methane emissions cattle: JBS, Marfrig and Minerva have all disclosed projects in this field. Research has estimated that this could achieve 11% - 26% emissions reduction within 10 years of development,[46] but significant investment is required to measure, identify and adopt low-methane breeds at scale and more research is needed to understand the heritability of the low-methane trait.

Fonterra, Danone, FrieslandCampina and Groupe Lactalis all disclose projects that aim to support breeding low methane emissions cattle. FrieslandCampina's current research into smart breeding to lower enteric emissions in partnership with Coöperatie Rundvee Verbetering (CRV), Wageningen University & Research (WUR) indicates that compared to 2018 levels, methane emissions could be reduced by up to 40% by 2050.[47]

More broadly, research has estimated that this could achieve 11% - 26% emissions reduction within 10 years of development,[48] but significant investment is required to measure, identify and adopt low-methane breeds at scale and more research is needed to understand the heritability of the low methane trait.

Manure management

Anaerobic digestors: these are the most common type of methane solution disclosed by meat companies. Research has shown that anaerobic digestors can reduce methane emissions by 17% - 85%.[49] Higher methane capture rates are often achieved when manure is co-digested with food waste, which may not be financially viable at larger facilities while small-scale digestors achieve lower emissions reduction rates.

Anaerobic digestors are estimated to cost $190–$240/tonne CO_2e for a 50% methane reduction which is the lower range for covered lagoons and upper for complete mix digesters,[50] making this technology unaffordable for many small-scale producers. Overall, the technology tends to be most viable for medium- to large-scale farms with access to financial support. This technology also has a significant risk of methane leaks and environmental justice issues from odor, pipeline construction and ammonia emissions. Increased funding and subsidies associated with this technology is a growing area of concern as it can provide farmers with a financial incentive to increase cattle numbers, pushing up methane emissions from enteric fermentation.

Rice cultivation

Alternate wetting and drying

Both Olam Group and LT Foods are founding members of the UN-backed Sustainable Rice Platform which provides farmer training and certification for more socially and environmentally sustainable farming practices, including requiring farmers to develop alternate wetting and drying practices.

Ricegrowers Limited is working with Deakin University to assess the impact of sowing and irrigation to help decarbonise the Australian rice industry, including the use of alternate wetting and drying. Riceland Foods' Ingrain Good Sustainability Initiative and the Riceland Carbon Ready Program promote and certify farmers developing sustainable rice farming practices, including alternate wetting and drying. The programme has enrolled 135.9 thousand acres of rice farms, including 194 farmers across 710 farms in Arkansas and Missouri.[51]

Ebro Foods' brand Herba Ricemills is running the Oryzonte project in Spain, which aims to reduce GHG emissions by 60% across 255 Ha with alternate wetting and drying.[52] Another Ebro Foods brand, Riviana Foods, teamed up with Knorr (owned by Unilever) and the University of Arkansas as part of its Regenerative Agriculture Programme to find ways for farmers to grow rice while preserving water reserves and reducing the large amount of methane released when rice fields are flooded, including using alternate wetting and drying. The project resulted in 76% less methane (kg of CO_2e per kg rice) released in comparison to the study baseline and 48% less GHG emissions (kg CO_2e per kg rice).[53]

Since 2019, Anheuser-Busch and Indigo Ag, a US-based agricultural technology company, have partnered on sustainable sourcing, including promoting alternate wetting and drying amongst rice farmers in the US. The partnership reported reducing average methane emissions from rice by 27%.[54]

As indicated by the details of company programmes above, alternate wetting and drying practices reduce water use significantly and there is some evidence that they can also reduce the bioavailability of arsenic in rice, creating public health benefits. However, these practices are not without their challenges. Many farmers do not have a reliable enough water supply through the growing season to re-flood their fields and there is often no financial incentive for farmers to reduce water use as water rates are fixed for the season or as a share of the crop. Another challenge is that this solution cannot be deployed in terrace paddies as drying could cause terrace collapse.

To scale up alternate wetting and drying practices more analysis is needed to identify suitable regions where they are viable. Investment is also needed for knowledge development, while incentives for water saving will be required to increase farmer uptake.

Direct seeding rice and off-season rice straw ploughing

Some of the rice companies assessed are trialing and scaling up multiple methane emissions abatement solutions and other sustainability measures in one go. For example, Olam Group's involvement in the Sustainable Rice Platform goes beyond alternate wetting and drying to include supporting farmers to deploy direct seeding rice and off-season rice straw ploughing to reduce methane emissions. Direct seeding rice sees rice seeds sewn directly into dry fields, rather than rice seedlings being grown in nurseries and then transplanted to flooded fields. Like alternate wetting and drying, this reduced the overall duration of anaerobic soil conditions and lowered methane emissions by 47% - 65%.[55] Off-season rice straw ploughing means that decomposing straw outside of the growing season in upland areas decreases the availability of carbon substrates available to methane-producing bacteria, reducing emissions in the following rice cropping season by 15% - 68%.[56]

Another example is Ricegrowers Limited program with Deakin University to assess the impact of sowing and irrigation to help decarbonise the Australian rice industry. This program explores flooded aerial-sown rice, direct drill-sown rice and direct drill-sown rice with alternate wetting and drying. This research has shown that drill-sown rice reduces methane emissions by 86% compared to aerial-sown crops.[57]

Rolling out multiple methane abatement measures will be key to achieving the methane emissions reduction required for the rice sector. The challenge with many of these solutions is that results vary by rice variety and soil type and that extensive farmer education, training and incentives will be required to scale them up. This highlights the importance of strong emissions reduction plans in coordinating company efforts to change practices at the farm level.

Appendix 2: Emissions estimation methodology

Meat and dairy emissions methodology

This study quantifies methane emissions from meat (beef, pork and poultry) and dairy production companies using the Global Livestock Environmental Assessment Model (GLEAM) version 3.0, developed by the United Nations Food and Agriculture Organization (FAO). The model calculates emissions from enteric fermentation and manure management based on animal category, production system, and geographical region. It incorporates life cycle assessment principles to provide an estimate of emissions intensity per unit of output.

Each company's total methane emissions were estimated by multiplying the reported production volumes for 2023 (the latest complete reporting year for all companies) by the corresponding emission intensity values generated by GLEAM for that livestock type and region. For dairy companies, emissions were calculated based on milk production, while for meat producers, emissions were based on liveweight or carcass weight equivalents for the year 2023. Where companies did not provide location data for commodity production, global production averages for each commodity were used.

GLEAM 3.0 Limitations

While GLEAM 3.0 represents an improvement on the previous GLEAM 2.0 model by incorporating updated datasets, refined methodologies, and broader geographical coverage, it has also faced some criticism.

One point of contention is that changes in emission factors and modelling assumptions between GLEAM 2.0 and 3.0 can result in significant differences in emission estimates for the same production systems, complicating comparisons over time. Critics argue that these updates, while methodologically justified, can obscure trends or inflate perceived emissions growth, especially without clear disclosure of methodological shifts.

Additionally, some stakeholders question the transparency and regional representativeness of certain default values used in GLEAM 3.0, particularly for intensive production systems in developing regions.

Rice emissions methodology

Methane emissions from rice production were estimated using the methodology outlined in the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report – see Figure 18.

$$CH_{4\,RICE} = \sum_{i,j,k} \left(EF_{i,j,k,} \times t_{i,j,k} \times A_{i,j,k} \times 10^{-6} \right)$$

EF - Emission Factor t - Cultivation period A - Annual harvested area of rice

Figure 18: Rice Methane equation. IPCC (2019). Source: Special Report on Climate Change and Land (SRCCL).

Data on rice production volumes and production location data for 2023 were collected from company annual reports. When direct volume figures were not available, rice production was estimated by dividing the company's rice-related revenue by the average regional rice price.

To adjust for post-harvest losses, a 31% loss rate was applied and cultivated area was then estimated using the FAO's average area per tonne of production. FAO regional mission factors and cultivation durations were then applied where companies provided production location data. Where companies did not disclose location-specific production data, the company headquarters location was used as a proxy.

Appendix 3: Scorecard methodology

Methane target scorecard methodology

Each element of the target scorecard is weighted as outlined below, to give a total maximum score of 10.

Table 12:

Metric	Max points	Weighting
Presence of science-based target	10	5%
Near-term GHG scopes covered / Absolute or intensity based target	10	35%
Near-term base year	10	10%
Near-term target year 1	10	10%
Long-term GHG scopes covered / Absolute or intensity based target	10	25%
Long-term target year	10	5%
Long-term target emissions reduction disclosed	10	10%

All total target scores are weighted by the methane specific target multiplier as outlined below:

Table 13:

Methane specific target	Target multiplier
Methane specific target	100%
GHG target including methane emissions	75%
GHG target excluding methane emissions	50%
No Target	0
No Data	0

Near-term targets:

Targets were scored based on whether they had been third-party verified as science-based. This element makes up 5% of the total score.

Table 14:

Science-based targets (weighting 5%)	
Is this a science-based target?	**Points**
Target set	10
Committed	1
No	0
No Target	0

Targets were scored based on the GHG emissions scopes covered and whether they were based on a reduction in absolute emissions or emissions intensity. This element makes up 35% of the total score.

Table 15:

GHG emissions scopes covered (weighting 35%)	Points
Scope 1 intensity	0.5
Scope 2 intensity	0.5
Scope 1 & 2 intensity	1
Scope 1, 2 & 3 intensity	5
Scope 3 intensity	4
Scope 1 & 3 intensity	4.5
Scope 1 & 2 absolute, Scope 3 intensity	5
Scope 1 absolute	1
Scope 2 absolute	1
Scope 1 & 2 absolute	2
Scope 1, 2 & 3 absolute	10
Scope 3 absolute	8
Scope 1 & 3 absolute	9
No Target	0
No Data	0

Neat-term targets were scored for the base year and target years, each making up 10% of the total score.

Table 16:

Short / Mid Term Target Timeframe			
Base year (weighting 10%)	**Points**	**Target year (weighting 10%)**	**Points**
2025	10	2025	0
2024	10	2026	2.5
2023	10	2027	5
2022	10	2028	7.5
2021	10	2029	7.5
2020	10	2030	10
2019	9	2031	10
2018	8	2032	10
2017	7	2033	10
2016	6	2034	10
2015	5	2035	10
2014	4	2036	10
2013	3	2037	10
2012	2	2038	10
2011	1	2039	10
2010	1	2040	10
No Target	0	No Target	0
No Data	0	No Data	0

Long-term targets:

Long-term targets were scored based on the GHG emissions scopes covered and whether they were based on a reduction in absolute emissions or emissions intensity. This element makes up 25% of the total score.

Table 17:

GHG emissions scopes covered (weighting 25%)	Points
Scope 1 intensity	0.5
Scope 2 intensity	0.5
Scope 1 & 2 intensity	1
Scope 1, 2 & 3 intensity	5
Scope 3 intensity	4
Scope 1 & 3 intensity	4.5
Scope 1 & 2 absolute, Scope 3 intensity	5
Scope 1 absolute	1
Scope 2 absolute	1
Scope 1 & 2 absolute	2
Scope 1, 2 & 3 absolute	10
Scope 3 absolute	8
Scope 1 & 3 absolute	9
No Target	0
No Data	0

Long-term targets were scores based on whether the company quantified the % emissions reduction they aimed to achieve as part of 'net zero', 'carbon neutral' or equivalent goals. This element makes up 10% of the total score.

Table 18:

Long-term target quantification (weighted 10%)	Points
Defines % emissions reduction	10
Does not define % emissions reduction	0
No target	0

Long-term targets were scored for their target year

Table 19:

Target year	Points
2035 to 2050	10
2051 to 2060	7.5
No Target	0
No Data	0

Methane emission reduction plan scorecard methodology

This section provides a qualitative assessment of companies GHG emissions reduction targets and their coverage of methane emissions using a methane target scorecard, as outlined in Table 11. This scorecard is independent of the previous ones.

Table 20: Methane emissions reduction plan scorecard. Source: Planet Tracker, 2025.

Methane plan focus	Points	Emissions reduction levers	Points	On-farm implementation	Points
Discloses a stand-alone plan to reduce methane emissions to meet methane targets.	10	Identifies and quantifies specific methane emissions reduction technologies and techniques needed to achieve near-/long-term methane targets.	10	Outlines explicit timebound measures for implementing methane emissions reduction strategies to farm level for all relevant commodities and markets.	10
Discloses a commodity-specific plan to reduce GHG emissions to meet methane or GHG targets.	7.5	Identifies and quantifies specific methane emissions reduction technologies and techniques needed to achieve near-/long-term GHG targets.	7.5	Outlines explicit measures for implementing methane emissions reduction strategies to farm level for all relevant commodities and markets with no timeline.	7.5
Discloses a general agriculture decarbonisation plan to meet GHG targets.	5	Identifies and quantifies some of the specific methane emissions reduction technologies and techniques needed to partially achieve near-/long-term GHG targets.	5	Outlines high-level measures for implementing emissions reduction strategies to farm level covering at least the biggest emitting commodities and markets with no timeline.	5
Discloses a high-level decarbonisation plan for the business and its supply chain to meet GHG targets.	2.5	Identifies some specific methane emissions reduction technologies and techniques needed to achieve near-/long-term GHG targets but does not quantify these.	2.5	Outlines high-level measures for implementing emissions reduction strategies to farm level but does not disclose commodity or market coverage.	2.5
Does not disclose a decarbonisation plan to meet GHG targets.	0	Does not identify any methane emissions reduction technologies or techniques to achieve near-/long-term GHG targets OR does not have a near-/long-term GHG target.	0	Does not outline any measures for implementing emissions reduction strategies to farm level.	0

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Planet Tracker is an award-winning non-profit financial think tank aligning capital markets with planetary boundaries. Created with the vision of a financial system that is fully aligned with a net-zero, resilient, nature positive and just economy well before 2050, Planet Tracker generates break-through analytics that reveal both the role of capital markets in the degradation of our ecosystem and show the opportunities of transitioning to a zero-carbon, nature positive economy.

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