IT'S BIG LIVESTOCK VERSUS THE PLANET

A case to cut off meat and dairy corporations' financial fodder

FEED BACK

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GLOSSARY

AGROECOLOGY

A form of farming that reflects the workings of natural ecosystems, embedding these processes into farm functions. Characteristics can include low external inputs, recycling of biomass, diversity of species and genetic resources, enhancing biological processes and minimising nutrient losses. See 'industrial agriculture'.

ANAEROBIC DIGESTION

The process by which animal waste (and/or food waste and energy crops) is broken down to produce biogas and biofertilizer.

BIG LIVESTOCK

In this report, we use 'Big Livestock' to denote transnational industrial meat and dairy businesses.

CARBON OFFSETTTING

A reduction in emissions of a greenhouse gases made in order to compensate for emissions made elsewhere.

CONCENTRATED ANIMAL FEEDING OPERATION (CAFO)

A form of intensive animal agriculture where animals are contained or confined for more than 45 days in 12 months, and the number of animals is more than 125,000 broiler chickens, 82,000 laying hens, 2,500 pigs, 700 dairy cattle or 1,000 beef cattle.

FACTORY FARMING

A form of intensive animal agriculture designed to maximise production while minimising costs, often synonymous with CAFO.

INTENSIVE ANIMAL AGRICULTURE

Often used as a synonym for industrial animal agriculture but tends to also refer to containing or confining animals. In the United Kingdom (UK), livestock farms are classified as 'intensive' by the Environment Agency when they contain more than 40,000 birds, 2,000 pigs or 750 breeding sows.

PEAK LIVESTOCK

The notion that the rising global livestock population needs to be reduced to meet global emissions targets. Derived from Harwatt et al. (2019)[1]

INDUSTRIAL AGRICULTURE

A type of agriculture, both of crops and of animals, with high levels of input and output per unit of agricultural land area. Offering a comprehensive definition of 'industrial' meat and dairy is challenging. Farming systems may have some 'industrial' features but not others. Nonetheless, it is useful to identify the types of features that characterise industrial meat and dairy.

To offer Feedback's definition, in general, at 'its most industrial', industrial meat and dairy has the following characteristics:

- Large embedded land use for growing feed, often overseas;
- High level of nutrient loss through pollution (e.g. by waste run-off);
- A low ratio of nutritional value to external resource input (i.e. significant inputs - energy, fertilisers, water and such - are needed to produce the meat and dairy products);
- High level of product specialisation (i.e. only one specific or a small number of meat and dairy products);
- Both inputs and outputs embedded in global, financialised commodity markets;
- Innovation solely profit-driven (i.e. driven by a need for higher shareholder returns);
- Productivity understood as the financial value generated.

In contrast, in a 'non-industrial' approach to livestock rearing, which, at its 'most non-industrial', is an agroecological one:

- Less embedded land use linked to imported feed (even if local land footprint may be larger due to less intensive practices);
- High levels of nutrient recycling, with soils replenished and enriched (e.g. through careful manure management);
- A high ratio of nutritional value to external resource input (i.e. few inputs, such as fertilisers or energy, are required to generate nutritional value);
- Diverse outputs (i.e. farmed produce, such as fruit and vegetables, in addition to meat or dairy);
- Both inputs and outputs embedded in a regionalised food economy, with short supply chains;
- Innovation-driven by increasing nutritional output and environmental enhancement;
- Productivity understood as seeking maximum nutritional value for minimal environmental damage, or maximum environmental enhancement.

Aerial shot of an European pig farm. Photo by Nordorden

Cattle-driven deforestation in the Amazon. Modified Copernicus Sentinel data (2017), SentinelHub

EXECUTIVE SUMMARY

The climate impacts of the world's largest meat and dairy corporations – Big Livestock – could soon rival that of the oil giants, Big Oil. The five largest Big Livestock industry players – JBS, Tyson, Cargill, Dairy Farmers of America and Fonterra, companies many of us would struggle to name – together emit more greenhouse gases than ExxonMobil[2].

If industrial animal agriculture continues with its business-as-usual, the industry's growth will cause us to exceed our global emissions budget for 1.5°C. Within ten years, the livestock sector will account for almost half (49%) of the world's emissions budget for 1.5°C by 2030[1a] and 80% by 2050[2]; requiring other sectors to slash their emissions beyond possible levels. To meet the steep and rapid reductions in greenhouse gas emissions necessary to achieve the goals of the Paris Agreement, global livestock numbers need to fall, and substantially. We have reached 'peak livestock'[3].

Peak livestock has existential implications for the small group of emissions-intensive agribusinesses that form the focus of this report. Headquartered in regions that produce and consume excessive quantities of animal proteins, these corporations are locking the world into a future dominated by ultra-high impact, industrially produced meat and dairy – with all the catastrophic threats this poses to our living Planet.

As the debate rages around meat, dairy and the climate, the transnational corporations that breed, grow, slaughter and process livestock face little scrutiny over their operations. Fuelled by staggering subsidies, enabling regulators and an extractive financial sector, Big Livestock dominates key markets, driving global consumption through cheap exports and by displacing smaller producers. Highly opaque and relentlessly controversial, these companies are prime drivers of the three biggest global challenges of our time: antibiotic resistance, biodiversity loss, and climate breakdown. Already these corporations have had huge impacts on the communities and ecologies where they operate, from factory farms polluting water in Iowa, to beef companies driving deforestation in the Amazon.

Like other globalised sectors, Big Livestock relies on the financial, moral and political backing of thousands of institutional investors and creditors around the world: university endowments, sovereign wealth funds, banks, asset managers and public pensions. High street names such as Barclays, HSBC and Santander are among the banks financing the expansion of some of the most destructive meat companies[4]. Universities that have banned beef on campus, continue to fund controversial beef giants such as JBS and Marfrig through their endowments[b]. And investment behemoths such as Blackrock, State Street and Vanguard continue to pour fuel on the flames of the Amazon fires by investing, again and again, in companies linked to deforestation[5].

The evidence is clear: Big Livestock, like Big Oil, is on the wrong side of history.

By highlighting the analogies between these two destructive industries, this report makes a case for the end of industrial animal agriculture. Drawing inspiration from the fossil fuel divestment movement, it emphasises the structural incompatibility of Big Livestock's business model and the imperative to reduce greenhouse gas emission. We call for broad, coordinated civil society action targeting the financial fodder that feeds Big Livestock.

a And 37% of the emissions budget for 2°C by 2030
b Forthcoming research from Feedback

INTRODUCING BIG LIVESTOCK

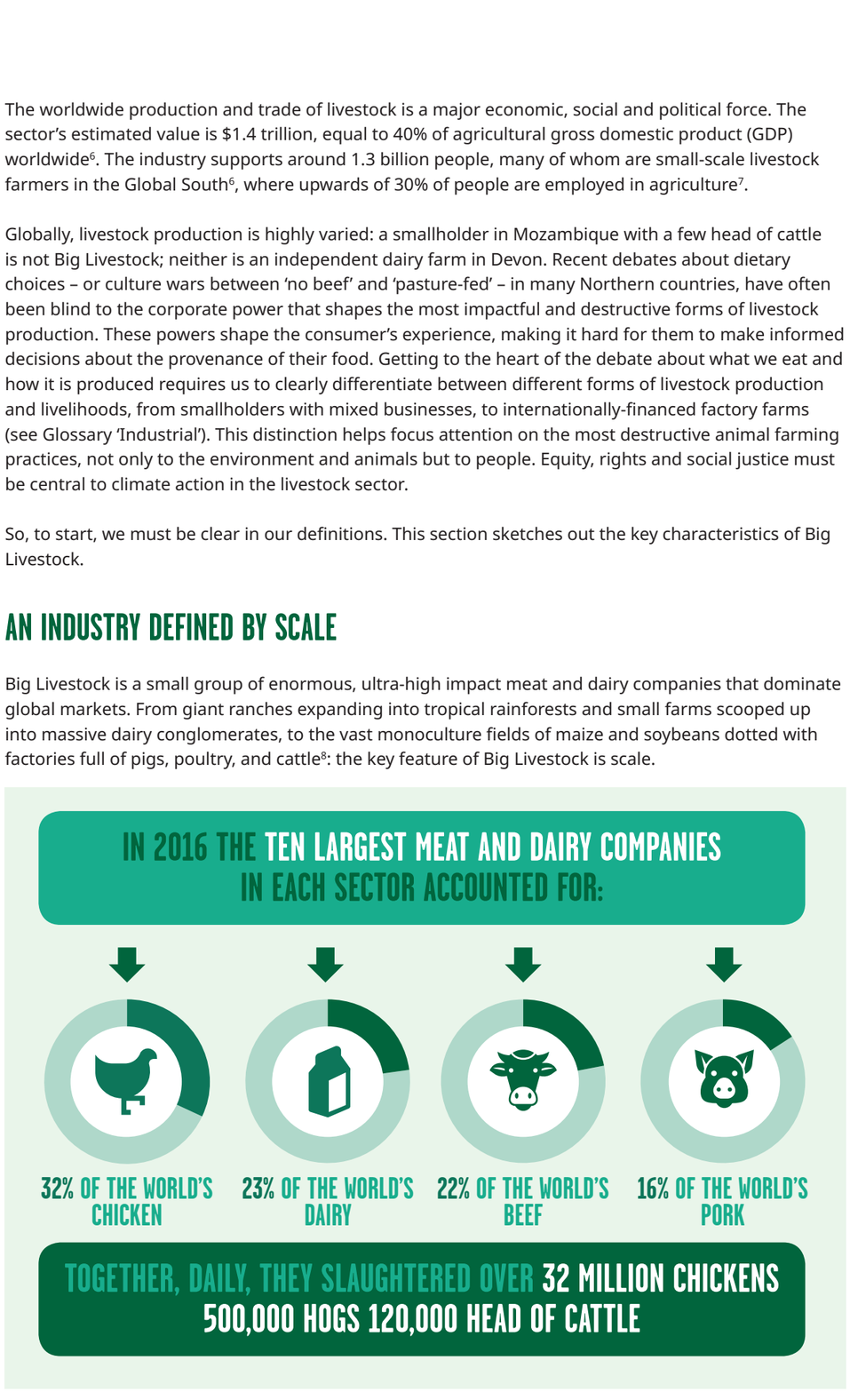
The worldwide production and trade of livestock is a major economic, social and political force. The sector's estimated value is $1.4 trillion, equal to 40% of agricultural gross domestic product (GDP) worldwide[6]. The industry supports around 1.3 billion people, many of whom are small-scale livestock farmers in the Global South[6], where upwards of 30% of people are employed in agriculture[7].

Globally, livestock production is highly varied: a smallholder in Mozambique with a few head of cattle is not Big Livestock; neither is an independent dairy farm in Devon. Recent debates about dietary choices – or culture wars between 'no beef' and 'pasture-fed' – in many Northern countries, have often been blind to the corporate power that shapes the most impactful and destructive forms of livestock production. These powers shape the consumer's experience, making it hard for them to make informed decisions about the provenance of their food. Getting to the heart of the debate about what we eat and how it is produced requires us to clearly differentiate between different forms of livestock production and livelihoods, from smallholders with mixed businesses, to internationally-financed factory farms (see Glossary 'Industrial'). This distinction helps focus attention on the most destructive animal farming practices, not only to the environment and animals but to people. Equity, rights and social justice must be central to climate action in the livestock sector.

So, to start, we must be clear in our definitions. This section sketches out the key characteristics of Big Livestock.

AN INDUSTRY DEFINED BY SCALE

Big Livestock is a small group of enormous, ultra-high impact meat and dairy companies that dominate global markets. From giant ranches expanding into tropical rainforests and small farms scooped up into massive dairy conglomerates, to the vast monoculture fields of maize and soybeans dotted with factories full of pigs, poultry, and cattle[8]: the key feature of Big Livestock is scale.



Date of last available independently calculated data. Collated by IATP & Grain, available online at https://www.iatp.org/blog/emissions-impossible

These global totals mask the uneven distribution of Big Livestock's enormous footprint. Big Livestock dominates a small number of regions characterised by both excess production and excess per capita consumption of meat and dairy [Figure 1], sometimes called the 'surplus protein regions'[2]. In the US, the four largest corporations – JBS, Tyson, WH Group and Cargill – process 85% of the beef, 71% of the pork and over half of the chicken between them[9,10,11]. This trend is mirrored elsewhere: Dairy giant Fonterra has a market share of over 80% in New Zealand[12] and in the UK, up to 70% of chicken is processed and supplied by four producers: Cargill & Faccenda (Avara), Moy Park and 2 Sisters[13].

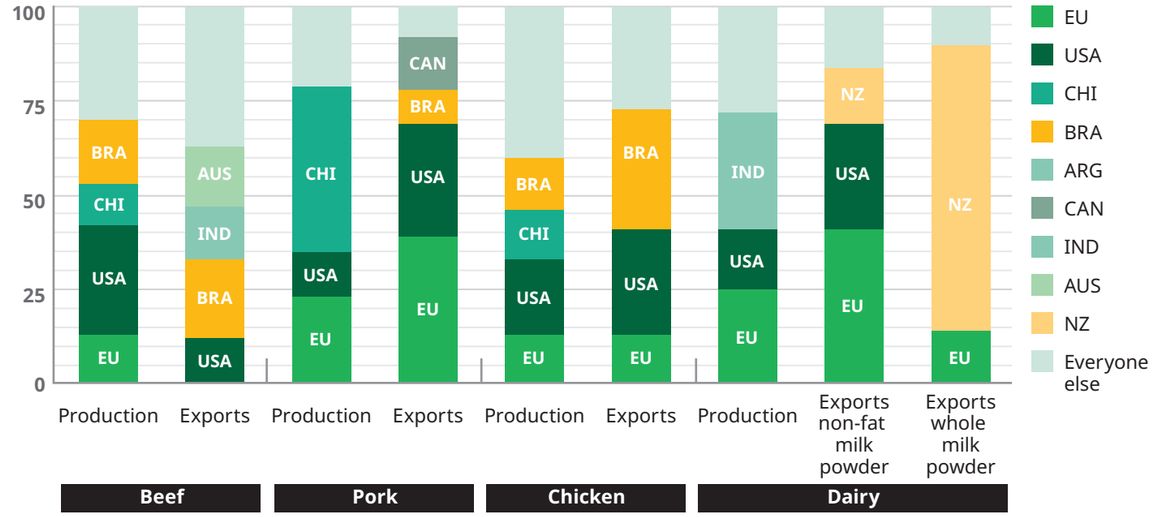


Figure 1 A few regions and countries dominate global meat and dairy production and exports. 2019 data from USDA PS&D database, methodology from the Institute of Agriculture and Trade Policy, see reference number[14]

These companies have various corporate structures, from being listed on global stock exchanges to closely held private businesses, from farmer-driven cooperatives to meat processing and distributing giants. The clearest defining feature of them all is simple: scale.

By applying industrial processes to animal husbandry and land management, Big Livestock disconnects agriculture and nature. The science consistently demonstrates the colossal environmental and climate impacts of rearing animals at an industrial scale[15–18]. This impact extends to people, from the effects on health and homes due to the destruction of local environments[19–21] to the broader public health impact of cheap industrial meat[16,22] and the rise of anti-microbial resistance. For a comprehensive overview of the global impact of the livestock sector, see references [8, 15, 17, 23, 24].

While the focus of this report is Big Livestock's emission impacts, the next pages set out the industry's colossal impacts across human health, rights and wellbeing and on the Planet's ecosystems.

1. EXTRACTION OF WEALTH FROM COMMUNITIES AND INDIGENOUS PEOPLES

Big Livestock displaces communities, destroys forests, depletes soils and pollutes the environment – at the expense of small farmers and Indigenous communities[4,19]. Land deals by livestock and feed companies ("Meat-grabs") are well documented[20]. In countries such as Kenya, China, and Brazil, small livestock producers have been displaced to clear spaces for industrial farming practices[125].

2. LAND USE, FORESTS AND BIODIVERSITY

By converting forests to farmland for feed and pasture, the global livestock sector causes habitat loss, with the biggest impacts falling in the world's most biodiverse regions[2,14]. By 2030 an additional 2.8 million square kilometers will need to be bought into production to produce the grain needed to feed industrial livestock systems.

3. WATER

Livestock production accounts for over a quarter of humanity's "water footprint"[9]. Tyson foods, for example, is the second largest "dumper" of toxic water in North America – above Exxon Mobil and steel giant Koch Industries[9]. Impacts range from damaging local communities' health[123] and increasing water prices[47], to fuelling a "dead zone" in the Gulf of Mexico[124].

4. AIR QUALITY

Fine particulate matter from animal agriculture costs more in health damage than the sector contributes to the US economy – industrial chicken is the biggest culprit[7]. "Community chokes on faecal dust from cattle feedlots"[8] read one headline last year.

5. WORKERS

65% per cent of meatpacking and food processing workers have been injured on the job[21], with JBS cited as having the second-worst employee injury rate of any US business[22]. With speed, scale and cost the key metrics, there is little room for good jobs, dignified work and widespread rights violations[23,24].

6. ANIMALS

The 20 largest Big Livestock corporations slaughter count of over 32 million chickens, 500,000 hogs and 120,000 head of cattle every day. The land required to feed them leads to habitat loss for other animals making Big Livestock a leading cause of our current sixth mass extinction event[2].

7. THREATS TO HUMAN HEALTH

"Big Farms = Big Flu"[25] - intensive farms risk of emergence of more virulent disease strains[26,27]. Three-quarters of all antimicrobials sold worldwide are used in livestock and fish[28]. This colossal use of antibiotics increases the risk of antimicrobial resistance[28] – which would reverse the gains of modern medicine.

GREENHOUSE GAS EMISSIONS

The 20 largest livestock corporations together emit more than Germany[6], making a huge contribution to the 14.5% of total global emissions attributed to livestock. These companies reside in regions home to just 15% of the world's population, but which produce almost half of global livestock emissions[6]. These companies and countries make an outsized contribution to climate breakdown.

AN INDUSTRY THAT IS BIG AND GROWING

In the classic argument in support of scale, as meat and dairy companies get larger, the cost per chicken, beefsteak or litre of milk decreases, leading to lower prices for consumers and companies competing on quality around consistently low price points. But low prices conceal the wider impacts of this model of production: the vast amount of market power held by giant agribusiness undermines public interests, impairs human rights and has a colossal impact on farmers, workers, the environment, nutrition and animals[9,11,25]

When our food is controlled by such a small number of companies, competition is reduced, driving smaller producers out of business and even raising prices for consumers as large players collude[10,11]. The dominance of Big Livestock leaves small and family producers with fewer choices, less independence and squeezes their margins. When plugged into the transnational meat-packers supply chains, these smaller producers become price takers rather than price makers[11]. It is no surprise, then, that each year more than half of US farm households lose money farming[26] despite there being more wealth in the US agricultural sector now than ever before. And so, across the regions that produce large volumes of meat and dairy, we continue to witness the rise of the mega-farm and Big Livestock[2,14].

> ***Now what we see, obviously, is economies of scale having happened in America – big get bigger and small go out.***
>
> US Secretary of State for Agriculture Sonny Perdue, 2019.

The growth of the sector, and its consolidation, are not slowing, and neither is the impact of these companies. For publicly listed Big Livestock companies, the growth paradigm is fundamental to their nature, with economies of scale and market expansion the best ways to deliver attractive shareholder dividends. For privately held corporations, it remains unlikely that the greed of their owners will slow down either: the Cargill agricultural empire has spawned more billionaires in one family than any other business[28].

To give just a few examples, dairy giant Arla is on track to increase its production by 14% between 2015 and 2020[29]; Marfrig's North American sales (by volume) grew by 2.6%, and its South American operation grew by 4% in 2019[30]; the same year, JBS Brazil experienced 13% growth by volume in domestic sales and 16% in exports[31], and research by IATP and GRAIN shows that New Zealand's dairy dominator Fonterra plans to increase production by a staggering 40% between 2015 and 2025[2]. Big Livestock is not only big, it's getting bigger.

AN INDUSTRY HIDING IN PLAIN SIGHT

Despite Big Livestock's vast size, the industry is often invisible – and it hides in different ways... Vertically integrated chicken operations appear as if they are just the activity of local, independent farms. Meat processing and distributing giants participate in the open commodity market, buying from both cattle producers, with thousands of animals, as well as small farming operations, with a dozen or two. And aggressive corporate lobbying for severe restrictions on industry transparency and whistleblowing makes it incredibly difficult to shine a light on malpractice.

But most importantly, Big Livestock hides behind other brands. In the US, the four largest corporations – JBS, Tyson, WH Group and Cargill – create an illusion of choice for the consumer, offering over 60 meat-focused brands between them[11]. In the UK, production companies such as Cargill and Moy Park are concealed by retailers' bucolic-sounding brand names such as 'Willow Farms'[32], Tesco's chicken brand. UK supermarkets, such as the Co-Operative and Sainsbury's, sell beef branded as their own that, in reality, comes from JBS, a firm linked to Amazonian deforestation[33].

Meat and commodities giant Cargill is described as one of 'the most powerful companies you've never heard of'[34]. Without name recognition, these companies continue to evade scrutiny and we remain ignorant of their scale and of the scale of their impact. Most people would struggle to name more than a handful of meat and dairy companies, and yet they buy their products every day.

A small seclection of meat brands from Tyson, JBS, Cargill and WH Group

Industrial poultry shed, David Tadevosian

CAN BIG LIVESTOCK TRANSFORM ITSELF?

> ***Their business model isn't amenable to modest changes because the flaw is their business plan***
>
> Bill McKibben, Environmentalist, on fossil fuel companies

The challenges are colossal, and the impacts vast. In order to be consistent with a sustainable and fair future, Big Livestock would need to undergo a whole-scale transformation to reduce its extractive burden on people and the Planet. Is Big Livestock is capable of such a change?

Focusing on the issue of emissions, we explore three critical questions that the industry must answer if it is to have a place in a low-emissions, ecologically viable future.

- Can Big Livestock reduce its emissions?
- Can Big Livestock offset its emissions?
- Can Big Livestock stop producing meat and dairy?

CAN BIG LIVESTOCK REDUCE ITS EMISSIONS?

Global livestock production is responsible for at least 14.5% of humans' greenhouse gas emissions[18]. The surplus protein regions and a handful of companies dominate this emissions footprint: Regions that are home to just 15% of the world's population (Figure 1), are responsible for 43% of the total global emissions from meat and dairy production[2]. As very few companies report their emissions, this impact is only known due to pioneering work by the Institute for Agriculture and Trade Policy (IATP) and GRAIN in the report "Emissions Impossible".

BOX 1: TARGETS AND TRANSPARENCY: BIG LIVESTOCK'S BIG SECRETS

The world's major meat and dairy companies are not transparent, with 77% of companies not measuring or publishing their GHG emissions data[35]. In 2019, there was no third-party verification of Big Livestock's emissions disclosures. Independent calculations suggest that variation in methodologies leads to massive under-reporting[2], and supply chain emissions – up to 90% of a livestock companies emissions footprint – are widely excluded. For publicly listed companies, this omission is perhaps unsurprising given that none of the 250 global exchanges require companies to report emissions associated with their food and agriculture activities, creating little incentive for transparency. So despite the efforts of some investors to force the disclosure of data on climate and other impacts data availability on the transnational corporations that dominate our food system remains shockingly sparse[25]. It has been left to civil society groups to produce company emissions data, most notably the pioneering work of IATP and GRAIN in 2016, who used the FAO's GLEAM model to calculate data emissions by company.

The 10 largest meat and dairy corporations ranked by their emissions are listed in the table below.[c] For comparison, the emissions of the entire UK farming sector is 46 million tonnes of CO2 eq, meaning it would rank behind the four largest companies[36]. This is what we mean when we say they operate at scale: the 20 largest Big Livestock corporations together emit more than the entirety of the German economy[2]. Given the enormous emissions footprints of these companies, and their deeply entrenched practices, it is worth asking: can they reduce them?

Aerial feedlot. Michael Kappel

Company Name	Headquarters	Sector	Emissions	Revenue	Number of meat brands
JBS S.A.	Brazil	Meat	280,025,749	$49.7	16
Tyson Foods, Inc.	USA	Meat	118,098,886	$40.1	36
Cargill, Inc.	USA	Meat	86,303,855	$114.7	28
Dairy Farmers of America, Inc.	USA	Dairy	52,150,572	$13.6	15
Fonterra Co-operative Group Ltd.	New Zealand	Dairy	41,535,799	$20.4	13
National Beef Packing Company LLC	Brazil	Meat	41,458,401	$7.3	5
Marfrig Global Foods S.A	Brazil	Meat	40,029,542	$41.4	28
Minerva Foods S.A.	Brazil	Meat	34,713,450	$3.2	11
WH Group Ltd. (Smithfield Foods)	China	Meat	30,107,612	$22.6	11

Figure 2 The 10 largest meat and dairy companies ranked by their meat and dairy emissions. Emissions from IATP & GRAIN (2016) Emissions Impossible – independently calculated using FAO GLEAM 2.0 and includes Scopes 1-3. Revenue from 2018 except for National Beef (revenue 2017), Cargill's revenue not restricted to its meat business. Meat brands calculated from the English language annual reports of the companies; does not include brands sold by third parties. Emissions calculated in tonnes of tonnes CO_2 equivalent a year. Revenue calculated in billions, USD.

c More information on the meat majors and dairy dominators in the Annex; for or a fuller list see IATP & Grain (2016) "Emissions Impossible".

EMISSIONS SOURCES AND TARGETS – A QUICK PRIMER

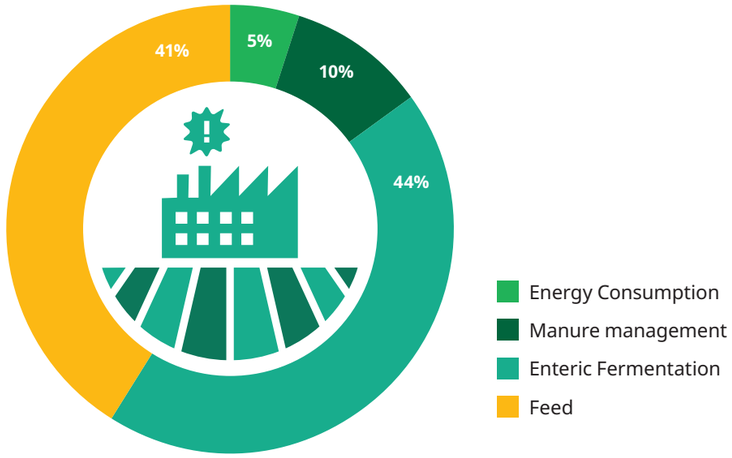


Figure 3 Global emissions by source. The relative contribution of primary sources of emissions from global livestock supply chains. Data from FAO GLEAM.

Big Livestock emits in various different ways (see Figure 3), with emissions consisting of a variety of gasses, including methane, carbon dioxide and nitrous oxide. For businesses, these emissions are usually split into three categories ('Scopes'):

- Scope 1 emissions come from in-house operations like company vehicles and gas boilers.
- Scope 2 emissions come from the energy purchased and used by the company.
- Scope 3 emissions come from activities within a company's supply chain. This scope covers the fertilizer used in producing animal feed and the methane and manure emissions from the animals themselves. For a meat and dairy company, Scope 3 emissions can be up to 90% of their footprint, which is why it is so critical that they are measured.

Aerial view of a feedlot. Photo by B Brown.

While global livestock emissions are primarily rising due to increases in livestock numbers[1,23], emissions are also rising due to the transition to more intensive livestock systems. For instance, the US has seen a rise in methane emissions from dairy cows and swine which is largely a result of a shift from dry to liquid manure systems – as factory farms have increased in size[37]. Additionally, nitrous oxide – the most rapidly rising agricultural greenhouse gas – is driven in part by the 'rapid recent increases' in nitrogen through manure deposition[23] – again, an effect of intensification. In the European Union, intensive livestock facilities that generate the largest volumes of pollutants, continue to receive the largest subsidies from the largely-critiqued Common Agricultural Policy[38].

BOX 2: THE METHANE QUESTION - REDUCING EMISSIONS THROUGH CREATIVE COUNTING?

Methane matters when tackling the climate impact of Big Livestock. Methane in livestock has several sources: it can come about from the way manure is managed, and some feedstocks (e.g. rice) also have methane footprint. But most of livestock's methane emissions are from enteric fermentation – the digestive process in ruminant animals that produces methane as a by-product. This means animals like cattle, sheep and goats produce more methane and therefore tend to have a higher climate footprint than other livestock[37].

In March 2020, farming groups from some of the world's biggest meat and dairy-producing countries (New Zealand and the UK) called for changes in how methane emissions are accounted when we discuss climate issues[38]. The science they propose focuses attention on carbon dioxide, which lasts in the atmosphere longer[39]. But methane is a more "powerful" greenhouse gas that makes a huge contribution to climate change. At a time when we need urgent reductions in greenhouse gases, now, not later – this makes it a good target for reductions. The fact that methane has a shorter atmospheric life-span than other greenhouse gases cannot be used by industry as a "Get Out of Jail Free" card for inaction. Meaningfully reducing methane emissions requires reducing livestock numbers.

The reality is that the majority of Big Livestock corporations are taking no action to reduce their emissions[2,35]. The handful that are attempting to reduce emissions do so set one of two types of target:

- The first, absolute targets, aim to reduce actual emissions for all company emissions. These are the same as the targets set by countries under international climate accords.

- The second type of targets, emissions intensity targets, aim to reduce emissions for each kilogram of chicken or beef or pork, or by litre of milk. This target is thus independent of overall production volumes.

To put these targets in perspective: Average global GHG emissions *per kilogram of chicken* have decreased since 1961 – and are now between 1/3 to 1/2 of what they were. However, the total GHG emissions from chicken production in 2010 were up to 5 times higher than in 1961[2], this is because far, far more chickens were produced than could be compensated for by a reduction in emissions intensity. If production rises quicker than emissions-intensity falls, emissions rise – just at a slightly slower rate. To answer the question of whether Big Livestock can reduce its emissions, it is necessary to address each of these separately. We look first at emissions intensity.

CAN BIG LIVESTOCK REDUCE ITS EMISSIONS INTENSITY?

The celebrated gains in the efficiency of industrial animal agriculture – such as doubling milk yields per cow over the past 40 years in Europe[42] – mask the inherent inefficiency of using livestock as a means to supply the majority of the protein in our diets. Globally, meat and dairy provide just 18% of calories and 37% of protein but use the vast majority of farmland (83%) and produce a whopping 60% of agriculture's greenhouse gas emissions[43].

Attempts to implement emissions reductions through efficiency gains in already hyper-intensive industrial, agricultural systems, has created a cascading series of challenges. While new technologies and changes in farm management practices could reduce emissions intensity, there is widespread scepticism about the ability of corporations to deliver substantial emissions reduction, particularly at low cost[2].

For reductions in emissions-intensity to be meaningful, they will need to come from Big Livestock's supply chain – which dominates its emissions profile. Options for mitigation include reducing enteric methane (i.e. through intensification of diets and feed additives); reductions of nitrous oxide and methane through manure management; sequestering carbon in pastures; the implementation of best animal husbandry and management practices; and land-use practices that also help sequester carbon.

As the International Panel on Climate Change (IPCC) outlines, there are trade-offs in all of these approaches[23]. For intensive cattle systems, there is limited methane mitigation potential through changes to diets, as methane-producing roughage tends to be a smaller proportion of feed and the diets already tend to be more carbon-intensive due to a higher percentage of grains. If only looking at emissions efficiency, already intensive industrial-scale systems offer fewer cost-effective opportunities for substantial emissions reductions compared to small-scale livestock systems in the Global South[23].

Efficiency drives focused on animals are likely to lead to further welfare problems and exacerbate the conditions that increase risks of the emergence of new threats to human health[44] – whether that be through the presence of antibiotic-resistant superbugs in supermarket chicken[45], or through flu viruses such as H5N1[46].

Efficiency trends result in perverse trade-offs – for example, gains in output, and reduction of some emissions have led to huge increases in others. While the US dairy industry has reduced its number of animals, methane emissions have still risen, due to the use of more intensive systems and the switch to liquid manure management systems that this has entailed[37]. This has led to further impacts on the communities surrounding mega-dairies[47] and the collapse of US family dairies, as corporations consolidate farms[48].

Workers cutting meat in a slaughterhouse. David Tadevosian.

Finally, taking a global view, the IPCC estimates that the overall potential to mitigate the emissions from livestock production ranges from 0.2–2.4 gigatonnes of CO2 equivalent a year (GtCO2-eq yr–1)[23d]. At its upper bound, this figure represents a third of current global livestock emissions (which are 7.14 GtCO2-eq yr–1). But a potential on paper doesn't mean results in practice, because cost gets in the way. At a carbon price of $50 per tonne of CO_2-equivalent, the total abatement potential is much lower, between 0.2 and 0.6 $GtCO_2$-eq-yr-1,[49], which is only 8.5% of GHG emissions of current global livestock production[49].

So, while there are options for reducing emissions-intensity for livestock products, these opportunities should be treated with caution. There remains a more fundamental problem with reducing Big Livestock's colossal emissions.

IS IT POSSIBLE TO DECREASE EMISSIONS INTENSITY ENOUGH TO 'CANCEL' OUT PRODUCTION GROWTH?

The issue of current and future goals for production growth has already been covered in the previous chapter. In short, Big Livestock shows no interest in curbing growth or shrinking its operations – limits to growth are anathema to their business model[2].

To explore this mismatch between growth and emissions reduction, let's take the example of meat major Tyson Foods. Tyson is unusual in that is outwardly committed to climate goals. Not only does it market itself as a sustainable protein leader, it is also one of the few to set an emissions reduction target[2e]. Tyson is also one of an even more select group of Big Livestock corporations that have established a Scope 3 emissions target[f].

Tyson's current sustainability guidelines call for:

- An absolute cut of their Scope 1 and 2 emissions (energy use and processes on Tyson's facilities, electricity purchases, transport etc.) by 30% by 2030.
- A cut of 30% in emissions intensity for their Scope 3 emissions.

Together, these targets mean that, even if Tyson's meat sales did not grow, the company would still have the same carbon footprint in 2030 as the entirety of Greece does now. This is because Scope 3 emissions make up 90% of of a meat companies overall carbon footprint and include emissions from fertiliser used for feed and the energy used by farmers who supply the cattle, hogs and poultry[2].

So, while Tyson tries to market itself as a climate leader, in practice its ambition is very limited. A heavy focus on Scope 1 and 2 emissions make Tyson a meat and dairy corporation looking to cut its emissions from offices and transportation. But even at this, it is failing. Between 2017 and 2018, Tyson's Scope 1 and 2 emissions rose by 5.4% as it increased production by 2.63% and acquired new companies and facilities[50].

The rare Scope 3 target also deserves scrutiny: Emissions intensity targets count emissions per weight of meat or milk. So, if Tyson were to increase its meat production, its absolute emissions would continue to rise. As Tyson is aiming for an annual 3-4% growth in its meat business[2], the company's emissions intensity targets might bend the curve, but they won't halt the upward trajectory of emissions.

Alongside Tyson, a few other Big Livestock companies have tried to position themselves as climate leaders. Maple Foods announced in 2019 that it was the first meat company to reach net-zero emissions, which it allegedly achieved through offsetting – but in reality, they failed to count vast

d Excluding land-use practices
e Only 14 of the 35 largest meat and dairy companies have emissions reductions targets[2]
f Only 6 meat and dairy companies have committed to Scope 3 targets, Feedback (forthcoming)

chunks of the company's emissions[51]. Dairy giants Arla and Danone have set partial net-zero targets for 2050, but Arla's target shockingly excludes the majority of its emissions by excluding methane (see Box 2)[52], and the gap between Danone's planned increase in output implies a remarkable reduction in emissions intensity (30-50%) by its suppliers[2] and massive offsetting of ~9 million tonnes of ~9Mt CO_2-eq – y-1[53]. Currently, Danone appears to offset a tiny fraction of this through two funds totalling 22 million tonnes of CO_2 equivalent over 20 years, with 10 companies invested in projects such as dairy market expansion in East Africa[9].

Big Livestock's targets (for the handful of corporations that have them) are less ambitious than the entire UK agricultural sector[h] and at the same level of ambition of oil giant British Petroleum (BP)[54]. **It turns out that reaching net-zero is as hard for a livestock corporation as it is for an oil and gas giant.**

CAN BIG LIVESTOCK OFFSET ITS EMISSIONS?

Again and again, companies use sustainability initiatives to lock-in existing high-emissions, high-impact business practices – greenwashing existing practices, rather than asking fundamental questions about their business model. Big Livestock is less than forthcoming about its plans for greenwashed decarbonisation, but for the plans we have seen, carbon offsetting features heavily.

As with all emissions-intensive extractive industries, substantial offsetting comes at a high annual cost. To date, no corporations have made available the carbon-cost that they are presuming within their sustainability strategies or the mechanism by which millions of tonnes of emissions offsets will be purchased and maintained over long periods. The UK Committee on Climate Change uses a price of £10 tCO_2-eq for forestry-based offsets in their 2050 scenario: a price that would likely lead to annual bills running into the tens of millions for meat and dairy companies.

An Euclalyptus plantation, Minas Gerais, Brazil. Eucalyptus and pine are the most common monocultures planted for offsetting. Dado photos.

g www.livelihoods.eu/lcf
h The National Farmer's Union has set an overall target for net-zero by 2040[122].

Big Livestock is predominantly looking to the Voluntary Carbon Market[i] for offsets. While there are a range of offsets and competing standards available, the industry's interest appears to be in those offsets that are mutually beneficial for their business model. These include agroforestry-based offsets in the Global South with a sustainable livelihoods component (i.e. building and expanding dairy value chains for local farmers) and anaerobic digestion for manure management and biofuel production. It's worth noting here that anaerobic digestion also attracts substantial additional subsidies[j].

Anaerobic digestors for pig slurry, Germany. Dimitry Naumov..

Huge risks are being added to the Big Livestock business model through an offsetting approach. The future regulation of carbon markets – both formal and informal – remains in flux, and offsetting programmes – particularly in the Global South – will add substantial further Environmental, Social and Governance (ESG) risks to organisations hoping to be seen doing well by doing good (see, for example, ref.[55]). For example, Nestlé has recently had to rip up trees they had planted as part of an offsetting drive at a partner dairy farm in Cumbria, because they had erroneously planted them on a wildflower meadow[56], and Maple Leaf's plans have attracted criticism[51].

But given the already enormous amount of land used by the largest Big Livestock corporations, arguably their biggest challenge in offsetting, is that the additional land-use that would be required for low-cost offsetting (primarily afforestation-based) adds further financial and ESG risks, such as land grabbing. Big Livestock will be in direct competition with other inherently unsustainable industries such as aviation, oil and gas, to offset carbon through controversial afforestation-based greenhouse gas removal.

BOX 3: LAND AND CLIMATE - THE NEW PRESSURE ON LAND FOR CARBON DIOXIDE REMOVAL

For all of the IPCC's emissions-reduction pathways, removing carbon dioxide from the atmosphere plays a substantial role. The IPCC estimates that to achieve the targets of the Paris Agreement, we will need to remove between 100-1,000GtCO2 by 2100 to compensate for sectors such as rice and meat production that cannot easily reduce their emissions[57]. The most common approach for carbon dioxide removal approach is simple, planting trees – which requires huge amounts of land. The UK's Committee on Climate Change's main scenario for reaching net-zero for 2050 involves converting a fifth of UK agricultural land to carbon dioxide removal[36]. A comprehensive review of the land implications of carbon dioxide removal will be outlined in the AR6 IPCC report due in 2022.

Major European dairy companies appear to use carbon offsetting schemes to help expand African markets while simultaneously framing the initiatives as part of their corporate responsibility and social licence to operate[58]. Arla set a precedent in Sweden's supreme administrative court by demonstrating that carbon offsetting increased the sales of its products, and therefore was tax-deductible as a marketing expense[59].

i The voluntary carbon market allows private investors, governments, non-governmental organizations, and businesses to voluntarily purchase carbon offsets. This contrasts with the compliance (regulatory) market through which carbon offsets are purchased to comply with caps on the amount of greenhouse gases emitted.
j Feedback and the University of Bangor (Forthcoming)

Another controversial and dubious source of offsetting comes from anaerobic digestion, the process by which animal (or food) waste is broken down to produce biogas and biofertiliser. Anaerobic digestion of manure does not deliver real renewable energy benefits, but instead is a waste management technology which, at best, potentially mitigates some of the harmful impacts from slurry[j].

Despite the dubious science, this is not stopping Big Livestock. By creating new sources of revenue for livestock corporations and a fresh cash-cow for financial institutions, anaerobic digestion schemes disproportionately favour the commercial viability of large operations. These accelerate the rise of large, intensive farms, from California[47] to County Derry[60]. For example, green energy schemes focussed on anaerobic digestion worth £100s of millions have been hijacked by Big Livestock to fuel their expansion in the UK[61]. In the US, WH Group-owned Smithfield, generates carbon credits through converting pork manure into biogas, before selling them to controversial coal giant Duke Energy[62], thereby propping up another obsolete industry. This pattern repeats for other subsidy schemes – the gaming of a biomass burning initiative in Northern Ireland to drive production growth has embroiled JBS-owned chicken giant Moy Park in the major political scandal: "cash-for-ash"[63].

Offsetting is contested and risky. It poses a risk not just to the corporations involved, but to the planet as well. By appearing to reduce emissions through creative accounting, offsetting distracts from the fundamental task of reducing livestock numbers. At its worst, subsidy schemes for green energy and offsetting have actively fuelled the expansion of the industry.

CAN BIG LIVESTOCK STOP PRODUCING MEAT AND DAIRY?

> ***For us, this is about 'and' – not 'or.' We remain firmly committed to our growing traditional meat business and expect to be a market leader in alternative protein***
>
> Noel White, CEO of Tyson, on alternative proteins

There is a growing market for plant-based protein products, but big Livestock is more than alive to this challenge. Many major meat and dairy companies have made forays into meat and dairy analogues – including Tyson, Cargill, Marfrig and Arla.

Carcasses of meat are suspended in a cargo van before unloading in a butcher's shop. Serhii

In its response, we see another echo of the Big Oil sector. At the turn of the millennium, oil giant BP launched a $200 million public relations campaign, changing its logo and coining the now-infamous slogan 'Beyond Petroleum'. Once seen as the poster child for the effectiveness of shareholder engagement on environmental issues, BP's renewables programme remains a fraction of its overall business, and it continues to be roundly criticised for its response to the climate crisis, even following recent high-profile climate pledges[54].

Fast-forward twenty years and the industrial meat giant Tyson is mimicking BP, with a high-profile foray into alternative proteins, a rebrand as a 'protein

Chicken on a conveyor belt. David Tadevosian

company,' and the launch of its Global Coalition For Sustainable Protein. This initiative aims to position current leading meat and dairy companies as being able to solve an invented 'global protein shortage'. There is not currently a shortage in per capita availability and consumption of protein[64] (Figure 4).

There is growing optimism among investors and climate advocates that by diversifying into 'sustainable' proteins, or plant-based proteins, Big Livestock could reduce its emissions and remove climate risks from its business model[65]. The uptake amongst the 60 most important meat, dairy and aquaculture producers is currently variable – only a quarter mention show evidence of engagement with alternative proteins[65] – but high profile forays into "alternative" proteins by companies such as Tyson have generated significant news interest. If the more radical predictions about the potential of alternative proteins hold true, then diversification and transformation is the only option to survive at scale; the only other choice is decline, more or less managed.

However, meat and dairy corporation executives are on record as saying they see alternative proteins as an addition to, not a subtraction from, their existing production models. The data appears to back this up: Currently, the market for alternative protein is roughly $2.2 billion compared with a global meat market of approximately $1.7 trillion[66] (that's 0.13%). Despite the rapid rise of meat and dairy alternatives, they are currently only a small fraction of the overall market. Rabobank, a Dutch financial services company, recently outlined a less bullish stance on the transformative potential of alternative proteins, highlighting that there is no current evidence that alternative proteins are displacing animal proteins[67]. And while Dutch meat giant VION predicts a 1-2% fall in meat and dairy consumption in Europe over the next ten years, resulting from alternative proteins, it also predicts an expansion in its international meat business[68]. This drive for growth across conventional and alternative proteins is mirrored by almost every meat and dairy company. Fonterra – the world's largest dairy exporter –is aiming to increase its milk production by 40% between 2015 and 2025[2], while dipping its hoof into alt-milks. Tyson has predicted an average 3-4% growth from meat and dairy sales[2] and spoken excitedly about the growth of the alternative protein market[69]. Beef giant JBS has undertook a "stealth" move into the US plant-based market in March 2020[70], weeks after triumphantly posting the growth figures for its meat business[31]. People are eating more protein; companies are using more resources; emissions continue to rise. There is, in short, no evidence that alternatives are currently an effective decarbonisation strategy.

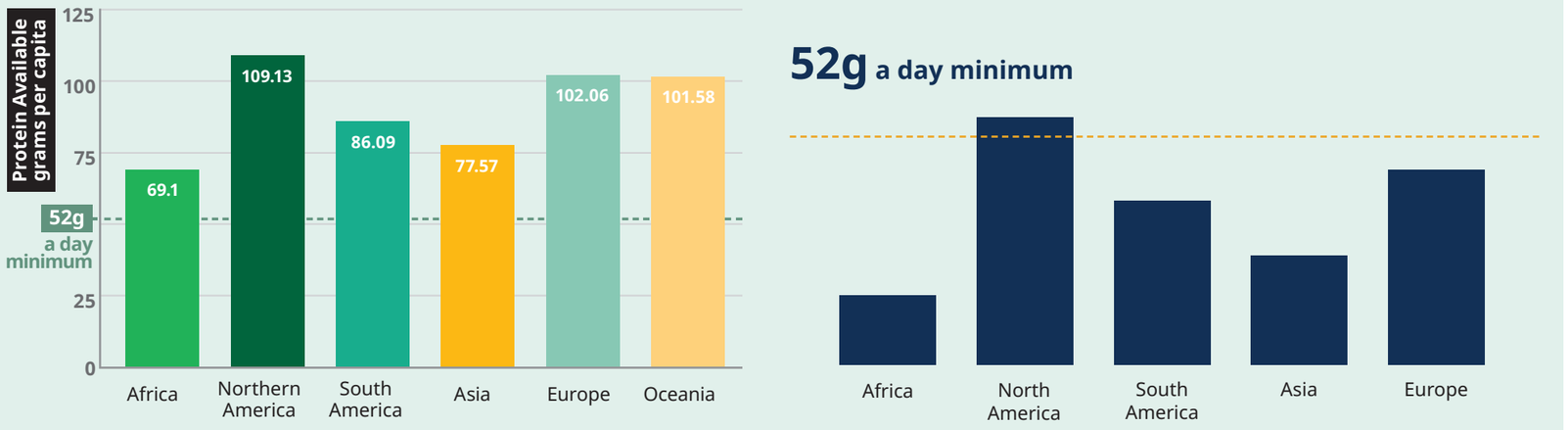


Figure 4 A screenshot from promotional material for Tyson's Coalition For Global Protein (right), appearing to show protein shortages in key regions, compared to actual FAO data (left) on protein availability per capita showing much greater availability. Both sources cited by Tyson do not link to data on protein availability or consumption. While inequities in access to sufficient protein exist, these are not apprarent when aggregated by regional.

But what if alternative proteins do begin to take a significant chunk out of the meat market? It simply seems impossible that Big Livestock companies like Cargill and Tyson could instigate a wholesale transition to alternative protein production. Like fossil fuels, there is no precedent for the wholescale transformation of an entire sector – while on the other hand, examples of industries disappearing with the emergence of new technologies abound[k]. It may be an option for a handful of companies to transform into alternative protein producers – mirroring Danish oil and gas giant DONG's transformation into wind company Ørsted[71]. Smaller players might find new leases of life as high-quality, low-impact and low-volume agroecological producers – but these small players are not Big Livestock – defined by scale – and locked into certain operations, processes, markets and supply chain networks: those of industrial meat and dairy production.

The most optimistic predictions for an emerging market in alternative proteins emphasise new actors, start-ups and disruptors, leading to the collapse of the meat industry by the next decade[72], not the transformation of current Big Livestock companies[72].

However much Big Livestock promises heightened emissions efficiencies, they will always be negated by the same corporations' growth ambitions, and will fail to result in an overall reduction of climate impacts[2]. Although not explored in this report, this same dynamic also precludes any material mitigation of meat and dairy companies' other impacts: land pressure, biodiversity loss and threats to land rights, for example, continue to be exacerbated by industry growth. For Big Livestock, there is *neither the will nor to the way* to transition to a low greenhouse gas model. **While some industrial meat and dairy corporations may pay lip service to the need to reduce emissions, if you scratch the service, it becomes clear that Big Livestock's colossal climate impacts are not a problem to be solved, they are an inherent part of their business model.**

k For example, the global ice trade collapsed in a matter of years with the introduction of refrigeration technology. Fax machine companies underwent managed decline as the internet age dawned.

HOW TO RESPOND TO AN INDUSTRY THAT POSES AN INSURMOUNTABLE THREAT TO OUR CLIMATE?

We see two key approaches to an industry that poses an insurmountable threat to our climate:

- Squeezing, through creating an inevitable, immediate policy response
- Delegitimising and defunding, through mobilising to cut off the industry's financial fodder

STRAND 1: SQUEEZE – CREATING AN INEVITABLE, IMMEDIATE POLICY RESPONSE

Since industrial animal agriculture sits at the nexus of climate change, biodiversity loss and grave threats to human health, a robust policy response is needed to mitigate its worse impacts. For civil society, the challenge is to hasten this policy response. Civil society campaigned to make a policy response to threat posed by the oil and gas industry inevitable, now again, civil society must campaign to make a policy response to the threat posed by Big Livestock inevitable, and immediate. Policy responses to squeeze Big Livestock broadly fall under demand and supply-side measures: squeezing through reducing the appeal of industrial meat and dairy products or squeezing through increasing the cost of production.

❭ SQUEEZING DEMAND

It used to be only fringe animal rights and welfare activists who campaigned for a reduction in meat consumption, but now environmental civil society groups have taken on this agenda – recognising its importance to their broader climate goals. [73]. Today, the mainstream environmental NGOs promote substantial meat and dairy reduction, switching the remaining production to smaller-scale and agroecological models[1]. New vegan movements, such as Animal Rebellion, have also emerged, and energised civil society pressure for a transition to plant-based diets. Once deemed too controversial, policies promoting meat reduction and sustainable agroecological proteins are being considered by several countries. Meat taxes are on the table in Germany, Denmark and Sweden. In other places, they are now no longer hypothetical, with New Zealand adopting taxes on methane from livestock in its climate bill[74]. In the UK, the Committee on Climate Change proposed a 20% reduction in red meat as part of the UK's net-zero ambition, even if the exact policy levers to achieve this reduction have not yet been identified[36]. While not at the pace necessary to curb damaging practices, sections of society are catching on to the planetary risk posed by Big Livestock.

Above -The Eat Lancet Report

Left - Amazon fires, iStock by Getty Images

As the EAT-Lancet Commission and the IPCC Climate and Land report underscore, there is an urgent need to address inequities in global diets[23,75]Big Livestock are currently threatening both. Providing a growing global population with healthy diets from sustainable food systems is an immediate challenge. Although global food production of calories has kept pace with population growth, more than 820 million people have insufficient food and many more consume low-quality diets that cause micronutrient deficiencies and contribute to a substantial rise in the incidence of diet-related obesity and diet-related non-communicable diseases, including coronary heart disease, stroke, and diabetes. Unhealthy diets pose a greater risk to morbidity and mortality than does unsafe sex, and alcohol, drug, and tobacco use combined. Because much of

[1] See, for example the Eating Better Coalition at www.eating-better.org

Plant-centric eating. Photo by The Creative Exchange on Unsplash

the world's population is inadequately nourished and many environmental systems and processes are pushed beyond safe boundaries by food production, a global transformation of the food system is urgently needed. The absence of scientific targets for achieving healthy diets from sustainable food systems has been hindering large-scale and coordinated efforts to transform the global food system. This Commission brings together 19 Commissioners and 18 coauthors from 16 counties in various fields of human health, agriculture, political sciences, and environmental sustainability to develop global scientific targets based on the best evidence available for healthy diets and sustainable food production. These global targets define a safe operating space for food systems that allow us to assess which diets and food production practices will help ensure that the UN Sustainable Development Goals (SDGs). Given the substantial overlaps between diets that are healthy and those that are sustainable, there are growing incentives for governments to act. To give an idea of the potential change – the UN Principles for Responsible Investments Association forecasts a 75% reduction in ruminant meat consumption by 2050, due to health and climate policy action[76].

Right: Fabrice de Nola, 2008. Flesh Lab, digital C-Print, cm 60x90

Complimenting the increased civil society pressure and heightened policy maker buy-in, the ease and consumer acceptance of meat and dairy reduction is rising in many "surplus protein" regions such as Europe, the US and Brazil[77]. The launch of branded plant-based burgers in fast food outlets is now a newsworthy event and The Economist declared 2019 "The Year of the Vegan". But promising signs of policy interest and journalistic interest in the widespread replacement of meat by high tech alternatives don't necessarily equate to tangible change. Substantial reduction of the production and consumption of industrial meat needs to happen rapidly for climate mitigation – but given the overlapping health, livelihood and development issues at play, this is an area managed change should be prioritised over "disruption" (Box 4)[78].

An image of a new-generation meat analogue product. Beyond Meat/Unsplash.

BOX 4: THE END OF MEAT – SCIENCE OR SCIENCE FICTION?

"Lab-grown food will soon destroy farming – and save the planet" argued influential environmentalist George Monbiot in a recent UK documentary[79]. Whether either of these two statements is right remains to be seen.

Discussion over whether novel technologies can "disrupt" and replace conventional meat and dairy production has rocketed into the mainstream over the past few years – stemming from the glitzy launch of a prototype of the "world's first lab-grown burger" in London in 2013. The products vary, from new-generation "plant-based burgers" to fermentation and tissue engineering, but the strategies are broadly the same 'to drive down prices through economies of scale, reach price parity and then undercut the price'[80] of target meat, fish or dairy products.

New meat-analogues generate huge political, economic, social and ethical questions for the food system. Industry boosters argue that these novel foodstuffs will dramatically reduce the environmental impact of food production. A controversial modelling exercise by think tank RethinkX predicted a dramatic collapse in production volumes of the U.S. beef and dairy industries and their suppliers will decline by more than 50% by 2030, freeing up 60% of the land currently used for livestock[81].

But questions remain over the true potential of these technologies, and whether they can be realised in the face of what would surely be a gargantuan counter-lobbying effort. For existing products, like plant-based burgers, there is not yet evidence they are displacing meat[67]. Other products, such as those made through cellular agriculture, remain largely imaginary foods with no immediate prospect of getting to market. Additionally, there are questions whether further adoption of these technologies would lead to the unacceptable destruction of food and farming cultures, livelihoods (RethinkX predicts 1.2 million job losses in the US alone) and further consolidate power within the food system.

These foods may form greater proportions of global diets in the future. But we do not have time to wait for an imagined investor-owned tech take-over of the food system, while working out the unresolved ethical, social justice and environmental issues. In the meantime, there is a very real risk that the allure of tech meat alternatives will prove a distraction to investors, business and policymakers, lulling them into waiting for the 'tech solution' rather than acting now on the tried-and-tested, real solution: the fast reduction of industrial meat consumption and uptake of plant-rich diets[78], supported in its scale and speed by ambitious regulatory intervention[82].

❭ SQUEEZING PRODUCTION

Differences in production practices are important: "It's not the cow, it's the how" goes a popular line among farmers. While the science shows clearly that both the "cow" and the "how" have an emissions impact[1,23,39]1 g of protein/person/day comes from solely grass-fed animals, as compared to 32 g/person/day coming from all animal sources (including fish). From a campaigning perspective, this phrase neatly summarises the key advantage of squeezing production over squeezing demand – it is easier to differentiate how meat and dairy is produced. This is critical as the climate, ecological and social justice profile of different types of meat production – from pastoral and agroecological on the one hand to industrial and financialised on the other, are clearly poles apart.

As we have seen, Big Livestock's proliferation of cheap meat and dairy through its mass production in regions dominated by high consumption has an outsized impact on climate. An extractive financial sector and a skewed system of subsidies fuel Big Livestock's vicious cycle of mass production. By way of example, a fifth (€31.6 billion) of the European Union's entire budget goes to the livestock sector, supporting increasing farm concentration: now over 70% of EU livestock is raised on large farms[14m]. To be truly effective, public policy must remove hand-outs to big agriculture, and redirect subsidies towards regenerative producers. This can readdress the imbalance that enables corporations to consolidate while fracturing family farms[14].

Regulating agricultural commodities, imported deforestation, supply chain emissions and supply chain due diligence, would also squeeze Big Livestock's transnational operations. France's pledge to stop "importing deforestation", for example, would impact both producers abroad and – through ramping up restrictions on feed imports – producers at home[83]. In the US, anti-monopolisation and structural critiques of industrial farming have emerged in recent years. For example, Senator Cory Booker's Farm Bill proposed a moratorium on factory farms, with plans for them to be completely phased out by 2040, and Democratic presidential candidates put forward anti-trust action targeting the big meatpackers[84], such as Tyson, Smithfield and JBS. Globally, civil society coalitions are developing and advocating for a just transition for agriculture[85] and policy approaches to transform the sector to be compatible with climate targets and sustainable development goals[86].

These wide-ranging policy and advocacy efforts aim to support the transformation of livestock production away from industrial models, to align with sustainable development goals and a low-carbon future. They are vitally important initiatives, ones that could be accelerated through increasing the pressure on existing bad practice – as outlined next.

m Large refers to the EUROSTAT definition of farms with an output of over €100,000.w

Animal Rebellion activists occupy Smithfield Meat Market in October 2019. Amy Jones/Moving Animals.

STRAND 2: DELEGITIMIZE AND DEFUND - MOBILISING TO CUT OFF THE INDUSTRY'S FINANCIAL FODDER

Last year's Amazon fires raised the profile of the corporations that are linked to its destruction[4]. Even as the role of meat in climate change reaches mainstream audiences[87], Big Livestock's response to the existential threat that it poses to humanity through its climate impact is akin to Big Oil's reaction to the hard science of its culpability in climate change. It's business-as-usual for the majority of Big Livestock corporations. While a few seek to improve their practices on the surface level – for example by improving their labour or sourcing practices – this usually comes as a response to civil society pressure, and more recently as a response to investor pressure.

❭ INVESTOR ENGAGEMENT: DOING MORE HARM THAN GOOD?

In the last few years, several investor engagement initiatives have sought to leverage the power of investors to drive improvement in performance[88]. For example, the Farm Animal Investment Risk and Return initiative was established in 2015 to, according to its literature, guide investors in identifying ESG risks linked to intensive animal agriculture, and seek to improve the ESG performance of industrial meat and dairy corporations[35]. While these initiatives have had some success in putting intensive animal agriculture on the radar of investors, reports and rankings produced by investor engagement initiatives rarely translate into results and actual change on the ground. In fact, investor engagement initiatives often inadvertently serve to provide false reassurance that the problem is in hand. Meat and dairy giants such as Fonterra and Tyson with colossal climate footprints and controversial track records sit atop rankings of protein producers[35], alongside aquaculture companies such as MOWI with huge environmental impacts[89]. Initiatives such as FAIRR seem to assume that meaningful action by these corporations across a range of ESG indicators is possible - yet data reveals scant evidence of action. A report in 2019, for example, found that 77% of significant meat, fish and dairy producers do not measure all GHG emissions, let alone have meaningful targets to reduce them[35]. From this starting point, action towards a low-carbon food system seems a very long way away.

Plant-based protein remains a miniscule part of the business of a few protein corporations – Only a quarter of companies in FAIRR's index show "some evidence of work to increase access to alternative proteins". In the face of this evidence, if investors continue to imply that a transition of the industry into alternative proteins is possible[65], a transformation with no precedent and without corroborating evidence[67], investors risk doing the industry's' greenwash for it.

More problematically still for investor-driven change, the extent to which many investors care remains debatable. For many, participation in engagement initiatives appears to be an elaborate corporate

social responsibility exercise where signing onto statements counts as action. Out of the 244 investors who signed onto the 'Investor statement on deforestation and forest fires in the Amazon' only 7 had policies on deforestation[90]. Currently, the allure of pushing for data disclosure to plug into risk models appears to be stopping investors asking more fundamental questions about sustainability. This is particularly true of organisations such as Blackrock, Vanguard and State Street – the asset managers with the most exposure to industrial animal agriculture.[35] While aiming to identify winners and losers through identifying leadership on climate and future food initiatives, pushing for emissions disclosure, decoupling and targets may temporarily offer hope via information-driven arbitrage[91], it won't stop climate breakdown. An approach that was compatible with the Paris Agreement would focus less on winners and losers and instead on decarbonisation, now. For this, we need more investors willing to do more than sign onto pledges.

But what can investors meaningfully ask of Big Livestock? Investor engagement lends itself to gradual change. If the challenge is structural and immediate, it is unclear what exactly can be achieved through investor engagement. Production of greenhouse gasses is an inherent feature of industrial meat production. Put simply: Big Livestock is not amenable to incremental changes. Investors may require efficiency improvements, but, however much we need to slash emissions, Big Livestock is not capable of doing so. The industry is structurally incompatible with emissions reduction. As with BP, incremental marketing-driven responses by Big Livestock corporations to investor engagement is not going to create change fast enough.

Investor initiatives fundamentally mis-frame the conversation, positing that climate change may pose a risk to them as investors in Big Livestock.[92] Investors must instead realize that the mere existence of Big Livestock poses a huge threat to meeting the Paris Agreement, and avoiding climate breakdown. This misframing is at best misguided, at worse, dangerous.

A MORE AMBITIOUS RESPONSE TO BIG LIVESTOCK

Trapped by short-term profit-driven mandate and an inherently carbon-intensive business model, Big Livestock corporations have been unable to face the enormity of the task that faces them – the task of fast decline. Similarly, with historically little civil society pressure on those financing meat and dairy companies, investors to Big Livestock are unwilling to stop propping up an industry driving climate breakdown.

In the last year though, organisations such as Global Witness and Amazon Watch have started to follow the money – tracing the complicity of institutions that provide the financial fodder to Brazilian meat and soy commodity producers with terrible records on deforestation[4,5]. The asset manager, Blackrock, once widely seen as a sustainability leader by a blinkered investment sector, has recently had to respond quickly to enormous focus oil, gas and agribusiness investments[93] and is under increasing pressure in its role as the 'world's largest investor in deforestation'[5]. And more broadly, there is a renewed focus on how to (re)direct finance to more sustainable agroecological approaches[14,86].

Climate protestors outside Blackrock's New York headquarters. Steve Sanchez.

s www.gofossilfree.org/divestment/commitments

Now, asks and responses mostly focus on more robust investor policies and the redirection of public money. But more aggressive calls for meat and dairy divestment are already in the public domain, with the UN Special Rapporteur on Human Rights and the Environment calling for the World Bank to divest from Brazilian Beef[94]. Some investors, such as the Norwegian Pension Fund, already exclude the producer JBS on corruption grounds[95].

Demanding divestment from industrial agribusinesses with high emissions profiles and inherently unsustainable business models would enable new stories to be told on the interconnections in the food system and in unsustainable finance. By looking beyond our dinner plates and questioning who funds the meat that is on them, we begin to unpack the power structures that prop up this potent industry. Campaigning for divestment exposes the institutions complicit in the deforestation of the Amazon and other ecologically sensitive regions, the universities that fund poor labour conditions in meatpacking plants, and the museums and galleries that enable land grabbing from indigenous territories. Divestment is effective because it makes tangible the structural issues at play. It forms cross-campaign solidarity so that campaigners can stand with those on the front lines of climate breakdown and with those most affected by Big Livestock's business practices: whether that be small farmers, rural communities or low-paid slaughterhouse workers.

With an industry that is not amenable to gradual improvement, little can be achieved through pleading with investors and creditors to pay attention and encouraging companies to change. Decades were lost engaging with Big Oil, seeking for transformation in the oil and gas industry. Today, time is running out for decisive action on our climate, and we simply cannot afford to make the same mistake with Big Livestock. **Funding industrial animal agriculture needs to become as unacceptably risky and socially toxic as funding Big Oil, fast.**

BOX 5: THE FOSSIL FUEL DIVESTMENT MOVEMENT: A QUICK PRIMER

Fossil fuel divestment aims to combat climate breakdown by using social, political and economic pressure to compel institutions to stop financing companies involved in extracting fossil fuels. As of December 2019, 1,200 institutions and over 58,000 individuals representing $14.4 trillion in assets worldwide have been divested from fossil fuels.

The successes are building. Shell now lists divestment as a material risk within its annual report[96]. When the world's largest sovereign wealth fund, Norway's $1.1 trillion Government Pension Fund, announced its plans to divest from oil and gas last year, 134 companies experienced a plunge of £130m from their combined stock market value[97]. But the importance of divestment extends beyond finance, where the value of fossil fuel investments is smaller, the act is more symbolic – a signal of solidarity with those on the front lines of climate breakdown. As institutions disassociate from destructive companies, it stigmatises them and consequently, BP, ExxonMobil, and Shell have become known as villains.

For fossil fuels, the emergence of the divestment movement, most notably the US campus-led movement, shifted the debate away from individual actions and opened space for radical, structural change[98]. Research shows, that as well as the direct effects of divestment, the new radical asks that divestment brought enabled marginal ideas such as carbon taxes to gain traction and litigitmacy[98]. This suggests divestment works in multiple ways: as a directly through economic, social and political pressure and indirectly through restricting companies social licences to operate and opening up spaces for new ideas, and new voices.

CONCLUSION

We have reached peak livestock. Industrial meat and dairy production are utterly incompatible with a safe, ecologically sustainable life on earth. JBS, Cargill and Tyson are businesses as damaging to our Planet as the fossil fuel industry. There is no version of industrial animal agriculture that is compatible with climate justice, and a zero carbon future.

Big Livestock is sustained by vast flows of public and private finance that prop up a fundamentally extractive business model. Without concerted targeting of these financial flows, change is unlikely to occur at the pace required for a climate crisis.

A precursor to significant action is adequate civil society pressure, and despite longstanding, and excellent critiques of industrial agriculture, gains have been incremental and primarily focused on animal welfare. There is a desperate need for new approaches that foreground the role of scale in industrial animal agriculture. There is a need to tell stories that don't downplay personal diets but put them in the context of a system designed to drive colossal levels of consumption of damagingly cheap meat and dairy. The relationship between individual action and structural change is not either-or. If anything, fossil fuel divestment movement was instrumental in making this link clear for energy. It is time we made this link clear for food, especially for meat and dairy.

The task ahead is vast, and the debate around meat and dairy has sometimes been bitter amongst those of us who should be natural allies. But it is time to put our collective focus towards common enemies: Big Livestock and its financiers.

New York City council member Eric Adams calls for a ban on the Big Livestock companies tied to the Amazon Wildfires

Pacific Press Agency / Alamy

ANNEX: THE MEAT MAJORS AND DAIRY DOMINATORS

This annexe profiles the four largest meat and dairy corporations by production volume.

MEAT MAJORS

1. JBS

Brazilian butchers JBS S.A. are the world's largest meatpacking company, earning $49.7bn in 2018. JBS has increasing influence beyond its home market, acquiring U.S. meatpacking company Swift & Co. before further acquisitions from its main competitors, including Pilgrim's Pride – through which JBS control Moy Park, the UK's largest poultry producer. JBS slaughters 85,000 cattle, 70,000 pigs, and 12 million birds every day[33] emitting a colossal 280.2 million tonnes of greenhouse gas emissions annually[2].

JBS funded this acquisition spree through finance from Brazil's state-owned bank BNDES – which JBS admits it secured, in part, due to the $123 million in bribes it has paid to more than 1,800 Brazilian politicians over the past 25 years[99]. Consequently its parent company was fined $3.2bn, one of the biggest fines in global corporate history[99].

JBS was also embroiled in the 'Carne Fraca' scandal in 2017 after it allegedly bribed food sanitation inspectors, resulting in rotten meat exported worldwide[100].

The USDA found in 2018 that JBS shorted US cattle producers on their payments at three separate slaughterhouses – paying $4 million to more than 12,500 people for its transgressions[11].

Despite signing the 2009 Cattle Moratorium, JBS is accused of continuing to violate efforts to conserve the Amazon101. It was fined $7.7m in 2017 for buying cattle raised on illegally deforested land. In the same year, it was linked to nearly 24,000ha of deforestation102. Currently, companies in JBS's supply chain are potentially responsible for the destruction of between 280-320 square kilometres of forest every year for exported beef[103].

2019 saw the most active year for fires in the Brazilian Amazon in nearly a decade, with 70% of these fires occurring in buying zones of cattle slaughterhouses[104]. A quarter of a million fire alerts occurred within estimated operating zones of JBS S.A alone[104].

2. TYSON FOODS

Tyson Foods is the world's second-largest meatpacker, with a revenue of $42bn and an annual emissions total of 118.1 million tonnes. Like JBS S.A., Tyson has consolidated its power by acquiring dozens of smaller competitors. Notably, a 2001 purchase of the then-largest beef producer, IBP, in the US for $3.2 billion, was approved by the Department of Justice – despite monopolisation concerns.

The corporation faces a class-action lawsuit that alleges Tyson and other major poultry corporations engaged in a long-term price-fixing scheme that stole the equivalent of $330 a year from the average family through inflated pricing[105].

Tyson chicken products have been contaminated on multiple occasions, raising serious concerns over their food safety standards. Product recalls have involved chicken containing rubber, plastic, and metal[106–108]. Tyson has also been untransparent about antibiotic usage, claiming that their chickens are 'Raised without Antibiotics' despite the USDA having discovered antibiotics in their chicken products[109].

In 2001, Tyson faced charges for knowingly employing undocumented immigrants. Company officials allegedly conspired to smuggle workers from along the border and into their plants[110] Workers endure harsh conditions, limiting breaks so frequently that some employees wear diapers to work and defecate on the lines[111].

3. WH GROUP

WH Group, known to American consumers by its subsidiary, Smithfield, is the world's largest producer of pork and the largest meat producer in China. It is a publicly-traded Chinese company with a revenue of $22.61bn and much like other meat majors, came to dominate the industry through its aggressive expansion. In 2013 it acquired the American meat giant Smithfield and now sells products to 44 countries on every continent, generating over 30.1 million tonnes of greenhouse gas emissions in the process[2].

Smithfield, itself a $5 billion company, has been accused of creating over 3,300 lagoons of contaminated waste containing faeces, urine, blood, and bodily fluids in North Carolina[112]. Around 160 North Carolinians live within a half-mile of a pig or poultry farm, causing damaging health and wellbeing impacts on its predominantly Black Caribbean community[19]. Another subsidiary linked to WH Group has been accused of human trafficking and modern slavery of Thai workers in Utah[113].

WH Group signed an MoU with JBS in Spring 2020 to secure a little regulated route for Brazilian meat into China, increasing deforestation risks[114].

4. CARGILL

As the second-largest meat processor worldwide, Cargill has a revenue of $115bn and is America's largest privately held, family-owned company. At 14 family billionaires, the Cargill family has more billionaires than any other family[28]. The conglomerate supplies 22% of the US domestic meat market and is the largest poultry producer in Thailand[34]. It also runs a $50 billion food additives business. In total, Cargill's worldwide meat operations generate 86.3 million tonnes in greenhouse gas emissions[2].

The company has been accused of wide-scale deforestation to produce soy for industrial livestock feed, causing mass biodiversity loss[115]. It's palm oil operations in Indonesia, and Papua New Guinea have been charged for violating human rights, using bonded labour and child workers[116]. Cargill is also linked to deforestation and land grabbing from indigenous territories in the Amazon region, through financing land-clearing operations for soy to feed hogs, chickens, and cows[115].

Cargill has repeatedly recalled large volumes of meat products due to contamination[117].

DAIRY DOMINATORS

1. DAIRY FARMERS OF AMERICA

A private cooperative owned by farmers across 48 states, Dairy Farmers of America (DFA) made an income of $108.5m in 2018[48]. As the largest dairy cooperative in the United States, DFA came to dominate the industry by acquiring many smaller cooperatives. It topped a 2016 ranking of dairy emitters, generating over 52 million tonnes of greenhouse gas emissions[2].

As well as buying milk from its farmers, DFA invests in its own milk production. Farmers claim that this has caused a conflict of interest since it enables DFA to manipulate prices and suppress farmers' wages[48]. In 2013 it agreed to a settlement of $156.8m for conspiring with Dean foods for price-fixing milk. Dean foods processing arm is soon to be acquired by DFA. This will make it the largest producer and processor of milk in the US.[48].

2. FONTERRA

Fonterra formed after a merger of New Zealand's two largest dairy co-operatives (New Zealand Dairy Group and Kiwi Cooperative Dairies). The co-operative, which is owned by farmers across New Zealand, is the world's largest dairy exporter, responsible for around 30% of the world's dairy exports[118]. It has a monopsony over New Zealand's dairy industry, controlling over 80% of New Zealand's raw milk intake[12], earning total revenue of $12.9bn in 2018. Fonterra is also New Zealand's largest producer of biofuel. Together its activities generate over 41 million tonnes of emissions annually[2].

Fonterra's expansionist strategy focused on the aggressive expansion of Asian has caused it financial and reputational difficulties[118]. It's 43% stake in its Chinese partner, Sanlu Group, embroiled the company in the 2008 contaminated milk scandal that affected around 300,000 Chinese infants and killed 6118 and in 2013, an international recall of contaminated baby formula resulted in the resignation of the head of its milk division[119].

As well as it's colossal emissions, Fonterra is linked to other environmental disasters. Wilmar, Fonterra's key supplier of palm kernel used in supplementary livestock feed, was linked by Greenpeace to deforestation an area twice the size of Paris in Indonesia[120].

3. LE GROUPE LACTALIS

Le Groupe Lactalis is a family-owned French business with operations in 50 countries. In 2018 it made a revenue of $20.8bn, and an independent assessment suggests that the group produced 23.85 Mt in emissions in 20162. It is second only to Nestle in terms of its production volumes[2].

In 2018 it withdrew 12 million boxes of baby formula worldwide due to salmonella contamination, affecting 83 countries. The epidemic hospitalised infants in France, Spain and Greece[121]. Lactalis was accused of hiding the contamination as it was later revealed that the factory at the centre of this scandal was also responsible for an outbreak in 2005[121].

4. ARLA

Arla, a Scandinavian cooperative owned by more than 11,200 farmers, is the largest dairy company in the UK. It encompasses a range of farms, including 'megafarms' across the country, with its largest in Buckinghamshire[122]. It is known in the UK under brand names including 'Cravendale' milk, 'Lurpak' and 'Anchor' butter.

Arla, alongside many other multinational dairy companies, has been embroiled in food safety scandals in China[123].

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