The Factory Farming Index

Quantifying factory farming's effects on animal welfare, human health, and the environment

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We are World Animal Protection. We're here to end animal cruelty and suffering. Forever. Putting animals first isn't just better for them, it's vital for our shared planet. It will take the combined power of people, companies, and governments to tackle the broken systems that cause animal suffering. Together, we can transform the lives of farmed and wild animals around the world.

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Contents

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Key findings

Despite factory farming beginning in the middle of the twentieth century, and now producing the majority of animal sourced food, there is very little research quantifying its multiple effects on animal welfare, human health, and the natural environment. The Factory Farming Index (FFI) is the first attempt to put into numbers the full harms caused by this industry which largely operates behind closed doors.

- We estimate 76 billion animals were factory farmed in 2020, with 46% of chicken, pigs, and cattle farmed in just four countries: China, Brazil, the USA, and Indonesia.
- On average, 10 chickens, pigs, and cattle (collectively) are factory-farmed per person per year. Israel, Qatar, Belarus, and Panama consume the largest number of factory farmed animals in their diets on a per person basis (39, 33, 32, and 32 respectively). This is due to high chicken consumption, large domestic factory farming systems, and imports from countries with large factory farming sectors.

Human health impacts

- The animal agriculture sector used an estimated 100,000 tonnes of antibiotics in 2020. This is three times higher than antibiotics used for humans (Mulchandani et al. 2023). For the three species which are the focus of the Factory Farming Index - chickens, pigs, and cattle - 66,000 tonnes of antibiotics were used in factory farms, double that used by humans.
- Due to the high volumes of animal excreta, factory farms emit pollutants which may cause pulmonary disease in humans, particularly for those living or working near factory farms. In total, we estimate they emit ~8 million tonnes of ammonia, ~260,000 tonnes of nitrous oxide, and ~230,000 tonnes of fine particulate matter.
- Around 2,100 trillion calories from crops are fed to factory farmed animals. This is a quarter of the world's food calories, enough to feed about 2 billion people.
- Of those, only about 17–30% come back to humans as meat, dairy, or eggs – meaning up to 70% of trillions of food calories are lost converting crops to intensively farmed animal products (Cassidy et al. 2013).
- Factory farming also drives down animal product prices and has driven the huge global increase in meat consumption (Whitton et al. 2021).
- Diets containing high shares of red and processed meat are linked to some cancers, bowel and cardiovascular disease and other health conditions. The IPCC notes that agriculture is a significant source of greenhouse gas emissions globally, contributing about 21% to 37% of total anthropogenic GHG emissions when considering the entire food system (Mbow et al. 2019).
- Factory farming uses ~14% of the world's irrigation water to grow feed crops, which causes water scarcity in many regions, driving shortages for humans.
- Considering all these pathways in a comprehensive modelling framework, we calculate that factory farming causes 1.8 years of healthy life to be lost per person on average globally. The main cause of this is antibiotic resistance (56% of the human health burden of factory farming). Put simply, whether you eat factory farmed animal products or not, the factory farming system is likely to be cutting your life expectancy, and the average life expectancy of all humans.
- The FFI's estimate of the human health burden of factory farming is probably an underestimate: aquaculture systems, buffaloes, and small ruminants are not included in our database; some disease pathways are missing (e.g., nitrates in drinking water caused by animal excreta; increased pandemic risk caused by factory farms); and it does not include projected future risks of antibiotic resistance (which could destabilise the entire global healthcare system which relies heavily on antibiotics).

Environmental impacts

We estimate that the factory farming of chickens, pigs, and cattle:

- Creates ~3.5 billion tonnes of greenhouse gas emissions. This is close to the European Union's total domestic emissions (3.6 billion tonnes CO_2eq) and is more than half of the livestock agrifood system greenhouse gas emissions of 6.2 billion tonnes CO_2eq (FAO 2023, EUROSTAT 2025).
- Emits ~21 million tonnes of substances which cause eutrophication, a form of water pollution related to excess nitrogen and phosphorus (around 25% of total human-caused eutrophication).
- Uses 530 trillion litres of water each year (~14% of human freshwater withdrawals).
- Uses around 350 million hectares of cropland. This is an area the size of India.

There is a worrying oversight here: on the one hand, factory farming is a major contributor to multiple environmental problems; and on the other it receives virtually no attention in climate and biodiversity policymaking. It is imperative to know why this oversight exists and how to address it.

Animal Welfare: Shortened lives

- We estimate that today, farmed chickens live for just 5% of their potential lifespan, and pigs live just 4%. These are global averages, and in industrialised countries like the USA, factory farmed chickens can live for as little as 35 days (1.3% of their potential lifespan) and pigs for 160 days (3%).
- These animals are therefore deprived of meaningful social interactions that require time (e.g., bonding experiences, satisfaction of maternal instincts, and group playfulness) and the expression of a full range of rewarding normal behaviours (e.g., environmental exploration and establishment of group hierarchies).
- Cattle live for 30% of their potential lifespan, given many are in the dairy system where productive lives are longer.
- In total, 550 billion years of potential animal life are lost due to premature death from slaughter, culling, and on-farm mortalities in factory farms each year.

Animal Welfare: Farming and slaughter conditions

- Using a ranking system previously developed by World Animal Protection from A-G, where 'A' represents the provision of the strongest animal welfare legislation and 'G' represents non-existent or extremely limited animal welfare legislation, we found that 44% of factory farmed chickens, pigs, and cattle live in the worst three conditions globally (E, F, and G).
- We also searched databases of national legislation to identify which countries regulate animal slaughter and what regulation they have. We found that 13% of factory farmed animals are produced in countries where there is no legislation related to slaughter at all. Some 61% of factory farmed animals are produced in countries where there are laws related to slaughter but in which there is no legal requirement for pre-cut stunning. Furthermore, 25% of factory farmed animals are produced in countries where pre-cut stunning is required but in which exemptions are permitted (such as for ritualistic slaughter e.g., halal, kosher, and jhatka).

Conceptualising this Animal Welfare burden

The Moral Weight Project (Rethink Priorities, 2023; Fischer (ed.), 2024) has recently attempted to estimate the differences in the intensity of positive and negative welfare that different species of animals can experience compared to humans. Using this framework, we can express both the loss of life in human equivalent years, and the physical and mental harm caused during farming and at slaughter in terms of the loss of healthy years of life for animals. Perfect welfare conditions lead to no loss of healthy life, whereas the worst welfare conditions lead to the full loss of healthy life (equivalent to death). Here, we provide the first estimates of the total global loss of factory farmed animal healthy life, expressed in welfare units, healthy years lost.

- In total, 94 billion years of healthy life are lost by factory farmed chickens, pigs, and cattle every year because these animals' lives are intentionally shortened to maximise production and profit. The countries driving this burden the most are China, the USA, and Brazil.
- Additionally, during their short lives, 9 billion years of farmed animals' lives are lived in the worst factory farming conditions globally. The countries contributing the most to this burden are China, Indonesia, and India, largely due to the scale of production and low welfare standards.
- It is very hard to conceptualise these vast numbers; however, we suggest a few comparisons:
    - Firstly, we can divide these results by the total human population, and find that one person, on average, is responsible for the loss of 13 healthy life years for farmed animals each year through the purchase of factory farmed animal products. We can again account for imports and exports and look at results per country, finding that some countries have an outsized burden. Specifically, Israel, Qatar, Panama, and Belarus drive the loss of 50, 44, 42, and 42 years of healthy life respectively each year through their high consumption of factory farmed animal products.
    - Secondly, we can say that, globally, on average, each person is responsible for one factory farmed animal living through one year of the most intense suffering. Thirdly, the Global Burden of Disease database estimates that in 2020, 2.8 billion years of healthy human life were lost due to disease and premature death. The burden of loss of healthy life for factory farmed chickens, pigs, and cattle is ~37-times higher.

Our work quantifies the scale of harm caused by factory farming systems. Immense animal suffering and the deprivation of animal life are normalised but hidden from view. The system also creates major human health and environmental burdens.

Report structure

This report summarises the Factory Farming Index (FFI), painting a detailed picture of the true scale and nature of factory farming at a global level. In part one, we describe the data used in the FFI and highlight new insights from this data. In part two, we summarise the methods and approach used to develop the FFI, with a more comprehensive account of the methods available in the separate Methods document. Part three contains the results section, identifying the worst and best performing countries from both the *production* and *consumption* perspectives. Finally, part four, focuses on how to change the system. We conclude that a whole package of measures would be necessary to tangibly improve the lives of factory farmed animals, including not just improving welfare standards on farms and at the point of slaughter, but also extending their lifespans in countries which have already addressed the most serious welfare concerns. The sheer scale of impact of factory farming on animal welfare, human health and our environment is further evidence for our need to transition to equitable, humane, and sustainable food systems.

Part One: A global picture of the factory farming system

The number of animals farmed

There are different ways of estimating the number of animals farmed each year. For example, the Food and Agricultural Organization of the United Nations (FAO) provides data on the stocks of farmed animals in virtually every country at a point in time in a year. Hence, FAOSTAT data offers a snapshot of the number of animals farmed in a year. However, because many farmed animals (particularly chickens raised for meat and pigs) live for less than a year in farm systems, reliance on stock numbers at a given time leads to an underestimation of the numbers farmed. Indeed, the average global life expectancy of a farmed chicken is 4 months, and the average global life expectancy of a farmed pig is 8 months. Hence, a single snapshot of stocks fails to account for the multiple life cycles (i.e., from birth to slaughter) on a farm each year.

Another approach for estimating the number of animals farmed each year is to consider the number of animals slaughtered each year, data which the FAO also provides. However, conversely, because some farmed animals (notably egg layer hens and dairy cows) live for longer than a year in farm systems, using slaughter data as a proxy for the number of animals farmed in a year will likely lead to underestimations.

To correct for these underestimations, the FFI method for estimating the total number of animals farmed in a year uses stock numbers for animals which live longer than a year and slaughter numbers for animals which live less than a year. The FFI then also corrects for culling (e.g., of male chicks in egg-production systems) and mortality on farms. More comprehensive details on the methods used are available upon request in the associated Methods document.

In total, we estimate over 100 billion land animals live on farms of all types in any year, excluding farmed insects. This already staggering number excludes aquatic species which are also intensively farmed but which are not accounted for in terms of the number of individual animals farmed, rather in terms of tonnes harvested. However, the best current estimates suggest that aquatic species are farmed in the hundreds of billions each year (Fish Count, 2025).

Species included in the FFI

In its current form the FFI focuses exclusively on factory farmed chickens (including layer hens), pigs, and cattle. The eggs, meat, and dairy products from these animals contribute 85% of human animal-source protein production (FAOSTAT, 2024). These animals represent 92% of the number of land animals farmed per year (FAOSTAT, 2024), excluding insects. In total, we estimate 92 billion chickens, 1.5 billion pigs, and 1.5 billion cattle live on farms in any year.

The number of chickens, pigs, and cattle in factory farms

Despite "factory farming" being a widely understood concept, there is no single universally agreed definition of a "factory farm." The definition of factory farms used in the FFI considers information on three important features: stocking densities, farm size, and an animal's access to outdoor space (see Table 1 and the Methods document for more details). For many countries, however, data on factory farming is scarce, and the FFI has therefore relied on the best-available estimates.

Photo credit: World Animal Protection / Evans Kipkorir

Table 1. Definitions of factory farming.

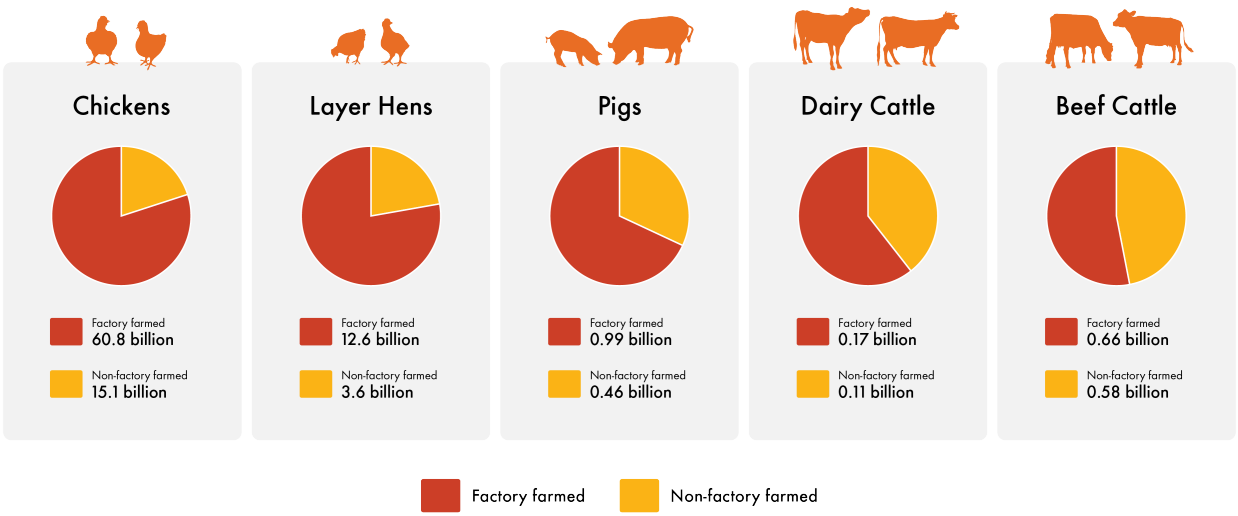
	Broiler (Meat) Chickens	Layer Hens	Pigs	Dairy Cattle	Beef Cattle
Density Based Definition	More than 12 chickens per m^2 indoor, and access to less than 1 m^2 outdoor space per bird.	More than 9 hens per m^2 indoor, and access to less than 4 m^2 outdoor space per bird.	Access to less than 12m^2 of outdoor area per pig.	None	None
Farm Size Based Definition	Over 37,500 chickens	Over 25,000 hens	Over 750 pigs	Over 200 mature cattle	Over 300 cattle or cow/calf pairs
Outdoor Access Based Definition	Not certified using an outdoor related practice (e.g., free range).	Not certified using an outdoor related practice (e.g., free range).	Not certified using an outdoor related practice (e.g., free range).	Not certified using an outdoor related practice (e.g., free range).	Not certified using an outdoor related practice (e.g., free range).

Based on this understanding of factory farming, the FFI estimates that there were approximately 73.5 billion chickens and layer hens in factory farms in 2020, 1 billion pigs, and 800 million cattle.

Table 2. Numbers of animals in factory farms in the year 2020.

million / yr	Chickens	Pigs	Beef Cattle	Dairy Cattle	Layer Hens
East Asia Pacific	16,595	456	63	15	7,176
Latin America / Caribbean	12,103	95	151	22	1,380
North America	10,375	182	59	7.3	667
Europe	6,778	196	41	7.1	545
Middle East	5,718	0.2	43	20	628
Africa	3,674	12	154	26	588
Russia	2,254	37	7.5	4.3	316
South Asia	1,853	3.2	132	58	922
Central Asia	1,478	12	11	10	427
Total	**60,827**	**994**	**661**	**170**	**12,649**

Figure 1. Shares of animals in factory farms in the year 2020.



Life expectancies on farms

The life expectancies of animals in factory farms are massively reduced relative to the life expectancies of animals in optimal farming conditions, understood as conditions in which animals enjoy the highest standards of welfare and are given sufficient opportunities to explore and display natural behaviours (e.g., environmental exploration, social interaction, satisfaction of maternal instincts etc.). Whilst length and quality of life are two distinct concepts, it is important to note that a significantly reduced lifespan has implications for quality of life. With too little time, farmed animals lose opportunities to meet basic needs such as resting, roaming, or foraging. They are also deprived of higher needs: to explore and learn; to form social bonds; and to exercise autonomy in making choices, expressing themselves, and even taking risks.

The natural life span of chickens, pigs, and cattle in optimal conditions has been estimated as 7.5, 15, and 20 years respectively (Scherer et al. 2018). In contrast, global averages of the lifespan of factory farmed chickens, pigs, and cattle are respectively 4 months, 8 months, and 5 years.[1] Put differently, farmed chickens are typically slaughtered after living for just 5% of the time they could be expected to live and pigs after living for just 4% of their potential lives. For cattle the situation is a little different because they can produce milk for several years, or because cows producing calves tend to be kept for several years before slaughter. Even so, factory farmed cattle are slaughtered after living just 30% of their estimated natural lifespan in optimal conditions. For further details on how these figures have been reached, see the separate Methods document.

Conditions in factory farms

Animal welfare conditions in factory farm systems are, by definition, sub-optimal. While some factory farming systems provide higher standards of welfare than others, the fact remains that animals suffer not only as a result of living in intensive conditions (where freedom of movement and social expression are inhibited) but also as a result of inadequate resources to manage their individual physical and mental health needs. Biologists, farm managers, and advocacy groups alike recognise that animal welfare is a multi-dimensional and evolving concept, which encompasses not only the physical but also the psychological health of an animal. The irreducibly subjective element – an animal's emotional and mental state – makes welfare difficult to assess because animals cannot verbally communicate their feelings. Nevertheless, the "five domains" model provides a firm basis for assessing welfare by evaluating how provisions within the physical domains of health, nutrition, environment, and behavioural interactions influence an animal's mental experience (Mellor et al. 2020).

Due to a lack of outcomes-based animal welfare data (i.e., data capturing on-the-ground realities of welfare conditions in factory farms globally), the FFI uses data from the Animal Protection Index (API) to capture information about the legal status of animals in 50 countries collectively responsible for the production of 90% of the world's factory farmed chickens, pigs, and cattle. Information concerning the legal status and protections afforded to farmed animals is translated into a ranking system to capture the estimated welfare conditions of factory farmed animals in different countries. The API ranks countries from 'A' to 'G', where A represents welfare free from substantial mental and physical harm, such that there is a 0% reduction in animal welfare and G represents non-existent or extremely limited welfare legislation such that there is 100% reduction in animal welfare. Of course, as numerous undercover investigations into factory farms have shown, there are important questions about compliance with animal welfare legislation. However, assuming compliance, the FFI finds that globally, the percentage of factory farmed animals living in welfare conditions from A to G are as follows: A – 0%; B – 3%; C – 17%; D – 36%; E – 18%; F – 23%; G – 3%. Put simply, using the API as a limited proxy for estimated welfare conditions for farmed animals, no country has optimal welfare conditions, and the majority are very far from this.

Slaughter conditions

In addition to facing variable welfare standards whilst living on factory farms, animals also experience different degrees of physical pain and psychological distress at the point of slaughter. The FFI does not capture all the components affecting animal welfare in the slaughter process, such as the impact of witnessing the slaughter of other animals. Nor does the FFI consider the effects of transportation from farm to slaughterhouse on animal welfare.

There is more to the harm involved in the slaughter process than the method of slaughter alone. Nevertheless, the FFI uses information on permitted slaughter methods in different countries to determine the degree of pain and distress at the time of slaughter. The FFI ranks countries on a scale reflecting the impacts of permitted slaughter methods on animal welfare where the most harmful methods do not require stunning and the least harmful methods require stunning without exception (i.e., where ritual slaughter is banned).

[1] We are unable to quantify lifespans of factory farmed and non-factory farmed animals separately at a global level, and these numbers are for all farmed animals, although they primarily represent factory farming as this system dominates global production.

While the nature of an animal's death is of great moral significance, the FFI takes the relatively short amount of time animals spend at the slaughterhouse into account. Hence, even though a more humane vs. an inhumane death is important, the conditions at slaughter have a relatively small effect on the overall welfare of factory farmed animals because slaughter duration is measured in days whereas lifespan duration is measured in months, or, occasionally, years.

Human health effects

Factory farms use substantial quantities of antimicrobials (particularly antibiotics). This is often essential to prevent disease outbreaks that are likely in confined and crowded conditions with close contact with excreta. Total global antimicrobial use for farmed animals has been estimated at ~100,000 tonnes for the year 2020 (Mulchandani et al. 2023). We estimate, of that, 66,000 tonnes (66%) of total antimicrobials are used to factory farm chickens, pigs, and cattle.

We also estimate that factory farms create around 8 million tonnes of ammonia, 260,000 tonnes of nitrous oxide, and 230,000 tonnes of PM2.5 (particulate matter with a diameter smaller than 2.5 micrometres). These emissions have been linked to a range of pulmonary health conditions, particularly for those living or working near factory farms.

Factory farms are heavily dependent on purchasing crops like wheat, maize, and soy to feed their animals. We estimate that around 2,100 trillion calories worth of crops are fed to factory farmed animals, around a quarter of the world's food calories, and enough to feed over 2 billion people. Up to only a third of these calories get returned to human diets through animal products. Growing food exclusively for direct human consumption could, in principle, increase available food calories by as much as 70%, which could feed an additional 4 billion people (Cassidy et al., 2013). It is therefore likely that factory farming is contributing to global caloric deficiencies in humans.

Furthermore, excess animal product consumption among some populations, particularly red and processed meat consumption, is linked to colorectal cancer, heart disease, type 2 diabetes, stroke, kidney disease, and possibly dementia (Springmann et al., 2020). This is largely driven by high consumption of these products, made possible by factory farming systems which produce meat so cheaply.

While in some countries, the nutritional benefits that animal products provide may outweigh their health costs (Godfray et al. 2018), at a global level factory farming is almost certainly inflicting net negative toll on human health. Indeed, there are many substitutes to animal products that deliver nutritional benefits without the harm (Springmann et al., 2020).

Photo credit: World Animal Protection

Environmental effects

While factory farming may have lower emissions at the farm level compared to other, more traditional, types of animal agricultural production - since shorter lifespans mean animals consume less feed and emit less directly - it relies heavily on soy and maize feed linked to deforestation and other land-use changes. When these wider impacts are considered, factory farms are often associated with higher overall greenhouse gas production and climate costs. By contrast, free-range or regenerative systems may show higher direct emissions per animal or per kilogram of meat, but may result in lower overall emissions once land use, feed supply chains, and potential soil carbon sequestration are factored in. Factory farms therefore cannot be considered low-emission food systems. A Methods document with further detail on this is available upon request.

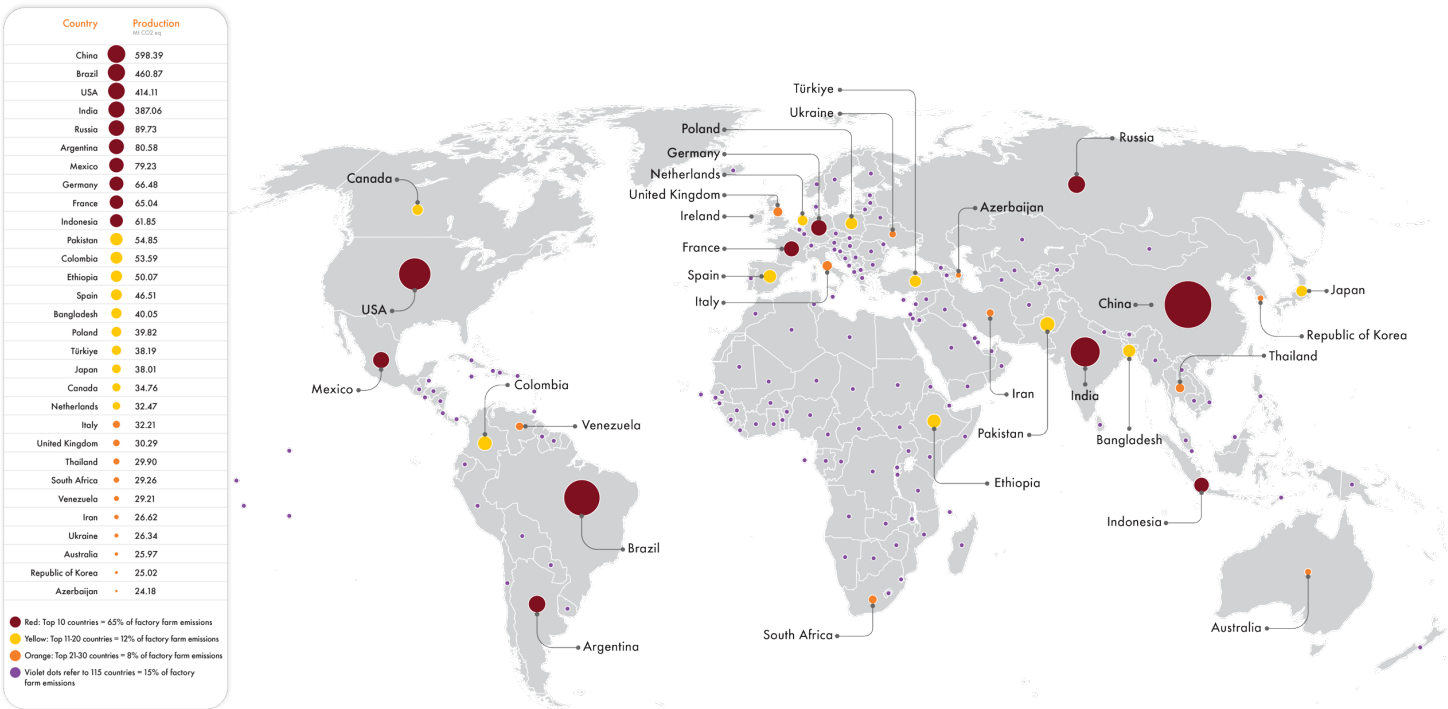
Factory farms concentrate vast numbers of animals into confined areas, generating large volumes of manure and nutrient waste. Widespread anecdotal and regional evidence shows that factory farms often overwhelm local ecosystems, fuelling dead zones in rivers, lakes, and coastal areas.

There is also a lack of data on whether factory farms use more or less cropland and more or less water than non-factory farms. Again, the high use of crops as animal feed suggests a potentially higher burden. Overall, we identified a major gap in scientific data in this area.

Here, we use data from the Food and Agriculture Organization's GLEAM database for estimated GHG emissions of factory farmed cattle, but otherwise use the Poore & Nemecek (2018) database, assuming factory farmed emissions are the same as global average GHG emissions for each factory farmed product (see the Methods document for more detail). We estimate that factory farming:

- Creates 3.5 billion tonnes of greenhouse gas emissions (Poore & Nemecek (2018). This is close to the European Union's total domestic emissions (3.6 billion tonnes, EUROSTAT 2025).
- Emits around 20 million tonnes of substances which cause eutrophication, a form of water pollution related to excess nitrogen and phosphorus (around 25% of total human caused eutrophication (Poore & Nemecek 2018).
- Uses 530 trillion litres of water each year, ~14% of human freshwater withdrawals (Poore & Nemecek 2018).
- Uses around 350 million hectares of cropland. This is an area the size of India.

Figure 2. Greenhouse gas emissions from factory farming (million tonnes of CO_2 equivalent).



Social effects

The harmful impacts of factory farming on animal welfare, human health, and the environment are quantifiable and objectively measurable. However, the negative effects of factory farming are not limited to these three areas of major concern but extend beyond them to include socio-economic considerations also. For example, factory farms have not only rivalled, and in some geographies replaced, more traditional methods of farming (which some would consider a cultural loss), they also tend to be located close to already socially disadvantaged groups, and are more prevalent in black, Indigenous, and minority ethnic communities where the health impacts of factory farming (e.g., from inhaling ammonia emissions) can exacerbate existing health inequalities (Cappiello, 2021). And, although factory farms provide work for local communities, the reality is that much of this work is physically and psychologically harmful. There are many reported incidents of injury, overwork, and PTSD amongst factory farm and slaughterhouse workers who either participate in or witness the slaughter of countless animals daily (Human Rights Watch, 2004; MacNair, 2023).

Other ways in which factory farming can negatively impact society include its undermining effects on food sovereignty (requiring large amounts of imported animal feed) and its effects on food security (as significant calorie shares are lost to animal feed which might otherwise have been directed to the production of human edible foods).

Despite the importance of these issues, none of them are captured in the FFI's calculations of the harms of factory farming (with the exception of issues that also contribute to human health burdens). This is because insufficient data is available on these issues at a global level to make country comparisons possible. However, the fact that this data is missing itself further indicates that the harms inflicted on some of the most marginalised social and ethnic groups are all too often overlooked.

Photo credit: Shutterstock.com / Canetti

Part Two:
The Factory Farming Index

The FFI focuses on three key areas of concern related to factory farming: animal welfare, human health, and the environment. Within each of these areas, sub-issues are identified, each with a corresponding quantifiable indicator. See Figure 3 below.

The FFI captures the effects of factory farming using composite indicators:

1. The estimated years of life lost (YLL) and the years of life lived with disability or disease (YLD) *for humans* as a result of the impacts of factory farming.

2. The years of life lost (YLL) and the years of life lived with disability, disease, or discomfort (YLD) *for factory farmed animals* (i.e., chickens, pigs, and cattle) as a result of the impacts of factory farming. This captures the effects of factory farming on animal welfare.

3. A combined indicator, calculated by summing up the years of healthy life lost both by humans *and* farmed animals due to factory farming, which we call healthy years lost for human and farmed animals.

4. The estimated biodiversity loss caused by factory farming. These effects include the effects of climate change, water scarcity, water pollution, and land conversion on biodiversity.

We express these indicators in two ways: in terms of total national *production* and in terms of *consumption per person nationally*. The *production version* considers the total impact on human and animal welfare and total biodiversity loss caused by production in each country. The *consumption version* expresses these impacts *per person* and accounts for the number of factory farmed animals embodied in exported and imported meat, dairy, and eggs, as well as accounting for the number of animals imported or exported live. It therefore reflects the effects of an average individual's consumption in a country.

Figure 3. The Factory Farming Index and areas of concern and indicators for each.

Human health and animal welfare calculations

We fully detail our modelling approach in the Methods document but provide an overview of key concepts here.

To calculate the human health effects of factory farming, we use the well-established method of disability adjusted life years (DALYs), which estimates the years of life lost to premature death (YLL) and the years of life lived with disability and disease (YLD). It combines these together to get an overall estimate of the burden of disease. Here we quantify how much of that burden of disease is driven by factory farming (Fig. 4).

To calculate the years of life an animal lives with disability, disease, or distress (YLD) we multiply the duration that animals live in factory farms by weights representing the physical and mental harms suffered on the farm. We lack global data on the welfare conditions in factory farms and instead use data on the legal protection of farmed animals in different countries as a proxy for welfare conditions. These data are taken from the World Animal Protection Animal Protection Index (API). We also calculate the amount of time animals spend in the slaughter process (which we set to one day) and multiply this by weights representing the physical and mental harms suffered in the slaughter process, which we generate for this report from each country's legislation. Added together, this gives us the YLD for factory farmed animals.

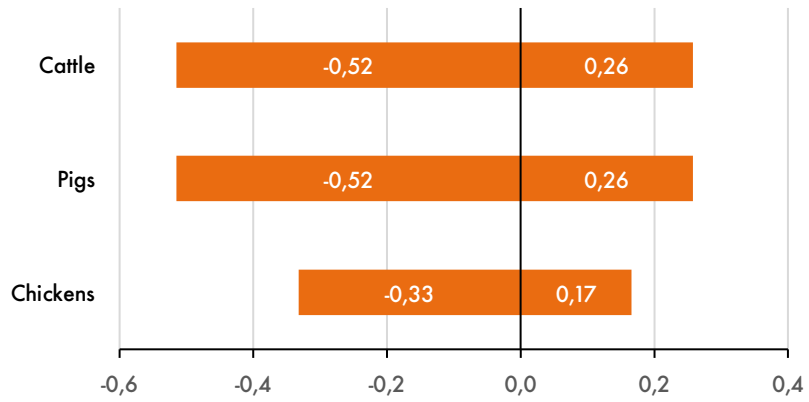
The FFI calculates the years of life lost (YLL) due to premature death by calculating the years of life lost due to either slaughter, culling, or on-farm mortality against a reference point of estimated natural lifespans for farmed chickens, pigs, and cattle in optimal conditions (respectively 7.5, 15, and 20 years).

We then add the YLD and the YLL numbers together and multiple these by the "welfare ranges" of the different species covered in the FFI. This allows us to combine data from multiple species into a single indicator by weighting each animal's loss of life and welfare by its welfare potential relative to humans.

Welfare ranges reflect the capacities of different species to experience welfare states, i.e., their capacity for either positive or negative states. For clarity, welfare ranges do not tell us about the relative value of different species or about how much different species matter compared to humans. The FFI draws on the welfare ranges developed by Rethink Priorities as part of its Moral Weight Project. The project examined a wide range of traits relevant for welfare, such as tool use, problem solving, cooperation, maternalism, displays of fear, boredom, and playfulness. These traits are important not only as markers of cognitive or behavioural sophistication but because they reflect underlying needs: the freedom to make choices, express themselves, enjoy themselves, seek stimulation, dissent, play, relax, and even take risks.

Figure 4. Welfare ranges used in the FFI.

Cattle, pigs, and chickens can have a half to a third of the intensity of negative experiences as humans. They have around a quarter to a fifth of the capacity for positive welfare experiences relative to humans.

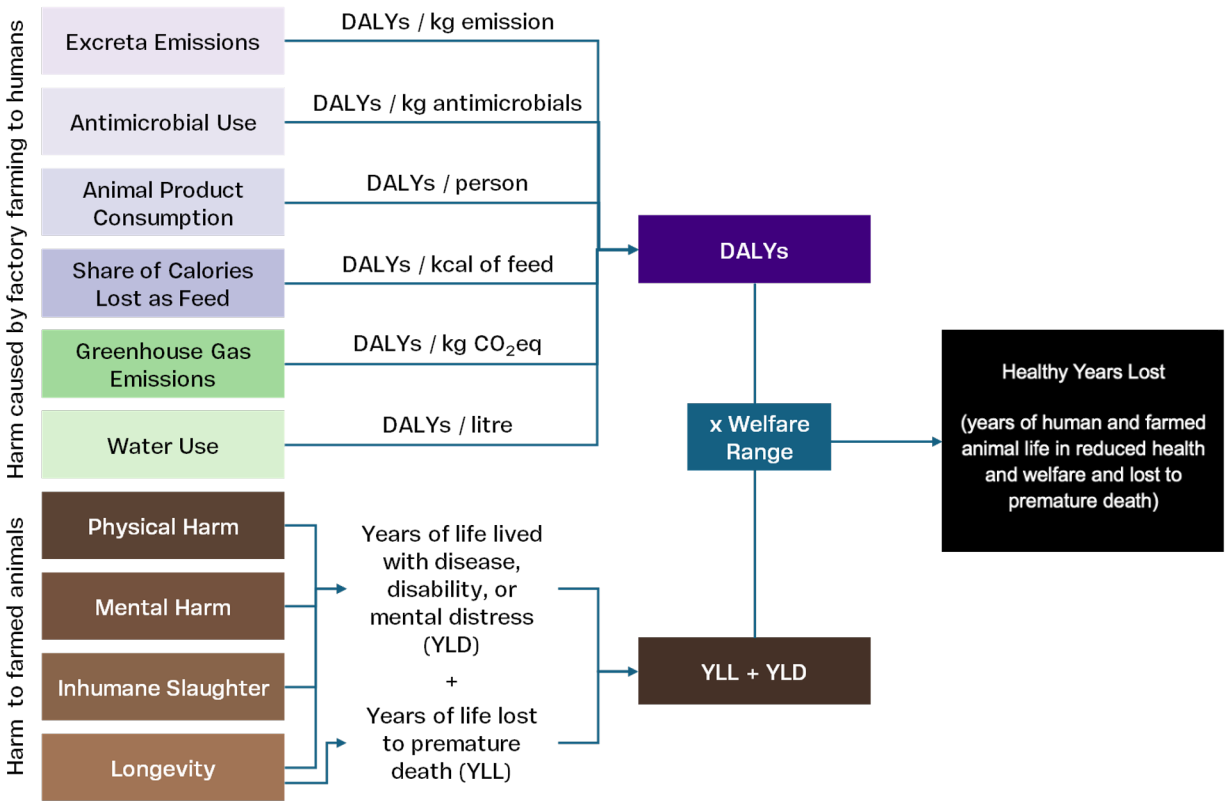


Welfare range estimates (human equivalent life years)

Welfare ranges not only allow us to quantify the harmful effects of poor welfare conditions but also to quantify the effects of premature death on animal welfare, and to see that such extreme curtailing of animal lives as commonly happens in factory farm settings is itself morally problematic. Scientists working in the field of animal welfare are divided over whether reduced lifespan ought to be considered a welfare issue *per se* since the concepts of longevity and quality of life are distinct. The arguments for including YLL calculations to quantify the effects of factory farming on animal welfare are ultimately moral arguments. Our basic contention is that by depriving an animal of life, all future opportunities for enjoying positive welfare are removed and the animal's fundamental – and intrinsic – interest in continued existence is thwarted (Richter, 2024). This arguably constitutes a harm, even if it does not reduce the quality of the present-moment experiences of the animal. The FFI uses the idea of welfare ranges to quantify the harms caused to animals by the loss of potential positive experiences so that, when a pig is prematurely killed, she is deprived of the capacity to enjoy pleasures at the maximum intensity she could experience them if allowed to continue living in optimal welfare conditions.

Importantly, whilst the FFI does compare the welfare ranges of different species, it remains neutral on the question of the relative moral value of different species.

Figure 5. A summary of the calculation of Healthy Years Lost.

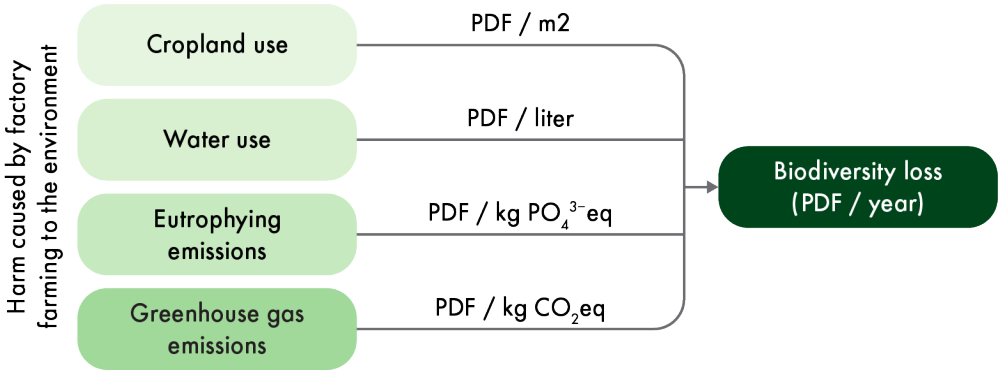


Biodiversity loss calculations

Biodiversity loss is calculated by multiplying the environmental impacts caused by factory farming by standard factors from the LC-IMPACT database (Verones et al., 2020). These factors quantify the number of species at risk of extinction from different environmental pressures (such as converting natural habitat to cropland). They are risk-based indicators and also associated with uncertainty and we therefore do not use them to quantify the actual number of species going extinct, but rather as a way to synthesise the effects of different pressures into a single environmental indicator. Figure 6 summarises the calculation and further information is available in the Methods document.

Figure 6. The calculation of biodiversity loss.

PDF stands for potentially disappeared fraction of species, and it represents the proportion of species expected to disappear due to human caused pressures like cropland land use or climate change.



Part Three: Results

Global Totals

We estimate that factory farming of pigs, chickens and cattle leads to:

- 165 *million* healthy years of human life lost each year.
- 103 *billion* years of factory farmed animal life lost to premature death or lived through the equivalent of the worst welfare conditions each year, converted into human welfare equivalents. This again breaks down into:
    - 9 billion years of factory farmed animal life lived through the equivalent of the worst welfare conditions each year, converted into human welfare equivalents.
    - 94 billion years of factory farmed animal life lost due to premature death, converted into human welfare equivalents.

These numbers can be hard to comprehend, both due to the units and vast scales. To make the human component more comprehensible, we convert into years of healthy life lost using the reference global lifespan in ideal health conditions of 86 years used by the Global Burden of Disease (WHO, 2020) and the 2020 global population of 7.8 billion, and calculate that factory farming causes a 2.1%[2] loss of healthy human life equivalent to 1.8 years[3] of life lost per person on average globally due to the factory farming of cattle, chickens, and pigs.

To make the non-human healthy years lost numbers more comprehensible, we can first divide these results by the total human population, and find that each person is, on average, responsible for 13 years of human welfare-equivalent years of life lost each year through purchasing of factory farmed animal products.

Secondly, we can compare the farmed animal healthy years lost component to the human burden of disease as our calculations follow the logic of typical calculations of human loss of life and loss of healthy life. Firstly, the Global Burden of Disease database estimates that in 2020, 2.8 billion years of healthy human life were lost due to disease and premature death. The burden of loss of healthy life for factory farmed animals is therefore 37 times higher.

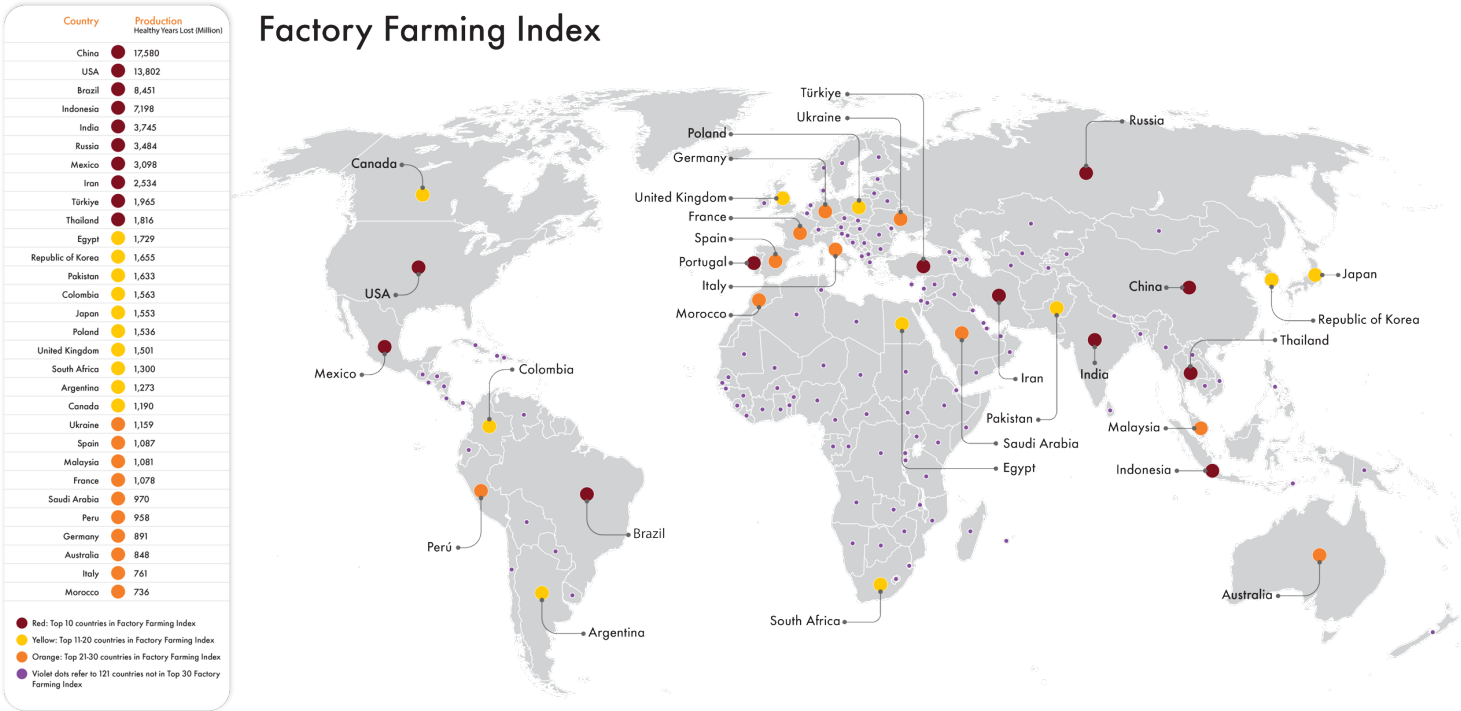
Photo credit: World Animal Protection

[2] 165 million health years of life lost (DALYs) ÷ 7800 million people = 2.1%
[3] 86 years × 2.1% = 1.8 years

Country Rankings

China is the largest producer, followed by the USA (Fig. 7). China has around 13 billion animals in factory farms per year, relatively close to the USA with 10 billion animals. Using the API ranking as proxy, we estimate that conditions in factory farms are worse in China (they have the second lowest ranking of 'F' on the API), and therefore the duration lived in high physical and mental harm is higher than in the USA which ranks slightly better on the API (they have a 'D' on the API). However, lifespans are shorter in the USA, meaning the years of life lost to premature death is higher. Combined, the vast numbers of animals living in factory farms, the poor conditions, and short lifespans drive China and the USA's high place in the rankings.

Figure 7. Total Healthy Years Lost caused by factory farmed animal production.

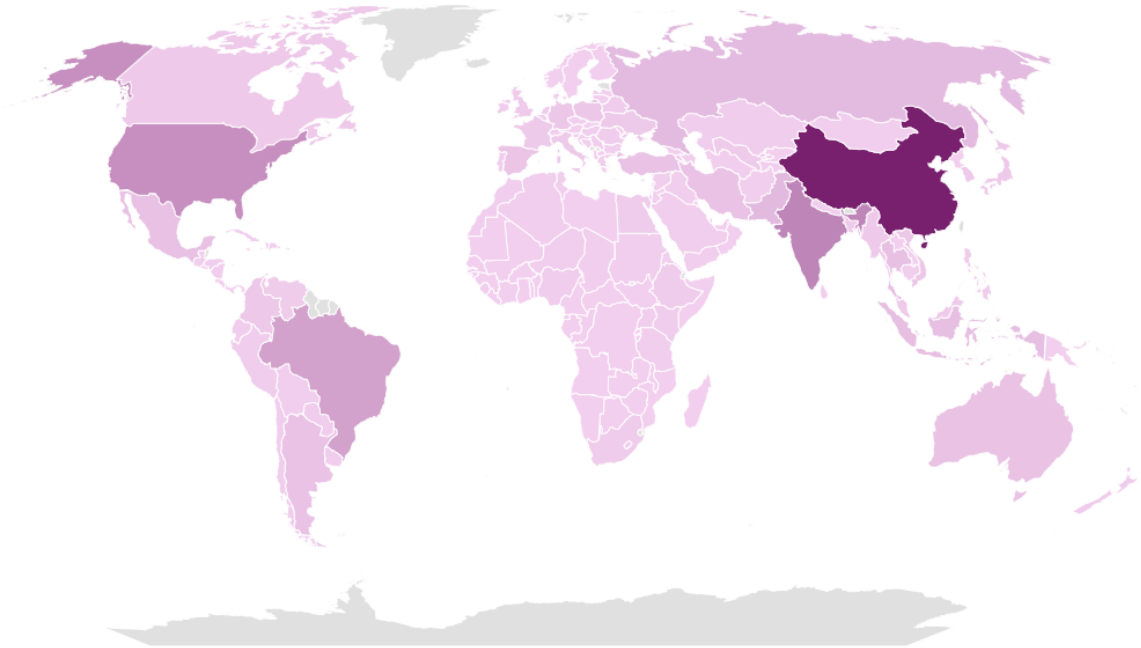


While a much smaller contributor, the human health component is nevertheless important. Again, we find that China dominates the rankings with 42 million human years of life lost to premature death, disease, or disability linked to factory farming (Fig. 8). This is equivalent to every person in China losing 2.5 years of healthy life. 76% of this loss (32 million human life years) is caused by antimicrobial use on factory farms, from which antibiotic resistance in humans may develop, because of the very large quantities of antimicrobial use in contemporary Chinese factory farms. Indeed, China uses 34% of the antimicrobials used in factory farms globally (Mulchandani et al. 2023).

The effects of factory farming production in China and the US on human health have global ramifications, since issues such as the rise and risk of superbugs resistant to antibiotics are not geographically restricted.

Figure 8. Total human health impacts caused by factory farmed animal production.

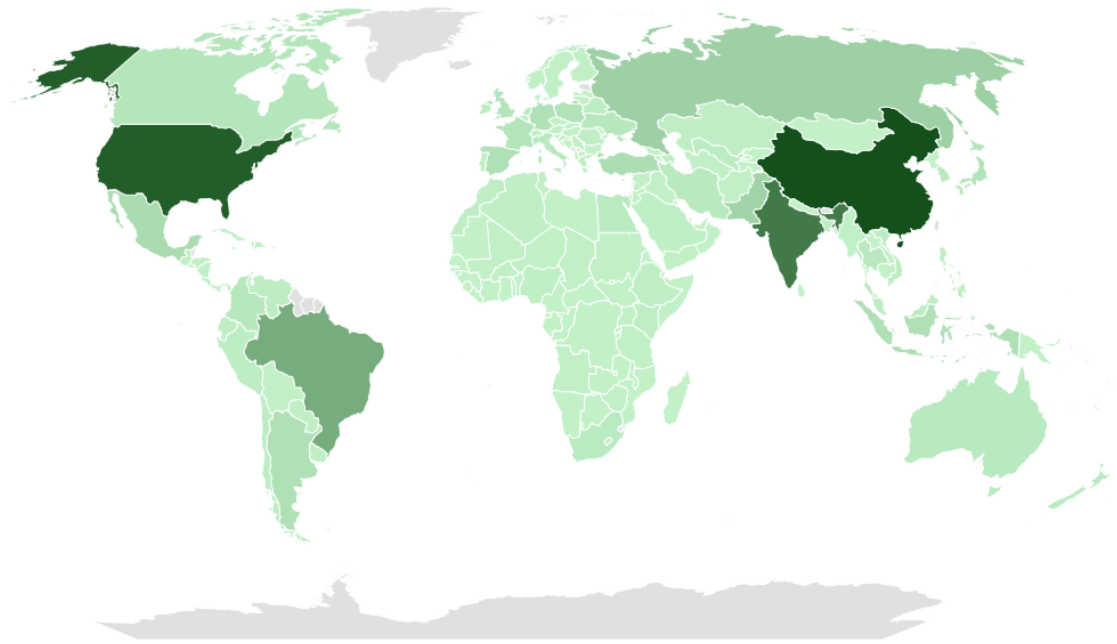
Human health impacts include those caused by antimicrobial resistance, protein-energy malnutrition caused by the diversion of crop calories to animals rather than humans, particulate matter emissions from animal excreta, high red and processed meat in human diets, water scarcity caused by high irrigation use for feed, and the effects of climate change particularly on water borne diseases.



We also look at the total biodiversity loss caused by factory farming (Fig. 9). We find that the USA, China, and India dominate on this indicator. The reason the USA dominates on this indicator is because substantial numbers of cattle are factory farmed in the USA, and cattle tend to have the highest environmental impacts.

Figure 9. Total biodiversity loss caused by factory farmed animal production.

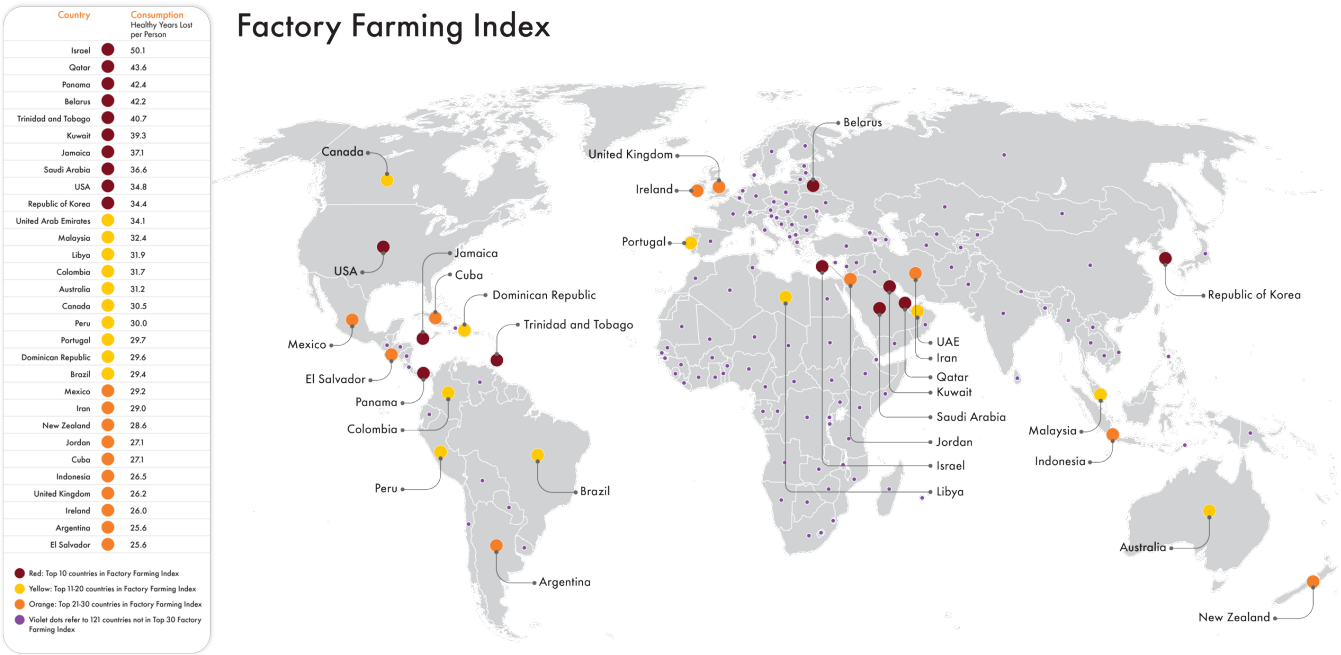
Biodiversity impacts are caused by agricultural land replacing natural habitats, water pollution, water use affecting aquatic habitats, and climate change.



Despite China dominating the total rankings, China has a high human population. When we calculate the consumption version of healthy years lost, the results change (Fig. 10). To recap, the consumption version accounts for food imports and exports and then divides total healthy years lost by the human population in each country.

Figure 10. Healthy years lost caused by the consumption of factory farmed animals, expressed per capita.

The consumption version considers the number of factory farmed animals embodied in food imports and exports.



Here, Israel, Qatar and Panama and Belarus top the rankings, with healthy years lost per capita of 50, 44, 42, and 42, respectively. These countries consume and import large numbers of factory farmed animals *per person*. For example, in Israel ~40 factory farmed animals are consumed per person per year, almost all of which are chickens.

The lowest impact countries are in Sub-Saharan Africa, with healthy years lost generally well under 5 per capita, driven by low overall animal product consumption and the low prevalence of factory farming in these countries. In general, factory farming is only just starting to reach Sub-Saharan Africa, but given current trends, it seems highly likely that it could dominate soon. Despite these maps showing Sub-Saharan Africa as a low contributor to healthy years lost today, without interventions to leapfrog factory farming to equitable, humane and sustainable food production, these maps are almost certain to change in the future.

We fail to find any industrialised countries in the bottom 25%. No industrialised country today seems to be farming using a different model. Supporting countries to achieve high quality of human life, whilst not causing tremendous animal welfare burdens and environmental impact should be a global priority.

Part Four: Changing the system

How can we solve these problems? We explore three possible scenarios.

First, if all countries achieved the highest welfare levels but nothing else changed, healthy years lost would fall by only 9%. While welfare conditions are improved, lifespans remain short and the broader environmental human-health harms associated with factory farming persist.

Second, if all countries increased farmed animal lifespans to their maximum levels, stopped culling animals, and reduced mortality rates to 0% without changing anything else, this increases healthy years lost by 50%. If lifespans increase without improving overall quality of life, the effect on healthy years is negative.[4] Therefore, increasing lifespans in factory farms, given low welfare conditions, worsens the problem.

Third, when we consider the effects of improving both welfare and lifespans to their maximum levels, we find this delivers a 99% reduction in healthy years lost. The FFI shows that incremental improvements within the current factory farming system are not enough to address the welfare burden. Raising welfare standards alone leads to only limited improvements, while extending animal lifespans under poor conditions can make outcomes worse.

Real progress cannot come from adjustments within factory farming itself. The only lasting solution is to move away from intensive systems altogether and transition towards a food system that is equitable, humane, and sustainable.

This means increasing the role of plant-based foods in our diets, supporting small-scale producers who prioritise care for animals and the environment, and ensuring that any remaining animal farming meets the highest standards for welfare, environmental protection, and human health.

Photo credit: World Animal Protection

[4] This is caused by having an asymmetric welfare range. To convert years of life lost into human equivalents, we multiply it by the positive part of the welfare range. This reflects the fact that animals are losing life, therefore losing the potential to experience positive welfare. However, in reality, their lives are extended in factory farms under conditions of mental and physical harm. The intensity of this suffering is much higher for animals than the intensity of positive experiences according to the welfare ranges we use here. Therefore, a larger burden of years of life lived with mental and physical harm is created, when expressed in human equivalents. These dynamics are relatively subtle. A similar conclusion could be reached by having negative welfare in factory farms, but we do not use this approach so as to be consistent with modelling approaches used in human health.

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