



Top Five Factory Farming Climate Culprits Scorecard

Background rationale and technical paper



About World Animal Protection

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Cover photo: Factory farming of pigs involves cruel production practices including tail cutting, cages, castration and overcrowding. It is often overlooked as a climate culprit. Credit: Andrew Skowron



Photo: Wildlife is also affected by factory farming - Soy monocrop expansion for animal feed production generates bushfires. An alligator killed by the drought and forest fires that hit the Pantanal - Brazil in 2020. Credit: Lucas Ninno / Getty Images

Executive summary

The April 2022 Intergovernmental Panel on Climate Change (IPCC) report focusing on mitigation has increased the focus on food systems, underscoring the need for rapid transformation to avoid the worst climate impacts.

According to the IPCC, even if all fossil fuel emissions were immediately eliminated, food system emissions alone would jeopardise the 1.5°C target and threaten the 2°C target set by the Paris Agreement.

Factory farming is often overlooked in the climate debate even though the climate impact of factory farming puts achievement of the Paris Climate Agreement goals and a climate-safe future out of reach.

Research released in 2022 by World Animal Protection found that consumption of factory-farmed chicken alone in four major production hot spots (Brazil, China, Netherlands and USA) creates the same climate change impact as driving almost 29 million cars year-round¹.

The research found that the resource-intensive business model of factory farming relies on a global trade in crops to feed animals suffering in cruel factory farms worldwide. Soy, corn, poultry, pork and beef are acknowledged as high-risk deforestation commodities², linked to large-scale emissions. Destruction of wild animal habitats (land use change) also risks disease spread, and contributes to biodiversity loss, wild animal suffering and depletion of carbon sinks.

Production of crops to feed farmed animals also requires large volumes of water and energy for growth and processing, fossil fuel-intensive pesticides and fertilisers, and transport.

On factory farms, energy is used for lighting, heating and ventilation. Methane is a powerful greenhouse gas released from manure on factory farms, especially from pigs.

With demand for meat expected to skyrocket in coming decades, attention is turning to the outsized role of the world's biggest meat companies in our climate crisis. Not only do these companies bear responsibility for contributing to climate change, they condemn billions of sentient animals to lives of cruelty on factory farms.

Our Top Five Factory Farming Climate Culprits scorecard finds that:

- The world's 5 biggest factory farming companies are responsible for emissions equivalent to 36.4 million cars on the road annually.
- JBS is a factory farming giant, slaughtering more animals than any other company globally. Its pig and chicken production alone causes emissions equivalent to 14 million cars on the road each year, more than double the second-biggest factory farming emitter.

- The biggest component of JBS emissions comes from producing feed for animals suffering in cruel factory farms, causing emissions equivalent to 7.8 millions cars on the road each year.

The factory farming business model is often defended based on upholding food security. Nothing could be further from the truth. Meat and dairy provide only 18% of overall calories and 37% of protein for humans, but they use 83% of farmland³. It is far better to grow crops that feed humans directly through mostly plant-based diets in the interests of food security.

The five biggest meat processors must:

- Have robust timebound commitments to stop destroying wild animal habitat and unlocking carbon to the atmosphere when land is cleared to grow crops to feed farmed animals.
- Have credible climate action plans that account for emissions from animal feed (Scope 3) and publicly report against them.
- Stop producing more and more factory farmed meat and dairy. Instead, produce more plant-based foods and ensure animal products are high welfare to address the climate, biodiversity and food security crisis.
- Stop the cruelty on remaining factory farms by implementing **FARMS** standards at minimum.



Photo:

Fires are lit in Mato Grosso state, Brazil, to clear land for soy plantations. Most soy goes to feed farmed animals, not to people. Credit: Noelly Castro / World Animal Protection

Objective

Our Top Five Factory Farming Climate Culprits scorecard compares emissions from intensive pig and chicken meat of the world's five biggest meat processors to shine the light on their outsized impacts on our climate.

Pigs and meat chickens are chosen as they are commonly factory farmed land animals, with strong projections of growth in coming decades. They suffer enormously in these systems.

Within the factory farming business model, production and processing of feed crops for farmed animals is especially emissions-intensive and destructive of wildlife habitat.

Most food businesses fail to accurately account for emissions from these upstream emissions under so-called Scope 3. As a result, they underestimate their overall emissions footprint.

For this reason, within the scorecard emissions associated with animal feed are separately calculated within the emissions total for each of the five biggest meat processors.

It's high time that the biggest meat processors redirect their business model away from cruel and emissions-intensive factory farming to a diversified portfolio focusing on plant-based foods and smaller volumes of high welfare meat and dairy.



Scope

The world's biggest five meat chicken processing companies and five biggest pig processing companies have been selected for this scorecard. This is based on number of heads of animals processed, using data sourced as outlined in latter sections of this document.

Number of heads slaughtered (processed) has been identified against markets relevant for the profiled companies. In some cases, this relates to operations in one market only, whereas for some companies it relates to operations across more than one market. This distinction is made clear in the tables in the Result section.

The scorecard considers emissions from all stages of production and inputs used in chicken and pork production, from farm to slaughter.

Emissions used in calculations in this report include carbon dioxide, methane and nitrous oxide, converted to a carbon dioxide equivalent measurement to compare across categories.

It should be noted that practices leading to these emissions also inflict animal suffering, environmental pollution, habitat destruction, and contamination of human food sources and water ways. These additional negative harms are out of scope for the scorecard.

Methodology and data sources

Total slaughter volumes of chickens and pigs by company

A range of sources were consulted to identify the number of meat chickens and pigs slaughtered by the companies in scope each year. Sources included consolidated industry reports such as the WATT ranking lists and annual reports of the companies (see data in Results section Tables 1 and 2). All data sources are listed at the end of the document.

All profiled companies were also contacted to provide relevant information. Please see the Responses of companies section that outlines the communication to and from these companies.

Where profiled companies were unable or unwilling to provide information, data was drawn on average emissions associated with stages of production and processing from the report “Environmental implications of alternative pork and meat production systems in the US, China, Brazil and the EU”⁴ commissioned by World Animal Protection in 2022 (<https://www.blonksustainability.nl/news-and-publications/publications/>).

Data drawn from this report is included in the Results section in Tables 2 and 4 for chickens and pigs respectively. Data on average emissions associated with animal feed as one component of overall emissions profile is included in Tables 3 and 5 for chickens and pigs respectively.

Total greenhouse gas emissions for slaughtered chickens and pigs by company

The factor for GHG emissions (**TFactorGHG_k**) is a variable obtained from the report commissioned by World Animal Protection, “Environmental implications of alternative pork and meat production systems in the US, China, Brazil and the EU” (Blonk Consultants, 2022) and determines the amount of GHG emissions per kg of the functional unit of chicken and pig including both life cycle emissions and land use change. The Blonk Consultants report describes the emissions per functional unit for four countries (the Netherlands, Brazil, the United States and China). When specific values were not publicly disclosed or provided upon request by the selected companies, values for country of production were used instead.

The equation to calculate the total GHG emissions for each selected company was adapted from the Institute for Agriculture & Trade Policy (IATP)⁵ methodology developed by the United Nations Food and Agriculture Organization - the Global Livestock Environmental Assessment Model (GLEAM)⁶.



Photo: Overcrowded conditions for pigs at a factory farm in an undisclosed location in Europe. Factory farming is highly emissions-intensive. Credit: World Animal Protection / Tracks Investigations

Proportion of greenhouse gas emissions from feed production within total by company

Commodity feed production contributes the majority of the chicken and pig industries' contribution to greenhouse gas emissions. Therefore, the scorecard provides the overall emissions per company as well as the proportion of emissions for which commodity feed production is responsible. Given that some companies do not report the amount of feed purchased or produced, the scorecard uses two different equations to calculate greenhouse gas emissions depending on the data available.

Equation 1.1 GHG Emissions caused by feed

$$\text{Feed GHG CO}_2 \text{ Kg Eq}_{inxi} = \text{Feed}_{in} * \text{FFactorGHG}_{xi}$$

Where:

Feed GHG CO₂ Kg Eq_{inxi} = is the annual total GHG emissions originated by total feed production (i) destined for (n) animals in company (x) and located in country (j).

Feed_{in} = is the (i) total annual animal feed production in 1,000 metric tons for (n) animals.

FFactorGHG_i = is the GHG emission factor expressed in GHG CO₂ kg of feed by company (x) in country (j). (Table 5)

The amount of feed (**Feed_{in}**) consumed by the animals produced by the company per year was obtained from the report of the World's Top Feed Companies in the digital version of Feed Strategy (2022)⁷.

The feed factor for GHG emissions (**FFactorGHG_i**) was obtained from the report commissioned by World Animal Protection, "Environmental implications of alternative pork and meat production systems in the US, China, Brazil and the EU"⁴.

Where data was unavailable on the total amount of feed used by a company per year, an alternative approach was used. This involved calculating the amount of commodity feed used by multiplying the total number of animals slaughtered by their live weight and by their feed conversion ratio (FCR). This gives an estimate of the total amount of feed used for chickens or pigs. This value can then be multiplied by the feed factor of GHG emissions per kg of CO₂ per kg of feed. The equation is as follows:

Equation 1.2

$$\text{Feed GHG CO}_2 \text{ Kg Eq}_{nikxi} = \text{Animals}_n * \text{Live}_i * \text{Conversion}_k * \text{FFactorGHG}_{xi}$$

Where:

Feed GHG CO₂ Kg Eq_{nikxi} = the total amount of GHG emissions in kg of CO₂ Eq of (n) animals slaughtered by (x) company in the (j) country with average live weight (i) and conversion_k.

Animals_n = the total number of animals slaughtered in one year by the selected company.

Live_i = the average live body weight (kg) of the slaughtered animals.

Conversion_k = the (k) amount of feed necessary to produce 1 kg of live body weight. (Table 6)

FFactorGHG_{xi} = the amount of GHG emissions in kg of CO₂ eq of (x) industry located at the (j) country per unit of feed produced.

Equivalence of greenhouse gas emissions with numbers of cars on the road by company

The scorecard converts the total greenhouse gas emissions by company for meat chickens and for pigs to equivalent emissions associated with number of cars on the road.

The US Environmental Protection Agency (EPA)'s "Greenhouse Gas Equivalencies Calculator"⁸ is used. For the purposes of this scorecard, we assume a standard, gasoline fueled, 5 passenger sedan, 5 year old car with efficient inline combustion engine.

The scorecard also converts the emissions associated with commodity feed production to equivalent emissions associated with the number of cars on the road. The scorecard uses the results of Equation 1.2 (outlined above) to establish the emissions from commodity feed and then uses the same US EPA calculator to determine equivalency with cars on the road. Results are presented in Tables 9 and 10 in the Results section.

Photo: Broiler chickens in close confinement. Credit: Andrew Skowron



Results

Total slaughter volumes of chickens and pigs by company

In total, over 72 billion meat chickens are slaughtered globally every year⁹. The top five companies account for approximately 11.5 billion or 23% of global activity¹⁰ (Table 1). These figures capture operations of the profiled companies within the countries listed.

Table 1. Number of meat chickens slaughtered by the top five companies in the world (2021)¹⁰

Company	Country	Animals Slaughtered in millions
JBS S.A.	Brazil	4,426
Seara*	Brazil	2,008
Tyson Foods	US	1,900
BRF	Brazil	1,732
Pilgrim's Pride*	US, Europe & Mexico	1,526

* Pilgrim's Pride and Seara are business units of JBS

For pork production a total of 1.5 billion pigs are slaughtered every year⁸. The top five companies are responsible for 10% of this activity (Table 2).

Table 2. Number of pigs slaughtered per year by the top five companies in the world (2021)¹¹

Company	Country	Animals Slaughtered in millions
WH Group	China	48.30
JBS S.A.	Brazil	28.00
Smithfield's Foods (subsidiary of WH)	US	27.90
JBS USA	US	22.30
Danish Crown	Denmark	22.00

Total greenhouse gas emissions for slaughtered chickens and pigs by company

Table 3 shows the variables for meat chickens and Table 4 presents the same variables for pigs.

Table 3. Live weight, carcass yield and GHG emissions per kg for meat chicken production by country

Country	Live weight for chickens at slaughter (kg)	Carcass yield of chickens in percentage	GHG emissions (life cycle & land use change)/ kg CO ₂ eq
Brazil	2.84	74.20	5.80
China	2.75	74.10	3.34
Netherlands	2.45	73.50	4.02
United States	2.89	74.30	2.58

Table 4. Live weight, carcass yield and GHG emissions per kg for pig production by country

Country	Live weight for pigs at slaughter (kg)	Carcass yield of pigs in percentage	GHG emissions (life cycle & land use change)/ kg CO ₂ eq
Brazil	120.90	91.90	8.51
China	117.00	87.00	6.84
Netherlands	124.70	98.90	5.05
United States	129.30	96.20	4.84

Proportion of greenhouse gas emissions from feed production

Columns 1 and 2 of Table 5 present the greenhouse gas emissions in kg of CO₂ eq per kg of feed. For some companies information relating to chicken and pig feed was not considered complete or fully reliable, therefore, a weighted average GHG kg CO₂eq per kg of feed was calculated as presented in Table 5, column 6.

Table 5. Greenhouse Gas Emissions in kg of CO₂ eq per kg of feed for meat chickens and pigs by country

Country	Chickens ^a GHGE kg CO ₂ eq/kg feed	Pigs ^b GHGE kg CO ₂ eq/kg feed	Chickens ¹² production in 1000 metric tons	Pork ¹³ production in 1000 metric tons	Weighted Average of GHGE kg CO ₂ eq/kg feed
Brazil	2.10	1.71	14,850	4,410	2.011
China	1.25	1.12	14,300	51,000	1.148
Netherlands	1.54	0.92	980	12,310	0.966
United States	0.71	0.68	20,525	12,288	0.699

a – See Tables 11-14 of “Environmental implications of alternative pork and chicken meat production systems in the US, China, Brazil and the EU” (Blonk Consultants, 2022)⁴

b – See Tables 16-19 of “Environmental implications of alternative pork and chicken meat production systems in the US, China, Brazil and the EU” (Blonk Consultants, 2022)⁴

Table 6. Feed Conversion Ratio (FCR) for meat chickens and pigs by country produced under conventional systems

Country	FCR Chickens*	FCR Pigs**
Brazil	1.57	2.56
China	1.89	2.42
Netherlands	1.79	2.75
United States	1.52	3.50

* See Table 2 of “Environmental implications of alternative pork and meat production systems in the US, China, Brazil and the EU” (Blonk Consultants, 2022)⁴

** See Table 4 of “Environmental implications of alternative pork and meat production systems in the US, China, Brazil and the EU” (Blonk Consultants, 2022)⁴

Overall, the amount of greenhouse gas emissions from feed produced for chickens is lower compared to feed produced for pigs. This is because pigs need higher amounts of feed and more time to grow to reach the required slaughter weight.

Equivalence of greenhouse gas emissions with numbers of cars on the road by company

Table 7. GHG emissions by total production of meat chickens or pigs by country of origin with equivalencies of cars on the road for year 2021

Rank	Company	Location of Factory Farms	GHGE Chickens	GHGE Pigs	Total GHGE (metric ton CO ₂ eq)	Cars on the road
1	BRF S.A.	Brazil	21,022,225	9,511,945	30,534,171	6,579,174
2	Tyson Foods	US	13,539,654	14,682,336	28,221,989	6,080,970
3	Seara	Brazil	16,206,669	7,463,568	23,670,237	5,100,208
4	Pilgrim's Pride	US, Europe & Mexico	18,872,830	4,623,312	23,496,142	5,062,696
5	Smithfield Foods (subsidiary of WH)	US	No data	19,047,423	19,047,423	4,104,134
6	JBS Pork	US	No data	17,393,402	17,393,402	3,747,743
7	New Hope Group	China	8,847,911	5,569,949	14,417,859	3,106,605
8	Danish Crown	Denmark	No data	11,771,070	11,771,070	2,536,303
9	WH Group	China	No data	7,742,229	7,742,229	1,668,212
10	WH Group	Europe	No data	4,440,620	4,440,620	956,817

Since some of the profiled companies operate across multiple markets, it is important to calculate their global impact. Table 8 shows the total volumes of greenhouse gas emissions from these companies worldwide with their respective equivalencies in cars on the road.

Table 8. Global rank by company for GHG emissions and their equivalencies in cars on the road

Rank	Company	Location of Factory Farms	GHGE Chickens	GHGE Pigs	Total GHGE (metric ton CO ₂ eq)	Cars on the road
1	JBS (Seara, Pilgrim's Pride, JBS Pork)	Brazil, US, Europe & Mexico	35,079,499	29,480,282	64,559,781	13,910,646
2	WH Group (includes Smithfield Foods)	US, China, Europe	No data	31,273,257	31,273,257	6,729,163
3	BRF	Brazil	21,022,225	9,511,945	30,534,171	6,579,174
4	Tyson Foods	US	13,539,654	14,682,336	28,221,989	6,080,970
5	New Hope Group	China	8,847,911	5,569,949	14,417,859	3,106,605
6	Danish Crown	Denmark	No data	11,771,070	11,771,070	2,536,303

Calculations of greenhouse gas emissions from feed by company shows similar results across the top 5 companies (see Tables 9 and 10 below)

Table 9. Total GHG Emission with equivalency of cars on the road caused by meat chicken feed production for year 2021

No.	Company	Location of Factory Farms	Head slaughtered annually (WAP estimates)	Chicken Feed GHGE (metric ton CO ₂ eq)	Cars on the road
1	BRF	Brazil	1,720,000,000	18,566,099	4,000,423
2	Seara*	Brazil	1,326,000,000	14,313,167	3,084,047
3	Tyson Foods	US	2,444,000,000	8,837,496	1,904,208
4	Pilgrim's Pride*	US, Europe & Mexico	2,262,000,000	8,421,535	1,814,582
5	New Hope Group	China	1,300,000,000	6,238,232	1,344,147
	Total JBS	Brazil, US, Europe & Mexico	3,588,000,000	22,734,702	4,898,629

* Pilgrim's Pride and Seara are business units of JBS

Table 10. Total GHG Emission with equivalency of cars on the road caused by pig feed production for year 2021

No.	Company	Location of Factory Farms	Head slaughtered annually (WAP estimates)	Pig Feed GHGE (metric ton CO ₂ eq)	Cars on the road
1	Smithfield Foods (subsidiary of WH Group)	US	31,638,600	7,863,677	1,694,380
2	JBS Pork*	US	28,891,200	7,180,819	1,547,246
3	Tyson Foods	US	24,388,000	6,061,562	1,306,080
4	BRF	Brazil	10,060,000	5,919,046	1,275,372
5	Danish Crown	Denmark	18,900,000	5,828,346	1,255,829
6	WH Group	China	11,120,000	5,227,579	3,298,346
7	Seara*	Brazil	7,893,600	4,644,392	1,000,724
8	New Hope Group	China	8,000,000	3,760,848	810,347
9	WH Group	Europe	7,130,000	2,198,736	473,760
10	Pilgrim's Pride*	US, Europe & Mexico	6,308,284	1,738,146	374,517
Total WH Group		US, China, Europe	49,888,600	15,289,991	3,294,522
Total JBS		Brazil, US, Europe, Mexico	43,093,084	13,563,356	2,922,487

*JBS Pork, Seara and Pilgrim's Pride are business units of JBS

Table 11 summarizes the total volumes of greenhouse gas emissions from feed with their respective equivalencies in cars on the road. We can compare results with Table 8 to see the extent of greenhouse gas emissions coming from animal feeds.

Table 11. Global rank by company for feed GHG emissions and their equivalencies in cars on the road

Rank	Company	Location of Factory Farms	Chicken feed GHGE	Pig feed GHGE	Total feed GHGE (metric ton CO ₂ eq)	Cars on the road
1	JBS (Seara, Pilgrim's Pride, JBS Pork)	Brazil, US, Europe & Mexico	22,734,702	13,563,356	36,298,058	7,821,115
2	BRF	Brazil	18,566,099	5,919,046	24,485,145	5,275,795
3	WH Group (includes Smithfield Foods)	US, China, Europe	No data	15,289,991	15,289,991	3,294,523
4	Tyson Foods	US	8,837,496	6,061,562	14,899,058	3,210,289
5	New Hope Group	China	6,238,232	3,760,848	9,999,080	2,154,494
6	Danish Crown	Denmark	No data	5,828,346	5,828,346	1,255,829



Photo: Factory farming green house gas emissions (GHGE) are compared with the number of cars on the road per year - North American city. Credit: Josh Hild

Assumptions and limitations

All technical parameters by country come from the research commissioned by World Animal Protection, "Environmental implications of alternative pork and meat production systems in the US, China, Brazil and the EU"⁴ and all other sources consulted for the specific information by company are included in the Detailed Sources of Data section. If technical parameters such as the feed conversion ratio, live weight or carcass yield were not available for the company, the results for the country where the company is based were used instead.

All companies were asked to provide data as outlined in the section below, Responses of companies.

To calculate greenhouse gas emissions caused by feed production we calculated the amount of feed per slaughtered animal based on the average live weight and the average feed conversion ratio. For the live weight and feed conversion we used the averages for the country of production

For life cycle and land use change, where specific values could not be obtained for each company, the values for respective country location were used instead.

We noticed some discrepancies in the WATT Poultry reports for the number of heads slaughtered. This is explained because while some companies report on a yearly basis others report on a monthly or weekly basis. When production data was not presented on a yearly basis, monthly or weekly production data was used to calculate yearly production, under certain

assumptions. For instance, Tyson Foods reports a 6-day production week, or 312 days of processing activity per year for pigs, while for chickens Tyson Foods only reported a 5 day week or 260 days of activity per year¹⁴.

To calculate commodity feed production, we assumed the produced feed is only used for slaughtered animals inside the company. Feed produced for other feed buyers or companies was not included. Thus, these estimates may be considered the minimum feed production values for each company.

To increase the robustness of the results, a stochastic method could be used to estimate a range of greenhouse gas emission values for each company, rather than a unique estimated value as presented here. The stochastic model addresses the random behaviour of some variables in animal production, which can impact overall results. Variables such as live weight, carcass yield (equation 1.1) and feed conversion ratio (equation 1.2) should be considered as a range of probabilities describing a normal distribution. The use of secondary data is another factor that warrants the use of the stochastic model, as secondary data can be less reliable. The difference between the deterministic model presented in this report and the stochastic approach is that the latter would provide results in the form of ranges based on the automated analysis of a large number of possible scenarios. Another reason to consider a stochastic method is because the data comes from a secondary source it makes more sense to calculate a probability rather than a specific value.

Responses of companies

All profiled companies were emailed on 9th January 2023 seeking input to the scorecard by 27th January 2023. They were asked to provide answers to the following questions.

1. Number of chickens slaughtered in 2021 for relevant business units by country
2. Number of pigs slaughtered in 2021 for relevant business units by country
3. Annual feed production/purchasing in kg for chickens in 2021
4. Annual feed production/purchasing in kg for pigs in 2021
5. Status of your submission to Science Based Targets Initiative (SBTi), including a one page summary of your submission

Reminder emails were sent on 20th January 2023.

JBS responded stating that the requested data relates to business strategy and the company reserves the right not to disclose it. It stated that it is on track to provide detail to the Science Based Targets Initiative this year on how it will meet its climate net zero commitment by 2040.

A response was received from BRF seeking more time to provide the requested information. An extension of time was offered until 2 February 2023.

Danish Crown provided a comprehensive response referring to the company's ambition to reduce the carbon footprint of meat by 50% by 2030, its validation by the Science Based Targets Initiative (Scopes 1, 2 and 3) and claiming a 30% reduction in emissions from Danish pigs since 2005.

In response to the question on number of slaughtered animals, Danish Crown referred to its Annual Report and Sustainability Report whilst disputing that slaughter numbers can be used to verify climate impacts because emissions vary depending on farmer management practices.

No response was received from the other profiled companies.

A copy of the completed scorecard and data therein was provided two weeks prior to publication to all profiled companies with a request for them to notify World Animal Protection if they disputed any of the data. We also sent it to the Science Based Targets Initiative for information.

BRF provided a response with further information on its approach to addressing emissions. No response was received from any of the other companies within this period indicating the data needed updating.

The full responses from Danish Crown and BRF are published on the World Animal Protection website alongside the scorecard. It should be noted that the scorecard uses production figures consistent with the Danish Crown Annual Report.

Separately, a search of the Science-Based Target Initiative site by World Animal Protection reveals that:

- As part of its climate net zero commitment, Danish Crown has a target to reduce its absolute Scope 1 and 2 emissions 42% by financial year 2030 based on a financial year 2020 baseline. Danish Crown also commits to reduce its Scope 3 emissions on an 'emissions intensity' basis of 20% per kilogram of output produced. World Animal Protection believes that Danish Crown's (or any other meat processor's) commitment to reduce Scope 3 emissions on an 'emissions intensity' rather than 'absolute emissions' basis allows it to continue to grow emissions within this Scope as production levels of meat and dairy increase.
- Smithfield Foods (subsidiary of WH Group) is listed on the Science Based Targets Initiative site as having near-term target but no net zero commitment. Parent company WH Group is not listed. The Smithfield Foods website claims the company aims to become carbon negative by 2030.
- Tyson Foods is listed on the Science Based Targets Initiative site as having set a target consistent with reductions required to keep global warming to well below two degrees Celsius. This includes a target to reduce Scope 3 emissions by 30% on an 'emissions intensity' basis by 2030. No net zero commitment is listed.
- BRF and JBS are listed on the Science Based Targets Initiative site as having near-term targets and net zero commitments. The BRF website claims the company has a modest 'Scope 3' emissions reduction target but it is not clear where animal feed sits within this. JBS subsidiary, Pilgrim's Pride UK, has a target to reduce Scope 3 emissions by 30% on an 'emissions intensity' basis by 2030.
- New Hope Group is not listed on the Science Based Targets Initiative site.

In the absence of full transparency from companies, we have consulted external sources to estimate emissions connected to their businesses as outlined in Methodology and Data Sources.

What companies must do

The top five global chicken and pig processors have outsized climate impacts. They are also key players within a global factory farming system that condemns billions of animals to cruelty, destroys wild animal habitats, causes environmental pollution and significant harm to human health.

It is not good enough for companies to greenwash their performance by setting climate action plans that fail to acknowledge and deal with the climate impacts across their business.

Of the companies profiled, only a minority commit to address emissions from Scope 3 even though emissions from animal feed constitute a large proportion of overall emissions within the meat sector. This means the meat sector tends to underestimate its carbon footprint and greenwash its climate performance. Further, 'emissions intensity reduction' approaches for Scope 3 allows for continued growth in emissions within this Scope as production levels of meat and dairy continue to rise.

Companies must:

- Publicly release credible policies to end habitat destruction in animal feed sourcing without delay*.
 - Report publicly and transparently on emissions across their businesses (including upstream and indirect impacts) by setting robust and transparent emissions reduction plans that account for Scopes 1, 2 and 3. These plans should focus on absolute emissions reductions, not 'emissions intensity reductions' that allow for continued growth in emissions within this Scope as production levels of meat and dairy continue to rise.
 - Stop producing more and more factory farmed meat and dairy. Instead, produce more plant-based foods and ensure animal products are high welfare to address the climate, biodiversity and food security crisis. World Animal Protection seeks a 50% reduction in animal production across the industry by 2040.
- From 2030, start phasing out the use of human-edible feed crops for farmed animals. Substantial reductions in animal production will allow for a shift to humane and sustainable food. This includes a majority plant-based food production and fewer farmed animals living good lives outside factory farms with feed sourced locally and sustainably.
 - Ensure all animals remaining on factory farms are spared the worst forms of cruelty by enforcing [FARMS](#) animal welfare standards at minimum.

* Danish Crown and Tyson Foods commit to zero deforestation for soy by end 2025. BRF aims to end deforestation from grain sourcing from Amazon and Cerrado regions by 2025. These commitments allow for ongoing habitat destruction in the interim.

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Detailed sources of data on slaughtered chickens and pigs per year including calculations and notes

JBS (Brazil, US, Mexico and Europe)

- JBS Business Units for Pilgrim's Pride (includes Pilgrim's Pride de Mexico and Moy Park in UK), slaughtered heads of chickens were derived by multiplying 8,700,000 by 5 and 52. The 8.7 million figure came from JBS Institutional Presentation¹⁵.
- For Seara in Brazil, slaughtered heads of chickens were derived by multiplying 5,200,000¹⁵ by 5 and 52.
- For JBS Pork in the US, slaughtered heads of pigs were derived by multiplying 92,600¹⁵ by 6 and 52.
- For Seara, slaughtered heads of pigs were derived by multiplying 25,300¹⁵ by 5 and 52.
- For Pilgrim's Pride, slaughtered heads of pigs were derived using the following equation $(11,133 * 6 * 52 * 0.826) + (11,023 * 6 * 52)$. Figures taken from Pilgrims Form K-10 Pilgrim's Annual Report for the Fiscal Year 2021¹⁶ page 18

BRF (Brazil)

- Slaughtered heads of chicken at 1.72 billion was taken from BRF 2021 Integrated Report¹⁷.
- Slaughtered heads of pigs at 10.06 million was taken from BRF 2021 integrated Report¹⁷.

Tyson Foods (US)

- For slaughtered heads of chicken, we multiplied 47 million¹⁴ slaughtered chicken per week by 52.
- For slaughtered heads of pigs, we multiplied 469,000¹⁴ slaughtered pigs per week by 52.

New Hope Group (China)

- New Hope Group (NH) website¹⁸ <http://en.newhopegroup.com/sp/index.html>

WH Group (China, US and Europe)

- WH Group (China) website¹⁹ <http://www.wh-group.com/html/index.php>
- In 2020, JBS and WH Group signed a memorandum of understanding (MOU) for the supply and distribution of fresh beef, poultry and pork to the Chinese market. Through the MOU, JBS and WH Group will jointly offer a portfolio of Friboi and Seara branded products in a deal that could reach BRL3 billion (US\$710 million) in business per year²⁰.

Danish Crown (Denmark)

- Danish Crown (Denmark) Annual Report 2020/21 see page 5²¹ https://www.danishcrown.com/media/9866/2020-2021_en.pdf

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Glossary

Carcass yield (Carcass_i): percentage of the live weight in kilograms which corresponds to the amount of meat after processing.

Factor for GHG emissions (TFactorGHG_k): amount of GHG emissions per kg of the functional unit of chicken and pig including both life cycle emissions and land use change.

Factory farming: Farming practices that do not acknowledge the sentience and welfare of animals, and where negative animal welfare, environmental and labour impacts are significant yet not factored into the costs of production. The business model is characterised by concentrated and highly corporatized management, production efficiency and process control, monocultures, high production volumes, and a strong focus on cost minimisation. These systems are associated with damaging human and planetary health impacts.

Feed conversion ratio (FCR): the amount of feed necessary to produce 1 kg of live body weight.

Functional unit: equivalent to 1 kg carcass weight broiler chicken and 1 kg carcass weight pork.

Greenhouse gas emissions (GHGE): emissions from main greenhouse gases composed of CO₂, N₂O and CH₄.

Live body weight (Live_i): live weight of animals in kg before they are slaughtered.

Scope 1: Direct emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment.

Scope 2: Indirect greenhouse gas emissions from consumption of purchased electricity, heat or steam.

Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, animal feed, etc.


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