Briefing III:

Causes and ongoing drivers of unsustainable animal-sourced food production

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KEY INSIGHTS

- Meat has become a centrepiece of the dinnerplate across Europe, and despite increasing evidence of negative health, social and environmental outcomes, consumption of animal-sourced foods (ASFs) is seen as "natural, nice, necessary and normal".

- What we buy and eat is influenced by numerous interrelated factors, such as social identity, cultural norms, marketing, media, product availability, point-of-sale design, policies and regulations, and ease of access to supermarkets and restaurants – as well as price and taste.

- Key to identifying effective campaign levers that can help transform the food system is an understanding of economic drivers, such as the low price of meat and policies that intensify industrial agriculture. Various lock-in factors are hindering progress toward a more sustainable food system. These include the concentrated power of the extractive ASF industry and consumers' expectations of cheap food.

- Although current agricultural policies and subsidies specifically benefit large-scale intensified production and even promote the consumption of meat and dairy, government policies could be catalysts of change.

- Supermarkets and food manufacturers have the strongest influence on food environments – the contexts in which consumers engage with the food system to make decisions about acquiring, preparing and consuming food. ASFs are only a part of their business, so gradually decreasing their share of total sales may therefore not be seen as problematic. The second-biggest market for meat and dairy is restaurants. Barring fast-food companies, this sector is for the most part not dominated by big and influential actors.

- The meat and dairy industry and the production chain in Europe (including traders, the feed and pharmaceutical industries, and breeders) are locked in their modes of production and represent a power for delay, rather than a power for change. These conservative actors have a very tight grip on policies, regulations, markets and research, and to a large extent frame the debate about meat and dairy to their advantage. The movement for healthy diets and sustainable farming seems to have insufficient influence to change entrenched power dynamics in the food system. Alternative food systems are limited to niche markets. However, there is a big grey zone of industry actors who might be interested in joining the transition away from unsustainable ASF production, and who can, with the right demand and policy support, change their mode of operations.

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Introduction

Dynamics behind the problematic animal-sourced food system

The consumption of meat and other animal-based food far exceeds what is healthy and sustainable. Briefings I and II explore trends in the production and consumption of these products and the outcomes for the environment and human health and societies. The growth in market share of plant-based products and more sustainably produced meat and dairy provides reasons for optimism, but the speed with which this share is growing is far from what is required to transition the food system.

To enable the formulation of effective interventions that reduce ASF consumption and improve agricultural production (see Briefing IV), a better understanding of the food system is needed. This briefing describes what drove development towards the current problematic industrial livestock sector and over-consumption of meat and dairy, and what hinders this system being changed for the better.

The briefing starts with a short history of the consumption of meat, before exploring the economic and psychological drivers that influenced the development of the food system. It then examines different factors that slow down or block change and keep the food system locked into the current situation. After assessing how "food environments" are shaped, it profiles the allies and opponents of food-system change.

A brief history of meat

In modern Western culture, animal-sourced foods (ASFs) became a highly valued centrepiece of the dinnerplate for most households. Researchers have argued that the primary narratives surrounding the legitimacy of meat in the modern diet centre on four themes, referred to as the "four Ns": eating meat is seen to be "natural, nice, necessary and normal".[1,2] The concept of the naturalness of meat consumption may be one of the most powerful and pervasive narratives in Western culture. Analyses of marketing campaigns for ASFs have noted the romanticisation of naturalness as a core theme.[3] Prominent international reports on sustainability and climate change consistently frame meat as a natural and necessary component of the modern diet.[4]

However, an examination of the history of ASFs shows that meat has not always been as much of a natural or necessary part of our diets as popular culture has portrayed. Early subsistence societies adopted animal agriculture to meet

nutritional needs, but as societies advanced, ASFs became increasingly important for political and economic reasons. These were accompanied by rituals and traditions that further shaped the demand for meat in particular.[5]

Early human consumption of meat was very limited. The earliest domestication of animals by humans (around 8500-2500 BCE) was not a "golden age" of sustainable livestock production. Agriculture of all kinds, plant or animal, when carried out poorly, was responsible for extensive environmental damage. Even well-run production systems could not prevent frequent famines and malnutrition.[6] Livestock production later became more common and meat consumption symbolised wealth, though it may still have contributed only about 1-2kg per year to the average ancient Greek's diet.[7] By the later Middle Ages, animal rearing for food had become much more important for rural communities. In the 15th century, urban consumers in Central Europe had become dependent on beef imports from Eastern and northern Europe[8]. The link between meat, social status and power continued to be entrenched and vegetarians were labelled as heretics. The 20th century saw a monumental shift in livestock production, practices and ownership. Western governments wanted rapid economic growth, and expanding food production was a key tool in ensuring a reliable source of affordable energy for factory workers and urban populations. The post-war Green Revolution brought technology innovations to farming that vastly increased agricultural production. The growth rate for chicken farming increased over 400 per cent between 1950 and 2005,[9] and the feed conversion ratio (the amount of feed that is required for the production of a unit of meat) for pigs decreased from 3.80 to 2.37 (1970-2016).[10] Alongside supportive government policies, and in an era of cheap energy, this led to the democratisation of access to relatively cheap meat, resulting in a huge increase in its consumption over the 20th century.

History helps us unpack what led to the present. Understanding why consumers select, purchase and consume ASFs is critical for developing strategies to shift current behaviours to achieve environmental, health and social benefits. However, changing consumption patterns at an individual or population level is not a straightforward task. What we buy and eat is influenced by numerous interrelated factors, such as social identity, cultural norms, marketing, media, product availability, the design of point-of-sale settings, policies and regulations, and ease of access to supermarkets and restaurants – as well as price and taste. These factors build food environments. This section focuses on the actors and the key economic, psychological, political and sociological drivers behind excessive and extractive ASF consumption and production.

Macro-economic drivers and shifts

A number of key factors have had a large influence on how today's food system and food environments are shaped. Understanding these drivers is important for finding the most effective interventions to create a sustainable, healthy food system.

Price of meat

Relative to average income, the price of meat today is lower than it has ever been. Analysis by the Food and Agriculture Organisation (FAO) shows that from the 1960s to the early 2000s, the price of livestock products declined in relation to other foods.[11] Globally, the two most important drivers of total meat consumption are rising income per capita, followed by rate of urbanisation.[12] However, income growth is linked to larger increases in meat and dairy consumption in lower-income countries than in wealthier ones, such as those in Western Europe.[13] There is some evidence that lower prices of alternatives can reduce meat and dairy consumption, especially in the case of vegetables, pulses and bread.[14] Pricing strategies have been shown to be effective in reducing the consumption of tobacco and sugar,[15],[16] and the approach has been applied to sustainability behaviours as well, such as reduced taxes on fuel-efficient cars and levies on plastic bags. Advocates and even some politicians have talked about imposing a meat tax,[17] but such measures are likely to be highly unpopular in the current environment – although there are significant differences across countries.

Demand for low food prices and uniform products

Supermarkets, traders and other actors in the food chain are in fierce competition with each other. Offering food at the lowest price is one of the most important factors for gaining market share. In the battle to get customers into supermarkets, retailers often advertise cheap meat and dairy at low prices. Eggs, milk and meat are often used as "loss leaders" – products marketed at a very low price, even below cost price, to attract customers that buy other, higher-priced products as well. This competition trickles down the food production chain, ultimately leading to low farm-gate prices. Food manufacturers and other actors also demand uniform production. Produce is supposed to have consistent consumption properties and food should be easy to process in an automated way.[18]

Low farm-gate prices and intensification of farming

Many dairy farmers acknowledge that farm-gate prices for milk do not fairly cover their labour costs and investments. Smaller farms generally have higher costs per unit of production than ones with more animals. Organic milk production is more profitable, but market opportunities have been limited. For many farmers, the only way forward seems to be to intensify their mode of production and increase the scale of operations. These business decisions require high financial investments, which farmers can often only cover with a bank loan.

While farmers who are land-bound (dairy farmers, those with grazing animals) are eligible for European Union (EU) subsidies, intensified industrial livestock farming is not land-bound, and as a result, these farmers do not receive subsidies under the EU Common Agricultural Policy (CAP). However, there is an indirect route of subsidising these farmers through feed production, market interventions, promotions and "innovation" subsidies.

To enable reduction of costs, farmers frequently invest in farming infrastructure (sheds, machinery) and finance this with credit and bank loans. Since the only likely way forward is repeated increased efficiency by economies of scale, the possibilities of attempting different business models are very limited. Instead, farmers get pushed into increased intensification.[19]

In 2005, the number of farms with livestock in Europe was slightly over 9 million. That number decreased in 2016 to 5.7 million. In EU member states in Central and Eastern Europe, the decline was even greater.[20] The remaining farms have much higher numbers of livestock and enormous productivity gains.[21]

The trends of intensification and upscaling production per farm have pushed relatively small farms out of the market. They cannot compete with bigger farms in cost reduction, and when financiers decide smaller farms are no longer viable, they risk bankruptcy. It is estimated that the number of farms in the EU diminishes by 2 per cent every year. This process of intensification is a general development in all agricultural sectors, but is especially noticeable in livestock farming, where the largest farms generate most of the production.[22]

Externalisation of costs

Environmental, climate, biodiversity, health and a range of societal costs of production are often externalised. This means they are not included in the price consumers pay for food, but are instead passed on to society. Although the calculation of specific external costs is complex, it is clear that the financial prices of industrially produced ASFs on supermarket shelves are much lower than the socio-ecological prices paid for ASFs across the supply chain.[23] A full cost assessment by the Dutch institute CE Delft estimates pork to be 53 per cent higher, beef 40 per cent higher and chicken 26 per cent higher when the externalised costs are included in the price paid by consumers.[24]

Economic growth and increase of consumption

Due to the intensification and mechanisation of agriculture over the last century, consumer food prices have decreased and the relative food expenses of households have diminished. This process has made ASFs more accessible to a wider range of the population, increasing meat consumption dramatically, but also exacerbating the external societal costs associated with its industrial production. In general, economic growth is assumed to promote the consumption of meat and dairy.[25] Within Europe, there are noticeable differences in the share of food in the total household expenditures between countries.[26] In 2019, people in Romania spent more than 25 per cent of their income on food and beverages, while at the other end of the spectrum in the UK, people spent less than 10 per cent of their income on these products.

Economic importance of the livestock sector

Livestock production plays a large role in the EU economy, accounting for 40 per cent of all agricultural activity.[27] The sector is also a crucial industry in many local and regional contexts, and a source of jobs and livelihoods.

Subsidised marketing of meat and dairy

The EU itself spends large sums on subsidies for marketing European ASFs. Between 2016 and 2020, the EU devoted 32 per cent of its marketing budget (€252.4 million) to promoting meat and dairy products. Over the same period, only 19 per cent of the budget went to promoting fruit and vegetable. Between 2016-2019 only €6.2 million was spent promoting organic animal products - only 3% of the budget for all ASF promotion projects.[28]

Increased consumer awareness

European consumers are becoming more aware of the impacts of food production and consumption on the environment, animal welfare and human health, and are demanding greater transparency from retailers and producers. This has various causes, including greater access to information, and the fallout of a series of food scandals in recent decades.[29] Researchers have linked shifting consumption trends, such as an increase in eating poultry, to health recommendations to consume less red meat and fewer fatty foods. This may also have been a result of the "BSE crisis" (see "Food scandals" below).[30]

Environmental issues lead to intensification and "end-of-pipe" solutions

Livestock farming has overt impacts on ecosystems. Given the industrialised operations predominant across the extractive livestock sector, the industry's response to ecological problems involves technological solutions that do not change the way meat and dairy are produced, but rather contain the influence of farming.

An illustration of this mechanism is the way the industry deals with problematic emissions of ammonia. This results from chemical reactions of proteins in the manure of livestock, and causes nitrification and acidification. The impacts on biodiversity forced the industry into action. A fundamental solution would be to avoid keeping livestock in concentrated animal feeding operations, reduce protein in feed and manage manure so that these chemical reactions do not take place. But instead, the industry invests in "end-of-pipe" technologies to reduce emissions without changing the problematic mode of operation – for example, by installing "air washers" in pig and poultry sheds, or low-emission flooring in dairy sheds.[31] Given the push for more intensification of production and to reduce the environmental impacts per kilogram of produce, such technologies are characteristic of the way the livestock industry deals with environmental issues.

Food scandals

The public image of the livestock industry, particularly in some European contexts, is tarnished by food scandals or high-profile public health crises related to livestock. One prominent example is bovine spongiform encephalopathy (BSE), which led to the deaths of 178 people from cases of the associated Creutzfeldt Jakob disease in the UK until December 2020[32]. BSE is a fatal neurological disease in cows, and people became infected by eating meat from infected cows. The BSE crisis lasted from the late 1980s until the late 1990s and led to trade bans on British and French beef. Feeding animal-based waste to livestock has since been banned[33] but only recently did the EU allow feeding pig 'by products' to chicken and vice versa again[34].

Science and technology

The development of agricultural science and technology in Europe is highly privatised.[35] New technologies are often designed to produce cheaper and more efficient food, which drives more uniformity of food products. Whereas agricultural technologies initially focused largely on the mechanisation of production, more recent agricultural production has become increasingly data driven. Management strategies for breeding and feeding, as well as housing systems and production processes, have been modified in response to data

insights. In precision livestock farming, for example, software and sensors enable farmers to feed animals exactly the right mix of nutrients and micronutrients for maximisation of growth. Dairy farming has become a robotised production system: robots clean sheds and cows are milked and fed by robots.

Feed

Research into animal nutrition has predominantly focused on increasing feeding efficiency: finding optimised rations for specific animal species in specific phases of their lives. This caused a change in the composition of feed, away from grass and leftovers from food production.[36] High-protein feed, such as soy, makes livestock grow fast. More recently, research on feed and additives also incorporates the reduction of emissions such as methane or ammonia. The availability of cheap feed from other regions of the world is a key permitting factor for the current size of livestock operations in Europe.

Breeding and animal genetics

Through in vitro fertilisation and genetics, animal breeders have used trait selection to put productivity increases at the centre of livestock breeding.[37] Current breeding programmes – along with a consolidation of the breeding industry, and large scale farming operations – have led to a genetic homogenisation of livestock and a decrease in the biodiversity of commercial livestock breeds. This is one of the drivers behind the loss of resilient farming systems and increased vulnerability to diseases and other biotic and abiotic stress.[38] Another driver behind the increase of scale of operations is the availability of antibiotics[39], which are basically needed to maintain lots of identical animals in a small space.

More recently, breeders are incorporating into their selection properties such as resilience. Some work on "dual-purpose chicken", so the males among chicks intended for egg production do not need to be discarded, but can be used for meat production. Others are developing hornless cows, so cows do not need to undergo the very painful removal of horns.

Globalisation of markets and export orientation

Economic globalisation is driving growth in EU meat production in two important ways. First, it has enabled the import of feed from other regions of the world. Currently, the EU produces only 31 per cent of its livestock protein feed. For example, dried forage (grass) and pulses are mostly grown in Europe, but only 2 per cent of soy – which makes up more than half of all the protein feed used – is grown in the EU.[40] The "virtual land area" required to grow all agricultural products - in particular feed - for consumption by the EU is estimated at 35 million hectares, an area the size of Germany.[41] A second result of globalising markets

is that Europe has become a net exporter of meat and dairy products. While European consumption of these products is stabilising or in many countries even decreasing, the livestock industry sees opportunities for growth in other regions of the world.

Policy and regulations

The majority of policies and regulations on agriculture and food in Europe are decided in coordination with the EU. The most important policy in this context is the Common Agricultural Policy (CAP). The CAP, the EU's oldest policy, was adopted in 1962 to establish a self-sufficient and stable food supply for Europe by giving farmers in the region income security. Today, the CAP is a set of policies, directives and regulations that control different aspects of the food system, from organic farming and labelling of food origin, to pesticide use. It also involves a subsidy programme.[42] In 2018, 38 per cent of the EU's budget (€60 billion) was allocated to CAP, with income support to farmers making up 71 per cent of the total CAP budget.[43] An important consideration is that the amount of "direct payments" – the vast majority of agriculture subsidies, intended for income support – are based on the size of a farm in hectares. In terms of ASF production, this means that dairy and other farms that work with grazing animals are often leading recipients of CAP subsidies, while industrial pork and poultry producers are not, as they often do not own land. However, these sectors do receive relatively smaller amounts of CAP budget for market interventions and rural development.[44] Subsidies for feed production are an indirect way of supporting the industrial livestock sector.

CAP also provides market stabilisation by allowing the European Commission to buy and release agricultural products to stabilise market prices. Prices paid to meat producers are higher than world prices, and livestock farming is the main beneficiary of the aid provided to farms in disadvantaged areas to compensate for additional costs linked to an unfavourable location or other factors.[45] Approximately 18-20 per cent of the EU's total annual budget (a sum of €28.5-€32.6 billion) goes to livestock farms or those producing livestock fodder.[46] Given the scientific evidence showing the environmental harm caused by the livestock sector, critics argue that it makes increasingly less sense to incentivise this type of production. CAP reforms since 1992 have expanded its objectives to include environmental protection and addressing climate change, but the success of measures aligned with these aims has been limited.

While an in-depth analysis of the CAP in relation to livestock is beyond the scope of this report, there is ample research documenting the influence of the European livestock industry on the policy[47] and the CAP's tendency to benefit and promote large-scale farming, rather than diverse ecological food systems.[48] Even the CAP's attempts to address the climate crisis have failed to produce results. In a recent report, the European Court of Auditors concluded that despite the EU spending €100 billion since 2010 on climate measures under

the CAP, the level of greenhouse gas emissions by the agriculture sector did not significantly change.[49] Another evaluation conducted by member states examining the effectiveness of biodiversity measures introduced as part of CAP policies concludes that "the combined effects of the CAP have not been sufficient to counteract the pressures on biodiversity from agriculture both in semi-natural habitats and in more intensively managed farmland."[50]

A recently published report about agricultural support from governments by the United Nations Environment Programme, the FAO and United Nations Development Programme concludes that: "unhealthy products, like sugar and emission-intensive commodities (e.g. beef, milk and rice) receive the most support worldwide, despite the potentially negative impacts on health as well as on climate change adaptation and mitigation, and the (relative) disincentives this support creates towards producing healthier and more nutritious foods, such as fruits and vegetables".[51] The report calls on governments to halt this distortive support of harmful practices.

Recently, negotiations on the new 2021-2027 CAP between the European Parliament, the European Commission and member states came to a provisional agreement. Technical details of the new policy still need to be settled, and the European Parliament, Council and member states' agriculture ministers need to give final agreement. Civil society organisations have reacted with disappointment to the long-awaited outcome of the review as virtually all the amendments that might have made the future CAP greener and fairer were rejected.[52]

Psychological drivers

Decisions we make throughout the day, including which foods to consume, are driven by unconscious and conscious processes. The two systems are referred to in different ways, sometimes "impulsive" versus "reflective"[53] or "System 1" versus "System 2",[54] but these dual-process models generally describe the same mechanisms. One system is automatic, non-conscious, driven by emotions and requires little or no cognitive effort, while the other is slower and more effortful, conscious, reflective and driven by logical reasoning. The systems constantly operate in parallel and generally work well together to allow us to complete tasks, but sometimes they work antagonistically. For example, after hearing increasing media reports about the environmental harm caused by livestock production, a person might have the strong intention to eat a meat-free meal, yet be tempted by a hamburger sold at a restaurant on the way home from work.

Moral conflicts: the meat paradox

When a person's behaviour consistently contradicts their intentions and beliefs, this can create uncomfortable cognitive dissonance that needs to be resolved. With

respect to ASFs, this has been referred to as the "meat paradox", in which people are morally conflicted by the thought of harming animals, while also enjoying the consumption of meat.[55] [56] Sometimes, they resolve this conflict by either rejecting meat-eating or switching to "better" sources, such as organic, which bring their behaviour into alignment with their intentions and values. But, more commonly, they employ various psychological strategies instead. For example, people will claim that animals are not worthy of moral concern,[57] reject the notion that animals reared for food suffer,[58] or use various rationalisations to justify their actions. This type of motivated reasoning also leads people to search for, interpret and favour information that confirms our existing beliefs ("confirmation bias").[59] At the same time, they will overlook or dismiss opposing arguments, which may be a reason why information campaigns alone tend not to be effective in influencing meat-eaters to change their diet.

Choice architecture

Our food choices are also influenced by "choice architecture", referring to the ways that the context in which people make decisions is shaped.[60] Hollands et al. (2017) developed a classification of strategies used in physical micro-environments such as shops, to help researchers examine and classify a range of behaviour-change interventions. Table 1 adapts their list of strategies, to describe ways in which retailers and other food businesses promote ASFs.

Table 1: Behavioural strategies used by food companies to promote products[61]

Lever	Description	Meat and Dairy Examples
Availability	Adding or removing products to increase, decrease or alter their range, variety or number	▪ Adding more meat-based dishes to a restaurant menu
Position	Altering the position, proximity or accessibility of products	▪ Placing promotions for ASFs on plinths (end-of-aisle displays) ▪ Placing meat dishes at the top of restaurant menus
Functionality	Altering functionality or design of products to change how they work or guide people to use them	▪ Creating meat snack products that can be eaten "on the go"
Presentation	Altering the visual, tactile, auditory or olfactory properties of products	▪ Images on meat packaging conveying a natural, traditional farm scene
Size	Altering the size or shape of products	▪ Selling multi-pack burgers and sausages
Information	Adding, removing or changing words, symbols, numbers or pictures that convey information about the product	▪ Using fake farm names on meat ▪ Using descriptive language in product names

Lock-ins delaying transition to healthy and sustainable food and farming

The drivers listed above, among others, lead to a landscape where the extractive production and consumption of ASFs is "locked" in place. Drivers help us understand why a certain phenomenon arose; lock-in factors help explain why this phenomenon has remained. These ingrained vicious cycles need to be challenged to enable a transition towards more ecological farming and healthier diets. Understanding these lock-ins can help us identify entry points and levers for change, as they relate to political structures that govern food systems, organisation of markets and conceptual barriers in how challenges are framed. The International Panel of Experts on Sustainable Food Systems (IPES-Food) describes eight lock-ins of industrial food systems. These are presented below, customised to reflect how they advance excessive production and consumption of extractive ASFs in Europe.[62]

1. Path dependency

Decisions made in the past influence and restrict the options for change today. Farmers have invested in specific production systems. Changing these has a high cost and is therefore unattractive. Markets and policies are largely designed to support industrial and extractive agriculture. Sunk costs and fidelity to previous practices suggest that the only way forward is doubling down on a model of even more intensified livestock production and investing in upscaling operations.

2. Export orientation

The livestock industry has increasingly become dependent on exports. The need to be competitive with international prices and standards incentivises more industrialised production.

3. The expectation of cheap food

Consumers are accustomed to cheap food in supermarkets and restaurants. Household budgets have adapted to that reality. People have become disconnected from food systems and the consequences of their decisions in relation to food.

4. Compartmentalised decision-making structures

Industrial agriculture is locked in place by the compartmentalised structures that govern the setting of priorities in politics, research and business. An integrated approach in policymaking and scientific research is needed to develop sustainable solutions for challenges in environmental protection, biodiversity, animal welfare and the socio-economic position of rural communities. Today, the focus of these endeavours is skewed towards agricultural productivity.

5. Short-termism

Systemic change in food production and consumption requires long-term thinking, but politicians and businesses favour interventions with immediate results. Short-termism helps to cement current systems and block the development of diverse, ecological farming approaches.

6. Colonial and "feeding the world" narratives

Food-system actors in Europe often frame food insecurity as a productivity issue that they are actively helping to address. The European industry also promotes itself as a "better than the rest" supplier of more sustainable and ethical meat. It points to the growing export of meat and dairy, and signals that in other regions of the world, "animal welfare and sustainability impacts are worse than in Europe".

7. Measures of success

The way the outcomes of interventions are measured and benchmarked is crucial in evaluating policies, research funding and farmers' performance. Productivity, efficiency and low costs are often the most dominant indicators.

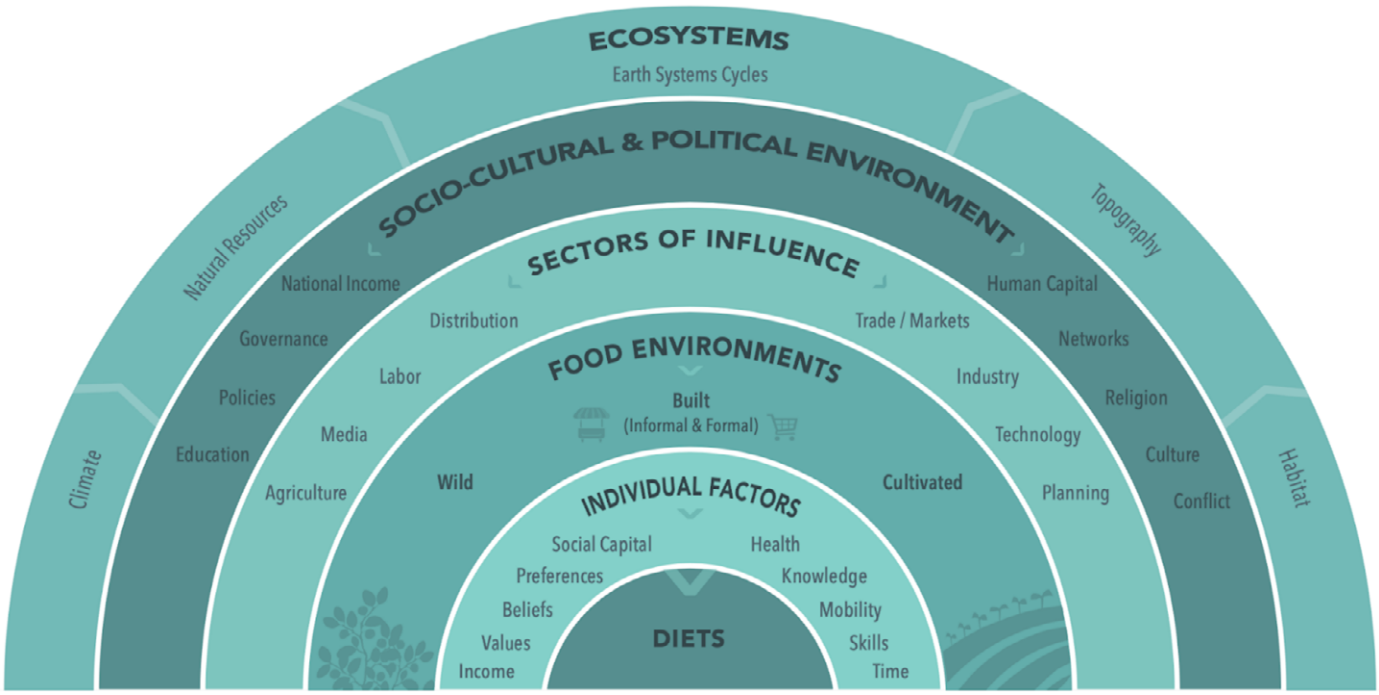
8. Concentration of power

The power of dominant actors in the production and distribution of food leads to a self-reinforcing system. The industry frames the debate about livestock, narrowing the food challenge to a problem of scarcity solved through producing more food to meet global demand. It also restricts solutions to those of increased productivity through intensification and technologies. Food industry conglomerates, input industries, and meat and dairy processors have well-organised and influential lobbying machinery. The development of public science is often influenced by corporate agendas. The incorporation of healthy and sustainable alternatives – such as organic production or plant-based products – remains small and limited.[63]

Influence of the food system on food environments

In addition to trends and drivers, understanding how a system works requires understanding of the different actors within that system. The Healthy Food Healthy Planet initiative is focused on changing food environments: the economic, political and socio-cultural contexts in which people engage with the food system to make their decisions about consuming food. Changing and fixing these is crucial because they are an important entry point to drive food-system change, due to their position between producers and consumers. They shape people's decisions about food by determining what is available, accessible, affordable and desirable. They also influence producers in the supply chain through the products consumers are willing to buy, the prices they are willing to pay and the standards they are willing to accept. Figure 1 below illustrates a socio-ecological understanding of food environments, showing how people's individual decisions sit within a broader context of influences.

Figure 1: Food environments in the socio-ecological model[64]

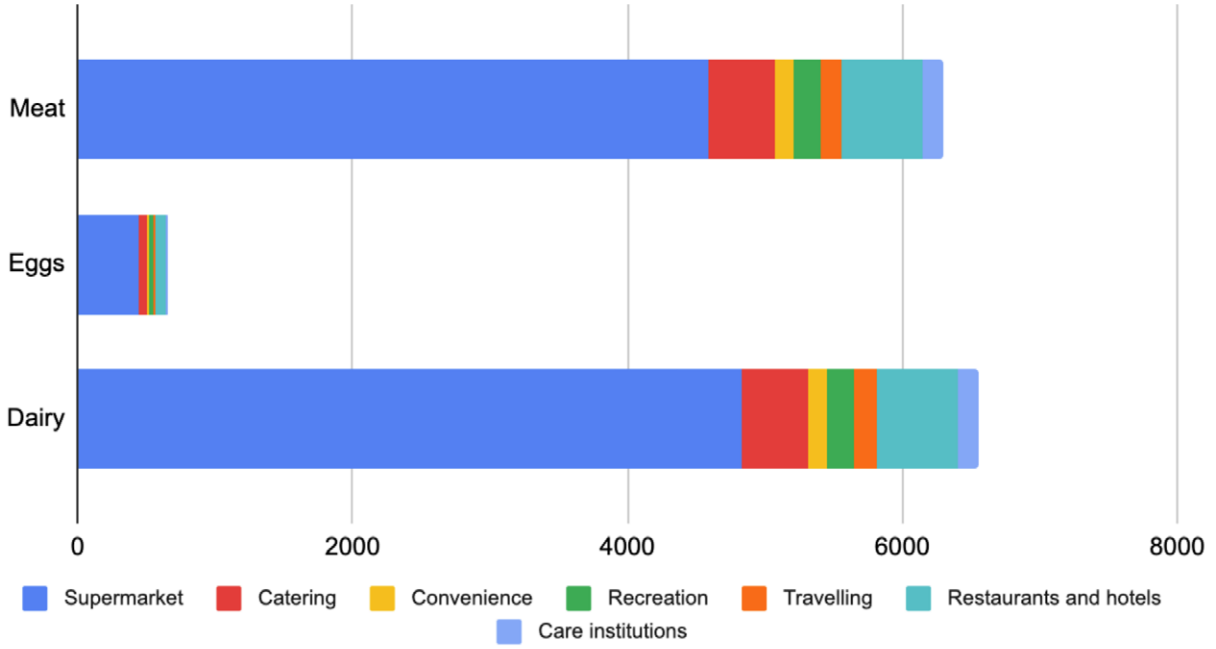


For the purposes of this report, and its aim to identify effective levers for changing food environments, a few actor-specific questions are important. What are the most dominant "interfaces" through which the biggest quantities of meat and dairy are purchased? Which "sectors of influence" determine which products are offered and how these are produced? In other words, how do meat and dairy find their way onto the plates of consumers?

These questions seem easy to answer, but they are not. Information about market shares of products via different distribution channels is sensitive and not public. Only traces of this information can be found in public documentation. For the purposes of this report, to provide a clearer picture of ASF landscapes in Europe, we present this information for one European country – the Netherlands – deeming trends in its national food and beverage market to be representative of the rest of Europe.

Figure 2 visualises an estimate of the sales of meat, eggs and dairy via different distribution channels. As shown, supermarkets have by far the biggest share of sales of these products: more than three-quarters of meat and dairy and two-thirds of eggs purchases are made via supermarkets. However, this estimate does need some nuance. Some upcoming "interfaces" are not well-represented in the presented data. For example, grocery delivery is a rapidly growing way for people to purchase food. This market is dominated by supermarkets, but others are involved.[65] Another upcoming food distribution channel is online ordering from cooperatives or even directly from farmers. The market share of delivery, food-boxes and online ordering has grown extraordinarily during the Covid-19 pandemic.[66] Farmers' markets are not represented in the data either, although they remain a minor distribution channel in Europe. It is likely that the share of the "catering" category is bigger in other countries, as catered school lunches are not common in the Netherlands.

Figure 2: Estimated sales of meat, eggs and dairy per distribution channel in the Netherlands, 2019 (millions of euros)



Calculation based on Logatcheva, 2019, Tables 5, 6 and 7.[67] Note: Calculation of shares of distribution channels other than supermarkets is by average share per category. Because of the lack of transparency of exact sales figures, this is an estimation for the situation in the Netherlands.

Allies and opponents of food-system transition

This sub-section analyses the position and influence of the most important stakeholders in the food system, particularly with a view to changing the consumption and production of ASFs.

Food vendors and manufacturers

Supermarkets distribute the largest amount of food to consumers (see Figure 2). In many European countries, the retail market is consolidated, with only three to four retailers serving most consumers. Some retailers are active in a single national market, others in multiple European countries.[68] Although supermarkets often promote cheap meat to attract customers, and in that sense their business model depends on the sales of meat and dairy, there are examples of retailers publicly committing to phasing out sales based on the worst production practices.[69] The core business of supermarkets is selling food, not necessarily meat, and with the right tactics, what they promote can be changed.

Fast food companies represent only a small share of meat and dairy sales in restaurants, but their brands are well known to customers. For many of these companies, selling meat products is their core business. They are also some of the most influential large-scale procurers of ASFs. For example, McDonald's is the world's largest purchaser of meat and pork, while KFC is the world's largest purchaser of chicken.[70] For these reasons, fast-food suppliers are assumed to be less supportive of the transition to a plant-based society. However, plant-based foods are increasingly offered by fast-food outlets.[71] In addition, fast-food chains are sensitive to trends and consumers' opinions. Although the market is relatively small in comparison to supermarkets, the number of individual fast-food chains is limited and the amount of meat sold per company is large. If a chain improves its policies, the impact can be high.

Food or catering services are companies serving meals that people consume out of their homes, in places such as university canteens, schools, hospitals and other care institutions. Some are within the scope of public procurement policies. In relative terms, food services are responsible for a small share of meat and dairy sales, but more plant-based and better produced products would create a substantial market signal and incentive. There are good examples of university caterers changing to vegetarian menus or of changing public procurement in schools and hospitals.[72] In 2018, the World Resource Institute launched the Cool Food Pledge, in which companies, including those in the food-service sector, pledge to reduce the greenhouse gas emissions associated with their food by 25 per cent by 2030. Membership now includes companies serving almost one billion meals annually worldwide.

Food manufacturers are dominant actors in the food system. In this highly consolidated industry, only a handful of mega-corporations who own a collection of national and international food brands compete with each other. Although meat and dairy are not their only business and many global food manufacturers like Unilever and Nestlé have been launching new plant-based products.[73]

Meat and dairy industry complex

The meat and dairy production chain is consolidated, with only a handful of big companies active in these industries nationally (such as VION in the Netherlands or Tönnies in Germany) or globally (such as JBS or Tyson food). The level of vertical integration varies. Poultry is the most vertically integrated sector and beef the least. Some meat and dairy companies incorporate different steps in the production chain, such as the input industry (feed and pharmaceuticals). Some even own the infrastructure and livestock at farms.

Annex II displays several visual representations of national and European livestock production chains. In terms of political lobbying and public communication, the industry cooperates as a coalition, together with farmers unions. Public communications by individual umbrella organisations often share the same narrative. Annex III gives quotes from open letters and other publications by livestock industry representation groups, creating an overview of the narrative used by the industry. Not surprisingly, these actors do not see the need for reduction of consumption of ASF's to develop more sustainable diets, but propose to improve on climate and biodiversity impacts through technological innovations. They disagree with the conclusion that an excessive consumption of ASFs has adverse health effects, emphasising the health benefits of these foods.

Butchers and processors are often highly mechanised and efficient operations. These companies specialise in processing live animals and meat of a specific species, as different species require different infrastructure. They work closely together with retail and other sales channels. These actors are so highly specialised that their business model needs a complete overhaul to transition to plant-based production. The European interest group for the industry is Clitravi, while other interest groups operate at a national level.

De Smog, a blog focusing on climate change, investigated PR strategies of the meat industry and concluded that its tactics are no better than those of the tobacco and fossil-fuel sectors. The industry's PR operations downplay the role of livestock in climate change, deny the need for more plant-based food and push technological fixes. They even present the livestock industry as a climate solution because of carbon sequestration in soils and biogas production from manure.[74]

The dairy industry is largely composed of cooperatives of farms previously owned by independent farmers, such as FrieslandCampina or Arla, and privately owned corporations, such as Lactalis and Danone. This distinction is important, as members of cooperatives – farmers – must agree changes in policies. Like other branches of the food industry, the dairy industry is consolidated.[75] However, because of the geographic distribution of milk production, smaller companies exist across the EU. Many larger dairies have organic production lines and have recently started to invest in research and development of plant-based milk or acquiring other companies for plant-based production.[76]

Dairy and cattle are often the major drivers of emissions in the agricultural sector. Research affirms that the needed emissions cuts cannot be achieved by technological developments and increased efficiency alone.[77] However, the dairy industry does not acknowledge a decrease in herd size as a solution. Instead it promotes animal feed, carbon sequestration, biogas and manure management as climate solutions.[78]

Agri-banks with a big share of their investment portfolios in the livestock and dairy industry run a financial risk on their investments, as the need for a reduction of livestock becomes starker. Often banks cooperate with farmers' unions in advocating other solutions to adapt the industry to the climate crisis.[79] Agri-banks are likely to resist change in the short term, but could follow in the medium and longer term, as reducing their investments in the industry takes time. Helping farmers transition to ecological practices is relatively unknown territory for banks and the tendency is to avoid that risk.

Other investors have become allies in the transition towards more sustainable and healthy diets, contrary to classical agricultural banks. The network of financial actors working together with the organisation FAIRR[80] currently has a staggering total of US$38 trillion of assets under management. The network is focused on "raising awareness of the environmental, social and governance risks and opportunities brought about by intensive livestock production".[81]

Farmer's unions are highly diverse in European countries. Some are more progressive than others, and push an agenda of improving the socio-economic position of farmers, but the majority promote the interests of large-scale industrial farming. The European umbrella organisation is COPA COGECA82, known for its effective and conservative lobbying. Corporate Europe Observatory has analysed COPA COGECA's lobbying against the EU's Farm to Fork Strategy, which is part of the European Commission's Green Deal.[83]

The feed industry and commodity traders are closely connected. The feed industry's core business involves assembling the perfect mix of nutrients for different species of livestock, at different stages of their lives. Companies such as Aveve (Belgium), ForFarmers (the Netherlands) and Avis Agri (the UK) are relatively unknown to the public, but are powerful driving

forces behind intensified livestock production.[84] The European feed industry is represented by the European Feed manufacturers' Federation (FEFAC). While feed producers' core business lies in the livestock industry, commodity traders such as Cargill and Bunge also produce and trade humane plant-based foods and some invest in plant-based protein foods.[85]

The input industry (pharmaceuticals, breeders and machinery) markets products and technologies that fit the system of large-scale, intensified, industrial livestock production. Consolidation is high in the input sector – for example, some livestock genetics corporations have acquired veterinary drugs producers.[86] Actors in the input industry are often part of coalitions with meat and feed industries, frustrating development towards more sustainable, diverse and healthy plant-based diets. Yet farming systems of the future also need technology, healthy animals and machines, so innovative companies that serve diverse ecological food systems could be motivated to join the transition.

The veterinary pharma industry, including companies like Zoetis and Boehringer Ingelheim, is represented by Animal Health Europe. Breeders and animal genetics companies, such as Hendrix genetics or Avigen, are represented by the umbrella organisation European Forum for Farm Animal Breeders (EFFAB).[87]

In general terms, the industries that provide inputs to the livestock sector all notionally affirm the need to act on the climate crisis. Without exception, they promote their technologies to be delivering solutions against climate change and other sustainability challenges, but none mentions the need for fewer livestock, as this reduction would undermine their business model.[88]

Individual industrial farmers are not easy to categorise when it comes to representing their attitude towards fewer livestock and more sustainable farming. European farmers are a diverse group, ranging from those intensifying production in concentrated animal-feeding operations to those developing more sustainable business models through animal welfare initiatives, local distribution and biodiversity improvements. Between these two ends of the spectrum there is a big grey area comprising farmers who experience first-hand the systemic failure of the production system and would like to change their mode of production, but cannot because of being locked in. These farmers' voices are not often heard in public discourse or the political arena, nor are they represented by farmers' unions. Financial support, fair prices for sustainable production, and stable market demand for better products could help them make the transition to ecological farming practices.

Policymakers

Most policies that concern agriculture, food and the environment are developed in coordination with and by the EU, via different decision-making processes. For non-politicised issues, civil servants from member states meet with European

Commission (EC) representatives to discuss and agree proposals made by the Commission. For politicised issues – which often include food and agriculture – ministers of member states vote in European Council meetings on EC proposals. In more politicised and complex negotiations about new legislation such as the CAP, decisions are made in a trialogue between the EC, the Council and the European Parliament. The Parliament supervises the EC and is a co-legislator with the same powers as the Council.

The current EC has made adressing climate change and biodiversity loss a priority. The European Green Deal and the related Farm-to-Fork strategy set ambitious goals for sustainable farming.[89] Proposed steps include the creation of healthy and sustainable food environments, and labelling for more transparency in environmental and health impacts. To achieve these goals, member states and the European Parliament should support progressive proposals.

Other European institutions and authorities can also be very influential in policy design. The conclusions and advice published by the European Food Safety Authority, the European Environmental Agency, and the Consumers, Health, Agriculture and Food Executive Agency, for example, all help shape the proposals and actions of the EC.

National governments are currently seen as both more conservative and more influential than the European Commission. Agriculture ministers, who predominantly defend the interests of the extractive agriculture sector, represent member states in negotiations. National governments claim autonomy for their own initiatives under CAP expenditure and policies, through “national strategic plans”.

National institutions and authorities include scientific authorities or research institutes relating to agriculture, land-use and rural planning, which inform political decision-making. Other relevant instruments issued by national institutions are the dietary guidelines through which governments advise consumers about healthy diets and increasingly about the ecological impacts of foods.

Local governments have traditionally had limited influence on regional or national agriculture and food policies. Policy and regulatory powers were typically developed at a time when most global populations lived in rural areas. Since 2008, a greater proportion of people worldwide lives in cities, but local and regional governments still lack significant formal powers to influence food policies. However, there is a growing global movement to leverage the powers of cities to address climate change, including by promoting healthy and sustainable diets. Key initiatives include the C40 Cities network of global megacities and the more recent Glasgow Food and Climate Declaration.

Civil society

Civil society organisations (CSOs) are a component of social movements. CSOs active over aspects of meat and dairy production include workers' unions (European Trade Union Confederation), social and food justice groups (Via Campesina), animal welfare NGOs (Eurogroup for Animals, Four Paws), environmental NGOs (Greenpeace, Friends of the Earth), health advocates (European Public Health Alliance, Health and Environment Alliance), nature conservation NGOs (WWF, Birdlife), plant-based and vegan groups (ProVeg) and agro-ecology movements (Via Campesina, Slow Food).

Often these organisations cooperate in coalitions – for example, collectively demanding that the European Commission withdraw its CAP proposal, or via a coalition letter against labelling restrictions for plant-based milk.[90] The latter was a successful call to politicians, as the tabled proposals were rejected by a majority in the European Parliament.

Alternative food systems

Plant-based producers and the meat replacement industry have been booming business in recent years, driven by fast-developing processing technology and consumer demand (see Briefing I). The influence of this industry on markets and policies is increasing accordingly, although its relative market share is still minimal. Organisations such as the Good Food Institute are pushing the sector's agenda and aim to catalyse the growth of plant-based products in the market.

Organic producers and farmers occupy a relatively minor market share in comparison to large-scale food producers, but continued growth and consumer appreciation are increasing their relevance. The organic sector is an incubator for sustainable farming practices. One prominent example is organic soil management, which has been adopted by conventional farmers over the last decade.

Online and local food distribution systems account for a small share of the market and have similarly limited influence. However, the Covid-19 pandemic led these channels to grow significantly and increase in relevance.

Annex I: Visualising influence over food environments and agriculture

The analysis of the most important stakeholders influencing food environments and the food system in general resulted in the two visual representations below. Figure 3 is a mapping of different actors' position towards and influence on "less and better" meat and other ASFs. Figure 4 visualises the relations between these stakeholders in a system map. It must be noted that these visualisations are a simplification of the realities of the food system. Power mapping and system mapping are commonly used in shaping strategies for campaigns, with the aim of giving a better understanding of the context in which a specific development is pursued. This allows identification of effective campaign levers. The system map builds further on the socio-ecological model proposed by Downs et al.[91]

Figure 3: Power map of actors in the European food system in terms of reducing animal-sourced food consumption and promoting sustainable farming

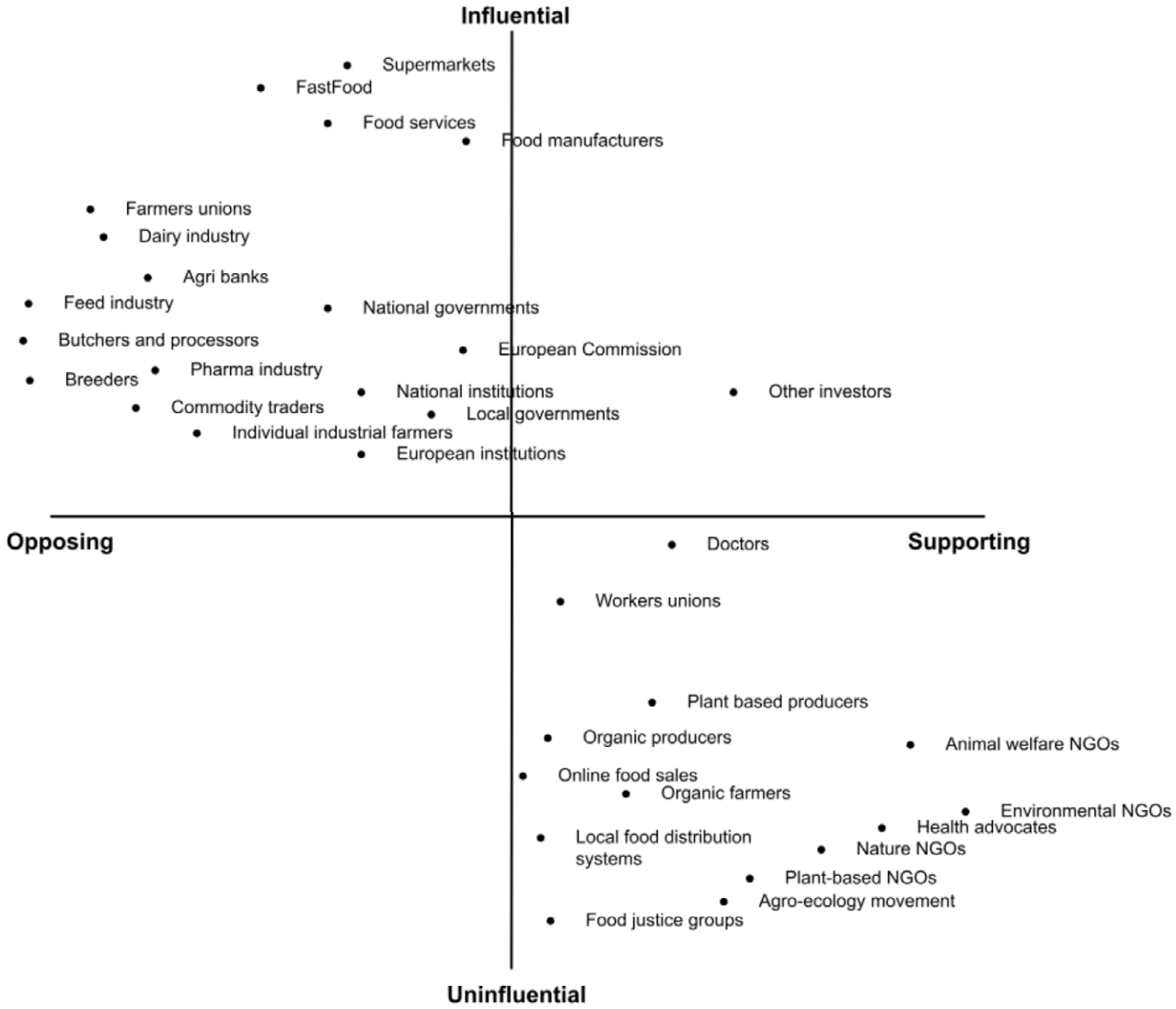
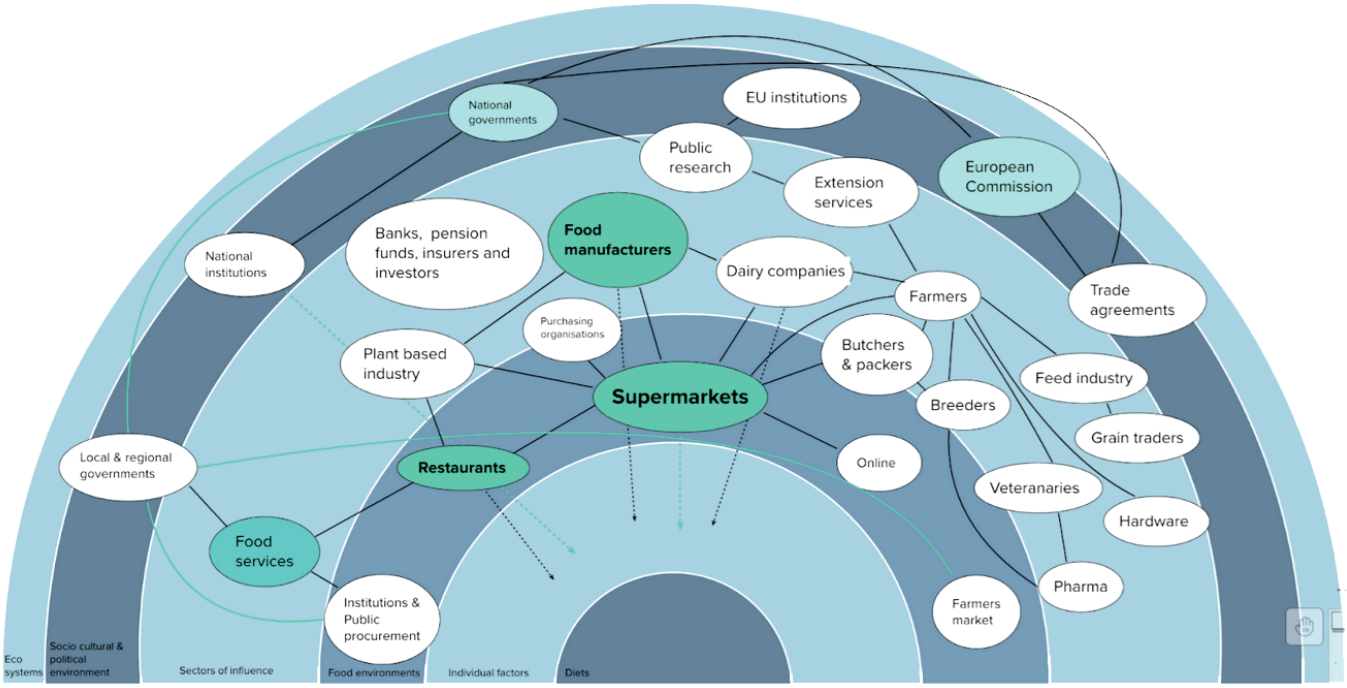
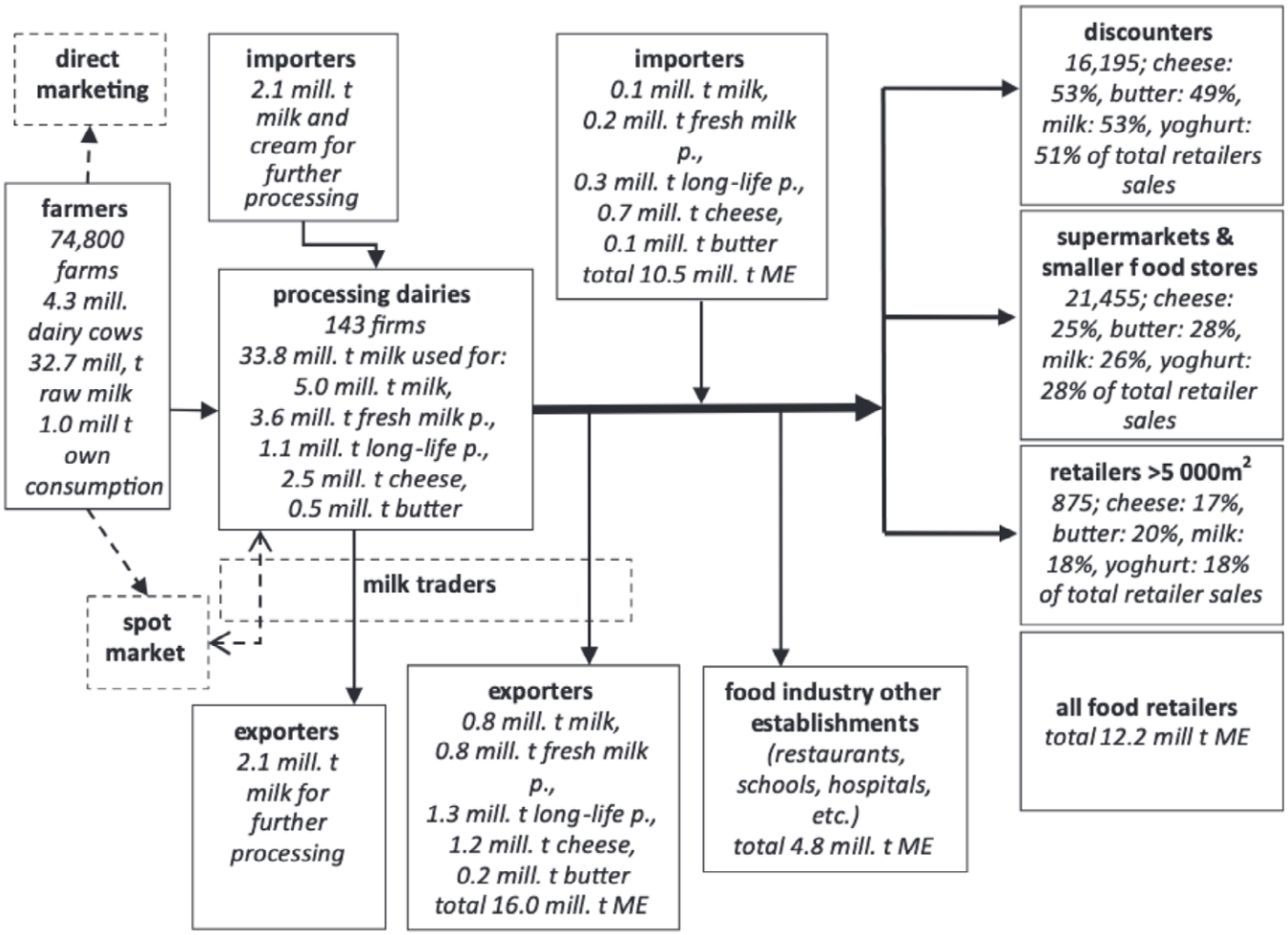


Figure 4: Map of food-system actors and their influence on food environments Plotted on the socio-ecological model by Downs et al.



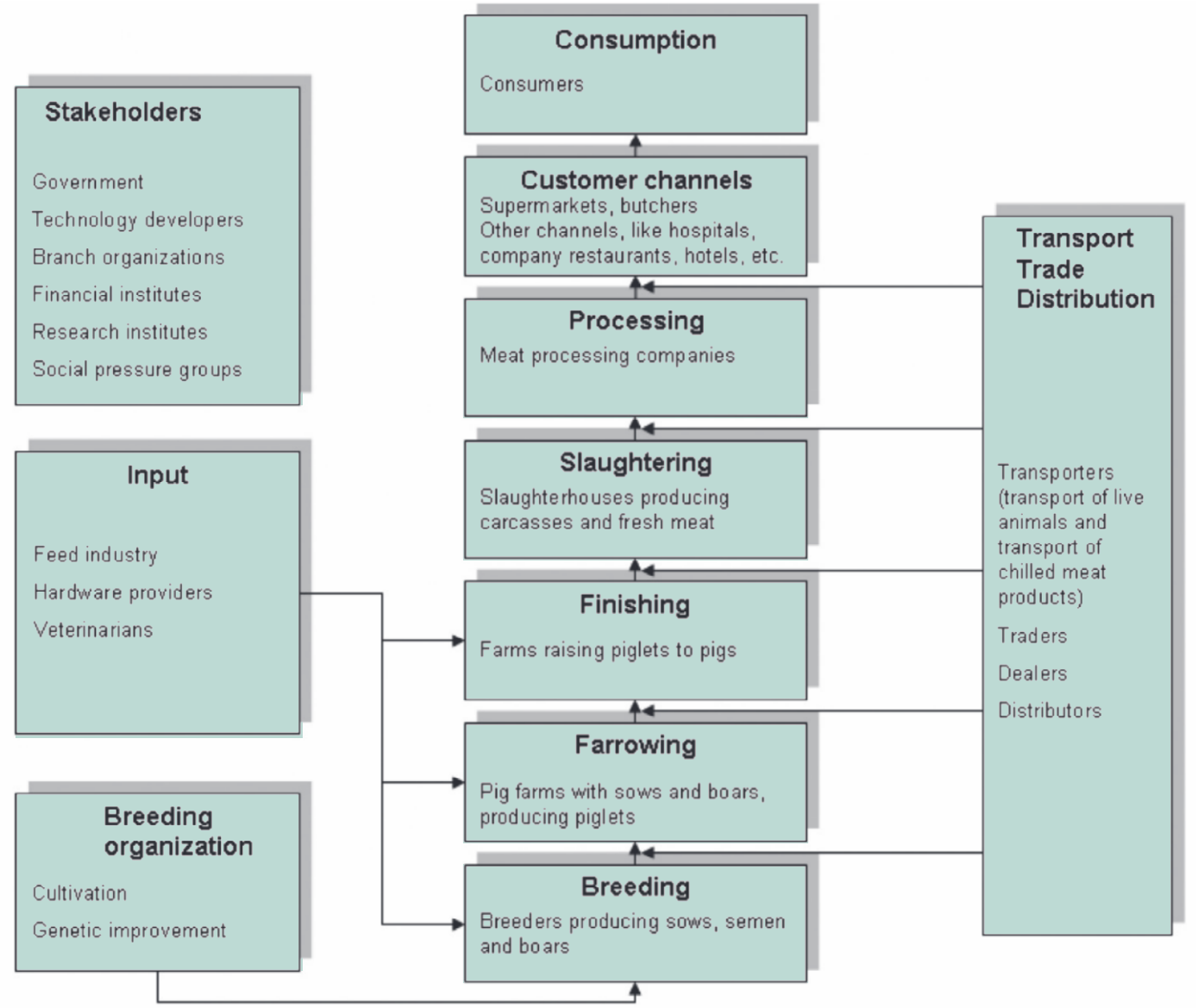
Annex II: Examples of production chains of animal-sourced foods in Europe

Figure 5: The structure of the German dairy supply chain (2014-2015) Taken from Grau, 2018[92]



Note: Mill = million, t = tonnes, p. = products, ME = Milk equivalent

Figure 6: The pork production chain in Europe
Taken from: Campanella and Dazzi, 2020[93]



Annex III: Quotes illustrating the narrative used by the meat and dairy industry

The quotes below are excerpts from recent position papers and other publications by actors in the meat and dairy industry. The underlined parts are of particular interest and are characteristic for the narratives used by the industry.

Quotes from an open letter to the European Commission from a large group of livestock industry representative bodies[94]

> … acknowledging that we produce animal products in a very **efficient and climate smart** way in the EU… The EU livestock sector provides **affordable food** for EU citizens. Sustainable animal production exported to other countries is also a source of **wealth and wellbeing** for the EU.

> …by **avoiding the externalisation and relocation of production** and research and innovation activities to **other countries with lower environmental, animal health and welfare, social and safety standards.**

In this letter, as in many others, the industry emphasises the "nutritional value and cultural heritage" of consuming meat and dairy.

Quotes from the communication platform Meat the Facts.EU[95]

> Meat has been and continues to be an important food source, delivering a wide range of valuable nutrients that can easily be absorbed by our bodies. **Along with other animal-source foods like fish, eggs and milk, it also plays an important role in several cultural traditions and recipes across Europe.**

> **People are biologically adapted to a diet that includes meat and it plays an important role in a healthy and balanced diet.** In fact, some nutrients found in meat and other animal-source foods are not always easily obtained (or even obtainable) from plant-based foods. (...)

> In summary, we have developed as omnivores and meat has been a central component of our diet for millions of years. **Meat and processed meat products can be safely consumed as a part of healthy and balanced diets.**

In this letter, as in many others, the industry emphasises the "nutritional value and cultural heritage" of consuming meat and dairy.

Quotes from COPA COGECA's position on climate action

These quotes illustrate the organisation's position on the transition towards more plant-based foods and ecological farming[96]

> It is essential to **maintain the levels of production** needed for the population and livestock, while at the same time keeping natural resources, water, soil, the climate and biodiversity intact with all their ecosystem benefits. A climate-neutral economy has to be achieved in the EU by 2050 to fulfil the Paris Agreement objectives. **Reducing EU agricultural production is likely to move production to countries where milk, cereal or meat production has a more negative climate impact,** leading to carbon leakage and increased global GHG [greenhouse gas] emissions. (...)

> In livestock farming, **some animal emissions cannot be avoided, but can be balanced by soil carbon sequestration in feed production or by substituting fossil fuels through the use of biogas from manure and crop residues.** It should be noted that since 1990 methane **emissions in EU agriculture have decreased by 20%**, while during the same period milk yields increased by 60% and carcass weight by 15%... The decrease in methane emissions has significantly compensated for the effect of global warming caused by other sectors. **It takes methane a decade to decompose into carbon dioxide which is then absorbed by plants in the livestock feed cycle.** To be carbon neutral in 2050, **methane production from ruminants does not have to be halted.**

Quotes from FEFAC's Feed Sustainability Charter

Illustrative for its position on the need for less animal-based protein food[97]

> **It is well-known that when considering the carbon footprint of an animal product, the feed ingredient production stage represents the largest share of the [greenhouse gas] GHG emissions.** This is particularly the case for pork, poultry meat, eggs and farmed fish, where the share ranges between 70-80%. There lies a responsibility and opportunity for the European feed industry to deliver the solutions that allow the livestock and aquaculture sectors to contribute to the climate change and zero-pollution requirements. **Innovations in feed formulation, precision feeding and processing technology are crucial assets here.** Another key strategy to lower the environmental footprint is the increased **incorporation of co-products from the food industry,** such as former foodstuffs, which benefit from a methodological advantage in terms of life cycle assessments. (...)

> Key public attention on GHG emissions in livestock farming is linked to methane emissions from cattle farming, resulting from the digestion of grass and forage cellulose in the rumen. It can first of all be argued that **the methane emissions from cattle are biogenic and a part of a circular system that doesn't contribute to additional heating of the atmosphere, when herd sizes remain stable.** Nevertheless, the reduction of methane emissions in cattle farming remains a key target for animal nutritionists, as it contributes to increased resource efficiency and reduced nutrient leakage. While the feeding of ruminant animals remains mostly reliant on pasture and forage feeding systems, **the feed sector is leading research that could provide innovative solutions included in concentrate feed delivered to the farm to help further mitigate methane emissions in cattle farming.**

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