Ahold Delhaize's Methane Footprint:

The hidden climate cost of animal products

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2 April 2025

About this report

This report has been commissioned by Mighty Earth. In this report, Ahold Delhaize's estimated methane emissions are presented.

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Authorship

This report was researched and written by Stefanie Geurts and Barbara Kuepper. Correct citation of this document: Geurts, S. and B Kuepper (2025, March), *Ahold Delhaize's Methane Footprint: The hidden climate cost of animal products,* Amsterdam, The Netherlands: Profundo.

Front page cover photograph by Fran Hogan - Unsplash.

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Summary

Methane (CH_4) is a potent greenhouse gas that accounts for more than 25% of global warming to date. Though secondary to carbon dioxide in driving climate change, Methane has a much higher global warming potential—28 times that of CO_2 over 100 years and 84 times over 20 years. It also contributes to ozone formation, posing serious health risks to the lungs. The livestock sector is the largest contributor to methane emissions globally, with cattle responsible for about 75% of enteric methane emissions.

Ahold Delhaize (AD) reportedly engages suppliers to set emissions reduction targets, including methane in the livestock sector, but does not disclose its current scope 3 methane emissions or set specific reduction targets. Its broader scope 3 targets for emissions from forest, land, and agriculture sectors are set for 2030 and 2050. AD's European brands will aim for at least 50% plant-based sales by 2030, but this goal does not directly address animal product emissions.

Due to this opacity, this report seeks to estimate AD's global methane emissions using external sources to better understand its size. It estimates AD's annual methane emissions at 11.7 million tons of CO_2-equivalents (CO_2e) (435,000 tons of CH_4) from animal product sales, making up 44% of AD's 2023 scope 3 emissions in the forest, land, and agriculture category (26.6 million tons CO_2e). The results of this study suggest that the largest share of methane emissions from AD's animal product sales is emitted in all European stores combined (51%), followed by the U.S. (49%).

Due to a general lack of disclosure in the sector, it is not possible to compare AD's methane emissions with those of other retailers. Its global scope 3 methane emission volume is comparable to that of a small to medium-sized European country and exceeds the emissions of Sweden and Denmark. Additionally, AD's methane emissions are similar to those of major global meat and dairy companies, ranking between Nestlé and Arla (both 500,000 tons of CH_4 emissions) on one side and FrieslandCampina and Saputo (both 390,000 tons of CH_4 emissions) on the other.

Ahold Delhaize CH_4 emissions per country (estimates)
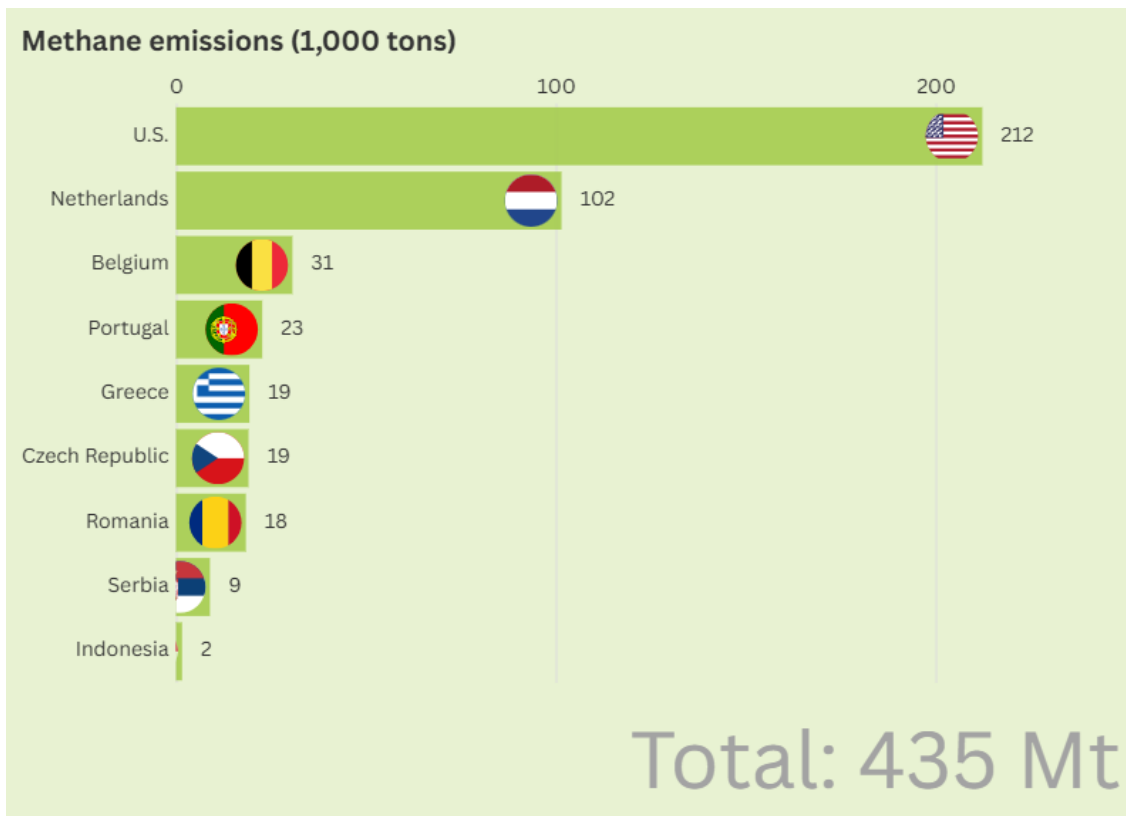
Source: Profundo.

Abbreviations

AD	Ahold Delhaize
CH$_4$	Methane
CO$_2$	Carbon Dioxide
CO$_2$e	Carbon Dioxide Equivalent
FLAG emissions	Forest, Land and Agriculture GHG emissions
GHG emissions	Greenhouse Gas Emissions
GLEAM	Global Livestock Environmental Assessment Model
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change

Introduction

Methane (CH$_4$) is a potent greenhouse gas (GHG) that accounts for more than 25% of the global warming that the world experiences to date.[1] The livestock sector is the largest human-related source of methane (CH$_4$) emissions, contributing 31-32% of global methane emissions,[2] with cattle alone responsible for about 75% of enteric methane production.[3] Methane, the second most significant greenhouse gas after CO$_2$, has a shorter atmospheric lifetime but absorbs significantly more energy, giving it a much higher global warming potential (GWP) than CO$_2$—27 times over 100 years and 80 times over 20 years.[4,a] It also contributes to ozone formation, exacerbating air pollution and posing serious health risks.[5]

Since 2023, Mighty Earth has run a programme focussing on methane emissions caused by the agricultural sector. The program aims to press meat and dairy companies and food retailers to report on methane emissions in their supply chains and implement meaningful reduction strategies. In January 2025, Mighty Earth and Changing Markets Foundation assessed the progress made towards reducing methane emissions for the 20 largest food retailers in Europe and the U.S., which resulted in the "Methane Action Tracker."[6] AD ranks 4th place, with a score of only 33 out of 100. The scorecard is based on elements grouped in five categories, including communication about and reporting on methane emissions and its reduction commitments, food and landfill waste policies and offerings of plant-based protein alternatives.

Supermarkets are uniquely positioned between farmers and producers and consumers to play a crucial role in shifting the food system to a more healthy and sustainable system. Ahold Delhaize is one of Europe's largest supermarkets playing a climate leadership role, but the group is being let down by the stagnated performance of its US subsidiaries. Almost 40% of AD's net sales are earned in Europe, while the remaining share is attributable to the U.S. segment.[7] AD does not publish details on the composition of its scope 3 emissions,[b] notably lacking reporting on the role of emissions from animal products in its supply chain, and does not set specific methane reduction targets. Due to this lack of transparency, this study seeks to estimate AD's global methane emissions using external sources to better understand its impact.

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[a] The Global Warming Potential (GWP) is a multiplier that accounts for the energy absorption ability of 1 ton of CH$_4$ and N$_2$O over a given period relative to 1 ton of CO$_2$.

[b] Scope 1 covers those emissions that are directly controlled or owned by a company. Scope 2 encompasses indirect emissions linked to energy purchase and use, while scope 3 emissions refer to indirect emissions in the supply chain of a company.

1

Methodology

In recent years, AD has not disclosed details on the composition of its scope 3 emissions, including the contribution of animal products in its supply chain. Therefore, methane emissions associated with AD's sales of animal products are estimated using an alternative approach.

1.1   Scope

In line with the goal to understand the size of AD's global methane footprint, this research estimates these emissions for every region the company is active in. The analysis focuses on animal products as the main source of methane emissions; it disregards other sources of methane such as waste.

AD's food retailing operates under different banners in the following countries:

- U.S.: Food Lion, FreshDirect, The GIANT Company, Giant Food, Hannaford, Stop & Shop.
- The Netherlands: Albert Heijn
- Belgium: Delhaize
- Greece: Alfa Beta
- Portugal: Pingo Doce (49% Joint venture)
- Czech Republic: Albert
- Romania: Mega Image[c]
- Serbia: Maxi and Tempo
- Indonesia: Super Indo (51% Joint venture)

This research estimates the related methane emissions composed of emissions from a) enteric fermentation, b) manure in the livestock sector, and c) a small share linked to livestock feed. Enteric fermentation is a natural digestive process in ruminant animals like cattle, sheep, goats, and buffalo. Microbes in the rumen break down and ferment food, generating methane as a by-product. Manure is an organic matter primarily composed of animal faeces and urine. It often includes plant material, such as straw, used as bedding, which absorbs waste from the animals and also emits methane.

1.2   Method

AD has not published a detailed breakdown of its product sales or the composition of its scope 3 emissions in recent years,[d] and notably the role of emissions from animal products in its supply chain. Therefore, the estimation of the methane emission linked to AD's sales of animal products is based on an alternative approach, involving the following calculations:

1. **Food sales share**: Based on the country-level split of food sales among the two main food sales channels – retailing and food services – and market share information on AD's grocery

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[c]   The recent increase in AD's Romanian footprint via the addition of grocery retailer Profi Rom Food to its portfolio has not yet been considered in the analysis as the deal was only closed in January 2025.

[d]   For 2019, AD published a detailed breakdown of purchased goods & services, which is the main category contributing to scope 3 emissions. Of the 90.77% of scope 3 emissions falling into this category at the time, 42% were attributed to animal products (22% meat and fish, 20% dairy and eggs).

retail sales per country of operation, its share in overall food sales per country can be estimated.

2. **Animal product consumption**: Statistics on the average per capita consumption of animal products - meat, poultry, dairy, and eggs - in a country multiplied by the population size gives an estimate of the total volume of animal products sold in a country annually. Applying AD's share in domestic food sales to these volumes results in an estimate of the retailer's sales volume of these products.[e]

3. **Product conversion**: Dairy products like butter or milk powder are converted into milk equivalents based on average milk use per unit of product. Where necessary, meat consumption is converted from retail to carcass weight based on average conversion factors.

4. **Emission calculation**: The Global Livestock Environmental Assessment Model 3.0 database by the Food and Agriculture Organization (FAO) (GLEAM 3.0) provides regional emission intensity factors for beef, pork, poultry, milk, and eggs. For the analysis at hand, the commonly used GWP 100 from the Intergovernmental Panel on Climate Change's 6th Assessment Report (IPCC AR6) (2021) is chosen. Applying these emission factors to the volumes of animal products sold under AD's banners allows us to estimate the CO_2-equivalent (tons CO_2e) GHG emissions linked to AD's global operations. Moreover, the specific methane emissions from enteric fermentation and manure per animal product category can be estimated, both in tons of CH_4 as well as converted to CO_2e. The results can be compared with the findings from other research, such as the October 2024 Greenpeace report *Turning Down the Heat*.[8]

AD was given the opportunity to provide feedback but referred to the 2024 annual report for information without giving further comments. Therefore, the estimates resulting from the method described in this section are reported. Appendix 1 provides a detailed overview of results and data sources.

Figure 1   Methodological steps to estimating AD's emission footprint from animal products
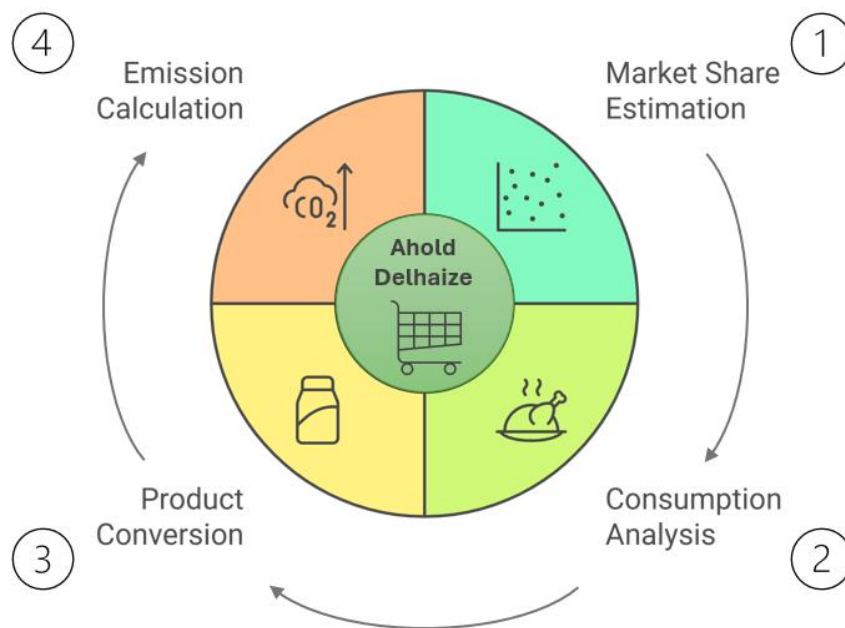
Source: Profundo.

1.3   Data limitations

While the goal is to use 2023 figures, the limited availability of data means that proxies such as AD's share in country-level food sales—including grocery retailing and food service as the two food sales channels—or per capita consumption of animal products must rely on data from different years. It is assumed that these numbers remained stable in recent years. The most recent year available is used for each estimate, which is either 2022 or 2023, except for Belgium. For this market, an average of AD's 2020 and 2024 grocery market shares is used to obtain an average for 2022, which is the year for which data regarding the domestic food sector is available.

To estimate AD's market share in the total domestic sale of animal products, its grocery retail market share is extrapolated to total food sales, including food service. Figures for these calculations are drawn from various sources that may use different methodologies. These sources include market research reports and media articles. Relying on sales distribution carries a certain risk of underestimating the volume sold through retailing, as prices per unit will be lower compared to food services. Therefore, the presented estimates are likely to be conservative.

Additionally, since this study's calculations use estimated sales volumes of animal products based on AD's total retail market shares extrapolated to total food sales, differences in retail food prices between geographies and variations in consumer behaviour regarding the out-of-home versus at-home consumption of various animal products could not be considered. The reports used to estimate AD's share in overall food sales suggest a considerably lower share of retailing vs. food service in the U.S. than in European countries, which may explain differences in sales contribution for the U.S. and Europe.[9]

The lack of detailed data means that figures are often only available for selected categories, especially for dairy consumption. The "other" category may include a wide range of differing dairy products, such as butter, milk powder, condensed milk, cream, and skim milk, which at times may use larger or smaller volumes of milk per unit of product. Based on the available information, it is not possible to correct for such insecurities.

Similar uncertainties exist for the category of "other meat". Based on checking several online stores, sheep, goat, and buffalo meat do not appear to be sold by AD, or in negligible volumes. There is some lamb meat sold in the U.S. and Indonesia. Therefore, methane emission intensity for "other meat" consumption is the region's average for sheep and poultry in North America and East Asia and for poultry in East and West Europe. The average methane emissions of chicken are used as a proxy for other poultry (turkey, duck, etc.).

2

Ahold Delhaize's methane position

This study finds that AD's estimated methane emissions from animal products amounted to 11.7 million tons CO_2e / 435,000 tons CH_4 annually, constituting 44% of AD's total scope 3 emissions from the forest, land and agricultural (FLAG) sectors in 2023 (26.6 million tons CO_2e). Meat is the key contributing segment, and the U.S. and the Netherlands are the largest geographies.

2.1 Summary findings

Table 1   AD: Estimated methane emissions from animal products

Country	Total GHG emissions animal product sales (est., mil tons CO_2e)	CH_4 emissions (mil tons CO_2eq)			CH_4 emissions (mil tons CH_4)		
		Meat & poultry	Dairy & eggs	Total	Meat & poultry	Dairy & eggs	Total
U.S.	10.67	3.63	2.10	5.73	0.13	0.08	0.21
Netherlands	5.63	1.48	1.27	2.74	0.06	0.05	0.10
Belgium	1.82	0.52	0.31	0.83	0.02	0.01	0.03
Portugal*	1.36	0.40	0.21	0.61	0.02	0.01	0.02
Greece	1.14	0.31	0.21	0.52	0.01	0.01	0.02
Czech Rep.	1.15	0.20	0.32	0.52	0.01	0.01	0.02
Romania	1.22	0.19	0.30	0.50	0.01	0.01	0.02
Serbia	0.61	0.14	0.10	0.24	0.01	0.00	0.01
Indonesia*	0.10	0.03	0.02	0.04	0.00	0.00	0.00
Total	**23.70**	**6.90**	**4.84**	**11.73**	**0.26**	**0.18**	**0.44**
% of total		**59%**	**41%**		**59%**	**41%**	

Note: The underlying calculations and estimates can be found in Appendix 1. * For Indonesia and Portugal, CO_2e emissions are adjusted for AD's share in joint ventures.
Source: see Appendix 1.

2.2 Methane emissions from animal products

In its AR 2024, AD states that it engages suppliers to set emission reduction targets, including methane emissions in the livestock sector.[10] AD subsequently reports that its "*[c]umulative estimated reduction potential of scope 3 decarbonization levers by 2030*" for livestock farming is between around 1.3 and 4.3 MtCO₂e,[11] but does not report on its current scope 3 methane emissions or set specific reduction targets for methane. Broader scope 3 targets for overall emissions from forest, land and agricultural (FLAG) sectors are set for the near (2030) and long term (2050).[12] As part of the drivers to reach these reduction targets, AD states that "*Our European brands agreed to a regional target of at least 50% plant-based sales by 2030.*"[13] However, the target does not quantify the reduction of emissions from animal products or extend to a similar shift for

US brands. This study focuses on estimating the amount of global methane emissions from AD via other sources to provide a sense of Ahold's share of methane emissions – and how far they have to go to meet GHG reduction targets.

The calculations result in total estimated annual methane emissions of 11.7 million tons CO_2e / 435,000 tons CH_4, linked to animal product sales by AD across all its geographies. These estimated methane emissions already amount to around 44% of AD's total scope 3 emissions from the forest, land and agricultural sectors in 2023 (26.6 million tons CO_2e).[14]

Figure 2   **Ahold Delhaize CH_4 emissions per country (estimates)**
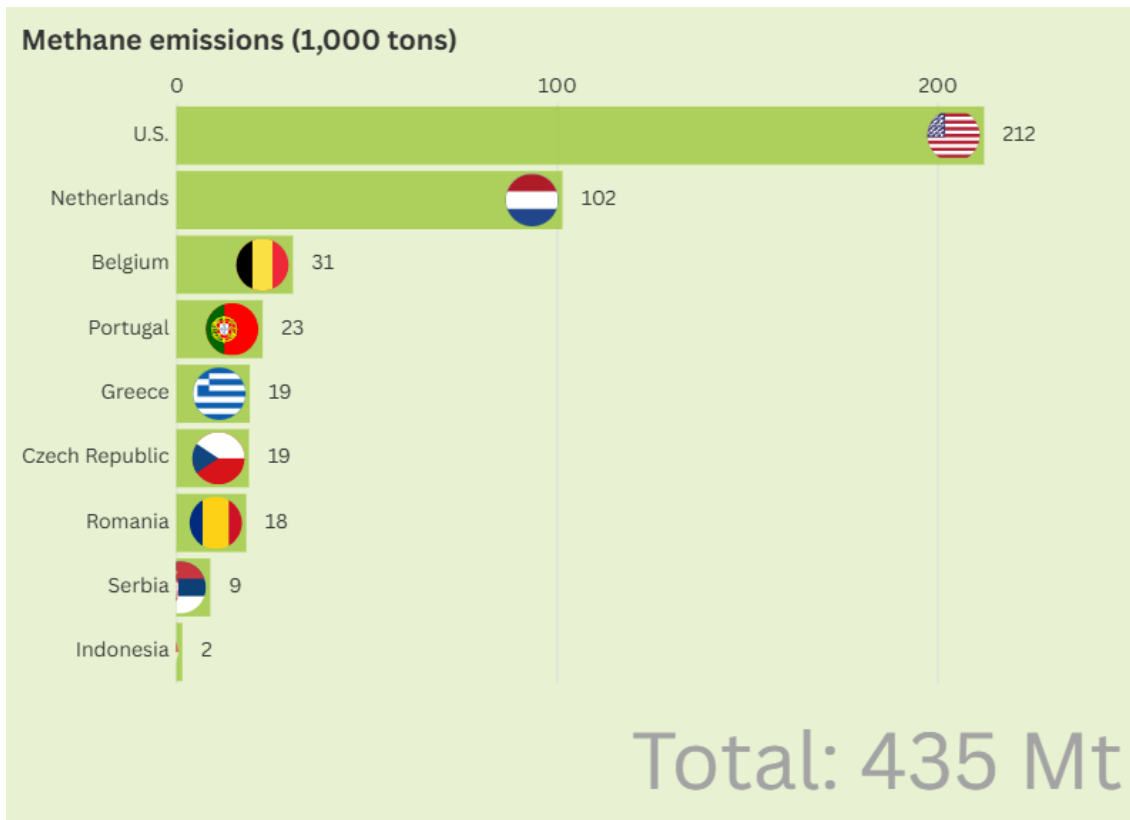
Source: Profundo.

The results of this study are compared with other studies to put the size of AD's estimated scope 3 methane emissions into perspective. The results show that AD's estimated methane emissions are comparable to the methane emissions of a small to medium-sized European country (see Figure 3) and are higher than the emissions of Sweden and Denmark. Furthermore, the company's estimated methane emissions are similar to some of the largest global meat and dairy companies; in between emitters Nestlé and Arla, on the one hand, and FrieslandCampina and Saputo on the other hand (see Figure 4).

Methane Emissions of Ahold Delhaize Compared to European Countries

(1,000 tons)

🔥 = 10   🔥 Methane   🔥 Methane AD

329 — Sweden
339 — Denmark
435 — Ahold Delhaize
639 — Netherlands
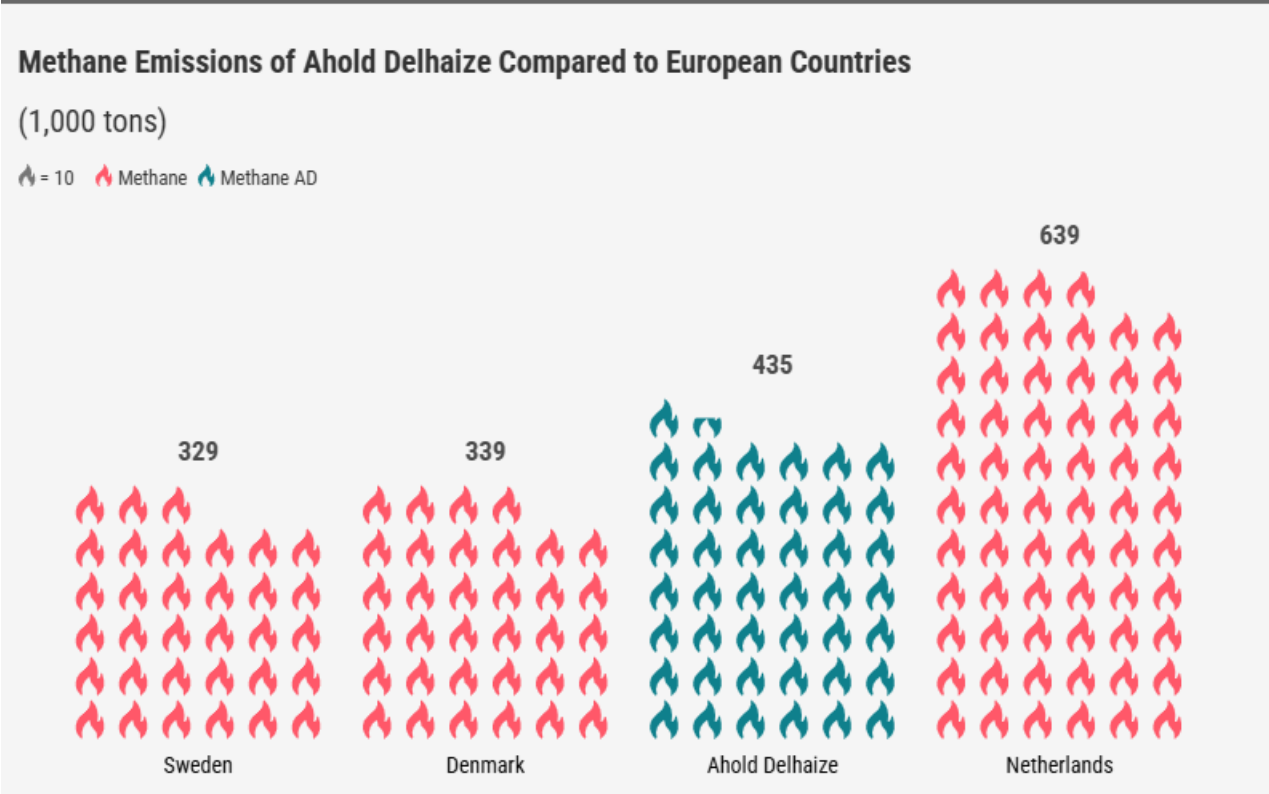
Source: IEA (2024), "Methane Tracker", online: https://www.iea.org/data-and-statistics/data-tools/methane-tracker, viewed in March 2025; AD's emissions are based on own calculations.

Methane Emissions of Ahold Delhaize Compared to Meat & Dairy Companies
(1,000 tons)

🔥 = 100   🔥 Methane   🔥 Methane AD

Company		Value
JBS (BR)	🔥🔥🔥	4520
Marfig (BR)	🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥	1810
Minerva (BR)	🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥	1100
Dairy Farms of America	🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥	1060
Tyson (US)	🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥	1050
Cargill (US)	🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥	970
Lactalis (FR)	🔥🔥🔥🔥🔥🔥🔥🔥🔥🔥	970
Nestlé (CH)	🔥🔥🔥🔥🔥	500
Arla (DK)	🔥🔥🔥🔥🔥	500
Ahold Delhaize (NL)	🔥🔥🔥🔥🔥	435
FrieslandCampina (NL)	🔥🔥🔥🔥	390
Saputo (CA)	🔥🔥🔥🔥	390
Danone (FR)	🔥🔥🔥🔥	380
Bigard (FR)	🔥🔥🔥🔥	370
Glanbia (IR)	🔥🔥🔥	330
Cremonini (IT)	🔥🔥🔥	320
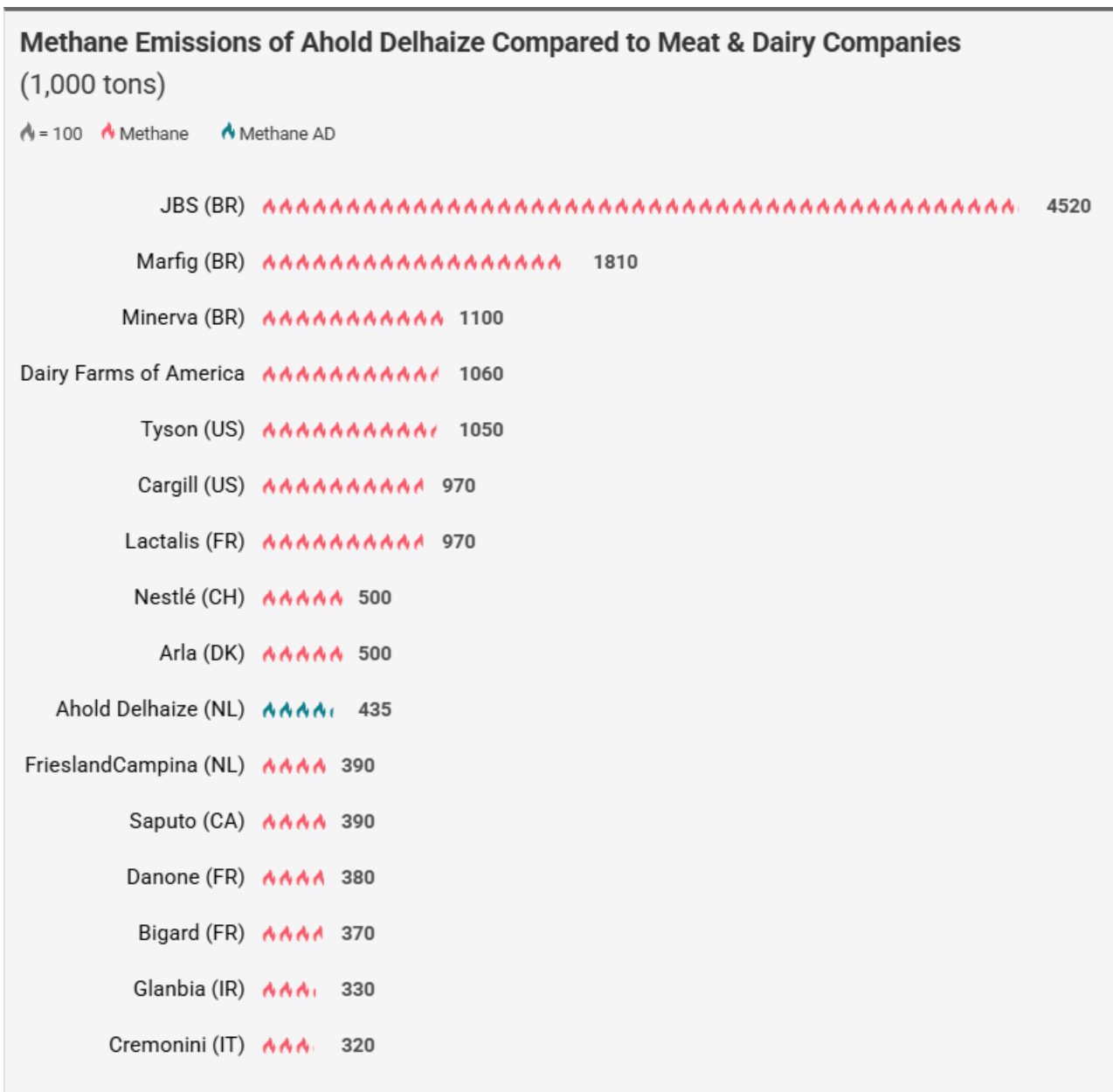
Source: Greenpeace Nordic (2024, October), *Turning Down the Heat: Pulling the Climate Emergency Brake on Big Meat and Dairy*, Stockholm, Norway: Greenpeace Nordic, pp.55-63; AD's emissions are based on own calculations.

References

1   UNEP (2022, October), "What's the deal with methane?", online: https://www.unep.org/news-and-stories/video/whats-deal-methane, viewed in March 2025.

2   UN Environmental Programme (2024, October), *An Eye on Methane: International Methane Emissions Observatory*, Nairobi, Kenya: United Nations Environment Programme, p.1;

    FAO (n.d.), "Livestock and enteric methane", online: https://www.fao.org/in-action/enteric-methane/en, viewed in February 2025.

3   FAO (n.d.), "Livestock and enteric methane", online: https://www.fao.org/in-action/enteric-methane/en, viewed in February 2025.

4   Forster, P., T. Storelvmo, K. Armour, W. Collins, J.-L. Dufresne, D. Frame, D.J. Lunt, T. Mauritsen, M.D. Palmer, M. Watanabe, M. Wild, and H. Zhang (2021), "The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity", in V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.), Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, p.117.

5   European Commission (n.d.), "Topics - Carbon management and fossil fuels - Methane emissions", online: https://energy.ec.europa.eu/topics/carbon-management-and-fossil-fuels/methane-emissions_en, viewed in March 2025.

6   Mighty Earth and Changing Markets Foundation (2025, March), *"Clean up on Aisle 3" - The Methane Mess Supermarkets Are Hiding*.

7   Ahold Delhaize (n.d.), *Annual Report 2024*, p.58.

8   Greenpeace Nordic (2024, October), *Turning Down the Heat: Pulling the Climate Emergency Brake on Big Meat and Dairy*, Stockholm, Norway: Greenpeace Nordic.

9   USDA ERS (2025), "Food service industry - Market segments", online: https://www.ers.usda.gov/topics/food-markets-prices/food-service-industry/market-segments/, viewed in January 2025;

    Pinckaers, M. (2024, July), Retail Foods Annual - Netherlands, USDA Gain Report NL2024-0008;

    StatBel (2023, September), "Nieuwe resultaten Belgisch huishoudbudgetonderzoek", online: https://statbel.fgov.be/nl/themas/huishoudens/huishoudbudget#news;

    Ahold Delhaize (n.d.), *Annual Report 2024*, p.272.

10 Ahold Delhaize (n.d.), *Annual Report 2024*, p.110.

11 Ahold Delhaize (n.d.), *Annual Report 2024*, p.112.

12 Ahold Delhaize (n.d.), *Annual Report 2024*, p.117.

13 Ahold Delhaize (n.d.), *Annual Report 2024*, p.110.

14 Ahold Delhaize (n.d.), *Annual Report 2024*, p.175.

Appendix 1   Country analysis of AD's methane position

The following tables provide a more detailed overview of the underlying calculations for Table 1. The estimates are based on grocery retail market share of AD in the country and consumption per capita of meat and dairy products, combined with GLEAM 3 emission intensity figures for the GLEAM region.

Table 2   Estimated methane emissions AD - U.S. (2023)

a. Market shares

	2022	2023	%
AD US turnover in US$ bln		59.43	
AD retail market share			5.6%
Food service turnover (bln US$)	1,340	1,500	58.4%
Retail	1,040	1,070	41.6%
Total food market		2,570	
Population		343,477,335	
AD share in total		**2.3%**	

Sources: National Retail Federation (n.d.), "Top 100 retailers 2024 list", online: https://nrf.com/research-insights/top-retailers/top-100-retailers/top-100-retailers-2024-list, viewed in Jaury 2025; USDA ERS (2025), "Food service industry - Market segments", online: https://www.ers.usda.gov/topics/food-markets-prices/food-service-industry/market-segments/, viewed in January 2025; Worldometer (2025), Population - World - Northern America - United States", online: https://www.worldometers.info/world-population/us-population/, viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO_2e)
Pork	32.9	261	614
Poultry	49.8	396	32
Beef & veal	33.6	267	2,829
Other meat**	1.3	11	155
Meat total (carcass weight)	*117.7*	*935*	*3,629*
Cheese	84.4		
Milk	58.1		
Yoghurt	6.3		
Milk-products (ex. yoghurt)	18.3		
Other dairy	97.3		
*Dairy total**	*264.3*	*2,099*	*2,015*
Eggs	*16.8*	*133*	*88*
Total			**5,732**

Note: * In milk equivalents. Milk equivalents are derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), skim milk (0.70), liquid milk (1.0). Averages were derived for the categories "Milk-products (incl. yoghurt)" and "Milk-products (ex. yoghurt)" based on the conversion factors for milk powder skim/whole milk powder, whole condensed/evaporated milk, yoghurt, cream, and skim milk. "Other dairy" includes butter, unless stated otherwise. ** Methane emission for "other meat" assumes sales of other poultry than chicken plus sheep/lamb.

Sources: USDA (2024), *Meat supply and disappearance tables, historical*, https://www.ers.usda.gov/data-products/livestock-and-meat-domestic-data, viewed in January 2025; USDA (2022), *Dairy products: Per capita consumption, United States (Annual)*,

Table 3 Estimated methane emissions AD – Netherlands (2023)

a. Market shares

Market shares	2022	2023	%
AD market share retail	36.7%	37.1%	
Food service turnover (bln US$)		17	23.9%
Retail		54	76.1%
Total food market		71	
Population		17,810,000	
AD share in total			**28.2%**

Sources: van Loon, D. (2024, January), "NielsenIQ: marktaandelen supermarkten 2023", online: https://www.foodpersonality.nl/branche-cijfers/branche-cijfers/18357/nielseniq-marktaandelen-supermarkten-2023, viewed in January 2025; Pinckaers, M. (2024, July), Retail Foods Annual - Netherlands, USDA Gain Report NL2024-0008; CBS (n.d.), "Bevolkingsteller", online: https://www.cbs.nl/nl-nl/visualisaties/dashboard-bevolking/bevolkingsteller, viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO$_2$e)
Pork	36.1	181	249
Poultry	21.6	109	12
Beef & veal	16.5	83	1,214
Other meat**	1.1	6	1
Meat total (carcass weight)	75.3	378	1,475
Cheese	110.0		
Milk			
Yoghurt			
Milk-products (incl. yoghurt)	114.9		
Other dairy	28.4		
*Dairy total**	253.3	1,273	1,260
Eggs	11.8	59	5
Total			**2,740**

Note: * In milk equivalents. Milk equivalents are derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), skim milk (0.70), liquid milk (1.0). Averages were derived for the categories "Milk-products (incl. yoghurt)" and "Milk-products (ex. yoghurt)" based on the conversion factors for milk powder skim/whole milk powder, whole condensed/evaporated milk, yoghurt, cream, and skim milk. "Other dairy" includes butter, unless stated otherwise. ** Methane emission intensity for "other meat" assumes other poultry than chicken sold in supermarkets.

Sources: Dagevos, H., D. Verhoog, P. van Horne and R. Hoste (2024), *Vleesconsumptie per hoofd van de bevolking in Nederland, 2005-2023*, Wageningen, Netherlands: Wageningen Economic Research, p.7; Dagevos, H., D. Verhoog, P. van Horne and R. Hoste (2023), *Melk(producten), boter, kaas en eieren; Consumptie per hoofd van de bevolking in Nederland, 2005-2022*, Wageningen, Netherlands: Wageningen Economic Research, p.8; *Eurostat* (2024, November), "Milk and milk product statistics", online: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Milk_and_milk_product_statistics, viewed in January 2025; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.

Table 4 Estimated methane emissions AD− Belgium (2022)

a. Market shares

Market shares	2020	2024	2022	Average
AD market share retail	24.4%	22.6%		24%
Food service turnover (bln US$)			7.0%	31%
Retail			15.8%	69%
Total food market			23%	
Population			11,697,557	
AD share in total				**16%**

Sources: De Tijd (2025, January), "Delhaize koopt 325 Louis Delhaize-supermarkten'", online: https://www.tijd.be/ondernemen/retail/delhaize-koopt-325-louis-delhaize-supermarkten/10582315.html#:~:text=Delhaize%2C%20dat%20808%20winkels%20heeft,naar%20schatting%205%20miljard%20euro; StatBel (2023, September), "Nieuwe resultaten Belgisch huishoudbudgetonderzoek", online: https://statbel.fgov.be/nl/themas/huishoudens/huishoudbudget#news; StatBel (2023, June), "België telde 11.697.557 inwoners op 1 januari 2023", online:https://statbel.fgov.be/nl/nieuws/belgie-telde-11697557-inwoners-op-1-januari-2023; all viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO$_2$e)
Pork	41.2	78	108
Poultry	15.8	30	3
Beef & veal	14.6	28	407
Other meat**	9.2	18	2
Meat total (carcass weight)	80.8	154	520
Cheese	77.4		
Milk	28.7		
Yoghurt	12.9		
Milk-products (ex. yoghurt)	5.3		
Other dairy	37.2		
*Dairy total**	161.5	308	305
Eggs	*19.3*	37	3
Total			**828**

Note: * In milk equivalents. Milk equivalents are derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), skim milk (0.70), liquid milk (1.0). Averages were derived for the categories "Milk-products (incl. yoghurt)" and "Milk-products (ex. yoghurt)" based on the conversion factors for milk powder skim/whole milk powder, whole condensed/evaporated milk, yoghurt, cream, and skim milk. "Other dairy" includes butter, unless stated otherwise. ** Methane emission intensity for "other meat" assumes other poultry than chicken sold in supermarkets.

Sources: *StatBel* (n.d.), "Supply balance sheets for meat", online: https://statbel.fgov.be/en/themes/agriculture-fishery/supply-balance-sheets-meat#figures, viewed in January 2025; Statista (2024, December), "Dairy consumption per capita in Belgium 2019-2029, by milk product", online: https://www.statista.com/forecasts/713115/dairy-consumption-per-capita-in-belgium-by-milk-product, viewed in January 2025; *FAOSTAT* (n.d.), "Food Balances (2010-): Food supply quantity: 2022", online: https://www.fao.org/faostat/en/#data/FBS, viewed in January 2025; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.

Table 5   Estimated methane emissions AD – Portugal (2023)

a. Market shares

Market shares	2022	2023	%
AD market share (in Pingo Doce, so for 49%)		15%	
Food service			30.9%
Retail			69.1%
Total food market			
Population		10,430,738	
AD share in total		**10.1%**	

Sources: Medina, A. (2024, October), *Retail Foods 2024 - Portugal*, USDA GAIN report PO2024-0003, p.7; Ahold Delhaize (2024), *Annual Report 2023*, p.268; Silva, M., S. S. P. Rodrigues, D. M. Correia, M. C. C. Rei, M. Severo, A. I. A. Costa, D. P. M. Torres and C. M. M. Lopes (2024), "Eating out of home in Portugal: characterisation and effects on dietary intake", *The British journal of nutrition*, 132(2), 169–181; Worldometer (2025), Population - World -Europe - Portugal", online: https://www.worldometers.info/world-population/us-population/, viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO_2e)
Pork	41.7	44	60
Poultry	47.2	50	5
Beef & veal	21.7	23	335
Other meat**	9.0	10	1
Meat total (carcass weight)	119.6	126	402
Cheese	65.6		
Milk	62.4		
Yoghurt	21.1		
Milk-products (ex. yoghurt)	36.4		
Other dairy	15.2		
*Dairy total**	200.6	212	210
Eggs	*11.9*	13	1
Total			**613**

Note: * In milk equivalents. Milk equivalents are derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), skim milk (0.70), liquid milk (1.0). Averages were derived for the categories "Milk-products (incl. yoghurt)" and "Milk-products (ex. yoghurt)" based on the conversion factors for milk powder skim/whole milk powder, whole condensed/evaporated milk, yoghurt, cream, and skim milk. "Other dairy" includes butter, unless stated otherwise. ** Methane emission intensity for "other meat" assumes other poultry than chicken sold in supermarkets.

Sources: *Statistics Portugal - the National Statistical Institute* (n.d.), "Products Database", online: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&contecto=pi&indOcorrCod=0000211&selTab=tab0, viewed in January 2025; *Statistics Portugal - the National Statistical Institute* (n.d.), "Products Database", online: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0000214&contexto=bd&selTab=tab2, viewed in January 2025; *FAOSTAT* (n.d.), "Food Balances (2010-): Food supply quantity: 2022", online: https://www.fao.org/faostat/en/#data/FBS, viewed in January 2025; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.

Table 6   Estimated methane emissions AD – Greece (2022)

a. Market shares

Market shares	2021	2022	%
AD turnover in EUR bln		1.92	
AD retail market share			13.5%
Food service turnover (bln EUR)	8		36.0%
Retail		14	64.0%
Total food market		22	
Population		10,242,908	
AD share in total		**8.6%**	

Sources: McHugh, R. (2024, September), "Top 10 Supermarket Retail Chains in Greece", *ESM Magazine,* online: https://www.esmmagazine.com/retail/top-10-supermarket-retail-chains-in-greece-236537, viewed in January 2025; Deloitte (2022), *Foodservice Market Monitor*, p.10; Lloyds Bank (n.d.), "Greece: Buying and Selling - The distribution network in Greece", online: https://www.lloydsbanktrade.com/en/market-potential/greece/distribution#:~:text=The%20second%20player%20is%20Koninklijke,respectively%20in%202020%20(KPMG), viewed in January 2025; Worldometer (2025), Population - World -Europe - Greece", online: https://www.worldometers.info/world-population/us-population/, viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO$_2$e)
Pork	42.1	37	51
Poultry	35.0	31	3
Beef & veal	19.7	17	256
Other meat**	13.3	12	1
Meat total (carcass weight)	110.1	98	312
Cheese			
Milk	232.1		
Yoghurt			
Milk-products (ex. yoghurt)			
Other dairy	6.7		
*Dairy total**	238.8	212	209
Eggs	9.5	8	1
Total			**522**

Note: * Reported in milk equivalent consumption. "Other dairy" includes butter, unless stated otherwise. ** Methane emission intensity for "other meat" assumes other poultry than chicken sold in supermarkets.

Sources: *FAOSTAT* (n.d.), "Food Balances (2010-): Food supply quantity: 2022", online: https://www.fao.org/faostat/en/#data/FBS, viewed in January 2025; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.

Table 7   Estimated methane emissions AD – Czech Republic (2022)

a. Market shares

Market shares	2022	2023	%
AD turnover in USD bln	2.8		

Market shares	2022	2023	%
AD retail market share			12.2%
Food service turnover (bln USD)	7		21.4%
Retail	25		78.6%
Total food market	31		
Population		10,809,716	
AD share in total		**9.6%**	

Sources: Hlavackova, M. (2023, June), *Retail Foods - Czech Republic*, USDA GAIN report EZ2023-0005; Statista (2024), "*Turnover of the food & beverage service industry in Czechia 2013-2022"*, online: https://www.statista.com/statistics/410371/turnover-food-beverage-service-czech-republic/#:~:text=The%20turnover%20of%20the%20food,2022%20with%206.2%20billion%20euros., viewed in January 2025; Converted to USD with rate of 31 Dec 2022 using Oanda; Worldometer (2025), Population - World -Europe - Czech Republic (Czechia)", online: https://www.worldometers.info/world-population/czech-republic-population/, viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO_2e)
Pork	43.9	46	58
Poultry	28.1	29	2
Beef & veal	8.9	9	136
Other meat**	1.9	2	0
Meat total (carcass weight)	82.9	86	196
Cheese	60.7		
Milk	59.5		
Yoghurt			
Milk-products (ex. yoghurt)	149.5		
Other dairy	34.3		
*Dairy total**	304.0	315	318
Eggs	*13.0*	13	1
Total			**516**

Note: * In milk equivalents. Milk equivalents are derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), skim milk (0.70), liquid milk (1.0). Averages were derived for the categories "Milk-products (incl. yoghurt)" and "Milk-products (ex. yoghurt)" based on the conversion factors for milk powder skim/whole milk powder, whole condensed/evaporated milk, yoghurt, cream, and skim milk. "Other dairy" includes butter, unless stated otherwise. ** Methane emission intensity for "other meat" assumes other poultry than chicken sold in supermarkets.

Sources: Czech Statistical Office, "Food consumption", online: https://csu.gov.cz/produkty/zem_cr, viewed in January 2025; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.

Table 8   Estimated methane emissions AD – Romania (2023)

a. Market shares

Market shares	2022	2023	%
AD turnover in USD bln	1.9	2.2	
AD retail market share			6.4%
Food service turnover (bln USD)		4	11.1%
Retail		34	88.9%

Market shares	2022	2023	%
Total food market		38	
Population		19,118,479	
AD share in total		**5.7%**	

Sources: Nistor, A. (2024, July), *Exporter Guide Annual - Romania*, USDA GAIN report RO2024-0004, p.7; Worldometer (2025), Population - World -Europe - Romania", online: https://www.worldometers.info/world-population/romania-population/, viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO_2e)
Pork	59.1	65	82
Poultry	38.7	42	3
Beef & veal	6.7	7	108
Other meat**	5.7	6	0
Meat total (carcass weight)	110.1	120	193
Cheese			
Milk	263.3		
Yoghurt			
Milk-products (ex. yoghurt)			
Other dairy	10.6		
*Dairy total**	273.9	299	302
Eggs	14.6	16	1
Total			**497**

Note: * Reported in milk equivalent consumption. "Other dairy" includes butter, unless stated otherwise. ** Methane emission intensity for "other meat" assumes other poultry than chicken sold in supermarkets.

Sources: *Institutul National de Statistica* (2024), "Disponibilitățile de consum ale populației, în anul 2023", online: https://insse.ro/cms/ro/tags/disponibilitatile-de-consum-ale-populatiei, viewed in January 2025; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.

Table 9   Estimated methane emissions AD – Serbia (2023)
a. Market shares

Market shares	2022	2023	%
AD turnover in USD bln		1.4	
AD retail market share			20.2%
Food service turnover (bln USD)		6	46.2%
Retail		7	53.8%
Total food market		13	
Population		6,773,201	
AD share in total		**10.9%**	

Sources: Serbia Business (2024, July), "Serbian economy profits 972.4 billion dinars in 2023; retail sector leads with 194.4 billion dinars in profit", online: https://serbia-business.eu/serbia-business-recent-economy-finances-apr-retail-trade/, viewed in January 2025. Converted to EUR using rate in article, then converted to USD with rate of 31 Dec 2023 using Oanda; Maslac, T. (2024, January), Exporter

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO$_2$e)
Pork	28.4	21	29
Poultry	25.1	18	2
Beef & veal	10.3	8	111
Other meat**	29.6	22	2
Meat total (carcass weight)	93.4	69	144
Cheese	34.2		
Milk	33.6		
Yoghurt	30.0		
Milk-products (ex. yoghurt)	-		
Other dairy	34.9		
*Dairy total**	132.7	98	97
Eggs	*13.1*	10	1
Total			**241**

Note: * In milk equivalents. Milk equivalents are derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), skim milk (0.70), liquid milk (1.0). Averages were derived for the categories "Milk-products (incl. yoghurt)" and "Milk-products (ex. yoghurt)" based on the conversion factors for milk powder skim/whole milk powder, whole condensed/evaporated milk, yoghurt, cream, and skim milk. "Other dairy" includes butter, unless stated otherwise. ** Methane emission intensity for "other meat" assumes other poultry than chicken sold in supermarkets.

Sources: Statistical Office of the Republic of Serbia (2024), *Household Budget Survey, 2023*, p.69; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.

Table 10 Estimated methane emissions AD – Indonesia (2023)

a. Market shares

Market shares	2022	2023	%
AD turnover in US$ bln (in Super Indo)		0.16	
AD retail market share			0.1%
Food service turnover (bln US$)		30	21.7%
Retail		108	78.3%
Total food market		138	
Population		281,190,067	
AD share in total		**0.1%**	

Sources: Yuningsih, N. (2024), *Retail Foods Annual - Indonesia*, USDA Gain Report ID2024-0026, p.8; Ahold Delhaize (2024), *Annual Report 2023*, p.268; Worldometer (2025), Population - World - Asia - South-Eastern Asia - Indonesia", online: https://www.worldometers.info/world-population/us-population/, viewed in January 2025.

b. Emissions

	Consumption (kg per capita)	AD sales (1,000 tons)	AD emissions (1,000 tons CO$_2$e)
Pork	1.2	0.4	1.0
Poultry	10.7	3.5	0.3
Beef & veal	2.3	0.7	20.5
Other meat**	0.9	0.3	4.3
Meat total (carcass weight)	15.1	4.9	26.0
Cheese	2.3		
Milk	4.4		
Yoghurt	0.7		
Milk-products (ex. yoghurt)	9.5		
Other dairy	7.2		
*Dairy total**	24.1	7.8	16.3
Eggs	19.5	6.3	0.5
Total			**43**

Note: * In milk equivalents. Milk equivalents are derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), skim milk (0.70), liquid milk (1.0). Averages were derived for the categories "Milk-products (incl. yoghurt)" and "Milk-products (ex. yoghurt)" based on the conversion factors for milk powder skim/whole milk powder, whole condensed/evaporated milk, yoghurt, cream, and skim milk. "Other dairy" includes butter, unless stated otherwise. ** Methane emission for "other meat" assumes sales of other poultry than chicken plus sheep/lamb.

Sources: *OECD* (n.d.), "Meat consumption: Beef and veal, Sheep meat, Poultry meat, Pork meat, Kilograms/capita - retail weight, 2022 and 2023", online: https://data.oecd.org/agroutput/meat-consumption.htm, viewed in January 2025; Darmawan, C. (2024, November), *Dairy and Products Annual - Indonesia*, USDA Gain Report ID2024-0038; *FAOSTAT* (n.d.), "Food Balances (2010-): Food supply quantity: 2022", online: https://www.fao.org/faostat/en/#data/FBS, viewed in January 2025; *FAO* (n.d.), "GLEAM 3 dashboard: Emission Intensities: GLEAM Regions", online: https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/, viewed in February 2025.