Delivering Sustainable Food and Land Use Systems: The Role of International Trade

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September 2019

This paper has been produced in support of the Food and Land Use Coalition's (FOLU) Global Report (2019), to provide research and analysis to help evidence the case for food and land use transformation.

The Hoffmann Centre for Sustainable Resource Economy is based at Chatham House. Its mission is to accelerate the uptake of smart policies, technologies and business models that will reshape the world's demand for resources and transform the global economy.

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Executive summary

I. Meeting future food challenges

Meeting future global food security requirements is not just about quantity; it is also about meeting growing needs in a manner that safeguards human as well as planetary health. To an increasing extent, the diets of urbanized populations have become less varied, made up of an ever greater proportion of high-energy, high-protein and processed products, and failing to deliver nutrition security. One in nine people (some 821 million worldwide) have an insufficient calorie intake, one in five (1.5 billion) suffer from micronutrient deficiencies, while more than 672 million adults are obese.[1]

Land-based agriculture provides the bulk of global calorie supply (including protein), but it also accelerates environmental degradation and biodiversity loss. Livestock production accounts for half of greenhouse gas emissions[2] from the global agricultural sector; almost 75 per cent of agricultural land use;[3] and 40 per cent of global arable land use.[4] Meanwhile, 27 per cent of global deforestation still results from permanent changes in land use for reasons related to increased commodity production (notably oil palm, soybeans and beef), mostly in tropical forests of Latin America and Southeast Asia. Achieving net zero deforestation by 2020 would require the elimination of five million hectares of conversion from agricultural supply chains each year.[5]

Despite growing awareness of these nutritional and environmental challenges, national priorities and policies often remain out of sync with general aspirations for more sustainable and healthy food systems. Market prices rarely reflect externalities embedded in the global food production process. Most governments have yet to incorporate land policy explicitly into climate strategies to provide the framework for governing and transitioning toward more sustainable land use systems.

However, challenging the status quo is far from straightforward. In the global food system, market power remains highly concentrated. In addition, the agricultural sector is often core to national income generation, to employment and jobs policies as well as to export income.

International trade and trade policies play an ambiguous role in the current food system. With 80 per cent of the world's population depending on imports to meet at least part of their food and nutritional requirements,

1 FAO, IFAD, UNICEF, WFP and WHO (2018), *The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition*, Rome: FAO, https://cht.hm/2AEAyZZ (accessed 20 Mar. 2019).

2 FAO (2013), *Tackling Climate Change through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*, Rome; FAO, https://cht.hm/2m8VXWQ (accessed 20 Mar. 2019).

3 Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., Mueller, N. D., O'Connell, C., Ray, D. K., West, P. C., Balzer, C., Bennett, E. M., Carpenter, S. R., Hill, J., Monfreda, C., Polasky, S., Rockström, J., Sheehan, J., Siebert, S., Tilman, D. and Zaks, D. P. M. (2011), 'Solutions for a cultivated planet', *Nature*, 478: pp. 337–42, https://doi.org/10.1038/nature10452 (accessed 20 Mar. 2019).

4 Mottet, A., de Haan, C., Falcucci, A., Tempio, G., Opio, C. and Gerber, P. (2017), 'Livestock: On our plates or eating at our table? A new analysis of the feed/food debate', *Global Food Security*, 14: pp. 1–8, https://doi.org/10.1016/j.gfs.2017.01.001 (accessed 20 Mar. 2019).

5 Curtis, P. G., Slay, C. M., Harris, N. L., Tyukavina, A. and Hansen, M. C. (2018), 'Classifying drivers of global forest loss', *Science*, 361(6407): pp. 1108–11, https://doi:10.1126/science.aau3445 (accessed 20 Mar. 2019).

trade has a unique function in offsetting imbalances between supply and demand. However, in the absence of effective regulatory frameworks or pricing frameworks that internalize environmental, social or health costs, trade can exacerbate and globalize challenges associated with food production and land use trends such as deforestation, land degradation, greenhouse gas emissions, biodiversity loss and the shift to unhealthy diets.

II. The changing geography of global food trade

Over the last two decades, trade in agricultural products (excluding intra-EU flows) has more than tripled, to reach $1.33 trillion.[6] The geography of global food trade flows has also shifted, primarily towards South–South trade, which now accounts for roughly one-quarter of total agricultural trade flows. Most of the growth can be attributed to a few developing countries such as Brazil, China, India and Turkey, even though the EU, the US and Japan remain significant players. China has become one of the largest importers of agricultural products, together with India, Mexico, and Nigeria. Over the next decades, the largest demand is projected to come from Asia, followed by Africa. Meanwhile, the share of global agricultural exports supplied by the EU and North America declined from 68 per cent in 1997 to 55 per cent in 2017.[7] By 2030, Brazil is expected to surpass both the EU and the US as an agricultural exporter.

As the centre of gravity in global food trade moves towards the South and the East, the composition of agricultural trade has also evolved, largely due to urbanization and evolving dietary patterns. Trade in traditional agricultural commodities, such as cereals and meat, is stagnating, in part due to protectionist policies. Food safety concerns and self-sufficiency policies in critical commodities have also reduced growth in the trading of traditional agricultural products. The irony is that, while purporting to fulfil national priorities, restrictive policies on trade in staple food and sensitive products generate volatility on world markets and limit food availability for countries dependent on imports – thereby increasing the vulnerability of these nations to external shocks.

In contrast, few policy restrictions have limited trade in processed products or ingredients such as vegetable oils, resulting in significant increases in trade. Trade in these goods is often organized by large multinational companies through fragmented production networks and complex global value chains. This evolution has been made possible by technological innovations that have pushed down transport and communication costs.

While trade in most traditional export products, such as wheat and coffee, has grown at a slow pace (in the region of 2 per cent per year) over the last 20 years, products such as palm oil, fruit juice, soft drinks and other processed products, such as breakfast cereals, have grown at annual

[6] Author's calculation, based on UN Comtrade Database (undated, https://comtrade.un.org/ (accessed 10 Mar. 2019). However, compared with other sectors (e.g. manufactured goods or services) it should be noted that agricultural trade has grown at a much slower pace. This can be seen in the declining share of agricultural products in world trade from 20 per cent in the 1960s to less than 9 per cent in 2017.

[7] Ibid.

rates of 8 per cent or more during the same period and now represent the most dynamic sectors in agricultural trade.[8]

The overall increase in trade in agricultural products raises questions about the growing utilization of resources, such as water or soil nutrients, that are embedded in those products through production and processing. Trade itself also causes negative environmental impacts, starting with greenhouse gas emissions associated with transport and storage. If the environmental cost associated with production and trade is not reflected in the final price of goods, trade may exacerbate the depletion of resources or their unsustainable use.

III. Navigating trade politics

Over the past decades, the global food system has been shaped in large part by trade policies pursued by key producing and consuming regions – the Americas, Europe and Asia. These policies, in turn, are a function of different domestic conditions, including farm sizes, and livelihood considerations, as well as export interests. These variations bring different approaches and attitudes when it comes to competitiveness and productivity. But growing awareness about resource constraints (such as limited availability of land or water) and environmental impacts (greenhouse gas emissions, soil erosion or deforestation) are likely to reshape future policy orientations in key countries and regions.

Against this backdrop, it is critical to ensure that trade policy options pursued by producing and consuming countries alike will support a transition to more sustainable and healthier food and land use systems.

Critical for this transition will be the introduction of effective market-correcting measures to internalize negative environmental and social costs, and the removal of perverse incentive structures encouraging unsustainable practices. There is also a need to update and harness trade-related measures that can encourage more sustainable and healthy production methods and consumption – such as labelling schemes, payments for environmental services, or the subsidized distribution of healthy food. While removing perverse incentives such as fossil fuel subsidies will bring significant welfare gains, it is also clear that such subsidies are extremely difficult to remove, not least because of the proliferation of vested interests, powerful industry lobbying, and fears of job losses.

The use of trade measures such as tariffs or taxes to internalize environmental or health costs – while a theoretical possibility – does face significant methodological challenges, such as the accurate measurement of the cost of externalities. From the trade perspective, a further complication is the imperative of designing such schemes in a non-discriminatory way. In the same vein, payments for environmental purposes can be helpful, but ensuring that such payments are proportionate to the costs incurred and the benefits delivered remains highly challenging.

Consumer subsidies (such as food stamps or school feeding programmes) that target poor or vulnerable segments of society can play a critical role in promoting nutrition security across different income

[8] Ibid.

There is an unprecedented need for new spaces for informal dialogue among actors, and 'soft' governance mechanisms that can help rebuild consensus on the best ways forward.

groups. The high cost associated with such schemes, however, means that fresh thinking is needed to design distributive approaches at the global level to scale their implementation in poor countries. Meanwhile, agricultural goods that are deemed essential for a healthy diet (such as fruits and vegetables) will benefit from enhanced efforts to reduce trade costs and improve the functioning of value chains.

IV. Recommendations

Given the fragmentation and polarization in today's global policy environment, which includes, in some cases, scepticism or outright hostility towards multilateralism and multilateral institutions, the first step towards addressing trade-related food systems challenges must involve rebuilding trust among policy actors. With key forums in crisis or appearing incapable of responding effectively to pressing practical problems, there is an unprecedented need for new spaces for informal dialogue among actors, and 'soft' governance mechanisms that can help rebuild consensus on the best ways forward. Meeting these challenges also requires an appreciation of the complex interactions between sectoral policies (e.g. on water, land, food, and so on) and their multifaceted interfaces with trade policies. Below is a set of trade-related recommendations that would help address the environmental, social and economic concerns associated with the global food system. (These are also summarized later in this paper, in Table 6).

1. **National dialogues to design corrective instruments that incorporate the true cost of unhealthy diets** Inclusive and transparent national dialogues are needed to build broader consensus on the design of the most appropriate instruments – from subsidy redirection to tax-related incentives. The toolkit could also include policies on labelling or restrictions on advertising, especially where children are targeted. Building on momentum for companies to commit to greenhouse gas emission reduction targets in line with the level of reductions proposed by the scientific community, a new World Economic Forum initiative on Science-Based Targets for the Global Environment Commons will expand these targets to cover issues related to water, land, and externalities that arise from food production.

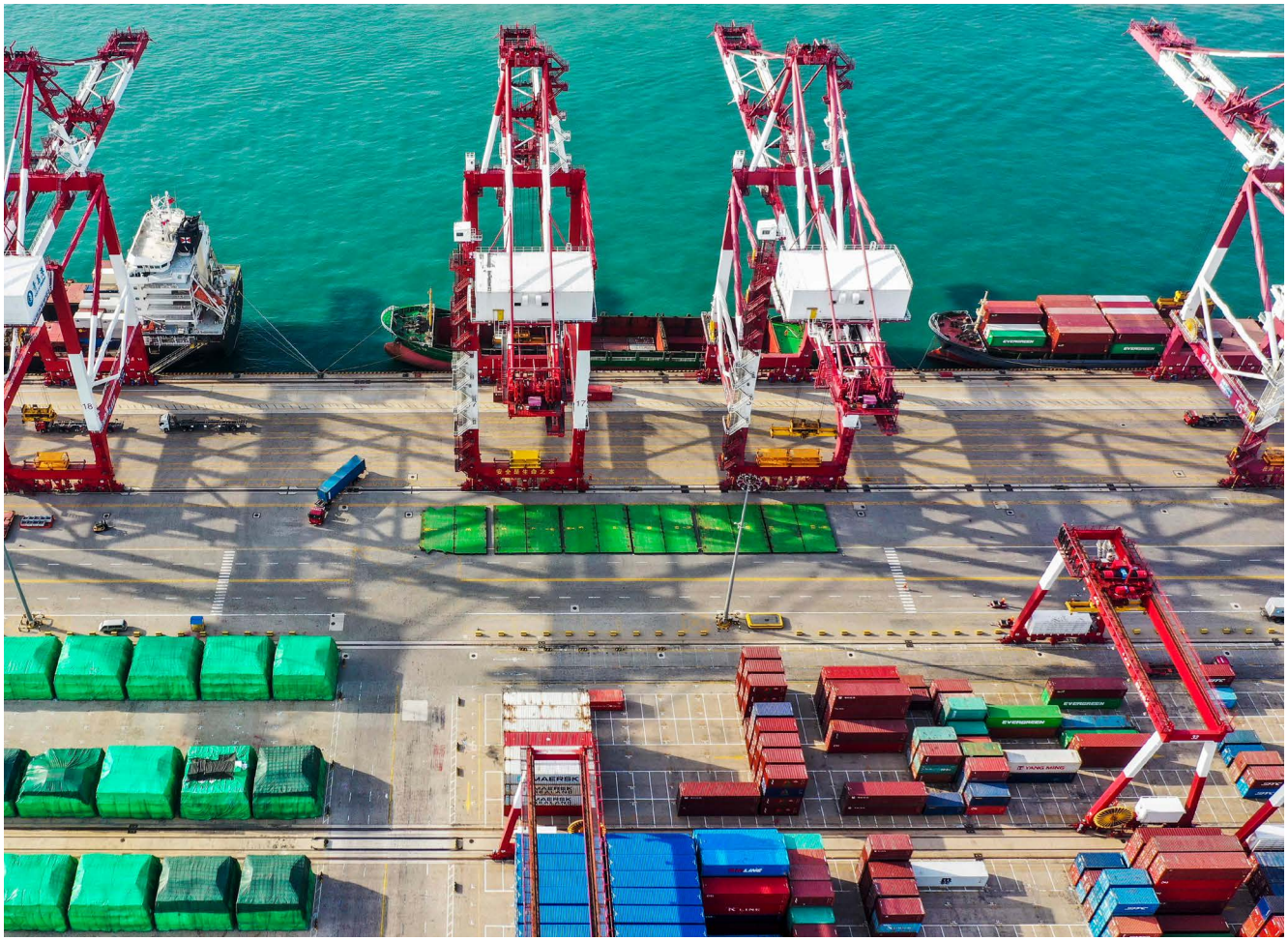
2. **Conditioning the use of subsidies on their sustainability and/or health impacts** Subsidies represent one of the key instruments at the disposal of policymakers, though they are very difficult to remove once granted. A first step comprises the removal of perverse incentives (e.g. subsidies encouraging the overuse of fertilizers or pesticides or the overproduction of certain commodities, as well as certain biofuels subsidies) and replacing them with market-correcting subsidies encouraging the delivery of essential public goods in ways that are consistent with sustainability and health goals. This could be achieved by conditioning the granting of subsidies not only on their trade-distorting effect – as currently envisaged under World Trade Organization (WTO) disciplines – but also on their impacts on resource use, environment and health.

3. **Trade facilitation initiatives for fruits and vegetables** Given the perishable nature of many fruit and vegetable products, trade facilitation measures aimed at easing transit at the border, by cutting unnecessary bureaucracy and reducing waiting times, can improve their availability, reduce costs and improve food quality and safety for consumers. Similarly, measures aimed at improving sustainable cold storage and upgrading value chains can affect diets and consumption by increasing the availability of fresh produce on markets, especially in developing countries.

4. **A global food stamps programme** Malnutrition is often a consequence of low purchasing power among poor consumers. International collaboration (including financial assistance) to design a global coordinating mechanism for 'food stamps' to tackle malnutrition in poor countries could emerge through the G20 process, while operational implementation could be carried out through the UN's Rome-based agencies (e.g. the Food and Agriculture Organization – FAO, International Fund for Agriculture – IFAD, and the World Food Programme – WFP).

5. **Integrating the notion of sustainable food and inputs trade in the post-2020 biodiversity framework** In preparation for the 2020 Biodiversity Conference of the Parties (COP15), like-minded countries could introduce a set of goals or targets aimed at mitigating the role of trade in placing indirect pressure on biodiversity (further exacerbated by policy failures), and to encourage trade in biodiversity-based products including natural ingredients produced ethically and following sustainability principles and criteria.

6. **A Sustainable Development Goals (SDG)-oriented agenda for agricultural trade** At the WTO, in each negotiating area, countries could seek to remove perverse incentives, as mentioned above. In addition, WTO members could agree on how best to guarantee a safe harbour for market-correcting measures (including within programmes such as research and development (R&D), pest and disease control, or extension services). Last but not least, WTO members should clarify existing rules – for example, under the Agreement on Subsidies and Countervailing Measures – to promote and further enable the internalization of socio-environmental costs at national level. Other creative approaches include plurilateral negotiations among subsets of the WTO membership, or sectoral approaches to address specific challenges from specific agricultural products or product groups. A value chain approach could allow members to bring in a broader set of trade-related topics and concerns. Environmental sustainability and health concerns could guide governments in selecting which products to prioritize. For example, trade distortions and market failures affecting livestock products, or fruit and vegetables, could be fast-tracked for action if a critical mass of countries were willing to do so.



Containers sitting stacked at Qingdao Port in Shandong Province of China. Image: Han Jiajun/Visual China Group via Getty Images

7. **Addressing greenhouse gas emissions resulting from trade in regional trade negotiations** With the proliferation of bilateral as well as mega-regional trade deals, and a growing perception that more trade means more greenhouse gas emissions (in part because international transport-related emissions are not covered under the 2015 Paris Agreement between participants in the UN Framework Convention on Climate Change), governments could ensure the carbon neutrality of existing and new deals either by connecting carbon markets among contracting parties or by developing joint initiatives to tax international maritime and air transport emissions.

1. Introduction

In recent years, the global debate on food security has increasingly shifted in emphasis from whether the world will produce enough food in calorific terms to how it can do so in a manner that safeguards not only human but also planetary health. This is in part spurred by the adoption, in 2015, by the UN General Assembly of the 2030 Agenda for Sustainable Development (also known as Agenda 2030), which highlighted the interdependent nature of the 17 SDGs.

Today, urban populations consume increasing amounts of high-energy, high-protein, processed products that depend on significant inputs of land, energy and water. With an expected net decline in global arable land area, brought about by climate change and land degradation, and the anticipated rise in demand for land for negative emissions technologies and bioenergy, more food will need to be produced with fewer resources and on less land.

Worse still, the global food system is also failing to deliver nutritional security. One in nine people (some 821 million worldwide) have an insufficient calorie intake, and one in five (1.5 billion) suffer from micronutrient deficiencies, while more than 672 million adults are obese.[9] Mounting evidence links overweight and obesity to diet-related non-communicable diseases (NCDs) such as type 2 diabetes, heart disease and certain cancers.

Feeding the future is therefore not merely a question of improving yield and producing more with fewer resources. The global burden of malnutrition is no longer one of hunger alone, nor is it confined to developing countries and low-income populations. It exists in the form both of overconsumption – excessive intake of calories and nutrients – and of nutrient deficiency. The latter is found not only among those with insufficient access to food, but also among consumers of high-calorie, nutrient-poor foods. Reducing food loss and wastage is also a matter of urgency, as approximately 24 per cent of all calories produced for humans are wasted,[10] representing not only a huge economic and resource loss for the global agricultural sector, but also a missed opportunity to feed millions of people and combat hunger.

The EAT-*Lancet* Commission Report[11] published in early 2019 highlighted the need to address unsustainable patterns of food consumption, calling for wider adoption of plant-based diets and a reduction in animal products; halving of global food-waste losses through improving post-harvest infrastructure, such as in transport and processing, as well as better training for producers and educating consumers.

The report also suggested that feeding the global population sustainably and healthily by 2050 would require a minimum 75 per

[9] FAO, IFAD, UNICEF, WFP and WHO (2018), *The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition*.

[10] Lipinski, B. et al. (2013), 'Reducing Food Loss and Waste', Working Paper, Instalment 2 of 'Creating a Sustainable Food Future', Washington, DC: World Resources Institute, https://cht.hm/2lMKNXP (accessed 17 May 2019).

[11] Willett, W. et al. (2019), 'Food in the Anthropocene: the EAT–*Lancet* Commission on healthy diets from sustainable food systems', *The Lancet*, 393(10170): pp. 447–92, https://doi:10.1016/S0140-6736(18)31788-4 (accessed 20 Mar. 2019).

cent reduction of yield gaps,[12] as well as a transformation in the use of phosphorus and nitrogen fertilizers. This could include the redistribution and a dramatic increase in efficiency of global fertilizer usage and increased recycling rates for phosphorus. More broadly, the report outlines a need for a significant change to agricultural production priorities, including the adoption and implementation of agricultural mitigation options and land management practices that not only reduce greenhouse gas emissions but also transform agricultural land from carbon sources into carbon sinks.[13]

Delivering these major changes will be no mean feat. It would necessitate a fresh look at the interface between the global food system and international trade. Robust evidence supports the view that, in the past, international trade has played a key role in securing global food security, as it will continue to do in the future: however, equally strong evidence substantiates the fear that trade has exacerbated and effectively globalized many food system challenges – encompassing land degradation, public health, nutrition insecurity, species loss and climate change.

This paper explores a set of core trade-related issues affecting the food and land use system, and proposes constructive ways forward in reconfiguring the global trading system towards delivering a more sustainable and healthy diet for all. Chapter 2 discusses core challenges facing the global food and land use system. Chapter 3 provides an overview on how the international trading system for food currently operates, including an overview of main commodity flows. Chapter 4 outlines the political economy conditions in key producing and consuming countries, and explores opportunities for using trade to deliver positive benefits to mitigate challenges highlighted in the previous two chapters. In conclusion, Chapter 5 outlines options and recommendations for the future.

[12] The yield gap is the difference between the maximum attainable yield and the farm-level yield.

[13] Willett et al. (2019), 'Food in the Anthropocene: the EAT–*Lancet* Commission on healthy diets from sustainable food systems'.

2. The global food system: challenges and concerns

At a glance

- Land-based agriculture provides the bulk of global calorie supply, including protein; it is also a major driver of environmental degradation (e.g. through soil erosion) and biodiversity loss. The livestock sector accounts for about half of the agricultural sector's greenhouse gas emissions, together with almost 75 per cent of global agricultural land use and 40 per cent of global arable land use. Over a quarter (27 per cent) of global deforestation still results from permanent changes in land use for reasons related to increased commodity production.
- Corporate concentration and globalized supply chains could further exacerbate the challenges that already characterize systems of food production and land use. Dependence on a few calorie-dense crops has led to global dietary convergence, which is becoming more calorific and less nutritious, creating widespread public health challenges such as obesity and diabetes. Aggressive marketing of less healthy, highly processed foods is often allowed to continue unchallenged or unregulated.
- Domestic priorities and policies have often remained out of sync with general aspirations for a more sustainable and healthier food system – whether in terms of land management, public health or agricultural policies. Market prices rarely reflect negative or positive externalities embedded in the global food production process. Most governments have yet to incorporate land policy explicitly into national, sectoral, and local climate strategies to provide the framework for governing and transitioning into more sustainable, alternative land use.
- Challenging the status quo is far from straightforward. In the global food system, market power remains highly concentrated. In addition, the agricultural sector is often core to national income generation.

A litany of challenges afflicts the global food system. These range from supply chain transparency and traceability, land rights and labour conditions, to the direct and indirect environmental and social impacts of the production process itself. Meanwhile, the intensification of global agricultural trade has raised significant concerns regarding the environmental footprint of food trade in terms of biodiversity loss, land degradation, greenhouse gas emissions or the use of embedded water. There are also increasing concerns over the widespread availability of unhealthy food at cheap prices, and its impacts on changing diets and on problems associated with nutrition and obesity.[14] This chapter will outline some of the major challenges confronting the international community in the transition to a sustainable and healthy food system.

[14] Ibid.

2.1 Unsustainable patterns of consumption and production

Land-based agriculture accounts for 99 per cent of global calorie supply and 93 per cent of protein supply today,[15] whether through arable farming, horticulture, livestock farming or other agricultural practices.

Scientists have warned that the capacity of natural infrastructure to sustain ecosystem services is being threatened, primarily by agriculture. In addition to land use, agriculture is a major degrader of soils. It is the main source of nutrient overload, for example, from the leakage of nitrogen and phosphorus into waterways. Intensive agriculture is depleting soils, creating a vicious circle of increasing intensification and further land degradation and abandonment, leading a senior FAO official to announce in December 2014 that there might only be 60 years of harvests left.[16]

At the same time, dependence on a few calorie-dense crops has led to global dietary convergence. These crops are suited to large-scale industrial farming, and their production has increased through support in the form of government subsidies and private R&D, as well as through increased trade. This has come at the expense of biodiversity and dietary diversity. While these crops are calorie-rich, they are nutrient-poor, and so diets have become more uniform, more calorific and less nutritious as their consumption has increased. This is contributing to the global obesity pandemic and public health crisis.[17]

Meanwhile, nearly two billion people worldwide are dependent on food imports, a figure which is increasing.[18] With the global population expected to rise to reach 9.8 billion by 2050, FAO has forecast that food demand could increase by 60 per cent by that date.[19] Other studies point to even greater increases in crop demand (around 100 per cent) as rising meat consumption translates into greater demand for feed crops.[20]

Scientists have warned that the capacity of natural infrastructure to sustain ecosystem services is being threatened, primarily by agriculture.

As income grows, the consumption of fats and proteins increases.[21] Looking to the future, the correlation between per capita GDP and per capita demand for crop calories and protein across different income groups presents a significant challenge. In 2000, those nations with the highest GDP per head used 256 per cent more calories and 430 per cent more protein than those nations with the lowest GDP per head.[22] This

[15] FAO (2013), *Tackling Climate Change through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*; Rome:FAO, https://cht.hm/2m8VXWQ (accessed 10 Jan. 2019).

[16] Arsenault, C. (2014), 'Only 60 Years of Farming Left If Soil Degradation Continues', Scientific American,, 5 December 2014, https://cht.hm/2lJUZ3k (accessed 20 Mar. 2019).

[17] Bailey, R., Lee, B. and Benton, T. (2018), 'Breaking the Vicious Circle: Food, Climate & Nutrition', London: Hoffmann Centre for Sustainable Resource Economy, Royal Institute of International Affairs, https://cht.hm/2zAqf8F (accessed 12 Sep. 2019).

[18] Porkka, M. et al. (2017), 'The use of food imports to overcome local limits to growth', *Earth's Future*, 5(4), pp. 393–407, https://doi.org/10.1002/2016EF000477 (accessed 31 May 2019).

[19] FAO (2017), *The future of food and agriculture: Trends and challenges,* Rome: FAO, https://cht.hm/2Q23YqZ (accessed 20 Mar. 2019).

[20] Tilman, D. et al. (2011), 'Global food demand and the sustainable intensification of agriculture', *Proceedings of the National Academy of Sciences of the USA*, 108(50): pp. 20260–4, https://doi:10.1073/pnas.1116437108 (accessed 20 Mar. 2019).

[21] Delgado, C. L. (2003), 'Rising Consumption of Meat and Milk in Developing Countries Has Created a New Food Revolution', *The Journal of Nutrition*, 133(11): pp. 3907–10, https://doi.org/10.1093/jn/133.11.3907S (accessed 20 Mar. 2019).

[22] Tilman et al. (2011), 'Global food demand and the sustainable intensification of agriculture'.

is due in part to greater meat consumption at higher income levels, and the relative inefficiency with which some types of livestock convert crop calories and protein into edible animal proteins.[23]

These global dietary patterns have become a major driver of environmental degradation and climate change. Globally, food systems are estimated to contribute up to 30 per cent of global anthropogenic greenhouse gas emissions.[24] While supplying only 18 per cent of calories and 40 per cent of protein, the livestock sector accounts for about half of agriculture's greenhouse gas emissions[25] – and 14.5 per cent of global emissions – in addition to almost 75 per cent of agricultural land use[26] and 40 per cent of global arable land use.[27] Livestock farming is the principal cause of habitat destruction and the main source of agricultural pollution. At the same time, growth of the livestock sector has also increased the risk of animal-to-human pathogen shifts. 60 per cent of new human diseases in recent decades have been of animal origin, including several alarming actual and potential pandemics such as severe acute respiratory syndrome (SARS), H1N1 flu (swine flu) and avian flu, raising the prospect that the next global killer will be a virus of animal origin.[28]

2.2 Agricultural commodity production continues to drive a quarter of global deforestation

Despite the plethora of commitments by nearly 400 corporations to end deforestation in commodity supply chains, these commitments are often inadequate, failing to deliver clear and actionable interventions.[29] An assessment published in September 2018 suggests that 27 per cent of deforestation still results from permanent changes in land use for commodity production purposes[30] (see Figure 1 and Table 1). Other major drivers of deforestation include forestry, shifting agriculture, and wildfires.[31] Urbanization has driven only 0.6 per cent of tree cover losses.[32] The amount of 'permanent' conversion of forest for production of commodities (such as palm oil, soybeans and beef) was most heavily concentrated in the tropical forests of Latin America and Southeast Asia. To achieve net zero deforestation (where conversion of natural forests in

[23] Ibid.

[24] Vermeulen, S. J., Campbell, B. M., and Ingram, J. S. I. (2012), 'Climate Change and Food Systems', *Annual Review of Environment and Resources*, 37, pp. 195–222.

[25] FAO (2013), *Tackling Climate Change through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*.

[26] Foley et al. (2011), 'Solutions for a cultivated planet'.

[27] Mottet, et al. (2017), 'Livestock: On our plates or eating at our table? A new analysis of the feed/food debate'.

[28] FAO (2013), *World Livestock 2013: Changing disease landscapes*, Rome: FAO, https://cht.hm/2k8SlDA (accessed 20 Mar. 2019).

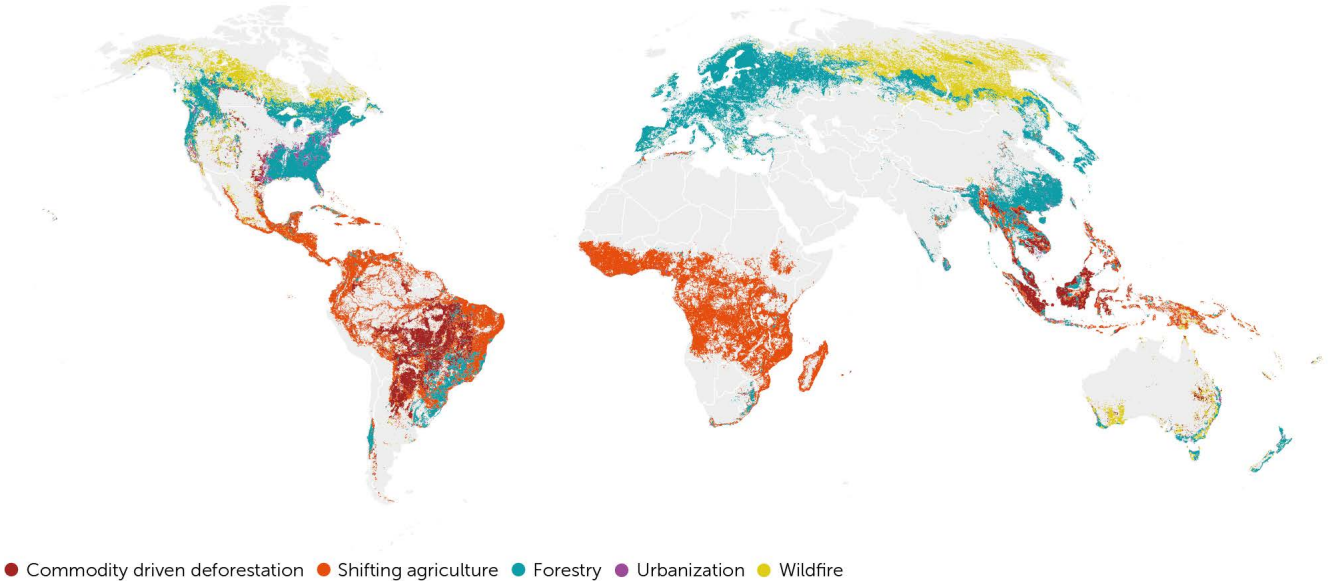
[29] Lambin, E. F. et al. (2018), 'The role of supply-chain initiatives in reducing deforestation', *Nature Climate Change*, 8, pp. 109–16, https://doi.org/10.1038/s41558-017-0061-1 (accessed 31 May. 2019)

[30] Curtis, et al. (2018), 'Classifying drivers of global forest loss'.

[31] Ibid.

[32] Ibid.

Figure 1: Primary drivers of forest cover loss, 2001–15



Source: Curtis, P. G., Slay, C. M., Harris, N. L., Tyukavina, A. and Hansen, M. C. (2018), 'Classifying drivers of global forest loss', Science, 361(6407): pp. 1108–11, https://doi:10.1126/science.aau3445 (accessed 20 Mar. 2019).

Table 1: Drivers of deforestation

Type of drivers	Share of contribution to deforestation	Description
Commodity production	27%	Defined as permanent conversion of forest for the expansion of commodities, such as palm oil, soybeans, beef, minerals, and oil and gas. These areas are not likely to be reforested.
Forestry	26%	Defined as loss within managed forests and tree plantations, which are expected to regrow after harvest. This type of loss has been concentrated in the natural forests and tree plantations of North America, Europe, Russia, China, southern Brazil, Chile, South Africa and Australia.
Shifting agriculture	24%	Defined as loss, primarily in tropical regions, that is cleared and burned for short-term cultivation of subsistence crops. These forests may or may not grow back, depending on the cultivation practices.
Wildfires	23 %	Defined as loss from fires, where trees are likely to regenerate gradually over time. This loss was concentrated in the northern forests of Canada and Russia.
Urbanization	0.6%	Defined as loss from urban expansion and considered permanent, this was concentrated mainly in the eastern United States.

Source: Curtis, P. G., Slay, C. M., Harris, N. L., Tyukavina, A. and Hansen, M. C. (2018), 'Classifying drivers of global forest loss', Science, 361(6407): pp. 1108–11, https://doi:10.1126/science.aau3445 (accessed 20 Mar. 2019).

one place can be offset by increasing forest cover in another place[33]) in agricultural production by 2020 would require the annual elimination of five million hectares of conversion from supply chains.[34]

2.3 Governance deficits in land use planning and policy

Issues related to land use and land management increasingly feature in global climate debates, both in forested nations and elsewhere. Climate change threatens the provision of critical ecosystem services by land – whether clean water or healthy soil, or the natural regulation of hazards (such as flooding). Higher levels of public awareness over land-related greenhouse gas emissions (from livestock and agriculture, for example) also compound the pressure. The UK's Committee on Climate Change, for example, called in 2018 for new land use policies that promote 'transformational land uses and reward landowners for public goods that deliver climate mitigation and adaptation objectives'.[35] It further suggested that '(n)ew policies should also reflect better the value of the goods and services that land provides'.[36]

Most governments have yet to incorporate land policy explicitly into national, sectoral and local climate strategies to provide the framework for governing and transitioning into more sustainable, alternative land use.[37] In many respects, the development of explicit policies that address the interface between land use policy and climate response is in its infancy. Existing frameworks are often incomplete or fragmented, in part because policies are often designed to satisfy a single policy need – such as ownership, redistribution or sustainable intensification (see Table 2).

2.4 The challenge of internalizing environmental and health costs

Today, food seems to be cheaper than ever, due in part to efficiency gains, some of which have been achieved through international trade and the fragmentation of production chains. However, market prices rarely reflect negative or positive externalities embedded in the global food production process. One example of a negative externality is the greenhouse gas footprint of the food system. A positive externality, which is often overlooked, is the social contribution of the sector – which employs more people than any other economic sector in the world.[38]

Accurately assessing the costs of these externalities poses immense methodological and conceptual challenges. However, failing to

[33] Pirard, R., (2015) 'Deforestation-free commitments: The challenge of implementation – An application to Indonesia', Working Paper 181, Bogor Indonesia: CIFOR, available online: https://cht.hm/2m5CE0y (accessed 31 May 2019).

[34] Curtis, et al. (2018), 'Classifying drivers of global forest loss'.

[35] Committee on Climate Change (2018), *Land use: Reducing emissions and preparing for climate change*, https://cht.hm/2kxqX2z (accessed 20 Mar. 2019).

[36] Ibid.

[37] Childress, M. D., Siegel, P. and Törhönen, M. (2014), *Linking Land Policy with Climate Change: A Multi-dimensional Landscape Approach to Territorial Development with a Focus on the Europe and Central Asia* (ECA) Region, World Bank, https://cht.hm/2kxr4ev (accessed 20 Mar. 2019).

[38] The Economics of Ecosystems and Biodiversity (TEEB) (2018), Measuring what matters in agriculture and food systems: A synthesis of the results and recommendations of TEEB for Agriculture and Food's Scientific and Economic Foundations report, Geneva: UN Environment, https://cht.hm/2kFKzBv (accessed 20 Mar. 2019).

Table 2: Examples of land use policies by orientation

Policy orientation	Examples		
	Name of policies	**Governance/instrument**	**Level**
Resource policies (focus on influencing how resources are managed and are designed to have a direct effect on the environment)	Land reform (India)	National/Transfer of land ownership	National, local
	Water Law (China)	State/Command and control of water use	National
	Soil and Water Conservation Law (China)	State/Command and control of soil and water conservation	National
	Forest Code (Brazil)	State and market/Land planning	Regional, local
	Environmental management (Indonesia)	State/Command and control	National
	Land tenure policy (Kenya)	State/Definition of right to land and land-based resources access	National/district
	Water and soil conservation strategies (Tunisia)	State/Investment	National
Sectoral policies (focus on specific usage of land to diminish/control impacts)	Initiative for the Integration of Regional Infrastructure in South America – IIRSA (Brazil)	International/Investment in power lines	International, national
	Agriculture culturing system (Indonesia)	State/Incentives	National
	Forestry (Indonesia)	State/Command and control	National
	Strategy for revitalizing agriculture (Kenya)	State/Incentives	National
	Macro-economic policies (Mali)	State/Investment, taxes, subsidies, credit, interest rate, devaluation	National
	Pollution-free, green and organic food policies (China)	State/Production standards, certification	National
Social policies (focus on improving social welfare and correcting inequalities; indirectly impact on land use)	National Rural Employment Guarantee Act (India)	State/Guarantees for work (unskilled manual labour)	National, local
	Strategic framework to fight poverty (Mali)	State/Incentives	National
Territorial policies (focus on addressing inequalities between regions; aim to influence the productive, economic and social aspects of a territory)	The Panchayat Raj Act (India)	State/Decentralized governance, planning and Implementation	National, regional
	Land Administrative Law (China)	State/Property rights, command and control of land use	National
	Protected land: Indigenous land (Brazil)	Actors/Land regularization and demarcation	Local
	National spatial planning (Indonesia)	State/Land use plan	National, provincial

Source: Bonin, M. et al. (2012), 'Critical analysis of land use policies', in McNeill, D., Nesheim, I., Brouwer, F. (eds) (2012), Land Use Policies for Sustainable Development: Exploring Integrated Assessment Approaches*, Cheltenham: Edward Elgar Publishing.*

Table 3: Current land-related policies/legal framework with unintended negative environmental impacts*

Legislation	Description	Why it fails to deliver sustainable, healthy food systems
EU EU Renewable Energy Directive (RED) 2009/28/EC	The directive mandates that 20 per cent of all energy usage in the EU, including 10 per cent of the transport fuel of every EU country, must come from renewable sources. The revised RED, which entered into force in December 2018, aims to reduce the negative impacts of indirect land use change.	The directive has encouraged the use of food crops like palm oil, rapeseed oil and soybean oil to make biofuels. As a result, it has contributed to: • Displacing crops that could be used for food, thereby driving up food prices. • Indirectly, to changes in land use outside the EU and higher greenhouse gas emissions. For example, one-third of EU crop biodiesel comes from palm oil, which is not only the highest emitting biofuel but also a major contributor to deforestation and peatland drainage in Southeast Asia, Latin America and Africa. • The EU Commission has proposed reducing the share of conventional biofuels used in transport from a maximum of 7 per cent in 2021 to 3.8 per cent in 2030. The impact of this proposal on rural development is still unclear.
Brazil 2012 Forest Code	Established in 1965 to regulate land use and conservation of native vegetation on private properties – landowners in the Brazilian Amazon should maintain 80 per cent of their land as forest. The law was revised in 2012 to strengthen monitoring and ensure compliance. Landholders are obliged to register their properties in the Rural Environmental Registry (CAR) to monitor data on rural properties and their compliance with the environmental requirements of the Forest Code.	The legislation has been ineffective as landowners did not stop deforestation and few restored illegally cleared areas due to disincentives for compliance and lack of financial incentives, e.g.: • No fines for areas deforested illegally before 2008 provided producers comply with new reduced restoration requirements. • The cost of compliance remains prohibitively high despite compensation mechanisms. This means that implementation of the Forest Code has been slow, and the forest debt is high in some Brazilian states (meaning insufficient trees have been planted to compensate for forest loss). • Substantial economic payoffs to producers who deforested illegally before 2008, while punishing those who refrained from clearing or invested in forest restoration to comply.
India Minimum Support Prices for agriculture	The Commission for Agricultural Costs and Prices (CACP) – formerly known as the Agricultural Prices Commission – was established in 1965 to recommend minimum support prices (MSPs) to support farmers to adopt technologies and new production measures to raise productivity and production in India. MSPs now cover 25 agricultural commodities.	• While it provided clear benefits to farmers investing in the Green Revolution and enhanced the adaptive capacity of poor farmers, the policy has had several side effects, e.g.: o increased water and energy demand; o environmental degradation; o monocropping, etc. • In the long term, these side-effects increase uncertainties for poor farmers. • A price policy that does not incorporate environmental externalities has exacerbated environmental degradation.
Indonesia Basic Agrarian Law (BAL) (1960) Law No. 6 on Villages (2014) Law No. 23 on Regional Governance (2014) Law No. 19 Revision of Law No. 41 of 1999 on Forestry (2004)	The BAL defines the fundamental rights of private individuals and entities, and the role of the state with regards to its direct use of land; and regulates private rights and uses of land. Law No. 6 of 2014 on Villages expands powers to the village level, strengthening the authority of village heads to administer their own villages, including managing their assets (including natural resources), revenue and administration. Law No. 23 of 2014 on Regional Governance withdraws some of the authority over natural resource management from district and city governments and shifts this to the provincial and/or national governments. National forestry laws regulate forests in Indonesia. The 1999 Forestry Law switched the focus of previous legislation from timber management to include broader conservation goals and increased recentralization. The recent Law No. 23 of 2014 also favours centralized forest management.	Despite attempts to improve land-use management in Indonesia, the land governance system in the country is characterized by a conflict between decentralization and recentralization in the forest and land-use sectors since 1999. This has contributed to: • Indonesia's economy relying heavily on natural resources, including converting forest and land ecosystems to plantations and other land uses; • Increasing conversions of agricultural land for commercial and industrial uses, as urban areas spread; • Increasing conflict between farmers and local communities due to lack of adequate amounts of agricultural land; • Indigenous peoples and local communities struggling to achieve recognition of their rights; • Land expropriation not being subject to uniform implementation guidelines; • A regime of laws and regulations that creates conflict and overlap of authority among the different layers of government. In the case of forestry, for instance, Law No. 23 of 2014 only provides local governments with the authority to manage 'grand forest parks'.

incorporate negative externalities in the price of finished products sends misleading signals to consumers. The Sustainable Food Trust in the UK estimates that an extra 50p would be required on every £1 spent on food to address the negative impacts associated with pesticide poisoning, antimicrobial resistance, and food-related healthcare expenses resulting from increased cardiovascular disease, diabetes and cancer rates. Environmental impacts such as soil degradation, nitrogen pollution, biodiversity loss or greenhouse gas emissions would add another 36p to every £1 spent on food.[39]

The same applies to nutrition and health costs. For example, the number of adults worldwide with diabetes increased from 108 to 422 million between 1980 and 2014.[40] On the current trajectory, this number will surpass 700 million by 2025 (with the age-standardized prevalence of diabetes being 12.8 per cent of men and 10.4 per cent of women)[41] with immense associated public health costs. The regions with the fastest growing numbers of diabetics are in South, East and Southeast Asia, and obesity is also increasing in sub-Saharan Africa. These trends create a double burden of under- and overnutrition. Extrapolating from the costs

[39] Ian Fitzpatrick, I and Young, R. (2017), *The Hidden Cost of UK Food*, Bristol: Sustainable Food Trust, https://cht.hm/2kwiSLw (accessed 12 Sep. (2019).

[40] NCD Risk Collaboration (2016), 'Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4.4 million participants', *The Lancet*, 387(10027): pp. 1513–30.

[41] Ibid.

* *Compiled by Hoffmann Centre (2019).*
Parsons, K. and Hawkes, C. (2018), 'Connecting food systems for co-benefits: How can food systems combine diet-related health with environmental and economic policy goals?', Policy Brief 31, Copenhagen: WHO Regional Office for Europe, https://cht.hm/2kw1Ih7 (accessed 12 Mar. 2019);
European Commission (2019), 'Biofuels' https://cht.hm/2m7VVOV (accessed 12 Mar. 2019);
TransportPolicy.net (undated), 'EU: Fuels: Biofuel Policy', https://cht.hm/2lLBd7q (accessed 12 Mar. 2019);
Transport & Environment (2017), 'Reality check – 10 things you didn't know about EU biofuels policy', https://cht.hm/2lIFo3T (accessed 12 Mar. 2019);
EUR-Lex (2018), Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, https://cht.hm/2kliVDP (accessed 12 Mar. 2019);
EUR-Lex (2018), Directive (EU) 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, https://cht.hm/2ktEb0d (accessed 12 Mar. 2019);
Bannon, E. (2018), 'EU ends target for food-based biofuels but will only halt palm-oil support in 2030', Transport & Environment, 2 July 2018, https://cht.hm/2mdOciw (accessed 12 Mar. 2019);
Stefanini, S. (2019), 'EU set to tighten rules on palm oil for biofuels', Climate Home News, 4 February 2019, https://cht.hm/2lIGkFr (accessed 12 Mar. 2019);
Rogerson, S. and Døvre, B. (2018), 'Brazil's Forest Code: Implications for financial institutions', Global Canopy, https://cht.hm/2lMSdKF (accessed 12 Mar. 2019);
Azevedo, A. A. et al. (2017), 'Limits of Brazil's Forest Code as a means to end illegal deforestation', Proceedings of the National Academy of Sciences of the USA, 114(29): pp. 7653–8; https://doi.org/10.1073/pnas.1604768114 (accessed 12 Mar. 2019);
Chikermane, G. (2018), '70 Policies – Agricultural Prices Commission, 1965', Observer Research Foundation, 4 August 2018, https://cht.hm/2mcBron (accessed 12 Mar. 2019);
Rajão, R. and Soares-Filho, B. (2015), 'Policies undermine Brazil's GHG goals', Science, 350(6260): p. 519; https://doi.org/10.1126/science.350.6260.519-a (accessed 12 Mar. 2019);
Bonin et al. (2012), 'Critical analysis of land use policies';
Mitra, S. and Sareen, J. S. (2006), 'Adaptive policy case study: Agricultural price policy in India', in International Institute for Sustainable Development and The Energy and Resources Institute (eds) (2006), Designing policies in a world of uncertainty, change and surprise: Adaptive policy-making for agriculture and water resources in the face of climate change, Winnipeg and New Delhi: International Institute for Sustainable Development and The Energy and Resources Institute;
Landlinks (undated), 'Indonesia', https://cht.hm/2kgLoAD (accessed 12 Mar. 2019);
Forest Legality Initiative (2016), 'Indonesia', https://cht.hm/2lKy0Fi (accessed 12 Mar. 2019);
Gindroz, A.-S. (2015), 'How Indonesian forest law is being used against poor people', The Jakarta Post, 16 August 2016, https://cht.hm/2mdFMaV (accessed 12 Mar. 2019);
Michalopoulos, S. (2017), 'Industry and farmers see biofuels as a crucial market 'outside CAP'', Euractiv, 19 May 2017, https://cht.hm/2kFNlXi (accessed 12 Mar. 2019);
World Resources Institute (undated), 'Indonesia', https://cht.hm/2kwhQiE (accessed 12 Mar. 2019);
Ardiansyah, F., Marthen, A. A. and Amalia, N.(2015), 'Forest and land-use governance in a decentralized Indonesia: A legal and policy review', CIFOR Occasional Paper no. 132, Bogor: Center for International Forestry Research, https://cht.hm/2lLCLOM (accessed 12 Mar. 2019).

Figure 2: Sugar taxation of beverages around the world, 2017

Source: NCDFree (2017), 'Sugary Drinks Taxes Worldwide', https://cht.hm/2kgDcQQ (accessed 20 Mar. 2019).

borne by the UK National Health Service today of treating 3.5 million diabetics – amounting to some £14 billion per year[42] (or roughly £4,000 per head) – the treatment costs for diabetes could amount to 5 per cent of global GDP in the next decade. More broadly, NCDs now account for 70 per cent of all deaths around the world,[43] even though they receive less than 2 per cent of donor assistance for health.[44] A new Lancet Commission on Obesity called for a global treaty to limit the political influence of large corporate players.[45] It also called for redirecting $5 trillion in government subsidies away from harmful products.

In response to the health burden associated with overconsumption of unhealthy food products, many governments have begun to explore different mechanisms to reorientate markets and mitigate the impacts of unaccounted externalities, from taxation to other regulatory guidance. These mechanisms include, for example, taxes on sugary drinks that have been put in place in over 30 jurisdictions around the world (see Figure 2).

In the US, the city of Berkeley, California, adopted a 'soda tax' in 2014. Researchers conducting a study four months after the implementation of the tax found a 21 per cent drop in the consumption of sugar-sweetened beverages and a 63 per cent increase in water consumption in low-

[42] Diabetes UK (2018), 'Cost of Diabetes', https://cht.hm/2kGvIqs (accessed 20 Mar. 2019).

[43] NCD Alliance (undated), 'NCDs', https://cht.hm/2kIe1GV (accessed 20 Mar. 2019).

[44] NCD Alliance (undated), 'The Financial Burden of NCDs', https://cht.hm/2kFJI3J (accessed 20 Mar. 2019).

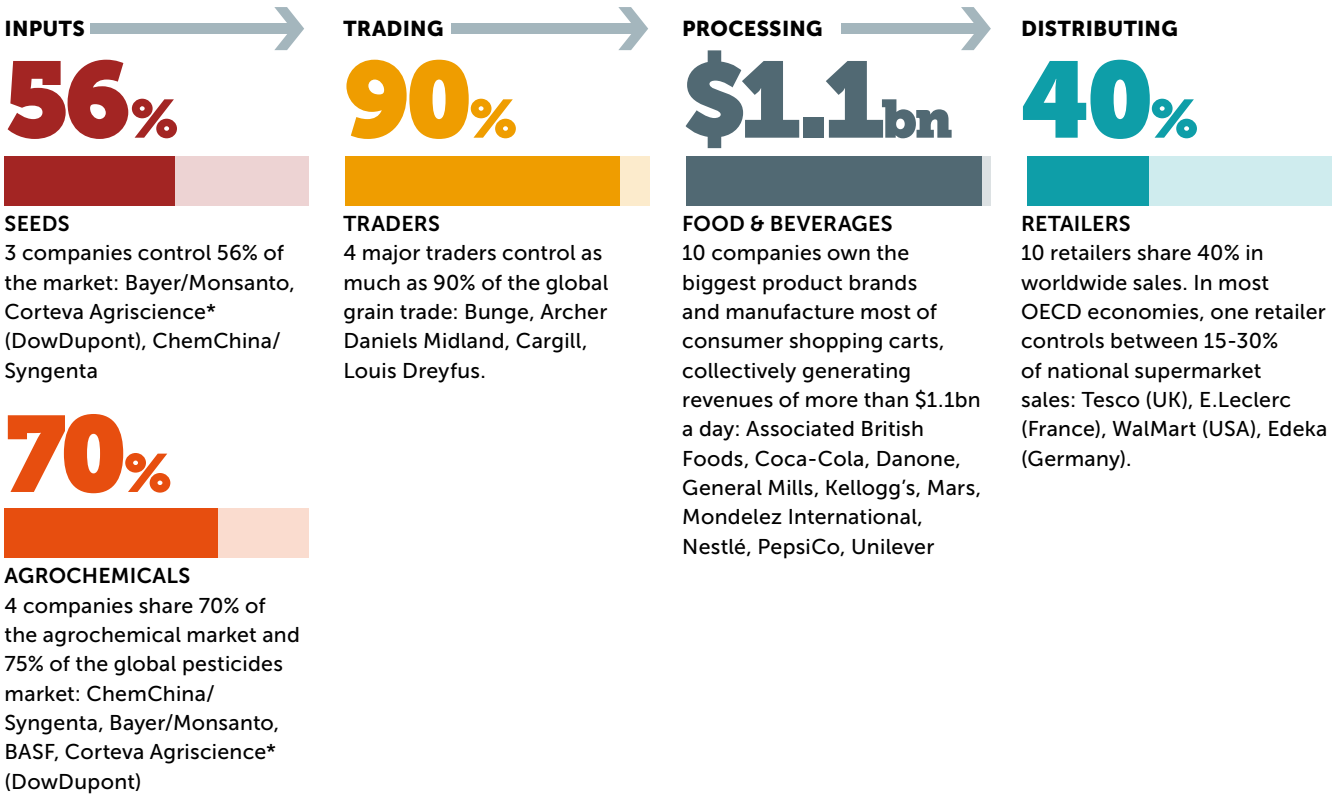
[45] Swinburn, A. B et al. (2019), *The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report, The Lancet*, 393(10173): pp. 791–846, https://doi.org/10.1016/S0140-6736(18)32822-8 (accessed 20 Mar. 2019).

Table 4: Measures to reduce consumption of unhealthy foods

Examples of taxation to reduce unhealthy food consumption targeting consumers		
Where	**What**	**Result**
Hungary	• 4 per cent on packaged foods and drinks that contain high levels of sugar and salt in certain product categories. • Focus on nutritional content.	• Decrease in junk food consumption (combination of price and educational campaigns), particularly low-income groups and frequent consumers of junk food. • Up to 16 per cent of consumers choose cheaper, often healthier products; consumed less unhealthy foods; changed brand or substituted (often with a healthier alternative). • 40 per cent of junk food manufacturers changed recipes. • $219 million revenue earmarked for health spending.
Mexico	• 8 per cent tax on foods including snacks, sweets, nut butters, cereal-based prepared products that are considered 'non-essential'. • Focus on calorific content – foods with more than 275 calories per 100 grams are taxed.	• 7 per cent reduction in junk food purchases.
Other taxes and measures to incentivize against unhealthy food production or consumption		
Where	**What**	**Result**
India (Kerala)	• 14.5 per cent fat tax on sale of fast food, targeting manufacturers.	• Increased revenue for the government. • Unknown health benefit.
Chile	• Increased tax rate from 13 per cent to 18 per cent on industrialized beverages with high levels of sugar in 2014. • A law implemented in 2016 limits cartoons on food packaging, stops schools offering unhealthy foods, restricts TV advertising, bans promotional toys and mandates large black warning labels on foods high in salt, saturated fat, sugar and calories.	• An overall 21.6 per cent decrease in the monthly purchased volume of the higher taxed, sugary soft drinks. Among middle and high socioeconomic groups, the monthly purchased volume fell by 16 per cent and 31 per cent respectively. Lower socioeconomic groups reduced their purchased volumes by 12 per cent.
Japan	• 'Metabo tax' is a penalty on firms and authorities that fail to meet targets on employee waist sizes – the latter cannot exceed 33.5 inches for men and 35.4 inches for women.	• Obesity rates have fallen to 3.5 per cent of adults aged 20 years and over, one of the lowest levels in the world.

Sources: Nakamura, R., Mirelman, A.J., Cuadrado, C., Silva-Illanes, N., Dunstan, J. and Suhrcke, M. (2018), 'Evaluating the 2014 sugar-sweetened beverage tax in Chile: An observational study in urban areas', PLoS Medicine *15(7): e1002596, https://doi.org/ 10.1371/journal.pmed.1002596 (accessed 29 Aug. 2019); Swinburn, A. B et al. (2019),* The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report, The Lancet, *393(10173): pp. 791–846, https://doi.org/10.1016/S0140-6736(18)32822-8 (accessed 20 Mar. 2019).; Daniells, S. (2018), 'Chile's sugar tax has led to consumption decreases, but does diet inequality still exist?, Food Navigator-LATAM. com, 9 July 2018, https://cht.hm/2lRB9CZ (accessed 20 Mar. 2019); Belluz, J. (2018), 'Mexico and Hungary tried junk food taxes – and they seem to be working', Vox, 6 April 2018, https://cht.hm/2kHetW2 (accessed 20 Mar. 2019); Sachitanand, R. (2016), 'Eight countries that have declared war on junk food',* The Economic Times*, 17 July 2016; https://cht.hm/2m5KIym (accessed 20 Mar. 2019).*

Figure 3: Concentration of food production chain



Source: IPES-Food (2016), From uniformity to diversity: A paradigm shift from industrial agriculture to diversified agroecological systems Brussels: IPES-Food https://cht.hm/2kAh5oL (accessed 20 Mar. 2019); USDA (2016), 'Food Market and Prices', https://cht.hm/2kLNjNN (accessed 20 Mar. 2019); Chazan, G. and Whipp, L. (2016) 'Farmers sound alarm over mega deals' Financial Times, 6 September 2016, https://cht.hm/2kwkfd7 (accessed 20 Mar. 2019); Oxfam (2013), Behind the brands: Food justice and the "Big 10" food and beverage companies, Oxford: Oxfam, https://cht.hm/2kgngxU (accessed 20 Mar. 2019); Renwick et al. (2012) 'Power in Agriculture: A vital Report on the future of farming', Oxford Farming Conference, https://cht.hm/2kL6cjL (accessed 20 Mar. 2019); DeCarlo, S. (2018), And Then There Were Four?: M&A in the Agricultural Chemicals Industry, USITC Executive Briefings on Trade, https://cht.hm/2INZMka (accessed 04 Sep. 2019); Vilmorin and Cie (2019), 'Investors Presentation February 2019', https://cht.hm/2kwl6ul (accessed 22 Aug. 2019); Statista (2019), 'Market share of the five largest agricultural chemical companies worldwide as of 2018', https://cht.hm/2ISAMII (accessed 22 Aug. 2019); Statista (2019), 'Market share of grocery stores in France for the 12 weeks ending March 12, 2019, https://cht.hm/2keeqkc (accessed 04 Sep. 2019).

**Corteva Agriscience was spun out of DowDupont on 3 June 2019, 'Corteva™ Separates from DowDuPont to Form Leading Pure-Play Agriculture Company', https://cht.hm/2kIBfgd (accessed 04 Sep. 2019).*

income areas in the city.[46] However, another study suggested that only 43 per cent of the tax was passed on to consumers.[47] Other regulatory measures have also been tested or designed to discourage consumption of products with known health impacts, such as restrictions on advertising unhealthy beverages in schools (see Table 4). Inclusive and transparent national dialogues are needed to build broader consensus on the design of the most appropriate instruments – from subsidy redirection to tax-related incentives. The toolkit could also include policies on labelling or restrictions on advertising, especially where children are targeted. Building on momentum for companies to commit to greenhouse gas emission reduction targets in line with the level of reductions proposed by the scientific community, a new World Economic Forum initiative on Science-Based Targets for the Global Environment Commons will expand these targets to cover issues related to water, land, and externalities that arise from food production.

[46] Falbe, J. et al. (2016), 'Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption', *American Journal of Public Health* (AJPH), 106(10): pp. 1865–71, https://doi.org/10.2105/AJPH.2016.303362 (accessed 20 Mar. 2019).

[47] Cawley, J. and Frisvold. D. E. (2017), 'The Pass-Through of Taxes on Sugar-Sweetened Beverages to Retail Prices: The Case of Berkeley, California', *Journal of Policy Analysis and Management*, 36(2): pp. 303–26, https://doi.org/10.1002/pam.21960 (accessed 20 Mar. 2019).

2.5 Corporate concentration

Large corporate players have been playing a disproportionate role in global trade across all economic sectors. According to estimates by the UN Conference on Trade and Development (UNCTAD), published in its *World Investment Report 2013*, about 80 per cent of trade (in terms of gross exports) took place through international production networks linked to multinational corporations. Transactions take place either as intra-firm trade (accounting for around one-third of the total), non-equity models (including contract manufacturing, licensing, and franchising), or arm's-length transactions involving at least one company.[48] Transnational corporations are also estimated to control around two-thirds of the world's foreign direct investment (FDI) stock.

Along the food value chain, corporate concentration through both horizontal and vertical integration is beginning to garner global attention. A small number of large firms dominate economic activity – for example in seeds and inputs, processing and trading, and manufacturing.

Figure 3 shows that three companies control over half of the seed market; four corporations share the global agrochemical and pesticides markets; and four traders are responsible for over 90 per cent of global grain trade. A report by a group of non-governmental organizations (NGOs), the ETC Group, further suggests that, in 2014, four corporations controlled 21 per cent of the fertilizer market; almost 54 per cent of the agricultural machinery market; and 54 per cent of food processing.[49]

Clearly, concerns over the impacts of agribusiness concentration – especially the impact on smallholders – is not new. According to UNCTAD, '[i]n 2002, two companies controlled nearly 50 per cent of the global banana trade and two others handled three quarters of the global grain trade'.[50] The same study estimated that in 2008, globally, the four largest companies carried out 45 per cent of coffee processing, and only three companies controlled 80 per cent of tea markets.[51]

Many reasons account for this concentration, from scale economy to the globalization of supply chains. On the positive side, trade and globalized production chains can contribute to better allocation of resources (see Section 3.6, Trade in embedded resources) and efficiency gains, especially if the benefits are passed on to market participants along the value chains. They could also enhance control over quality and safety, at least in principle. On the other hand, market concentration raises serious questions over the relative bargaining power of big and small producers, and of producers and consumers.

In part due to such concentration, private innovation has primarily focused on incremental improvements for existing products and

[48] UNCTAD (2013), *Global Value Chains: Investment and Trade for Development*, https://cht.hm/2mcNdPE (accessed 20 Mar. 2019).

[49] Mooney, P. (2018), *Blocking the Chain: Industrial food chain concentration, Big Data platforms and food sovereignty solutions*, Val David, QC: ETC Group, https://cht.hm/2lMtQwu (accessed 20 Mar. 2019).

[50] UNCTAD (2016), *Agricultural commodity value chains: The effects of market concentration on farmers and producing countries – the case of cocoa*, Geneva: United Nations Conference on Trade and Development, https://cht.hm/2kFDyk9 (accessed 20 Mar. 2019).

[51] Ibid.

customers rather than high-risk, high-return opportunities.[52] Due in part to these trends, there is a risk that smaller firms could be squeezed out of future markets, even if they are more innovative. The size and high investment costs associated with agribusinesses (for quality control, regulatory compliance and marketing in multiple geographies) can also disadvantage smaller players.

In addition, concerns remain that concentration could squeeze farm income and reduce farmer autonomy through consolidation, accelerating corporate ownership and control over significant sets of data and reducing transparency – whether over costs or sustainability performance along value chains.

Put together, corporate concentration and globalized supply chains could further exacerbate the challenges that are already adversely affecting the food and land use system. Surprisingly, however, despite the plethora of concerns, overconcentration of corporate power in the food system has remained largely unchallenged. In the US, much has been written on how the judiciary system has tended to shy away from anti-trust challenges since the advent of 'Reaganomics' in the 1980s.[53] That said, government policies have also continued to play a role in perpetuating the status quo. The Environmental Working Group in the US found, for example, that the top-selling 10 per cent of farmers receive 70 per cent of crop insurance subsidies.[54]

[52] Bailey, R. (2017), 'Disrupting dinner? Food for the future', London: Hoffmann Centre For Sustainable Resource Economy, Royal Institute of International Affairs, https://cht.hm/2lNxZQP (accessed 20 Mar 2019).

[53] Howard, P. H. (2016), Concentration and Power in the Food System: Who Controls What We Eat?, London: Bloomsbury Academic.

[54] Faber, S. (2018), 'Top 5 Reasons to Reform Crop Insurance', AgMag, 27 June 2018, https://cht.hm/2khUn4y (accessed 20 Mar. 2019).

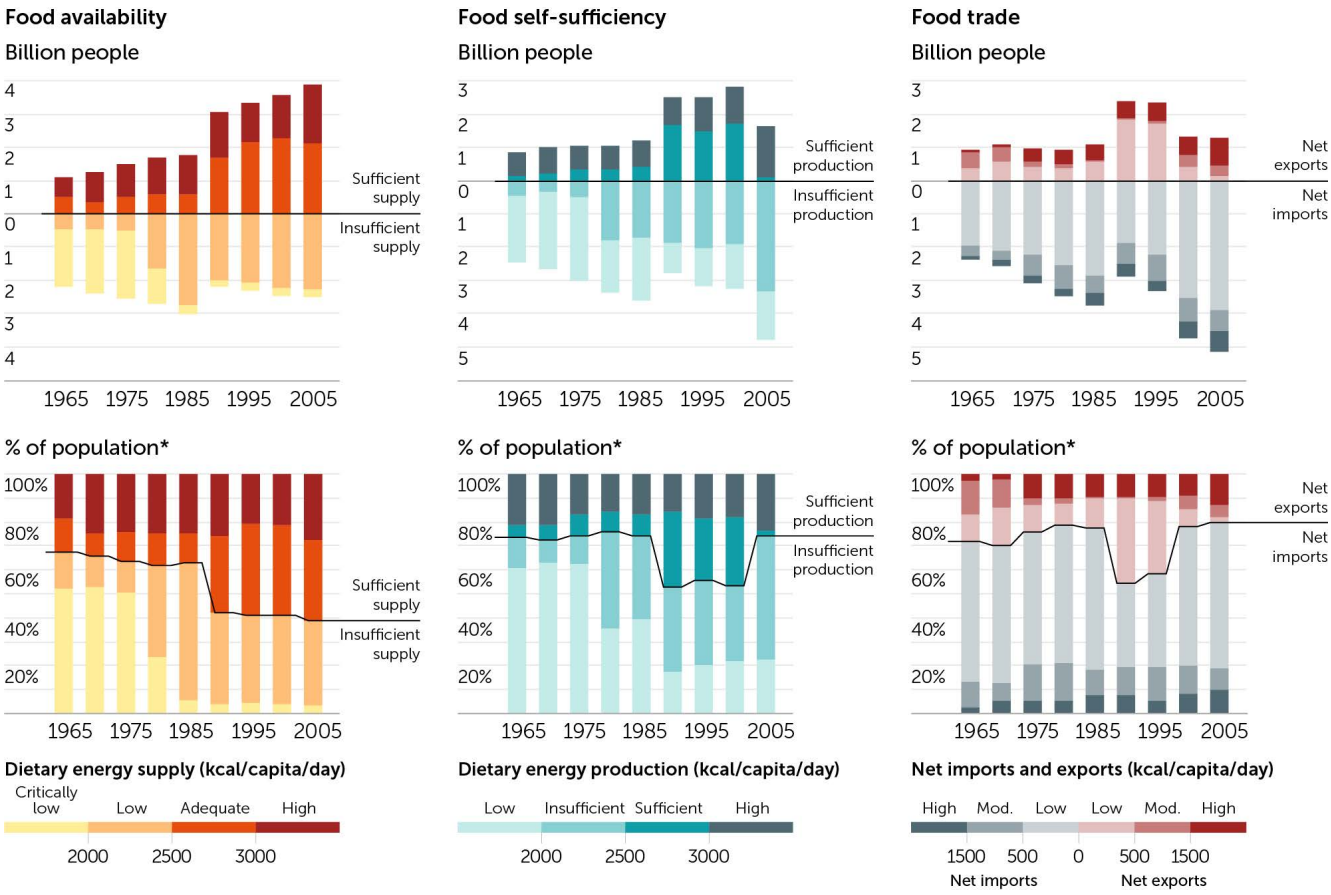
3. Global food trade: What, where, who and how

At a glance

- Trade, and trade policies in agriculture, play an ambiguous role in the current food system. In the absence of effective regulatory frameworks or pricing frameworks that internalize environmental or health externalities, trade can exacerbate some of the challenges to food and land use systems that were highlighted in Chapter 2, including deforestation, land degradation, greenhouse gas emissions, biodiversity loss and unhealthy diets.
- On the other hand, trade can play a critical role in enabling countries to purchase food that they cannot produce themselves at an affordable price. With 80 per cent of the world population depending on imports for at least part of their food and nutritional security, trade is likely to play an increasing role in the future as countries strive to achieve the SDGs.
- The emergence of South–South trade, as a result of growing urban populations and changes in diets, is redesigning the geography of global trade flows. As the centre of gravity in global food trade moves towards the South and the East, the composition of goods trade also evolves. Trade in traditional agricultural commodities, such as cereals or meat, is stagnating – not least due to protectionist policies. Food safety concerns and policies aimed at promoting self-sufficiency in critical commodities have also contributed to these trends.
- While they may respond to national priorities, trade restrictive policies on staple food and sensitive products generate volatility on world markets and limit food availability for countries that depend on imports to feed their populations – thereby increasing the vulnerability of these nations to external shocks.
- In contrast, processed products or ingredients such as vegetable oils have tended to face fewer policy restrictions and have witnessed significant increases in trade. Large multinational companies increasingly organize production and trade in these goods through highly fragmented production networks and complex international value chains. This evolution is made possible by technological innovations that have pushed down transport and communication costs.
- From an environmental perspective, the growth of trade raises the question of embedded resources such as water or soil nutrients. Trade itself also causes negative environmental impacts, starting with greenhouse gas emissions associated with transport and storage. If the environmental cost associated with production and trade is not reflected in the final price of goods, trade may exacerbate the depletion of resources or their unsustainable use.
- The physical impact of climate change on production and yields may well redesign completely the geography of trade in the next few decades, with some regions becoming more dependent on imports to meet demand, and others no longer able to rely on exports. All these developments have potentially significant implications for a transition to a more sustainable and healthy food system.

This chapter provides an overview of the main features of international trade in agricultural products and trade-related policies affecting the sector. It starts by highlighting the role of trade in an

Figure 4: Growing interdependence in the food system, 1965–2005



Source: Porkka, M. et al. (2013), 'From Food Insufficiency towards Trade Dependency: A Historical Analysis of Global Food Availability', PLOS ONE, 8(12), doi:10.1371/journal.pone.0082714 (accessed 10 Mar 2019)

**Population based on data available in each given year.*

increasingly interdependent food system, from the perspectives of both food security and nutrition. It then describes recent evolutions in the geography and composition of trade flows resulting from changing demand, and explains the role of trade policies and private sector strategies in shaping those flows. Finally, it highlights the implications of such changes from a sustainability perspective.

3.1 Trade as a mechanism to offset imbalances between supply and demand

Trade enables countries to purchase food that they cannot produce themselves at an affordable price. With 80 per cent of the world population living in a net food importing country and depending wholly ,or in part, on imports to meet their food needs, trade plays a critical role in offsetting imbalances between supply and demand (see Figure 4) and will continue to do so in the future, particularly when considering the potential production shortfalls which could result from new external shocks, such as those due to climate change.

This interdependence is due to various factors. The rise in average incomes across the developing world contributes to a growth in effective demand that – even accounting for domestic productivity increases – cannot be met solely through domestic production or through existing

trade flows (see Section 3.2). It is also due to differences in natural resource endowments: for example, some estimate that 66 countries, mainly in Africa and the Middle East, do not have sufficient water resources and land to feed their population, at least with existing technology.[55]

In this context, most analysts agree that there can be a direct correlation between increased trade and food security of countries.[56] In other words, a country can become more food secure even if it does not produce enough domestically – providing it has strong purchasing power, is advantageously situated geographically, or has strong trading relationships with its neighbours.[57]

There are major variations in the way different commodities contribute to global trade, depending on whether those contributions are considered in terms of calorific versus monetary values (see Figure 5).[58]

For example, between 2000 and 2009, while wheat, soybeans

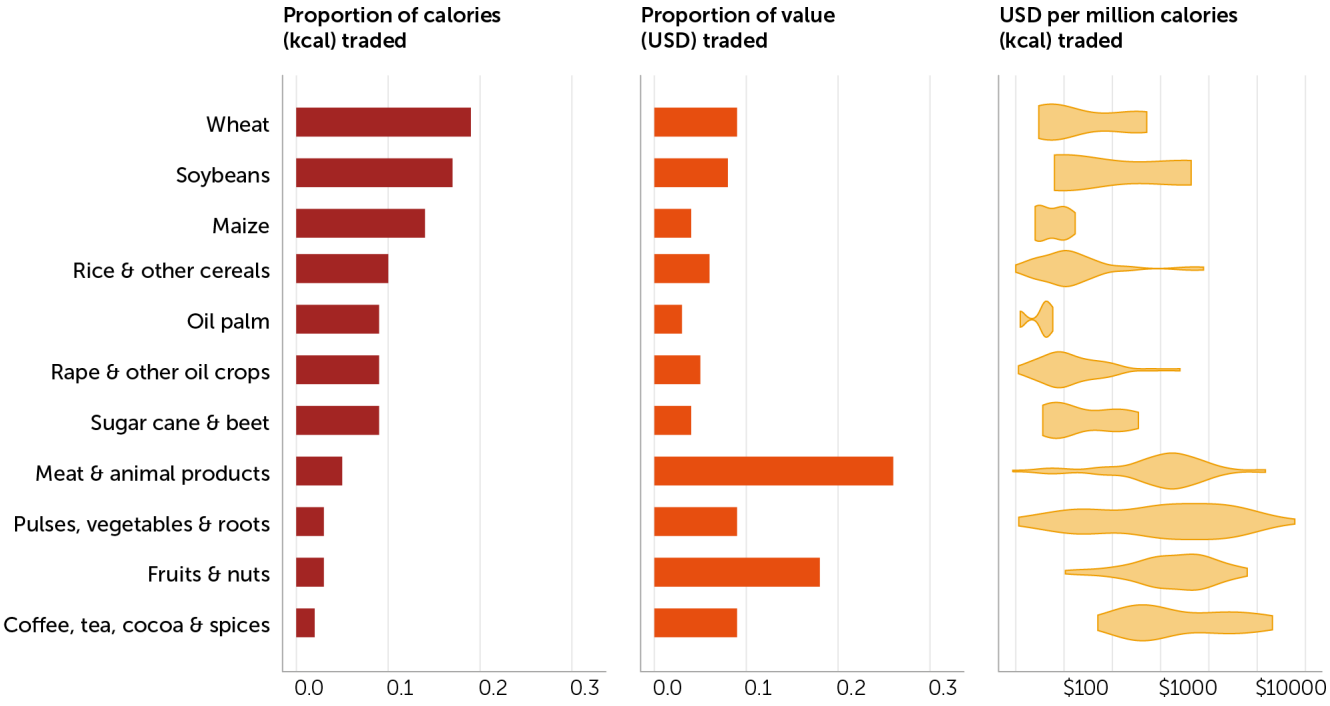
[55] Fader, M. et al. (2013), 'Spatial coupling of agricultural production and consumption: quantifying dependences of countries on food imports due to domestic land and water constraints', Environmental Research Letters, 8(1), https://doi:10.1088/1748-9326/8/1/014046 (accessed 10 Mar 2019).

[56] FAO (2015), *The State of Agricultural Commodity Markets. Trade and Food Security: Achieving a Better Balance between National Priorities and the Collective Good*, Rome: FAO.

[57] Ge, J. et al. (2018), 'The Impact of Trade on Food Security – Preliminary Results from an Agent-Based Global Trade Model', Conference Paper: Social Simulation Conference 2018, Stockholm.

[58] MacDonald, G. K. et al. (2015), 'Rethinking Agricultural Trade Relationships in an Era of Globalization', *BioScience*, 65(3): pp. 275–89, https://doi.org/10.1093/biosci/biu225 (accessed 20 Mar. 2019).

Figure 5: Global agricultural trade comparison: calories versus monetary value



Source: MacDonald, G. K. et al. (2015), 'Rethinking Agricultural Trade Relationships in an Era of Globalization', BioScience, 65(3): pp. 275–89, doi: 10.1093/biosci/biu225 (accessed 20 Mar. 2019).

Figure 6: Structure of global agricultural trade for major importing and exporting countries

Source: MacDonald, G. K. et al. (2015), 'Rethinking Agricultural Trade Relationships in an Era of Globalization', BioScience, *65(3): pp. 275–89, doi: 10.1093/biosci/biu225 (accessed 20 Mar. 2019).*

and maize made up 50 per cent of global exported calories, they only amounted to 21 per cent of the monetary value of global exports. Meanwhile, 44 per cent of traded value was attributable to meat and animal products, together with fruits and nuts. To further illustrate the contrast in the volume of traded calories versus monetary value, Figure 6 shows the structure of global agricultural trade for major importing and exporting countries, expressed both in value terms and in calories.

Finally, trade is important in meeting not only calorific needs but also nutritional security, which includes providing a balanced diet of macro- and micronutrients.[59] Figure 7 illustrates this point by showing how a large number of people would not have access to different types of nutrients without trade. More importantly, Wood et al. have shown that if equitably distributed – including through trade – current food supply could meet nutrient demands for all. There is enough supply of vitamin B12 for 16.79 billion extra people (in addition to the existing global population), and enough protein to meet the needs of an additional 11 billion.[60]

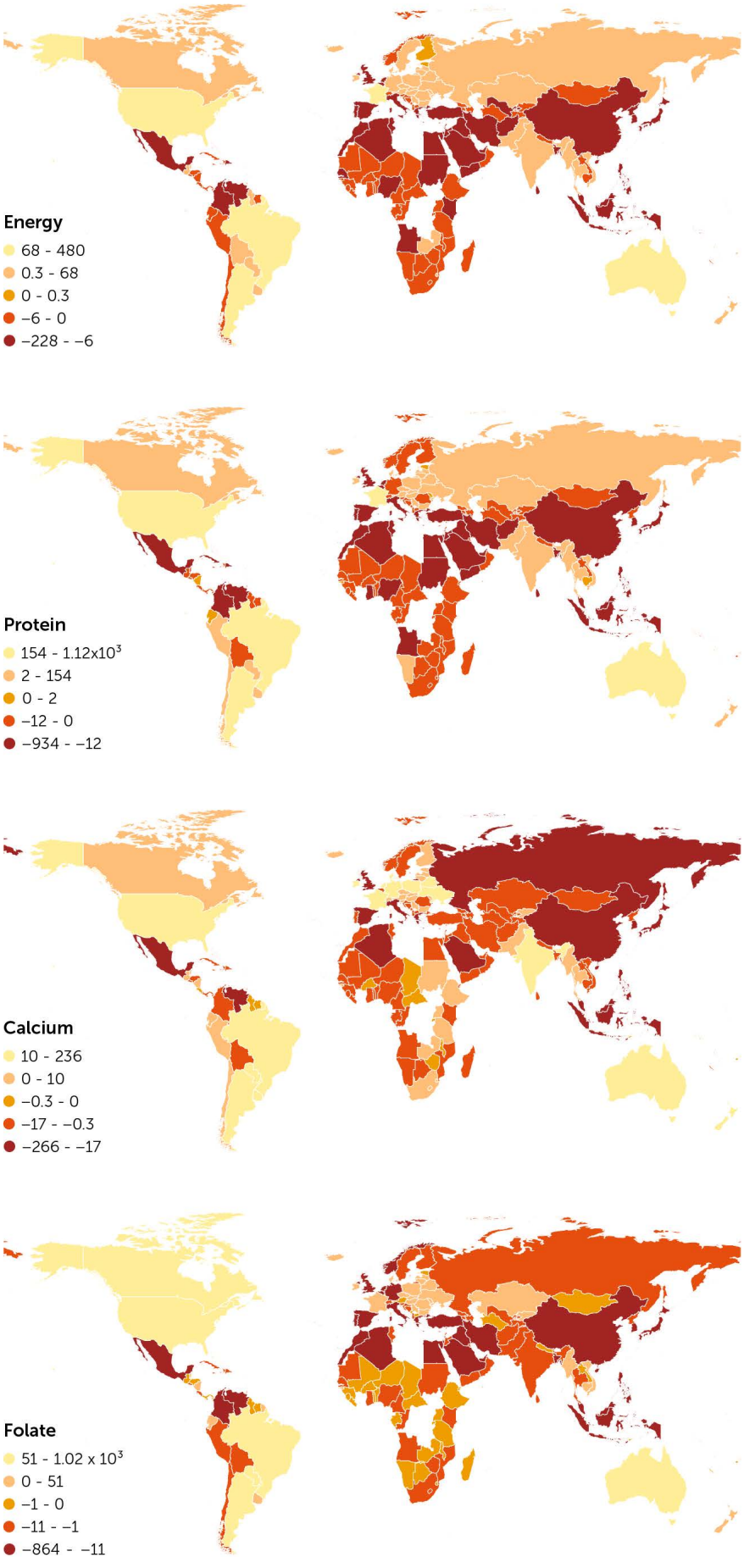
At current levels of global production, there is already enough food to meet two times the calcium needs and five times the protein needs of the current global population. This means that bridging the gap between the production of nutrients and their supply to populations is achievable if the right policies are in place to improve access to nutrients.[61]

[59] Wood, S. A. et al. (2018), 'Trade and the equitability of global food nutrient distribution', *Nature Sustainability*, 1, pp. 34–7, https://doi.org/10.1038/s41893-017-0008-6 (accessed 10 Mar 2019)

[60] However, there is a deficit of folate to meet current needs: this nutrient is the only one for which losses from production are greater than food supply.

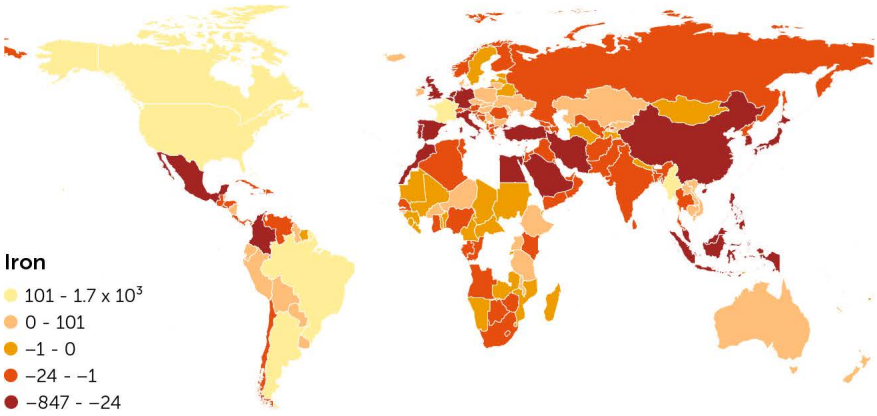
[61] Wood et al. (2018), 'Trade and the equitability of global food nutrient distribution'.

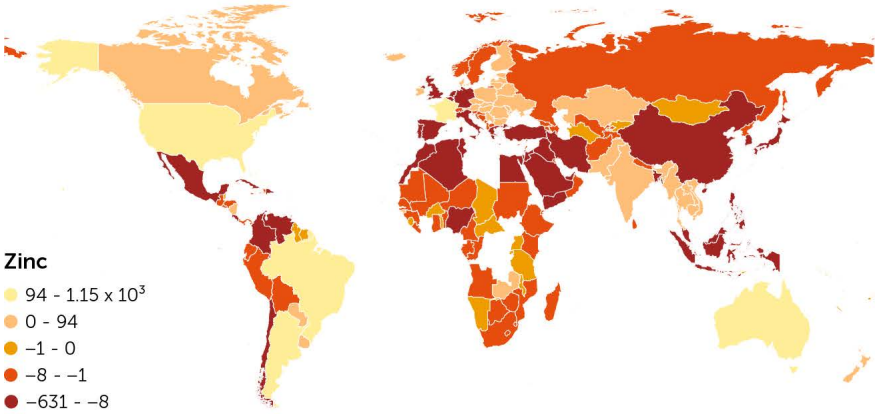
Figure 7: Change in number of people (in millions) who could be nourished without trade

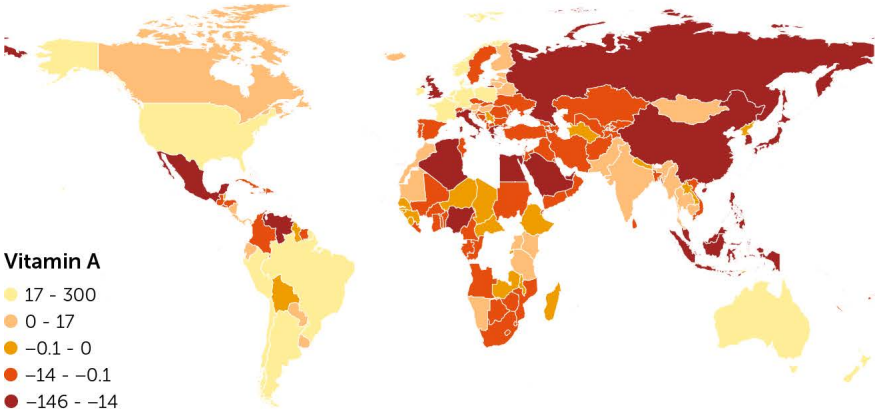


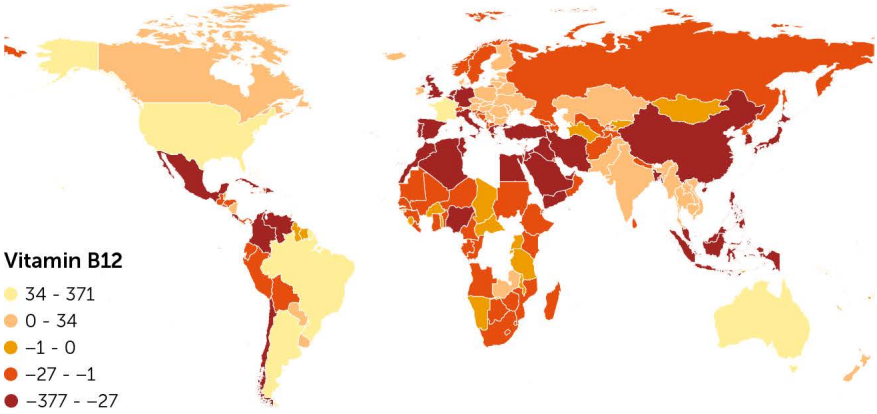
Source: Wood, S. A. et al. (2018), 'Trade and the equitability of global food nutrient distribution', Nature Sustainability, 1, pp. 34–7, https://doi.org/10.1038/s41893-017-0008-6 (accessed 10 Mar 2019)

Figure 7. *continued*



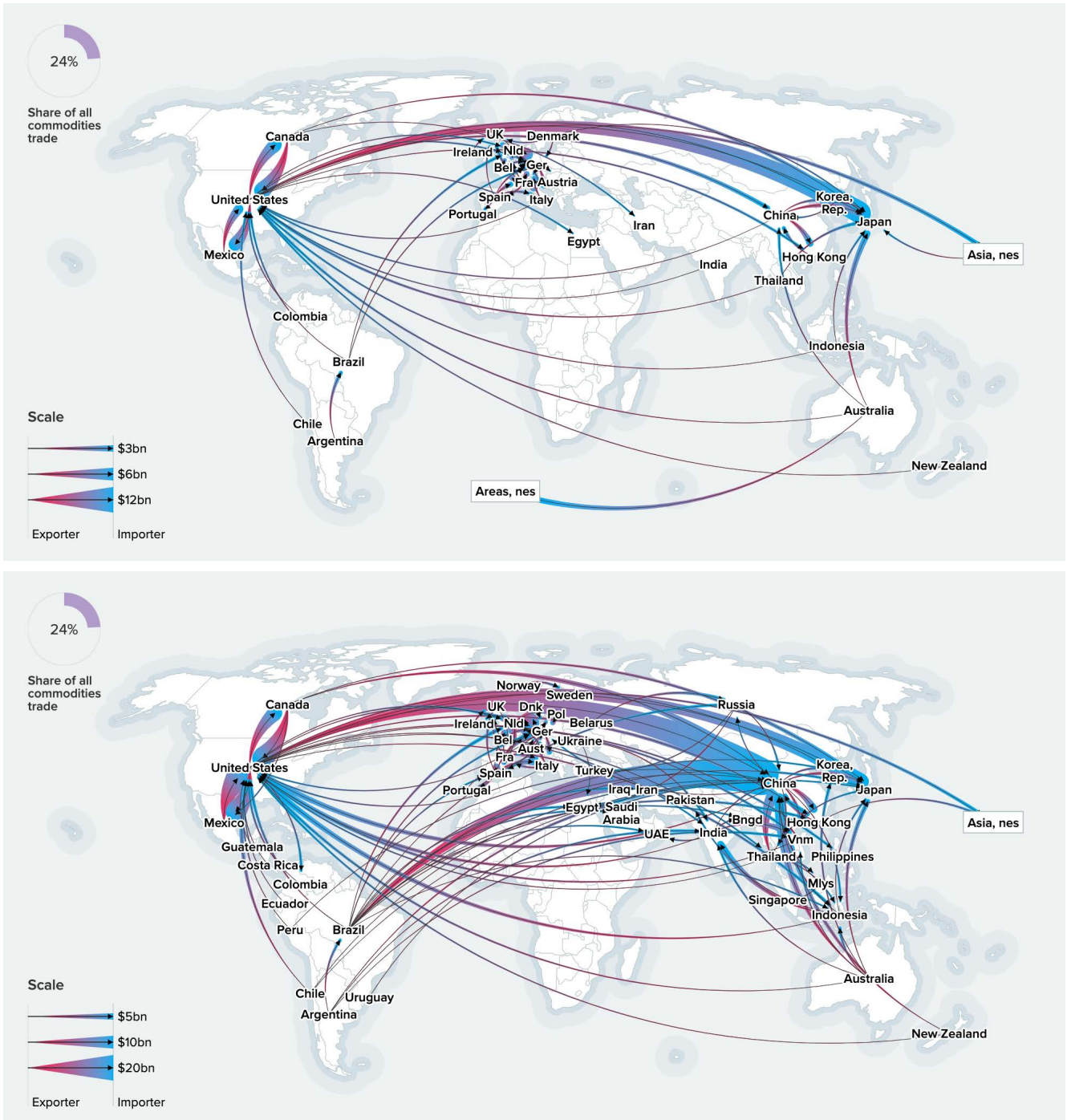






** For each country, the figure shows the changes in the number of people (in millions) who would have access to different elements of their diet under a no-trade scenario compared to the 2007-2011 average. Map breaks correspond to minimum, first quantile, medium, third quantile, and maximum for each nutrient.*

Figure 8: Agricultural trade flows, 2000 (top) and 2017 (bottom)



Source: Chatham House (2019), 'Exploring interdependencies in global resource trade', resourcetrade.earth, http://www.resourcetrade.earth (accessed 10 Mar 2019).

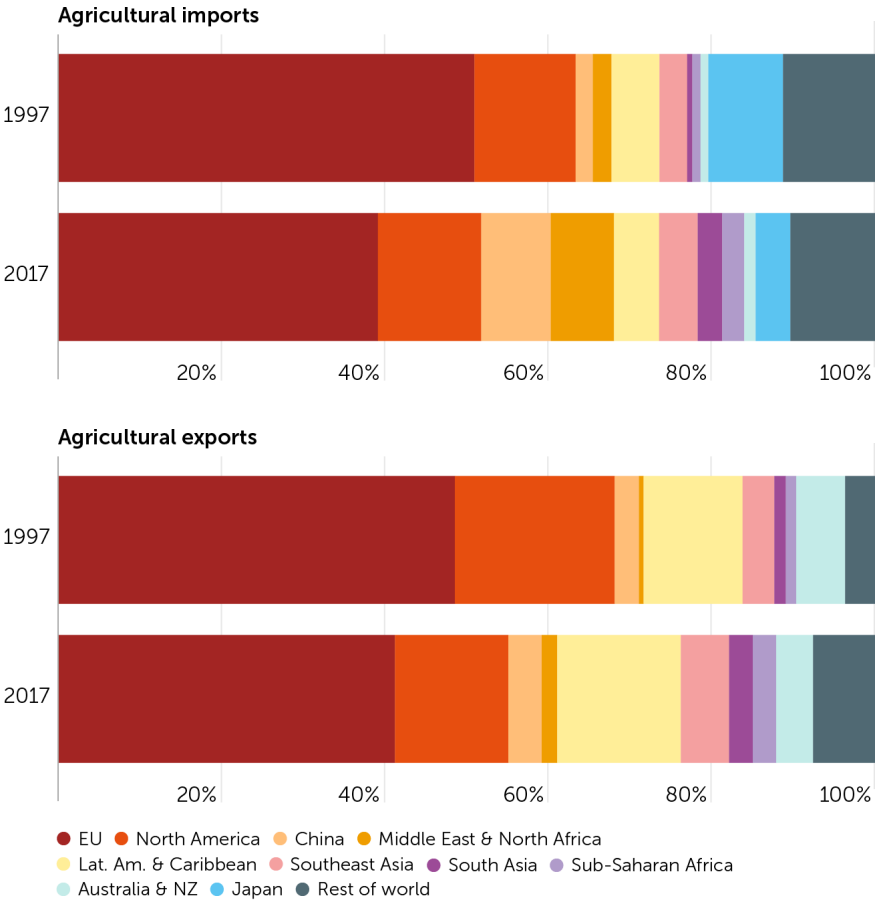
3.2 The emergence of South–South trade: redesigning the geography and composition of global trade flows

Over the last 20 years, trade in agricultural products (excluding intra-EU flows) has more than tripled, to reach $1.33 trillion[62] – driven primarily by demand growth in large emerging economies and a greater volume of South–South trade. The centre of gravity of global food trade has gradually moved from the North (the EU and US) to the South, and from the Atlantic to the Pacific (see Figure 8). While the EU, the US and Japan remain significant players, their relative importance has been declining. In contrast, most of the growth in trade can be attributed to a few developing countries such as Brazil, China, India and Turkey. Their progression as global trading nations is due primarily to the development of South–South trade, which now accounts for roughly one-quarter of total agricultural trade flows.

China has become one of the largest importers, together with other populous developing countries such as India, Mexico and Nigeria. Over the next decades, the largest demand is projected to come from Asia, followed by Africa. On the export side, while the EU and the US together

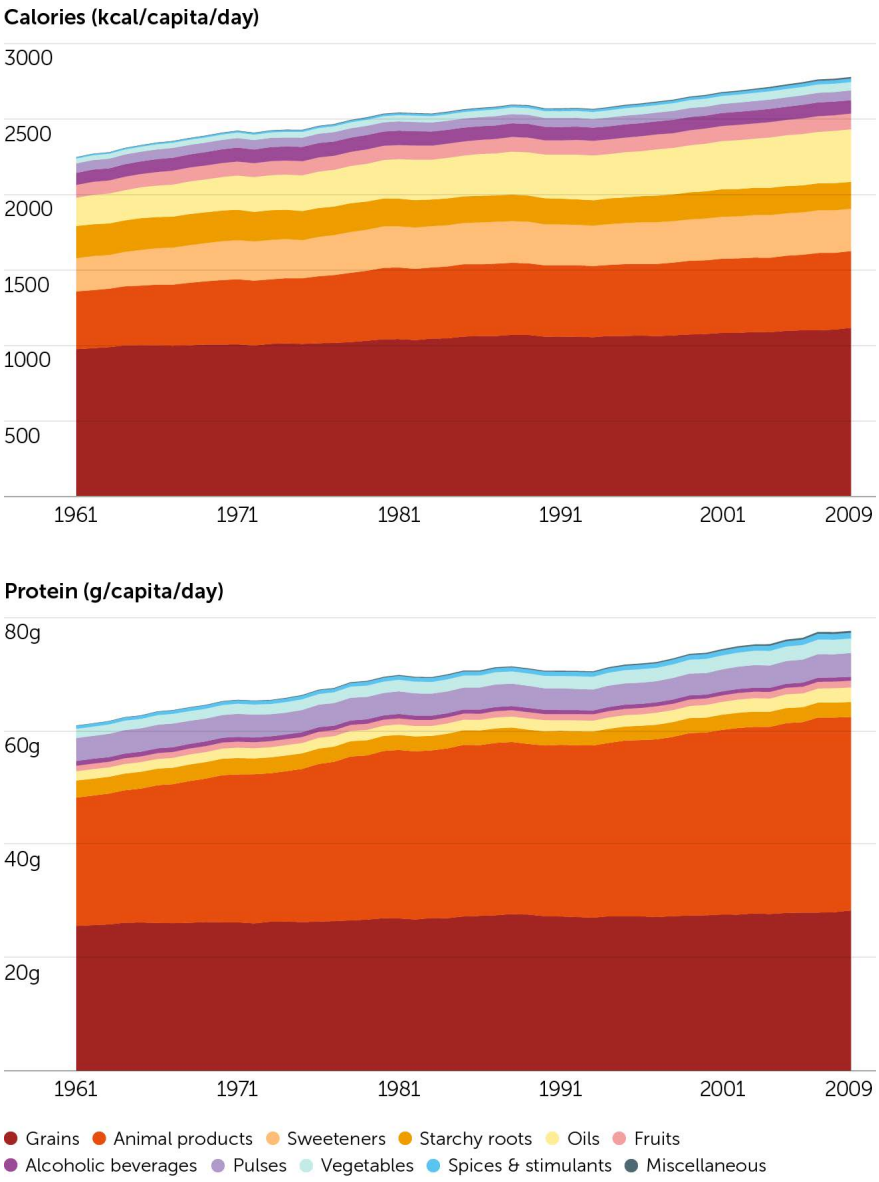
[62] Author's calculation, based on UN Comtrade Database (undated), https://cht.hm/2lIAQul (accessed 10 Mar. 2019). However, in comparison with other sectors (e.g. manufactured goods or services) it should be noted that agricultural trade has grown at a much slower pace. This can be seen in the declining share of agricultural products in world trade from 20 per cent in the 1960s to less than 9 per cent in 2017.

Figure 9: Evolution of agricultural trade by main trading region, 1997 and 2017



Source: Author's calculation based on UN Comtrade Database (undated), https://cht.hm/2lIAQul (accessed 10 Mar. 2019).

Figure 10: The changing global diet, 1961-2009



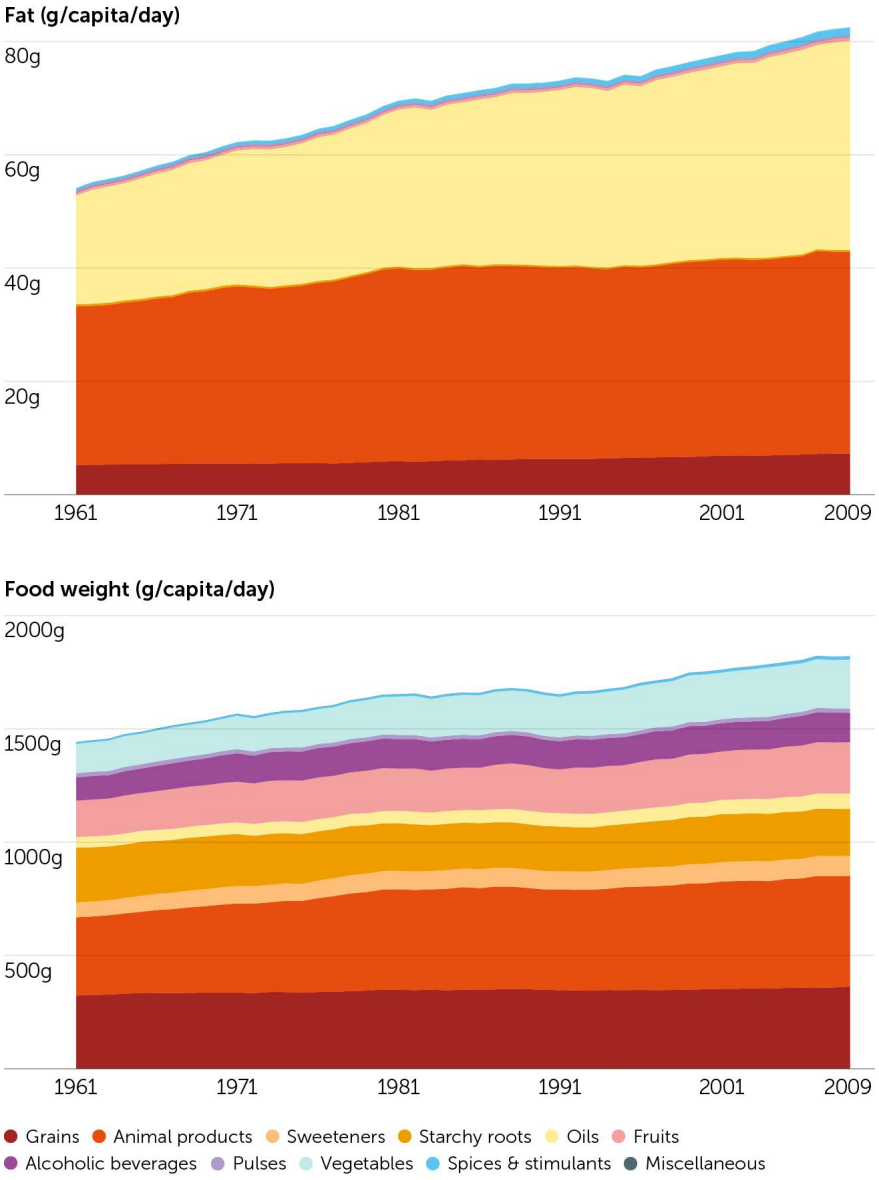
Source: International Center for Tropical Agriculture (CIAT) (2017), https://cht.hm/2kH9qoy (accessed 17 May 2019).

accounted for 68 per cent of total agricultural exports in 1997, this share had declined to 55 per cent by 2017 (see Figure 9).

After the EU and the US, Brazil has emerged as the third largest exporter. It is the world's biggest supplier of soybeans, poultry meat, sugar, and coffee, and is rapidly moving towards more processed products.[63] By 2030, Brazil is expected to surpass both the EU and US as an agricultural exporter. Other developing countries have also emerged as significant suppliers of agricultural exports, starting with China – primarily as a result of the large scale of its agricultural sector– but also India, for cotton, sugar, beef and rice, or Indonesia and Malaysia with palm oil. Finally, Russia and Ukraine are (re)emerging as significant exporters of maize and wheat.

[63] Author's calculation, based on UN Comtrade Database (undated), https://cht.hm/2lIAQul accessed 10 Mar. 2019).

Figure 10. *continued*



3.3 The evolving basket of traded agricultural goods

The composition of trade in agricultural products has also experienced significant changes. This is largely explained by shifts in demand resulting from urbanization and evolving dietary patterns. The proportion of the global population living in cities has increased from one-third in the 1960s to nearly 55 per cent today.[64] The transition is particularly evident in East Asia, where the share of the urban population has grown from less than 17 per cent in the early 1960s to around 55 per cent in 2018.[65] This trend has been accompanied by a change in diets, with increases in the overall amount of food consumed by individuals, as well as specific increases in consumption of animal products and oils (see Figure 10).

[64] World Bank (2018), 'Urban Population (% of population)', https://cht.hm/2mdJhhy (accessed 12 Sep. 2019)

[65] Ibid.

Secondly, commodities are increasingly not only used as food or feed, but also for fuel, either as ethanol (produced from sugar or maize) or biodiesel (produced from vegetable oil). In the late 2000s, a period that coincided with high fossil fuel prices, several governments encouraged the production of biofuels through subsidies or blending mandates imposing a minimum use of biofuels in transport or through renewable energy requirements. These policies contributed to an increased demand for sugar cane, vegetable oils and maize, pushing prices up and prompting concerns that the expansion could affect food availability in certain parts of the world.[66]

A third critical trend is the growth in processed and semi-processed products. In value terms, fruits and vegetables have surpassed cereals and tropical products such as tea, coffee or cocoa. While trade in most traditional export products, such as wheat and coffee, has grown at a slow pace (in the region of 2 per cent per year) over the last 20 years, products such as palm oil, fruit juice, soft drinks and other processed products such as breakfast cereals have grown at annual rates of 8 per cent or more during the same period, and now represent the most dynamic sectors in agricultural trade (see Figure 11).

Food security concerns partly account for this evolution of trade patterns. Cereals like maize, rice and wheat are considered essential for food security, which means that governments often seek some level of self-sufficiency in these products through different types of import or export restrictions – such as market access barriers or subsidies (see Section 3.4).[67] Food safety considerations have also shaped this landscape, with governments frequently establishing strict sanitary and phytosanitary requirements for imports, particularly for animal-derived products, such as bovine meat or dairy products, which may be more sensitive to sanitary risks.

In contrast, growth in more heavily processed products such as vegetable oils (which are not perceived by governments as critical in terms of food security) is more often a direct result of strategies developed by the private sector, including by multinational food companies, large retailers or supermarket chains. These products are not only more integrated in international value chains; they also face fewer regulatory barriers.

In short, food and agricultural markets are increasingly characterized by a duality. Significant trade obstacles remain on staple foods, cereals, and on other politically sensitive products where governments have chosen to shield domestic producers from international competition. At the same time, trade in processed products and their ingredients is increasingly driven by private sector decisions and integrated in globalized production networks. The following section further examines this duality.

[66] The increased demand for crops for the production of biofuels may also have contributed to food price spikes in 2008–11 and established a new long-run link between energy and agricultural markets. In the coming decade, the demand for biofuels is likely to stabilize, however, as mandatory blending requirements are not expected to rise as rapidly as in previous years.

[67] This trend is, however, less pronounced in Africa, where – in the absence of sufficient domestic production – trade in several essential crops has been growing steadily, to feed urban populations.

Figure 11: Evolution of trade in agricultural products by category, 1990, 2000 and 2017

Source: Author's calculation based on UN Comtrade Database (undated), https://cht.hm/2IlAQul (accessed 10 Mar. 2019).

3.4 The challenges associated with trade restrictions in food and agriculture markets

Paradoxically, in a world where interdependence is growing, protectionist policies continue to restrict imports of key staple foods and cereals in an effort to isolate domestic producers from international competition.[68] Food politics can often fail to balance the interests of consumers and producers equitably, instead they are almost always influenced more by a producer bias rather than a consumer interest. As a result, restriction and protection have dominated political aspirations and decisions on international trade in agricultural products. This phenomenon occurs in many countries, including the US, members of the EU, and a number of Asian and African countries. These policies have a number of perverse effects.

First, they result in a low rate of internationalization for many agricultural products.[69] Cereals, for example, represent the largest category of exported products by volume, but trade in cereal products only represents 15 per cent of world production – a ratio that is even lower for other staple foods, such as rice. This situation results in what is often described as 'thin markets', within which those depending on imports to meet their domestic needs are particularly vulnerable to external shocks or changes in trade policies.

Second, by imposing trade restrictions, countries ultimately export volatility on to world markets and further reduce incentives to invest in agriculture worldwide. Traditionally, when world prices are low, policymakers have recourse to farm subsidies or border taxes to protect their farmers from international competition. Historically, these measures have helped stabilize domestic prices, but they have also encouraged overproduction that resulted in food surpluses which had to be disposed of in international markets – often with the help of export subsidies, whose effect contributed to further exacerbating the downward spiral of low prices.

By contrast, when prices are high, governments intervene to reduce domestic prices, and many of them resort to export restrictions as happened in 2008 and 2011 during the global food price spikes in those years. This, however, further exacerbates scarcity on world markets and drives prices up further, ultimately reducing the ability of poor consumers in food-importing countries to access adequate food at affordable prices. As other countries apply similar policies, those restrictions undermine confidence in international markets, and their competing effects partially

[68] As a result, the alignment of domestic and international prices which usually results from trade integration remains elusive, and this is unlikely to change in coming years. While the free movement of goods remains hampered by high trade costs and domestic policies, economic integration could also result from the free movement of the factors of production – in this case, labour, capital and land. In practice, however, labour mobility remains limited to a few labour-intensive sectors with low levels of mechanization, such as fruits and vegetables, and is largely constrained by immigration policies. After a significant increase in the 1990s, FDI in the agricultural sector has slowed down and still represents a marginal share of total FDI flows. Finally, land acquisitions attracted a lot of media attention in the late 2000s, due in part to human rights concerns. This phenomenon – which involved several countries, particularly in Africa and Southeast Asia – seems to have slowed down after 2011, showing the volatility and unpredictable nature of such investments in the future.

[69] The rate of internationalization corresponds to the share of total production traded internationally.

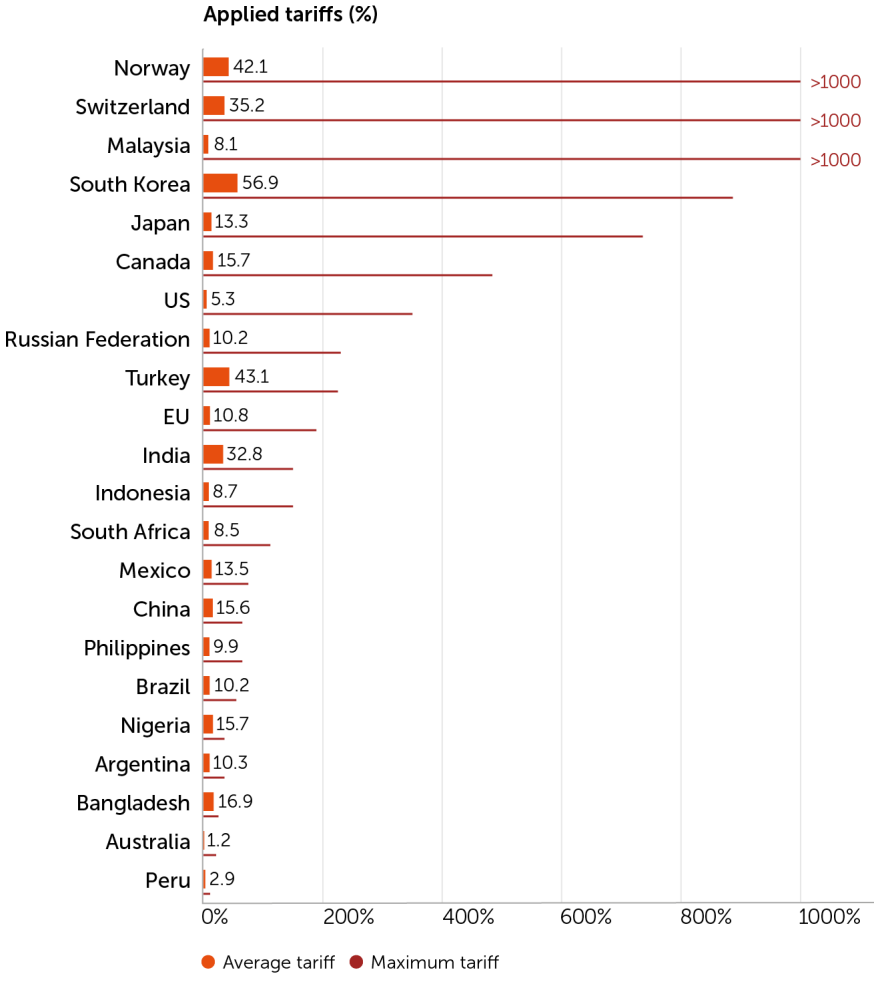
offset each other. These are typical problems of collective action, and they can only be resolved through international cooperation. In the absence of such cooperation, the food and agricultural sector continues to suffer from high trade costs.

Tariff and non-tariff barriers

A significant part of trade restrictions comes from border measures. These take the form of tariffs (including unusually high 'tariff peaks' on sensitive products), quotas, safeguard measures and export restrictions. Average applied tariffs – although often used as an approximate benchmark of the degree to which an economy is open to trade with other countries – can be a misleading metric if not appropriately contextualized. As Figure 12 shows, tariffs applied on sensitive products can be exceptionally high: in the cases of Malaysia, Norway and Switzerland, over 1,000 per cent, and in Japan, over 700 per cent. Average tariffs for these countries nonetheless remain far lower, in double digits or less.

As Figure 13 shows, tariff peaks are often concentrated on a handful of highly sensitive tariff lines: tobacco, sugar, groundnuts and dairy in the US; rice, silkworm cocoons and certain mushrooms in Japan; and poultry, milk and dairy products, and certain cereal products in the EU. In these countries, despite the high peaks on certain tariff lines, many other products can be imported at low tariffs or even duty free. While many developing countries class agricultural tariff lines in a number of bands,

Figure 12: Average applied tariffs and maximum peaks in selected countries



Source: Author's calculation based on World Integrated Trade Solution (WITS) (undated), https://cht.hm/2lJJMjh (accessed 10 Mar 2019).

Figure 13: Agricultural tariffs set by leading exporting countries, by commodity (*ad valorem* equivalent)

Source: UNCTAD (2019), Trade Analysis Information System (TRAINS), https://cht.hm/2lQhT8W (accessed 22 Aug. 2019).

Figure 13. *continued*

Source: UNCTAD (2019), Trade Analysis Information System (TRAINS), https://cht.hm/2lQhT8W (accessed 22 Aug. 2019).

with each subject to a greater or lesser degree of protection, this can also vary depending on the country's overall trade policy orientation and other factors, such as their experience negotiating to join the WTO. India, as a founding member of the trade body's forerunner, the General Agreement on Tariffs and Trade (GATT), has set noticeably higher tariffs than China, which had agreed to set low tariffs on many products during its WTO accession negotiations.

Over the last 15 years, tariffs have partially decreased (mainly as a result of unilateral trade liberalization) but still remain significant. This trend has been accompanied by a rise in non-tariff measures such as sanitary and phytosanitary measures, regulations, or technical barriers to trade. While there are often legitimate food safety and quality control concerns, these measures can also constitute disguised protectionism. For example, Russia's ban on pig and pork exports from certain EU countries, while justified on the grounds of food safety, was linked by many observers to political tensions following Russia's annexation of Crimea from Ukraine in 2014.[70]

With limited progress in multilateral talks at the WTO, bilateral and regional trade agreements (RTAs) have become the main driver of new tariff reductions. These include transcontinental agreements such as the EU–Canada or EU–Japan free trade agreements, or the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), as well as agreements within new trade corridors such as the Belt and Road Initiative led by China. While sensitive agricultural products are often excluded from RTA coverage, Bureau and Jean[71] estimated in 2013 that, on average, RTAs have increased agricultural and food exports between signatories by 32–48 per cent when fully phased in.

Agricultural subsidies

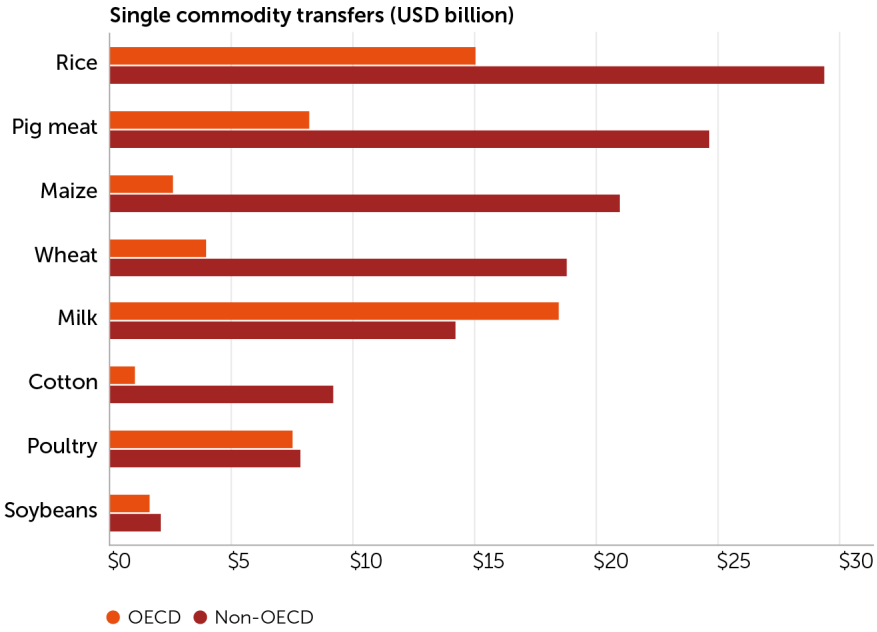
The food and agricultural sector also remains highly subsidized, both in developed countries and increasingly in emerging economies. Between 2015 and 2017, the top 20 largest producing countries for which subsidy data is available provided more than $630 billion on average to support agriculture – a figure which is expected to increase yet further in the future. Out of this amount, nearly $475 billion was made up of transfers to individual farmers. As with tariff protection, this support is largely concentrated on a narrow basket of products, such as rice, wheat, corn, dairy products, beef, pork and poultry (see Figure 14).

For some proponents of farm support, subsidies represent sensible policy responses to a range of market failures, and can play a useful role in advancing certain public policy objectives such as reducing income inequality or encouraging environmentally sustainable production methods. Critics point to the inefficiencies and economic distortions created by subsidies, and their perverse distributive consequences (benefiting mostly large and wealthy farmers). They also highlight the

[70] Following a WTO dispute, the measures were subsequently found not to be justified under WTO law.

71 Bureau, J.-C. and Jean, S. (2013), *Do Yesterday's Disciplines Fit Today's Farm Trade? Challenges and Policy Options*, E15 Initiative, Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum.

Figure 14: Single commodity transfers by product, 2016



Source: Author's calculation based on OECD Stat (undated), https://cht.hm/2kFNhqD (accessed 10 Mar 2019).

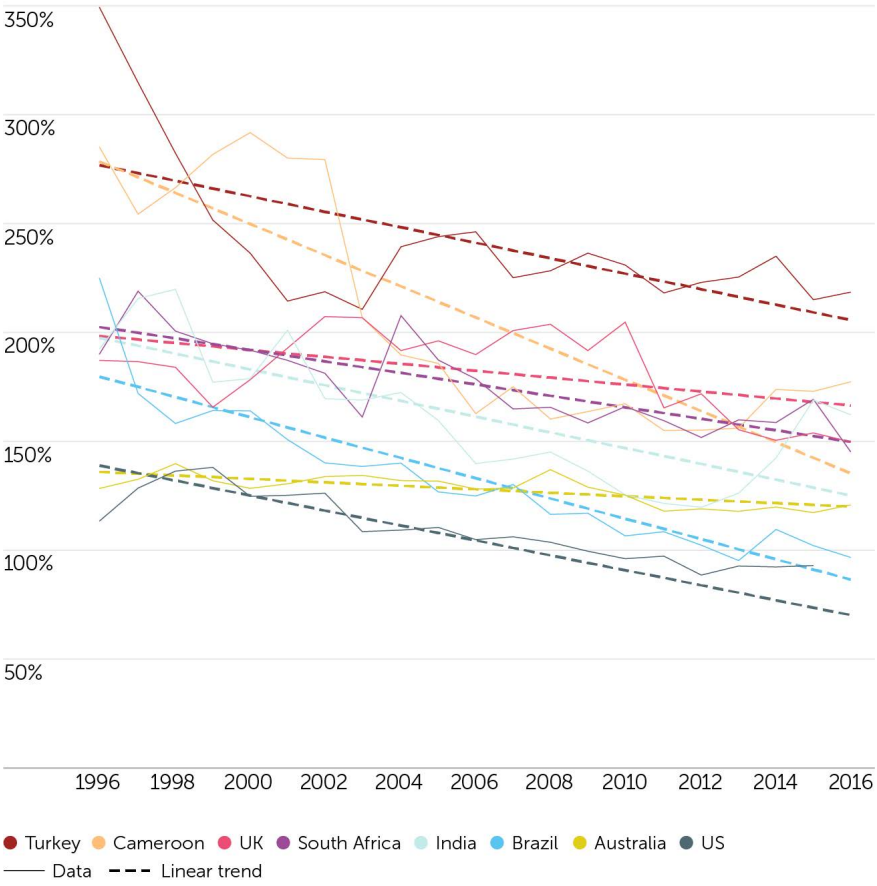
negative environmental impacts as artificially lowered global prices incentivize unsustainable use of natural resources.

In the absence of adequate environmental regulation, programmes that are production-enhancing tend to intensify the negative environmental effects associated with certain agriculture practices, by bringing marginal land into production, increasing exposure to pesticides and fertilizers, and accelerating habitat destruction and land degradation. By incentivizing certain commodities, this type of support can also promote intensification at the expense of more diversified production systems. By artificially depressing international prices, these support schemes may ultimately result in higher consumption of cheap products with a high environmental footprint in terms of biodiversity loss, water use, soil erosion or greenhouse gas emissions. Input subsidies – in the form of lower electricity prices, subsidized fertilizer, fossil fuel subsidies, pesticides, seeds, or machinery – also tend to result in unsustainable energy consumption or the overuse of pesticides and fertilizers. Electricity subsidies in India, for example, have long contributed to unsustainable use of ground water resources through over-incentivizing water pumping.

3.5 Processed products: the emergence of fragmented production networks in the just-in-time economy

While most trade restrictions apply to staple food or sensitive products such as meat for the reasons highlighted above, trade in processed products has faced far fewer obstacles and regulations, and was more directly influenced by the strategies developed by the private sector, including multinational companies, large retailers, or supermarkets. As with other sectors, the lowering of transport costs and the revolution in information and communications technology (ICT) have given firms the ability to coordinate their production needs on a real-time basis, regardless of the geographical location of the producer. This has contributed to the emergence of international value chains as one of the most salient

Figure 15: Trade costs associated with exports of agricultural products to China, 1996–2016



Source: Author's elaboration based on UN Economic and Social Commission for Asia and the Pacific (UN ESCAP) (undated), Statistical Database, https://cht.hm/2lJK8GD (accessed 10 Mar 2019).

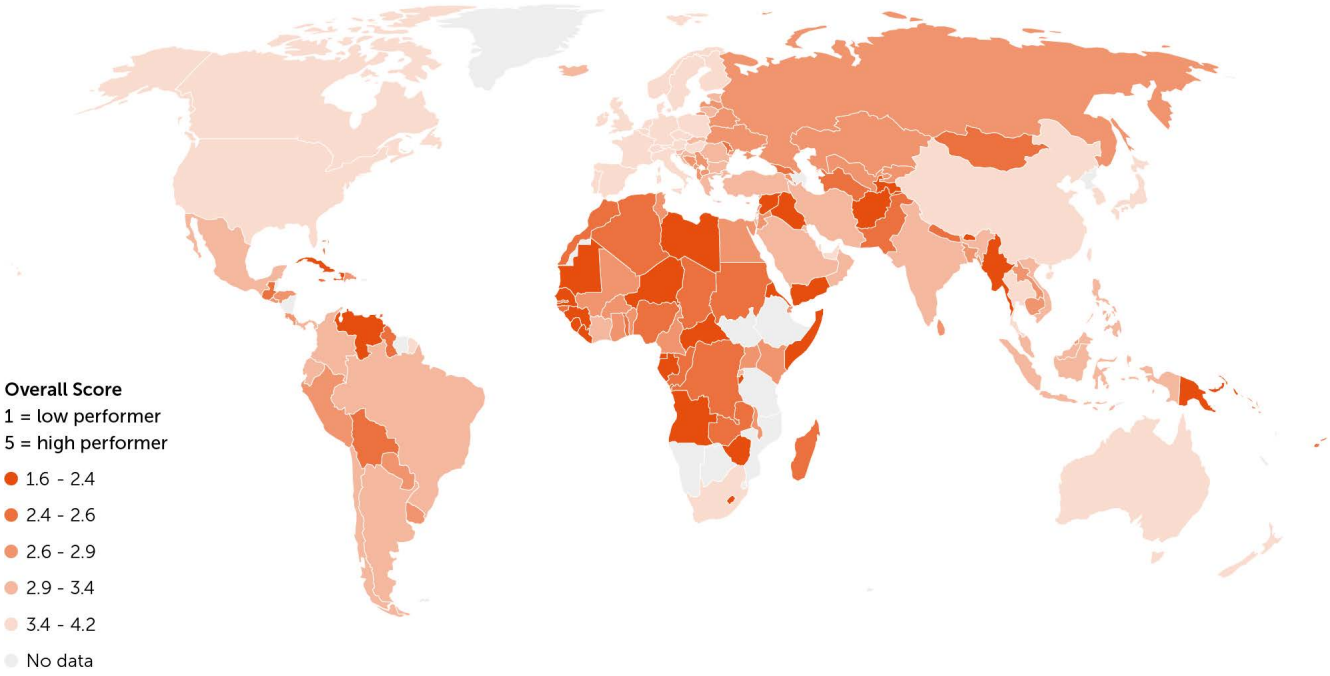
manifestations of globalization. Today, a pizza can be produced by sourcing tomato sauce from China, wheat from Ukraine, and cheese from the Netherlands, with the final product being processed in the US.

Figure 15 illustrates this by showing the evolution of the cost of bilateral trade in agricultural products between China and several exporting countries. These costs are expressed as a percentage of the price prevailing in the domestic market of the exporting countries, and therefore represent the additional cost associated with trade (excluding tariff protection) such as transportation or logistics. While costs tend to fluctuate, the overall trend is clearly towards significant decreases in trade costs.

Under this model, it becomes critical to minimize trade frictions – such as delays at the border or problems resulting from low-quality distribution facilities. Similarly, connectivity – including transport, logistics services, cold chains and ICT networks – has become a key feature of agro-food chains. This type of specialization offers clear opportunities for firms – including smallholder farmers, small and medium-sized enterprises (SMEs), and service and logistics providers – to participate in the international division of labour. However, it also involves challenges. As illustrated in Figure 16, not all countries have developed efficient logistical support across customs, infrastructure, competitive shipping arrangements, tracking and tracing consignments and overall competence to deliver services.

While this phenomenon is clearly present in the agricultural sector, its

Figure 16: World Bank Logistics Performance Index, 2018



Source: World Bank (2018), 'Logistics Performance Index homepage', https://cht.hm/2m8ZiFm (accessed 10 Mar 2019).

**Index based on qualitative evaluations of a country in six areas by its trading partners, logistics professionals working outside the country across: customs; infrastructure; international shipments; logistics competence; tracking and tracing; and timeliness.*

intensity is less than in other sectors.[72] This translates into a comparatively low share of foreign value addition being integrated in exported agricultural goods. Compared to other manufactured goods sectors, where the share of foreign inputs tends to approximate 30 per cent of gross exports, in agriculture this percentage is closer to 10–15 per cent and does not exceed 30 per cent, even for more heavily processed food products (see Figure 17).

As we move forward, there will be an increasing trend of non-conventional technological solutions toward food security, which will also increase the effectiveness of food trade. Information technology, including big data and other ICT, provides clearer information for both consumers and producers. This information can be easily utilized to form a stronger linkage between farmers and end consumers. It can also trigger better decision-making on production and consumption, not only for present purposes but also in terms of future planning by individual producers and consumers. Digital technology, combined with biotech and agriculture instrumentation, is already proven as a means of both increasing the productivity and variability of a product and improving efficiency in resource utilization.

[72] While value chains witnessed a surge in the 1990s, the process decelerated in the late 2000s with the average share of intermediate goods stagnating – a phenomenon that has been invoked as one of the structural causes behind the trade slowdown observed since the 2008 financial crisis. See Hoekman, B. (2015), *The Global Trade Slowdown: A New Normal?*, VoxEu.org e-Book, London: CEPR Press, https://cht.hm/2lKtuGQ (accessed 21 Mar 2019).

3.6 Implications for sustainability

The rapid growth of trade, particularly – in the case of processed products – through the development of highly efficient supply chains, has raised a number of environmental challenges, not only in terms of the environmental impact associated with the production of such heavily traded goods (e.g. on soil erosion, biodiversity loss and water depletion) but also with the transport of such goods over long distances. This is not to say, however, that trade restrictions necessarily result in a lower incidence of environmental issues. As highlighted above, certain forms of agricultural subsidies, such as fertilizers or irrigation subsidies, can generate significant environmental externalities. By preventing an efficient use of resources, trade restrictions can also result in certain goods being produced in one particular location when they could be produced elsewhere more efficiently from an environmental perspective.[73] This section will address first the issue of natural resources embedded in traded goods, and then the environmental cost of trade flows.

[73] It should be noted, however, that the opposite may be true as well. In other words, trade restrictions may prevent the import of products with a high environmental footprint which could be produced domestically at a lower environmental cost.

Figure 17: Foreign value added as a percentage of gross exports, 2006 and 2016

Source: Author's calculation based on OECD (undated), 'Trade in Value Added', https://cht.hm/2IIC88F (accessed 10 Mar 2019).

Trade in embedded resources

The question of embedded resources has highlighted challenges and opportunities associated with the transfer of otherwise geographically-bound terrestrial and sub-terrestrial resources through trade, especially concerning resource-intensive agricultural goods such as meat.
Early research focusing on the water required to produce a particular commodity introduced the concept of 'virtual water' embedded in exports.

Referring to this approach, the proponents of trade liberalization have argued that trade can result in efficient and optimized resource allocation. In theory, water-scarce countries can import water-intensive goods and specialize instead in agriculture products that require less water. But the reality tends to be more complex.

Work cited in Muller and Bellmann[74] shows that water endowments constitute only one factor among several which determine competitiveness. Taking the case of the Southern Africa region as an example, its exports to other regions tend to specialize in goods that require relatively less water, while Southern Africa as a whole imports more water-intensive agricultural products. Inside the region, however, the pattern is different. South Africa, which is the most water-scarce country, is a net exporter of virtual water, even if neighbouring countries have significantly better water endowments. This is explained by the fact that other factors, such as infrastructure, technology, transport and logistical facilities, also contribute to defining comparative advantages and, ultimately, trade flows.

Keeping these limitations in mind, analysis shows, for example, that irrigation water embedded in exports (which accounts for about 8 per cent of total water use for exports)[75] often flows from countries with higher per capita water availabilities to more water-limited ones.[76] A small number of countries – the US (29 per cent of embedded irrigation consumption), Pakistan (15 per cent), India (14 per cent), Thailand (11 per cent), China (3 per cent), Mexico, Australia, Egypt and France (2 per cent each) contributed about four-fifths of global flows of embedded irrigation water. Maize and soybean exports from the US to Japan, China and Mexico were also heavily dependent on irrigation water consumption (see Figure 18). Water-poor states from the Middle East and sub-Saharan Africa were particularly dependent on foreign irrigation water through rice imports from Pakistan and India.

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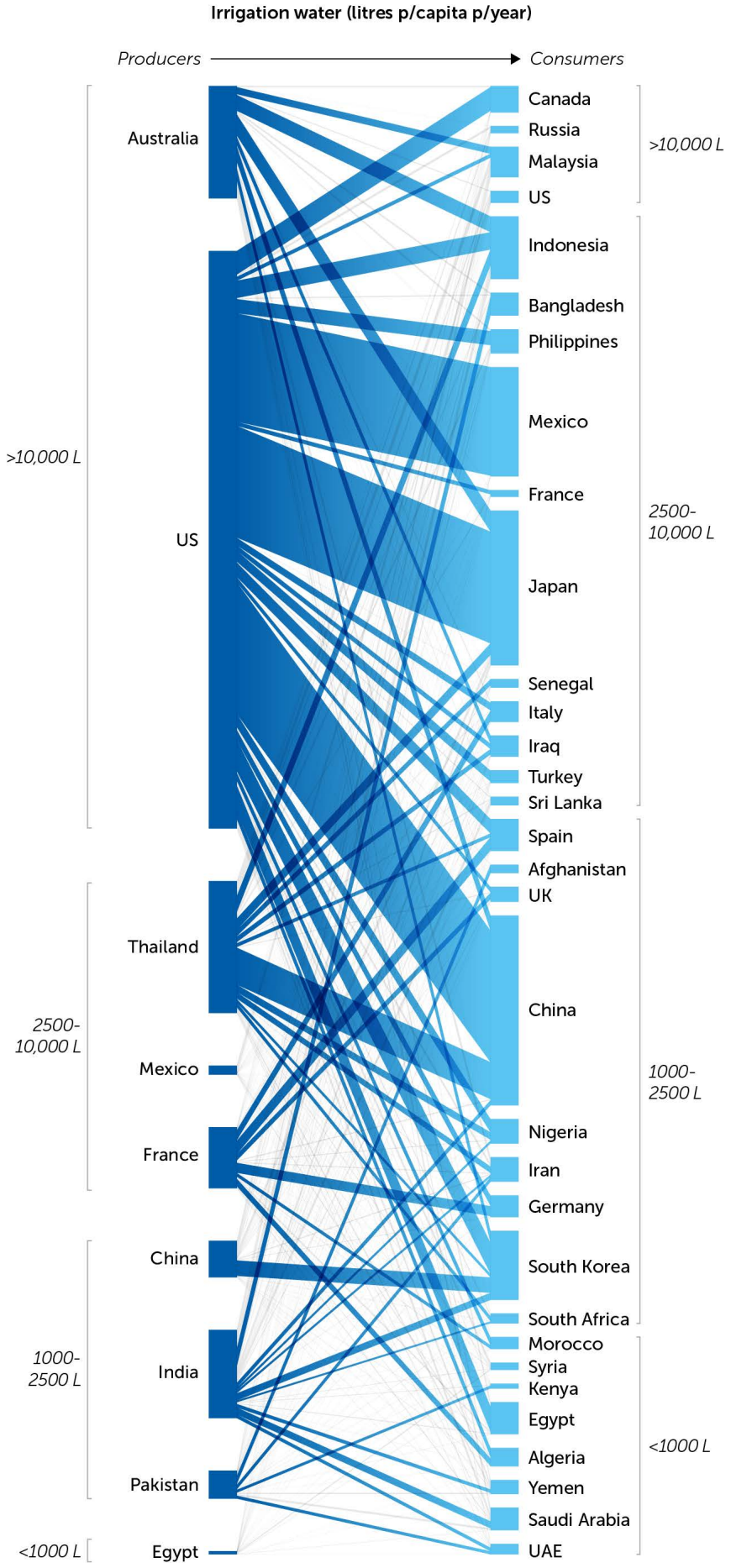
[74] Muller, M. and Bellmann, C. (2016), 'Trade and Water: How Might Trade Policy Contribute to Sustainable Water Management?', Geneva: International Centre for Trade and Sustainable Development (ICTSD), https://doi.org/10.13140/RG.2.2.15310.87362 (accessed 21 Mar 2019).

[75] MacDonald et al. (2015) assessed the amount of water consumption embodied in exports from 16 major food crops with fine resolution water productivity data from Brauman et al. (2013, see next footnote). These 16 crops accounted for more than 85 per cent of the traded calories from 2000 to 2009. They found approximately 810 cubic kilometres per year of water was consumed to produce exports of these crop commodities worldwide (approximately 65 km3 per year as irrigation water, plus about 745 km3 per year from rainwater), which led to the conclusion that 8 per cent of the total water embodied in international trade was derived from irrigation.

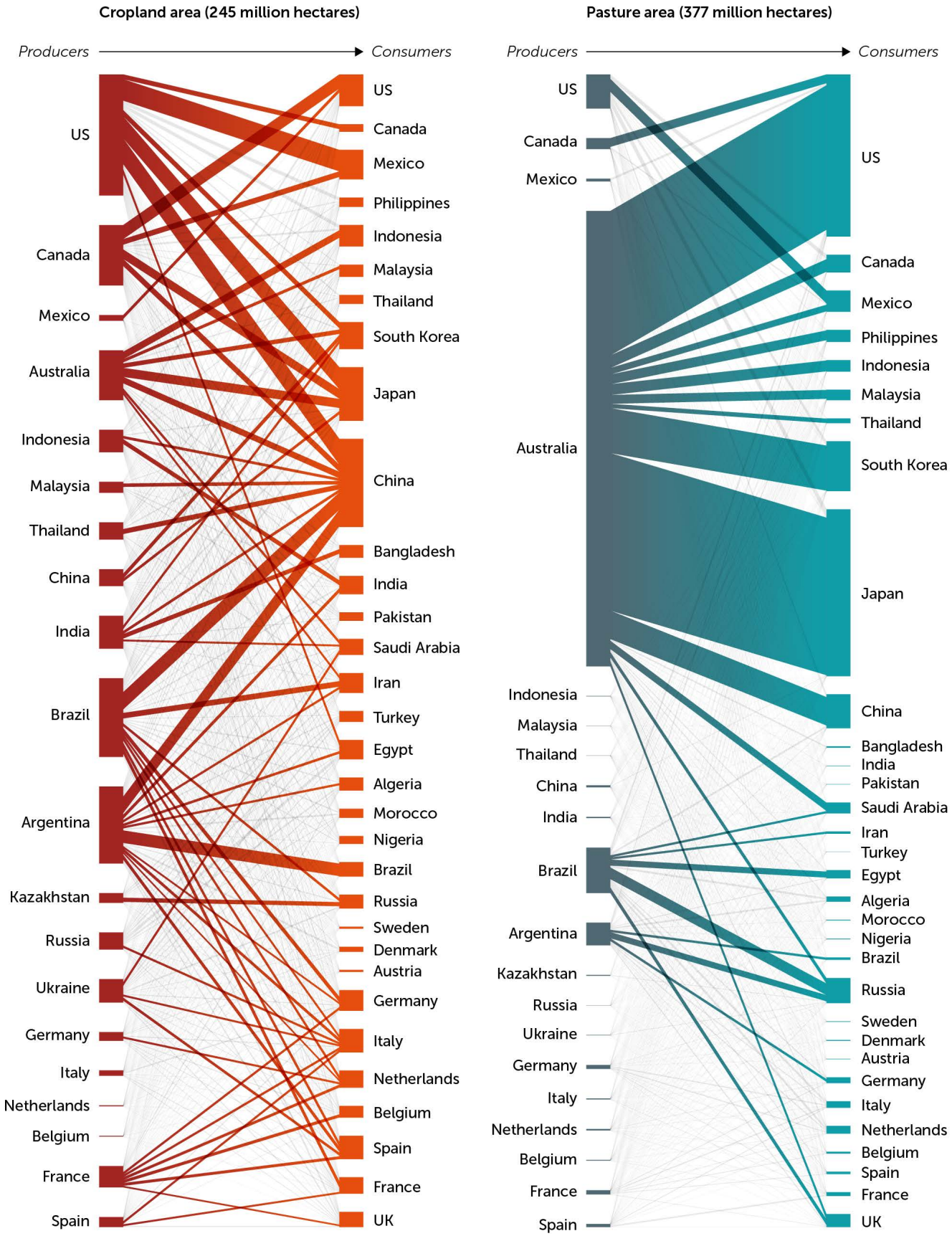
[76] Brauman, K. A et al. (2013), 'Improvements in crop water productivity increase water sustainability and food security – a global analysis', *Environmental Research Letters*, 8 (2), pp. 1–7, https://doi.org/10.1088/1748-9326/8/2/024030 (accessed 21 Mar 2019).

Figure 18: Structure of trade in terms of embedded irrigation water



Source: MacDonald, G. K. et al. (2015), 'Rethinking Agricultural Trade Relationships in an Era of Globalization', BioScience, 65(3): pp. 275–89, doi: 10.1093/biosci/biu225 (accessed 20 Mar. 2019).

Figure 19: Structure of trade among major trading countries, in terms of embedded cropland harvested area and embedded pasture or forage area



Source: MacDonald, G. K. et al. (2015), 'Rethinking Agricultural Trade Relationships in an Era of Globalization', BioScience, *65(3): pp. 275–89, doi: 10.1093/biosci/biu225 (accessed 20 Mar. 2019).*

Global trade in food also acts as a mechanism for transmitting global biodiversity loss. High-income, industrialized countries tend to be major net importers of biodiversity impacts from tropical countries.

Similar analysis has been conducted on different types of land used for the production of agricultural exports. In 2015, researchers estimated[77] that around 13 per cent of global agricultural land use is for exports – including harvested food croplands, forage croplands and permanent pasture – an area equivalent to half that of the US. More specifically, 20 per cent of global harvested area is used for export production,[78,79] while the pasture and forage area embedded in ruminant product exports represents approximately 11 per cent of the permanent pasture area (365 million hectares) and about 9 per cent of forage crop area (13 million hectares). From a global perspective, embedded land use is concentrated in major export-producing countries, such as the US, Brazil, Argentina, Canada and Australia. Figure 19 suggests that embedded cropland is primarily made up of large exports from the US to East Asia and Mexico, and exports from Brazil and Argentina.

Although representing only 11 per cent of global pasture area, Australia uses over half of the total pasture and forage area embedded in ruminant exports (57 per cent).[80] In the US and Brazil, embedded pasture and forage land represents 5–7 per cent of exports, a proportion reflective of their 6–7 per cent share of global pasture area. While 19 per cent of global pasture is found in China and the US, these countries are among the largest embedded pasture importers in the world, alongside the UK, Russia, South Korea and Japan (see Figure 19).

Global trade in food also acts as a mechanism for transmitting global biodiversity loss. High-income, industrialized countries tend to be major net importers of biodiversity impacts from tropical countries. A study on biodiversity impacts embedded in international crop trade and consumption (based on an assessment of 170 food crops in 184 countries) found that 83 per cent of total species losses attributed to agricultural land use (4,747 species) results from land use for domestic consumption, with the remaining 17 per cent (969 species) being linked to the use of land for production for export.[81] Countries with the largest exported impacts include Indonesia, Thailand, India and Malaysia, while Brazil, China and India suffer most species loss to domestic consumption. However, countries with a combination of high per capita consumption and high levels of imports, such as France, Germany and Italy, could also contribute to high biodiversity losses.

Cropland use is not a proxy for species loss, as crops occupying less cropland area – including sugar cane, palm oil, rubber and coffee – have disproportionately high biodiversity impacts. Meanwhile, wheat, rice and maize, which occupy around 40 per cent of global cropland, were found to contribute a matching 40 per cent to global biodiversity impacts.

[77] MacDonald et al. (2015), 'Rethinking Agricultural Trade Relationships in an Era of Globalization'.

[78] Ibid.

[79] Kastner, T., Erb, K-H. and Haberl, H. (2014,) 'Rapid growth in agricultural trade: effects on global area efficiency and the role of management', *Environmental Research Letters*, 9 (3): pp. 1–10, https://doi.org/10.1088/1748-9326/9/3/034015 (accessed 21 Mar. 2019).

[80] FAO (2013), FAOSTAT, https://cht.hm/2LWVmyI (accessed 10 Jan. 2019).

[81] Chaudhary, A. and Kastner, T. (2016), 'Land use biodiversity impacts embodied in international food trade', *Global Environmental Change*, 38: pp. 195–204, https://doi.org/10.1016/j.gloenvcha.2016.03.013 (accessed 21 Mar 2019).

The environmental impact of trade flows

Moving food products across borders incurs environmental costs, especially greenhouse gas emissions from transportation and cooling over long distances. A decade ago, this concern gave rise to the concept of 'food miles', which was subsequently adopted by some major retailers. It has also led to the notion – almost a knee-jerk reaction – that consumers should prioritize locally produced food, as it generates lower emissions. The problem is that while food products travel during their life cycle, transport represents only one source of emissions. Production methods and storage conditions often play a more important role. Kasterine and Vanzetti show, for example, that importing dairy products or sheep meat from New Zealand may actually generate lower greenhouse gas emissions than purchasing those produced in the UK.[82] Placing British apples in storage for 10 months leads to twice the level of emissions as is expended transporting South American apples by sea to the UK. Besides the distance travelled, the mode of transportation used is also important. Maritime transport tends to generate 25 to 250 times lower emissions than trucks, and air freight generates five times more emissions on average than road transport. Crossing Europe by truck might therefore generate more emissions than making transatlantic shipments. Finally, scale matters: a consumer driving more than 10 km to purchase one kg of fresh produce will generate more greenhouse gas emissions than air-freighting one kg of produce from Kenya.

In spite of these caveats, concerns remain that – unlike the carbon footprint generated during production or consumption – the greenhouse gas emissions generated by international transport (and particularly by air and maritime transport) are not included in the nationally determined contributions (NDCs) envisaged under the 2015 Paris Agreement on climate change. In other words, these emissions are 'orphans' and, in the absence of internationally concerted action, will therefore not be tackled. (See also the discussion in Chapter 5.)

3.7 Climate change impacts on trade flows

Crop and animal productivity will be altered by the biophysical impacts of climate change, including those associated with changes in temperatures and precipitation, and those due to the increased likelihood and intensity of extreme weather events.[83] Assessing the scope and magnitude of these changes is difficult, not least because of the uncertainties regarding future climatic conditions.

The impact of climate change also depends on the type of agricultural production – for example, rain-fed systems are more vulnerable than irrigated agriculture – or the underlying ecological conditions or preferences. Most models point to the prospect of higher yields from higher latitudes, while major disruptions are likely to afflict Asia and

[82] Kasterine, A. and Vanzetti, D. (2010), 'The Effectiveness, Efficiency and Equity of Market Based and Voluntary Measures to Mitigate Greenhouse Gas Emissions from the Agri-Food Sector', 24 February 2010, *UNCTAD Trade and Environment Review*, SSRN: https://cht.hm/2kHbAVc (accessed 21 Mar 2019).

[83] FAO (2018), *The State of Agricultural Commodity Markets 2018. Agricultural trade, climate change and food security*, Rome: FAO, https://cht.hm/2lNAT8b (accessed 21 Mar 2019).

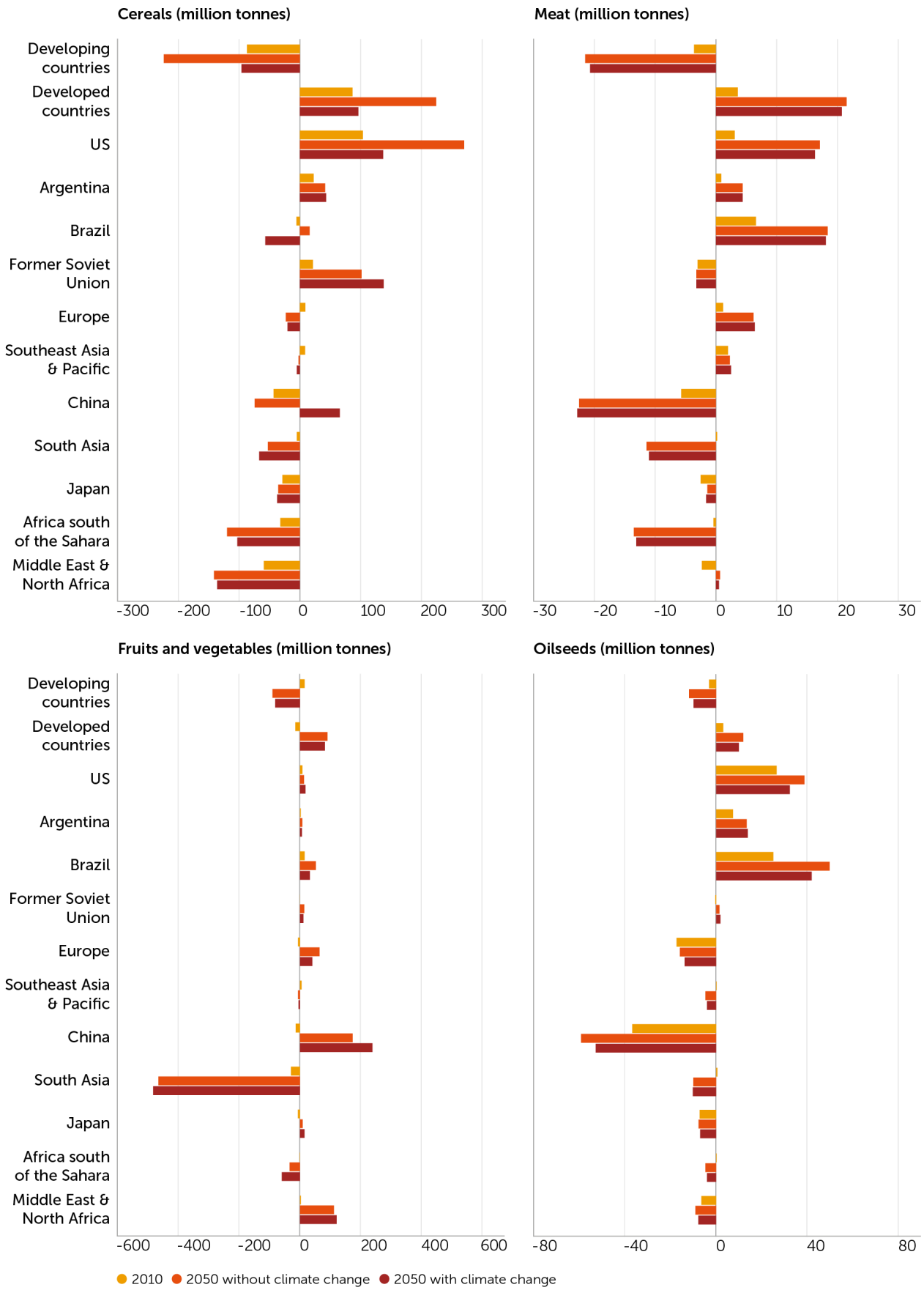
Africa, which have the highest concentrations of fast growth in population.

The International Food Policy Research Institute (IFPRI)[84] has estimated that by 2050 prices will rise by about 50 per cent for most food commodity groups when the impacts of climate change are considered – about double the increase projected in the absence of climate change. As comparative advantages evolve in response to changes in yields and prices, several food importers will see their food bills surge, while others may lose their ability to grow and export food. Figure 20 provides an overview of how net trade flows (i.e. exports minus imports) will evolve by 2050 for key commodity groups with and without climate change, based on the IFPRI's IMPACT projections.[85] While, at least in theory, trade can help address these production shocks by improving access to affordable food, this assumes that production increases in other part of the world can compensate for the losses elsewhere.

[84] IFPRI (2017), 2017 Global food policy report, Washington, DC: International Food Policy Research Institute, https://doi.org/10.2499/9780896292529 (accessed 19 Mar 2019).

[85] IFPRI (2017), IMPACT Projections of Food Production, Consumption, and Net Trade to 2050, With and Without Climate Change: Extended Country-level Results for 2017 GFPR Annex Table 7, Washington, DC: International Food Policy Research Institute [dataset], https://doi.org/10.7910/DVN/8GYEHI (accessed 19 Mar 2019).

Figure 20: IMPACT projections of net trade flows to 2050, by commodity groups and with and without climate change



Source: IFPRI (2017), IMPACT Projections of Food Production, Consumption, and Net Trade to 2050, With and Without Climate Change: Extended Country-level Results for 2017 GFPR Annex Table 7, Washington, DC: International Food Policy Research Institute [dataset], https://doi.org/10.7910/DVN/8GYEHI (accessed 19 Mar 2019).

4. Trade policy options to promote sustainable food and land use systems

At a glance

- The global food system has been shaped in large part by trade policies pursued by key producing and consuming regions like the Americas, Europe and Asia, largely reflecting their respective natural resource endowments, productivity and trade interest.
- New challenges, including rapid urbanization, rising incomes, climate change and growing concerns about the environmental impacts associated with farming are, however, reshaping national priorities.
- In this changing political environment, it is critical to ensure that different trade policy options pursued by individual producing and consuming countries will support a transition towards a more sustainable, and healthier, food and land use system.
- This will imply the introduction of effective market-correcting measures to internalize negative environmental and social externalities and the removal of perverse incentive structures encouraging unsustainable practices. It will also require trade-related measures that encourage more sustainable and healthy production methods and consumption, such as labelling schemes, payments for environmental services, or the subsidized distribution of healthy food.
- Removing perverse incentives such as fossil fuel subsidies will bring significant welfare gains, but the political economy surrounding subsidies is such that removing support once it has been granted remains particularly difficult, not least because of considerable vested interests, powerful industry lobbying and fears of job losses.
- The use of trade measures such as tariffs or taxes to internalize environmental or health externalities faces significant conceptual challenges to accurately measure the cost of those externalities: there is also a political imperative to design such a scheme in a non-discriminatory way.
- Payments for environmental purposes may significantly support a transition towards more sustainable practices, but ensuring that such payments are proportionate to the costs incurred and to the benefits delivered remains highly challenging.
- Consumer subsidies such as food stamps or school feeding programmes that target poor or vulnerable segments of society can play a critical role in promoting nutritious food and more balanced diets. Given the high cost associated with those schemes, however, a major challenge consists in scaling up such approaches and applying them within resource-poor countries.
- Given the critical role of trade in providing access to food, certain agricultural products that are essential for a healthy diet may benefit from enhanced efforts at reducing trade costs and improving the functioning of value chains.

This chapter provides an overview of the political economy dynamics that have shaped the global food system at the international and regional level, highlighting the political economy conditions associated with food and farming in key producer countries. It examines trade policy instruments that may help address the challenges highlighted earlier and support a transition towards a more sustainable and healthier food and land use system. It focuses on key trade policy instruments such as tariffs, subsidies, labelling schemes or trade facilitation mechanisms.

4.1 Navigating the political economy of trade

The food system is significantly shaped by patterns of economic activity in North America, Europe and the Asia-Pacific region. Regulatory frameworks in key economies within these regions have disproportionate implications for global public policy outcomes in food-related areas such as environmental sustainability and healthy diets.

While Latin American countries have in recent decades become increasingly integrated in the global economy – through the expansion of their food and agricultural value chains – African countries continue to remain largely marginalized in the global economy, with a few key players dominating trade on the continent.

Table 5 provides a broad overview of some of the dynamics and conditions in a cross-section of selected countries in these regions – including not only major economies, but also key actors determining policy outcomes in areas such as deforestation, undernutrition, overnutrition and obesity, and smallholder livelihoods.

In the US, Mexico, Brazil and Argentina, very large average farm sizes are the norm, with a significant degree of corporate concentration. This means that large landowners, food processing firms and exporters all have outsized roles in shaping public debates and policy trajectories. At the same time, these countries have sizeable populations of small farmers and rural communities, whose role in shaping farm policy and food system outcomes varies across different jurisdictions. In recent years, environmental concerns have come to the fore, as awareness grows over the impact of large-scale, intensive agricultural production on land, water, climate and biodiversity; agriculture-driven deforestation is a major factor in shaping land use and environmental outcomes. While undernutrition has declined significantly, overnutrition and obesity have become a growing concern as lifestyles change and diets evolve.

In Europe, significant differences persist in food and agricultural production systems and diets across the continent, due both to agro-ecological conditions as well as political and economic factors shaping farming in different regions. European agriculture has been significantly shaped by the evolution of the EU's Common Agricultural Policy (CAP), including successive reforms aimed at increasing the market orientation of European farming and increasing support for environmental outcomes. These have included initiatives aimed at maintaining biodiversity and protecting ecologically sensitive areas, as well as supporting rural development.

European citizens have been broadly supportive of these objectives, with climate change a focus of attention in recent years. Market actors have also capitalized on these dynamics, through privately funded voluntary initiatives such as labelling schemes aimed at promoting fairly traded food and farm goods as well as organic agriculture. While corporate concentration remains an issue for dairy products, for example, EU competition policy is widely regarded as more advanced compared with other jurisdictions. With the production of commodities such as cereals facing strong competition from exporters in other world regions, economic actors have increasingly gravitated towards high-value exports such as meats and cheeses, seeking recognition in regulatory frameworks in the form of 'geographical indications' for their products. The EU is both a major exporter and importer of food and farm goods.

Table 5: Key sustainable food and agriculture indicators in selected countries

Indicator Group	Indicators	Argentina	Brazil	China	India	Indonesia	Japan
Economic indicators	Gross domestic product per capita, PPP, dissemination (constant 2011 international $) (2016)	18,645.10	14,200.30	14,612.00	6,145.30	10,748.30	38,108.40
	Average value of food production (constant 2004-2006 I$/capita) (2015-17)	694.00	454.00	255.00	122.00	161.00	88.00
	Employment in agriculture (% of total employment) (2018)	0.06	9.39	26.77	43.86	30.53	3.41
Food & nutrition security indicators	Prevalence of undernourishment (%) (2016-18)	4.6	<2.5	8.5	14.5	8.3	<2.5
	Number of people undernourished (million) (2016-2018)	2.1	<5.1	122.4	194.4	22	<3.2
	Prevalence of obesity in the adult population (% of population 18 years and older) (2016)	28.5	22.3	6.6	3.8	6.9	4.4
Environmental indicators	Agriculture land (1000 ha) (2016)	148,700	235,254	528,532	179,721	60,200	4,471
	Agriculture area under organic agriculture (1000 ha) (2016)	2,844	750	2,288	1,490	126	10
	Primary forest (1000 ha) (2015)	1,738	202,691	11,632	15,701	46,024	4,905
	Emissions from agriculture (CO2 eq – 1000 tonnes) (2016)	116,396.1	455,387.8	691,256.1	634,114.5	175,892.2	19,549.9
	Pesticides (kg/ha) (2016)	5.17	4.31	13.06	0.30	0.03	11.41
	Average land degradation (in GLASOD erosion degree) (1991)	2.60	1.96	7.87	1.64	2.51	0.51
Trade indicators	Cereal import dependency ratio (%) (2011-13)	-225.3	-15.3	3.4	-8.6	15.4	75.8
	Value of food imports in total merchandise exports (%) (2011-13)	1	3	3	5	6	6
	Producer support as % of farm income (2018)	-21.2	1.5	14.3	-6.4	24.6	46.7
	Average tariffs on agriculture (%)	10.3	10.2	15.6	32.8	8.7	13.3
	Maximum duty (%)	35	55	65	150	150	736

Source: FAO (2018), FAOSTAT, Pesticides, https://cht.hm/2kIUG8P (accessed 18 Sep. 2019); FAO (2013), FAOSTAT, Soil, https://cht.hm/2kU5eSi (accessed 18 Sep. 2019); FAO (2019), FAOSTAT, Land Use, https://cht.hm/2m2dgZw (accessed 18 Sep. 2019); FAO (2019), FAOSTAT, Agriculture Total, https://cht.hm/2m2drnE (accessed 18 Sep. 2019); FAO (2019), FAOSTAT, Suite of Food Security Indicators, https://cht.hm/2lYHFrX (accessed 18 Sep. 2019); OECD (2019), Agricultural Support Estimates (Edition 2019), https://cht.hm/2kRsLmU (accessed 18 Sep. 2019); World Bank (2019), World Bank Open Data, (https://cht.hm/2lVqRSH) (accessed 18 Sep. 2019); WTO (2019), Tariff Download Facility, https://cht.hm/2mow9Gu (accessed 18 Sep. 2019); OECD (2019), Agricultural policy monitoring and evaluation, (https://cht.hm/2m3jmJ7) (accessed 19 Sep. 2019).

Table 5. *continued*

Indicator Group	Indicators	Kenya	Mexico	South Africa	United States	EU
Economic indicators	Gross domestic product per capita, PPP, dissemination (constant 2011 international $) (2016)	2,891.50	17,790.90	12,245.60	53,631.80	31,861.20
	Average value of food production (constant 2004-2006 I$/capita) (2015-17)	97.00	196.00	147.00	469.00	303.00
	Employment in agriculture (% of total employment) (2018)	57.45	12.99	5.16	1.42	4.16
Food & nutrition security indicators	Prevalence of undernourishment (%) (2016-18)	29.4	3.6	6.2	<2.5	<2.5
	Number of people undernourished (million) (2016-2018)	14.6	4.7	3.5	<8.0	<18.5
	Prevalence of obesity in the adult population (% of population 18 years and older) (2016)	6.0	28.4	27.0	37.3	25.4
Environmental indicators	Agriculture land (1000 ha) (2016)	27,630	104,992	96,341	406,183	181,630
	Agriculture area under organic agriculture (1000 ha) (2016)	155	674	14	2,031	11,950
	Primary forest (1000 ha) (2015)	0	33,056	947	75,300	4,055
	Emissions from agriculture (CO_2 eq – 1000 tonnes) (2016)	41,843.9	87,852.4	27,627.1	35,6562.6	414,700.3
	Pesticides (kg/ha) (2016)	0.25	1.87	2.08	2.63	3.14
	Average land degradation (in GLASOD erosion degree) (1991)	2.73	1.78	2.67	1.51	2.21
Trade indicators	Cereal import dependency ratio (%) (2011-13)	32.7	30.5	3.9	-19.1	-16.1
	Value of food imports in total merchandise exports (%) (2011-13)	26	6	5	4	6
	Producer support as % of farm income (2018)	-	8.1	3.8	12.2	20.0
	Average tariffs on agriculture (%)	20.2	13.5	8.5	5.3	10.8
	Maximum duty (%)	100	75	112	350	189

Asia is likely to remain a major driver of global trends in global food and agriculture. Two countries in this region – China and India – account for the largest numbers of undernourished people in the world, but rapid economic growth has meant that the number of undernourished in China has fallen dramatically in recent decades. At the same time, these far-reaching changes in social structures and patterns of economic activity, together with rural–urban migration, have meant that government policies have had to evolve quickly to cope with new dynamics and challenges. All these developments have brought significant levels of environmental stress, especially those associated with water. Other countries in the region, such as Indonesia and Malaysia, have struggled to address environmental challenges associated with rapid agriculture-driven deforestation, especially biodiversity loss and greenhouse gas emissions.

While concerns around food security and rural livelihoods have played a key role in shaping government policy, with many countries favouring a relatively interventionist approach to markets for food and agriculture, China in particular has sought to reform farm policy in recent years, as fiscal and environmental sustainability concerns have led to intensive domestic debate over how best to achieve enduring policy goals, such as addressing inequalities between rural and urban income growth rates. Most Asian countries remain net food importers, but some have emerged as significant exporters of particular commodities such as palm oil, rice or beef.

In Africa, rapid urbanization and rising average incomes, coupled with low levels of investment in farming and persistent yield gaps, have seen demand growth outstrip the increase in supply for some key commodities. In many countries, large-scale commercial agriculture coexists alongside smallholder farming. A few major economies account for the bulk of agricultural trade on the continent: these include South Africa, Nigeria, Egypt and Kenya. In many cases – despite efforts at regional economic integration – trade remains geared towards distant global markets (the EU in particular), with a relatively high level of dependence on unprocessed commodities such as tea, coffee or cotton.

Weak provision of public goods such as rural roads and transport infrastructure, as well as extension and advisory services for farmers, often impede the development of well-functioning markets, although improvements in communications technology and related services have led increasingly to better access to market information for producers. Government policies often seek to balance pressure from consumers for low food prices with calls for protection from import-competing sectors.

4.2 Designing trade policies that contribute to more sustainable and healthy food systems

Due to different priorities and interests highlighted above, the reshaping of trade policies to address the challenges identified in Chapters 2 and 3 will need to fulfil three main goals. First, there is a need to remove perverse incentive structures encouraging unsustainable practices, such as fossil fuel subsidies which encourage wasteful consumption, or fisheries subsidies that encourage overcapacity and overfishing. Second, there is a need to introduce effective market-correcting measures to internalize negative environmental and social costs associated with agricultural

production. Finally, there is a need to update and harness trade-related measures that can encourage more sustainable and healthy production methods and consumption – such as labelling schemes, payments for environmental services, or the subsidized distribution of healthy food.

4.2.1 Removing perverse incentives As highlighted in Chapter 3, in the absence of adequate environmental regulation, subsidies – particularly those that encourage production or the use of certain inputs – tend to intensify the negative environmental effects associated with agricultural practices. They can contribute to bringing marginal land into production, to promoting unsustainable types of intensification or incentivizing overuse of pesticides and fertilizers. By distorting price signals and production patterns, they discourage exit from the sector and encourage overproduction. By artificially depressing international prices, these support schemes may result in the higher consumption of cheap products with a high environmental footprint in terms of biodiversity loss, water use, soil erosion or greenhouse gas emissions.

To mitigate these challenges, the first step involves removing perverse incentives, and particularly those subsidies that encourage overproduction or environmentally damaging production methods. A good example of such incentives is the provision of fossil fuel subsidies.

Greenhouse gas emissions resulting from the combustion of fossil fuels represent the main cause of climate change. Governments continue to provide fossil fuel production or consumption subsidies – which, according to the International Monetary Fund (IMF), can amount to between $333 billion and $5.3 trillion, if the full cost of associated externalities is taken into account.

These subsidies incur high societal costs. Besides the sum of tax money foregone, the subsidies also exacerbate environmental degradation and create health hazards such as air pollution.

Another example of perverse incentives are fisheries subsidies, which contribute to overfishing and overcapacity. Here again, in the absence of effective resource management, subsidies for vessel construction, fishing equipment or operational costs such as fuel, ice and bait contribute directly and indirectly to the build-up of excessive fishing capacity, leading to the overexploitation of fishery resources. Today it is estimated that this support amounts to some $35 billion worldwide per year, of which roughly $20 billion consists of production-enhancing subsidies.

Although removing perverse incentives brings significant welfare gains, the political economy surrounding subsidies is such that removing support once it has been granted remains particularly difficult, not least because of considerable vested interests, powerful industry lobbying, and fears of job losses. Without collective action, individual countries are unlikely to act, resulting in a suboptimal outcome. While this calls for multilateral action to remove the most harmful support measures, lessons from the EU or Switzerland show that reform is more likely to succeed if it promotes a gradual shift

towards more beneficial forms of support. A significant incentive to remove perverse subsidies may therefore involve replacing them with market-correcting subsidies that encourage the delivery of public goods while maintaining the same level of income for farmers (see Section 4.2.3).

4.2.2 Market-correcting measures to address negative environmental externalities As highlighted in Chapter 2, market prices rarely reflect the negative or positive costs embedded in the global food production process. Environmental production standards can help mitigate some of these externalities, but if these are not applied to imports, trade could undermine the effectiveness of these standards. For example, cereal producers who have to maintain hedgerows, woodlands or other ecologically important landscape features may argue that they face unfair competition from producers abroad not bound by the same rules. Indeed, farmers and other economic actors in countries with high environmental standards often complain that producers in other jurisdictions with lower standards enjoy an unfair competitive advantage.

Farmers and other economic actors in countries with high environmental standards often complain that producers in other jurisdictions with lower standards enjoy an unfair competitive advantage.

In the area of climate change, similar concerns have prompted governments and stakeholders to suggest that higher duties could be imposed on imports which do not comply with certain environmental standards, such as those related to greenhouse gas emissions. Known as 'border carbon adjustment' measures, these duties would serve as a tool for promoting fairer international competition by addressing the problem of 'carbon leakage' – the phenomenon of environmentally harmful production relocating to jurisdictions less constrained by strict rules on greenhouse gas emissions. Over time, the debate has evolved away from the original border adjustment focus to explore emissions trading schemes which allow firms that generate greenhouse gas emission to trade emissions permits between them. Under those schemes, public regulators set an overall limit on the number of permits in the economy, thereby capping greenhouse gas emissions and creating a market mechanism for further reductions. As more jurisdictions have adopted schemes of this sort, interest has grown in linking these together through 'carbon clubs'. But such approaches have their limitation. Citing the risk of carbon leakage, trade-sensitive sectors often benefit from free allowances, which ultimately undermines the effectiveness of the schemes.

The unilateral use of tariff barriers to address carbon leakage or, more broadly, the notion of the 'pollution haven effect' – in which polluting industries relocate to jurisdictions with weak environmental regulation – has proved highly controversial, with exporting countries arguing that such unilateral trade restrictions would be illegal under WTO law and constitute disguised protectionism. A less discriminatory approach would probably consist of imposing a tax, applied equally to imported and domestic goods that do not comply with certain environmental requirements. This approach is used already in several countries to tax food and drinks that contain high levels of sugar or salt as a means of protecting consumers' health (see Table 4). Such a tax is, however,

much easier to apply in cases where the sugar or salt content of food and drink can be measured relatively precisely in the final product. Determining accurately the cost of those environmental externalities – such as soil erosion, deforestation or greenhouse gas emissions – that are generated at the production stage, but are not reflected in the final product, raises further conceptual and methodological challenges.

In short, whether it is through tariffs, taxes, or other mechanisms such as environmental payments (as discussed in Section 4.2.3 below), designing and implementing such schemes in agricultural trade confronts significant practical and political difficulties, not only to measure externalities accurately, but also to implement such an approach in a non-discriminatory way. This may call for a multi-stakeholder process to build broader consensus on the design of the most appropriate instruments, using science-based approaches to cover issues related to water, land, and other externalities that arise from food production (see Recommendation 1 in Chapter 5).

4.2.3 Incentives for sustainable production and consumption

Payments for environmental purposes

Agriculture plays a critical role in preserving landscapes upon which rural tourism depends. It also provides a series of environmental services such as watershed management, biodiversity conservation and carbon soil sequestration. Society values these services as public goods, but they have no market value. This reality results in suboptimal delivery of these public goods, which is ultimately reflected in biodiversity decline, water pollution and degraded landscapes and soils. This is a typical case of market failure, where market forces alone do not result in an efficient allocation of resources.

As is already the case in the EU, for example, agricultural payments to producers can be made conditional on certain requirements, including the maintenance of a diversified set of crops, to conserve permanent grassland or to devote a share of arable land to ecological practices, including leaving some land fallow each year, and the permanent establishment of buffer strips and afforested areas.[86] From a sustainability perspective, these approaches may result in significant benefits by promoting environmentally sound agricultural practices, fostering diversification or increasing the range of economic opportunities for farmers to generate more income and diversify their revenue sources.

A critical challenge, however, consists in ensuring that the amount paid corresponds in effect to the cost of implementing environmental practices. In other words, while it may be acceptable to provide a small incentive to make it attractive for farmers to shift towards more environmentally friendly production methods, such payments should be proportionate to the costs incurred and benefits delivered, rather than resulting in a disguised income support mechanism or production enhancing scheme. An interesting approach currently being considered in the debate around the new EU CAP could consist in shifting from a 'compliance-based' approach, under which farmers have to meet certain criteria to qualify for a payment, towards a 'performance-based' or 'result-based' system. In other words, emphasis could be shifted towards whether a particular subsidy scheme – regardless of how it is designed – effectively contributes to achieving the intended sustainability objectives. In practice, this would require a set of measurable targets and objectives to be achieved, combined with a new framework for performance monitoring and evaluation, the latter being based on a set of objective indicators by which progress can be measured (see Recommendation 2 in Chapter 5).

[86] Matthews, A. (2014), 'The Common Agricultural Policy and Development' in Cardwell, M. and McMahon, J. A. (eds) (2015), *Research Handbook on EU Agriculture Law*, Cheltenham: Edward Elgar Publishing.

Consumer subsidies

Other instruments, like consumer subsidies, can help promote healthier diets and demand for more nutritious food. These include 'safety net' policies that target poor consumers or vulnerable segments of the population (e.g. children or pregnant women) by providing different types of in-kind support or cash transfers. Examples of such schemes include food stamps or school feeding programmes that can be used to promote the benefits of nutritious food and more balanced diets. While these programmes tend to be expensive and – if badly designed – prone to leakage and corruption, the notion of enhancing the purchasing power of poor consumers may be more effective than employing indirect measures such as price controls or production support. Given the high costs associated with these types of promotional schemes, a critical challenge consists here in scaling up such approaches and applying them in resource-poor countries (see Recommendation 4 in Chapter 5).

Voluntary sustainability standards in agro-food value chains

Standards usually specify requirements about a product or a process that producers, traders or retailers need to meet in order to access specific markets. They are typically accompanied by enforcement measures such as labelling requirements and procedures to assess conformity. Standards can be applied by the public as well as the private sector. Food safety standards, such as Sanitary and Phytosanitary (SPS) standards, are examples of public standards applied by governments to ensure food safety and protect human health from food-borne diseases. Private standards, while not mandatory, can be equally important in determining whether producers can access markets. These include Voluntary Sustainability Standards (VSS), which specify product and process requirements that aim to achieve a variety of social and environmental objectives, such as respect for basic human rights, workers' health and safety, the environmental footprint of production, or land use planning.[87]

The role of standards has increased in importance in recent years, due in part to the emergence of international supply chains (as discussed in Chapter 3) as well as changes in strategies adopted by large NGOs. In the context of these highly fragmented production networks, standards help firms meet their economic 'bottom line' in terms of production timing, quality and cost as well as their social and environmental goals, either to avoid reputational damage or gain marketing advantages. They also increasingly fill a regulatory vacuum left by the inability of governmental initiatives

[87] Examples of such private initiatives include the Marine Stewardship Council (MSC) for sustainable seafood, which started in 1996 as a joint initiative of Unilever and the World Wildlife Fund (WWF). Another example is the Round Table on Responsible Soy (RTRS), an international initiative bringing together soy producers, traders, processors, banks and social organizations to ensure sustainable cultivation of soybeans and the social responsibility of the sector.

to regulate on sustainability issues from the transnational to municipal level.[88]

The application of government food safety standards is regulated by the WTO's SPS and Technical Barriers to Trade (TBT) Agreements, which strongly encourage WTO members to use international standards, guidelines and recommendations as the basis for their measures. VSSs, on the other hand, are not subject to any disciplines, even if they often end up being de facto mandatory requirements for economic participation in global production networks. Several concerns have been raised regarding the level of transparency of VSSs and their economic viability and credibility.[89]

Some initiatives are underway to help 'discipline' private standards and to ensure that they are based on sound science, and are non-discriminatory and interoperable. These include, for example, the WTO TBT Agreement Code of Good Practice. The International Organization for Standardization (ISO) has also developed 'meta-standards' in areas such as transparency and accountability. The non-governmental International Social and Environmental Accreditation and Labelling (ISEAL) Alliance also codifies best practice for the design and implementation of social and environmental standards initiatives. However, such efforts remain highly fragmented and uncoordinated, and concerted efforts will be needed in order to consolidate them, ensure that they are effectively based on science, and promote interoperability among different schemes.

Reducing trade costs affecting environmental goods or services

The idea of fast-tracking liberalization for environmental goods and services has a long history at the WTO. In 2001, WTO members agreed to pursue the 'reduction or, as appropriate, elimination of tariff and non-tariff barriers to environmental goods and services' at the Fourth Ministerial Conference in Doha, Qatar.[90] In 2014, a subgroup of some four dozen WTO members launched 'plurilateral' negotiations aimed at the establishment of a new Environmental Goods Agreement. The talks included major economies such as China, the EU, Japan and the US. These negotiations were reportedly

[88] A vast body of literature documents this trend, focusing both on benefits (including for example objective improvements in workers' conditions) and limitations of self-regulation through private sustainability standards, Corporate Sustainable Responsibility (CSR) codes, and similar private governance initiatives (for instance, the 'fox that guards the hens' argument). See Meliado, F. (2017), 'Private Standards, Trade, And Sustainable Development: Policy Options for Collective Action', Geneva: International Centre for Trade and Sustainable Development (ICTSD).

[89] Concerns related to transparency include information relating not only to compliance requirements and conformity assessment, but also to the terms of stakeholder participation in the design and governance of standards. With respect to economic sustainability, concerns have been raised around the cost-benefit analysis of compliance, the support that is being provided particularly to small producers (financial and technical), and the interoperability of different standards or schemes. Finally, the credibility of certain schemes, in terms of both the science underpinning the standards and the conformity assessment techniques, has also been questioned.

[90] WTO (2001), 'Ministerial Declaration', https://cht.hm/2kdqVwp (accessed 21 Aug. 2019).

close to conclusion in December 2016, when a ministerial-level meeting closed without any agreed substantive outcome. Despite difficulty in reviving the talks, environmental goods and services have remained a focus of bilateral and regional negotiations.

Part of the challenge in liberalizing trade in environmental goods and services is defining which products or services might qualify for special treatment. To date, these negotiations have focused on goods that are potentially important to the development of more sustainable food production systems – such as water and soil treatment equipment, or biomass boilers. Similarly, trade in services aimed at helping producers to install or use specific environmental goods could be liberalized alongside the technology itself: trade in advisory services on the use of drip irrigation technology, for example, could be liberalized along with the technology.

To date, agricultural goods themselves have not featured heavily in negotiations in this area, partly due to difficulties in defining and assessing which types of farm products might be considered as 'environmental' goods. For example, countries might seek to prioritize trade liberalization in organic agricultural goods – considered essential for a healthy diet. Besides tariffs, such agricultural products could also benefit from enhanced trade facilitation measures. Given the perishability of many fruit and vegetable products, measures could be introduced to ease transit at international borders, reducing waiting times, or improving sustainable cold storage (See Recommendation 3 in Chapter 5).

5. Ways forward

Opportunities for strategic coalitions

Ensuring the global food system is equipped to deliver sustainable, healthy and equitable outcomes now, and in the years ahead, is a major task. Achieving progress is particularly challenging given the degree of polarization and antagonism among major players today on a number of global public policy challenges. States are at loggerheads on issues ranging from climate change to trade and military alliances, and long-established political and economic frameworks are in the process of fragmenting or collapsing. However, there are grounds for cautious optimism. Leaders have agreed a collective blueprint for a sustainable food future in the form of the 2030 Agenda for Sustainable Development and the SDGs. Also, during the preparatory process for these commitments, governments have engaged with countless civil society groups, private sector actors and UN agencies, creating in the process a built-in constituency in support of implementing and realizing the vision of the agreed goals and targets.

In many respects, the complexity of the challenges confronting the global food system is mirrored by the breadth and scope of the SDGs. This paper has explored some of the most significant aspects without seeking to be comprehensive in its treatment of the subject. Clearly, strategies to achieve progress in this complex policy landscape will need to be tailored to tackle specific challenges and the particular political economy challenge associated with each of them. As discussed in Chapter 4, the blockers, champions and swing countries or corporations that are active in the debate around more sustainable and healthier diets may not be the same actors that can bring the most capability to bear when it comes to halting deforestation, conserving agrobiodiversity or raising the incomes of small farmers.

That said, building on the holistic vision provided by the 2030 Agenda for Sustainable Development is likely to be the most effective strategy for moving forward. Especially in today's polarized global policy environment, isolating one area or dimension of importance to a subset of countries or interest groups is likely to provoke a backlash by those who feel that their concerns are being marginalized. Not surprisingly, some developing countries may remain wary of efforts to address environmental challenges such as climate change mitigation and biodiversity loss if they are not accompanied by a commitment to tackle concerns of importance to them, such as poverty reduction and livelihoods. It is also clear that – for food system challenges that necessitate international collaboration – building a broad coalition of support across both developed and developing countries is critical.

Given the fragmentation and polarization in today's global policy environment, and, in particular, the emerging scepticism or outright hostility in some quarters to multilateralism and multilateral institutions, the first step towards addressing the challenges facing the food system must be to rebuild trust among policy actors. With key forums in crisis or appearing incapable of responding effectively to pressing practical problems, there is arguably an unprecedented need both to create new spaces for informal dialogue among actors and to rebuild consensus on how to move forward. In this context, there is a growing need for 'soft' governance mechanisms such as the G20, which can help governments identify the best ways forward.

Table 6: Summary of policy recommendations

Target groups	Proposal	Environmental concerns		Social concerns		Economic considerations	
		Biodiversity conservation	Greenhouse gas emissions	Natural resources e.g. soil, water	Triple nutrition burden	Employment and livelihood	Trade and market distortions
Non-state actors (private sector, think tanks, civil society)	National dialogues on instruments that reflect true costs of unhealthy diets	✓	✓	✓	✓		
	Conditioning the use of subsidies on sustainability/ health impacts	✓	✓	✓		✓	✓
	Promoting trade in fruits and vegetables				✓	✓	✓
Governments	Global food stamps programme				✓		✓
	Targets on sustainable food and inputs trade in the post-2020 biodiversity framework	✓		✓			✓
	SDG-proof WTO agricultural trade negotiations	✓	✓	✓		✓	✓
	Addressing greenhouse gas emissions arising from trade in RTA negotiations		✓				✓

This concluding chapter explores different ways in which policy actors can take action on the issues identified in this paper. It contains recommendations targeted at non-state actors (the private sector, think tanks and civil society), and also at governments. The proposals identified address the environmental, social and economic concerns associated with the global food system, with a view to identifying how trade and markets could better contribute to achieving public policy goals in these areas (see Table 6).

Newly produced soft drink bottles on an assembly line at a bottling plant. Image: Lionel Bonaventure/AFP/Getty Images

Targeting multi-stakeholder groups

1. **Corrective instruments to incorporate the true cost of unhealthy diets** As discussed in previous sections, many stakeholders, especially governments, have begun to pilot or implement policy measures to tackle unaccounted, negative social and environmental impacts from an unsustainable and unhealthy food system, most of which will be borne either by society today or by future generations. Clearly, implementing concrete instruments that incorporate the cost of externalities into consumer price signals is far from straightforward, whether through subsidies redirection or tax-related incentives, which could be positive or negative.

   A host of countries have begun to implement a variety of taxes on unsustainable production or unhealthy foods. These include taxes on sugary drinks, which over 30 jurisdictions around the world have now adopted (see Chapter 2). More governments are also exploring 'win-win' taxes and other measures on unhealthy foods. As recommended in 2019 by the Lancet Commission on Obesity, tackling corporate influence in global and domestic decision-

making is key.[91] The battlefront on corporate influence often involves labelling or restrictions on advertising, especially advertisements targeting children.

Many international initiatives have sprung up to help quantify and reduce the externalities of food production. These include The Economics of Ecosystems and Biodiversity (TEEB) Agri-Food Initiative and the UN-backed Natural Capital Accounting and Valuing Ecosystem Services Project. Building on momentum for companies to establish targets to reduce greenhouse gas emissions in line with the level of reductions proposed by the scientific community, a new initiative on Science-Based Targets for the Global Environment Commons will expand these targets using science-based approaches to cover issues related to water, land and externalities that arise from food production.[92]

Ultimately, reflecting the true cost of production and consumption of unhealthy foods requires a range of instruments. It is also highly dependent on national circumstances. Inclusive and transparent national dialogues are needed to build broader consensus on the design of the most appropriate instruments that best suit citizens' needs, whether through a redirection of subsidies or tax-related incentives. The toolkit could also include policies on labelling or restrictions on advertising, especially those targeting children.

2. Conditioning the use of subsidies on their sustainability impacts

As highlighted above, subsidies represent one of the key instruments at the disposal of policymakers to internalize the negative social and environmental costs associated with unsustainable food production and unhealthy diets. However, the political economy of subsidies means that it can be excessively difficult for governments to remove support once it has been granted. A first step in introducing reform may therefore be to promote a transition towards less harmful forms of support. In other words, policymakers should take measures to remove perverse incentives, such as subsidies encouraging the overuse of fertilizers or pesticides, certain biofuels subsidies or those stimulating overproduction of commodities with a significant environmental footprint, and replace them by market-correcting subsidies encouraging the delivery of essential public goods. This could be achieved by making conditional the granting of subsidies not only on their trade-distorting effect – as is currently envisaged under WTO disciplines – but also on their impacts on resource usages and on health.

For example, instead of subsidizing beef production (one of the commodities with the highest levels of greenhouse gas emissions), support provided to producers could be linked to the delivery of environmental services such as maintaining biodiversity

[91] Swinburn et al. (2019), *The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report*.

[92] World Economic Forum (2019), 'Science-Based Targets for the Global Environment Commons', https://cht.hm/2mdMv4E (accessed 20 March 2019).

or permanent pasture, fostering diversified production systems, encouraging crop rotation, carbon sequestration, and greenhouse gas emissions reduction, or keeping minimum areas devoted to non-productive features like hedges. This approach is similar to the conditionalities imposed by the EU on its farmers requesting direct payments under the CAP, as described in Section 4.2.3. Its application should, however, be generalized to other countries and the amount provided should be commensurate to the cost of delivering those public goods.[93] More importantly, payments should be results-based (i.e. conditioned on the effective delivery of the relevant environmental services).

In practice, a results-based management system would require a set of clear targets supported by the use of objective indicators to monitor progress. It should also be easy to implement and provide incentive premiums. Designing such a mechanism would benefit from a 'bottom-up' multi-stakeholder process. This should involve consultations among key actors in some of the target countries identified above, supported by state-of-the-art research and practical tools for implementation. Among other things, it would also require establishing a menu of objective targets and indicators to define conditionalities and monitor progress; practical and cost-effective implementation modalities; a review mechanism; and, ultimately, options for international cooperative arrangements reflecting such an approach. This process should be led by a coalition of leading think-tanks and universities, and should involve the participation of farmers, private companies, investors, and institutions with specific expertise on health, nutrition and natural resources, as well as key governments and subnational entities.

3. **More fruits and vegetables may mean more trade** Addressing malnutrition is expected to mean that, in many countries, diets will need to evolve, including by becoming more diverse. This means increasing consumption of certain product groups such as fruit and vegetables as well as nuts and pulses. As many types of fruits and vegetables are more perishable than other products, production is often for the domestic market, with output in many developing countries concentrated near population centres. Many countries with the fiscal resources to do so continue to provide trade-distorting support for production of staple grains such as rice and wheat, meaning that output tends to be skewed towards these products and away from fruits and vegetables. At the same time, while some producers of fruit, vegetables and nuts do benefit from production-linked payments, these subsidies may distort markets and disadvantage more competitive producers in developing regions of the world.

Given the perishability of many products in this category, trade facilitation measures aimed at easing transit at the border

[93] For the time being the EU scheme is essentially an income support mechanism with a few environmental conditionalities. It can hardly qualify as payments for environmental services.

by cutting unnecessary bureaucracy and reducing waiting times can be important in improving product availability, reducing costs, and improving food quality and safety for consumers. Similarly, measures aimed at improving sustainable cold storage and upgrading value chains can affect diets and consumption by increasing the availability of fresh produce on markets, especially in developing countries.

Targeting governments

4. **Towards a global food stamps programme** Malnutrition is often a consequence of low purchasing power among poor consumers. In order to improve access to food in humanitarian emergencies, agencies such as WFP have piloted initiatives such as 'Purchase for Progress', which seek to replace traditional forms of in-kind food aid with direct transfers to poor consumers. The approach also has the advantage of supporting local producers, who themselves may be food-insecure. While social security programmes in developing countries are often weak or non-existent, several governments are also trying to tackle poverty and food insecurity in rural and urban areas through mechanisms which provide direct transfers to low-income citizens. Many developed countries already have similar systems in place. For example, the US provides targeted assistance through the Department of Agriculture's Supplemental Nutrition Assistance Program (SNAP – previously known as the Food Stamp Program). In other countries, such schemes are implemented through school feeding programmes. If carefully designed, such 'safety net' schemes can not only contribute to improving calorific intakes but also to delivering more balanced and healthier diets.

   With inadequate financial resources and administrative challenges preventing many governments in developing countries from establishing effective social safety nets, international collaboration (including financial assistance) will be needed to achieve the targets set out under SDG 2: 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture'.[94] The impetus for establishing a global coordinating mechanism could emerge through the G20 process, while operational implementation could be carried out through the UN's Rome-based agencies. To contribute effectively to addressing the triple burden of malnutrition, the implementing agency would need to give careful attention to how the scheme would work in practice, building on experience to date with similar initiatives.

5. **Integrating the notion of sustainable food and inputs trade in the post-2020 biodiversity framework** As highlighted in previous sections, agricultural production remains one of the main drivers of environmental degradation. In the absence of effective regulatory frameworks, trade tends to exacerbate the impact of

International collaboration (including financial assistance) will be needed to achieve the targets set out under SDG 2: 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture'

[94] UN (undated), '2 Zero Hunger', *The Sustainable Development Goals Report*, https://cht.hm/2ZvEZA2 For the full set of SDGs and associated targets, see https://cht.hm/2m5IgrE

agricultural production and is often considered as an indirect factor of biodiversity loss. In 2018, the Conference of the Parties to the Convention on Biological Diversity adopted a comprehensive and participatory process for the preparation of the post-2020 global biodiversity framework. This process should lead to the adoption of a universal framework for action on biodiversity consistent with commitments under other instruments such as the SDGs and the Paris Agreement on climate change. More specifically, it should take the form of a set of knowledge-based specific, measurable, and time-bound biodiversity targets and sub-targets for the period 2021–30, following the SDG model and being supported by an effective review and monitoring process. Surprisingly, trade has been largely absent from the process so far. In this context, the two-year preparation process provides a critical opportunity to introduce a set of goals or targets that mitigate the role of trade as a form of indirect pressure on biodiversity (further exacerbated by policy failures). This also presents a window of opportunity to encourage trade in biodiversity-based products, including natural ingredients, produced ethically and following sustainability principles and criteria.

While the new framework is likely to take the form of a non-binding document, it will nevertheless inform policy orientation in the next 10 years. Furthermore, after integrating specific targets on the role – both positive and negative – of trade, progress would then have to be monitored by establishing an internationally recognized baseline and a set of indicators to measure progress towards the agreed targets. This could play a critical role in generating momentum for addressing the trade and biodiversity interface at the global level. Such a process could be led by a coalition of like-minded countries, including the 17 'megadiverse' countries[95] that have a particular interest not only in preserving biodiversity but also in benefiting from the sustainable use of biodiversity-based agricultural products.

6. **An SDG-oriented agenda for agricultural trade** WTO members could contribute to achieving the vision of the 2030 Agenda for Sustainable Development by revitalizing talks on trade and restructuring them around the SDGs. This would involve a wholesale rethink of the negotiating agenda, and of how countries can best achieve shared goals. It would have implications for talks already under way, and for new negotiations yet to be initiated. In agriculture, governments would need to rethink their existing approach with a view to achieving SDG 2b with regard to correcting and preventing trade restrictions and distortions in world agricultural markets, as well as commitments such as SDG 12.3 on food loss and waste. In fisheries, it would mean accelerating existing negotiations based around the mandate in SDG 14.6 of prohibiting certain forms of fishery subsidies. On fossil fuel subsidies, it would mean building on the 2018 G20 Buenos Aires declaration on energy

[95] Those countries identified as the most biodiversity-rich in the world.

A worker unloading bananas in Tegucigalpa, Honduras. Image: Elmer Martinez/AFP/Getty Images

transitions, with a view to advancing SDG 12 – to ensure sustainable consumption and production patterns – on rationalizing inefficient fossil fuel subsidies that encourage wasteful consumption.

Following the approach described in Section 4.2, countries could usefully examine, in each negotiating area at the WTO, how sustainable development can best be advanced by taking a three-pronged approach to the talks. Firstly, countries could seek to remove perverse incentives, such as trade-distorting agricultural subsidies, fisheries subsidies that contribute to overcapacity and overfishing, or fossil-fuel subsidies that encourage wasteful consumption. Second, WTO members could seek to agree on how best to guarantee a safe harbour for market-correcting measures – for example, in agriculture, this could include environmental programmes or other programmes aimed at delivering public goods, such as support for R&D, pest and disease control, or extension and advisory services. Third, WTO members could facilitate trade in healthier or environmentally sound products through a positive agenda.

Governments could also consider creative approaches to achieving progress on unresolved issues, including options for plurilateral negotiations among subsets of the WTO's membership, or sectoral approaches aimed at addressing challenges affecting specific products or product groups. A value chain approach could allow members to bring in a broader set of trade-related topics and concerns. Environmental and health concerns (such as those raised by the World Health Organization (WHO) and its Independent High-level Commission on NCDs) could provide guidance for governments in selecting which products to prioritize under this approach. For example, trade distortions and market failures affecting livestock products or the fruit and vegetable sector could be fast-tracked for action if a critical mass of countries were willing to do so.

7. **Addressing greenhouse gas emissions resulting from trade in regional trade agreement negotiations** With slow progress on trade talks at the WTO since 2008, many governments have redoubled their efforts to pursue bilateral trade deals with key trading partners, or advance regional integration through preferential agreements. The number of these deals notified to the WTO has continued to grow exponentially. Today, RTAs are the de facto locus of further trade liberalization. More recently, a trend has also emerged for countries to try to negotiate 'mega-regional' trade deals, with the 11-member CPTPP providing a notable example of this type of pact, despite the decision of the US to withdraw from the agreement's predecessor after the election after the election of the Trump Administration in 2016. Other examples of such agreements include the EU–Canada Comprehensive Economic and Trade Agreement (CETA), which entered into force in 2017, or the EU–Japan Economic Partnership Agreement, which followed in February 2019. Asian countries are also negotiating the Regional Comprehensive Economic Partnership (RCEP), and African governments have moved relatively quickly towards a large continental free-trade

agreement which builds on regional integration initiatives to date.

Impact assessment of those agreements mostly point towards increases in greenhouse gas emissions due to a boost in trade flows, including of agricultural products.[96] These largely result from emissions associated with certain agricultural production practices, but also international transport (e.g. air and maritime transport) as a result of enhanced and increased trade, particularly in the case of the new mega- and trans-continental agreements. Whereas greenhouse gas emissions resulting from production stimulated by new trade opportunities will have to be addressed under the NDCs of the Paris Agreement commitments, emissions associated with international transport are not covered under national commitments. This has prompted calls to limit trade flows to address the problem of these 'orphan emissions'.[97] However, such an approach represents a very expensive and inefficient way of reducing greenhouse gas emissions. According to Bureau et al., if trade were stabilized at today's level until 2030, this would reduce global emissions by 3.5 per cent while also resulting in a decline of 1.8 per cent in global GDP.[98] An alternative option would be to incorporate within RTAs (or develop in parallel) complementary initiatives aimed at ensuring the carbon neutrality of these new deals, either by connecting carbon markets among contracting parties or by developing joint initiatives to tax international maritime and air transport emissions. This approach was suggested in a recent assessment of the EU–Canada CETA and supported by the French government.

[96] While these remain more protected than manufactured goods and are often only partially addressed in RTAs, even limited trade opening tend to result in new trade flows of agricultural goods when manufactured goods usually already benefit from open markets with the exception of a handful of sectors.

[97] In practice, these are discussed under International Organization for Migration and Interagency Climate Adaptation Committee, but so far significant progress in reducing those emissions has proven largely elusive.

[98] Bureau, D., Fontagné, L. and Schubert, K. (2017), Trade and Climate: Towards Reconciliation: Les notes du Conseil d'Analyse Economique', 37, Paris: French Council of Economic Analysis.

Appendix: The slowdown in advances in tackling illegal logging

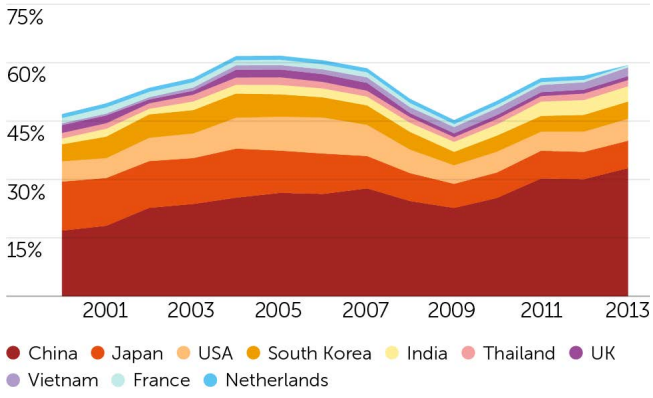
Despite progress made in the early 2000s (through improved law enforcement) towards a reduction of illegal logging in many countries, more recent assessments point to mixed outcomes. At the national level, progress is clearly evident. Nearly all the consumer countries assessed have reduced the shares of illegal timber in their imports. Although forest governance remains very weak in most of the producer countries, there has been continued improvement in numerous areas. Correspondingly, many of the producer countries assessed have reduced the shares of illegal timber in their exports.

However, at the global level progress has stalled. In the countries assessed, the volume of illegal timber imports rose by one-fifth following the end of the 2008–09 financial crisis to an estimated 60 million cubic metres (roundwood equivalent – RWE) by 2013, almost the level of a decade previously. Efforts to tackle illegal logging have been eclipsed by three major changes in the forest sector. First, new markets for timber have diluted the impact of policies introduced by some developed countries. Half of all the trade in illegal wood-based products is now destined for China, the largest consumer as well as a major processing hub.

At the same time, domestic demand for timber has been rising in producer countries, providing a market for both legal and illegal timber. Second, more forest is being cleared for agriculture and other land uses. As much as half of all tropical timber traded internationally now comes from forest conversion, of which nearly two-thirds is thought to be illegal. Third, logging by small-scale producers has soared in many countries. Such activity is often illegal and remains beyond the scope of many policy and regulatory efforts.

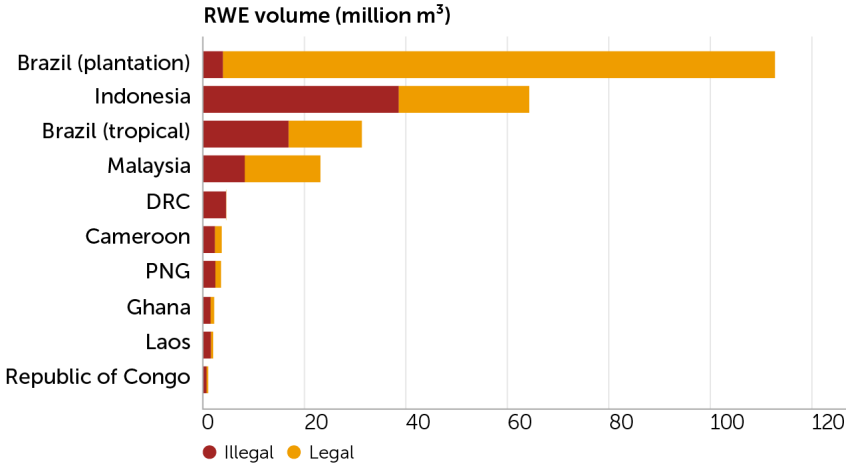
Most illegal timber comes from just three producer countries, although some other countries have much higher shares of illegal timber within their overall production. The vast majority of illegal timber in 2013 came from Indonesia (around 50 per cent of the global total), Brazil (25 per cent) and Malaysia (10 per cent). This in part reflects the size of these countries' forest sectors, as they also produce large volumes of legal timber.

Figure 21: Estimated percentage of imports of wood-based products at high risk of illegality into the 10 largest processing and consumer countries (by Roundwood equivalent volume), 2000–13



Source: Hoare, A. (2015), Tackling Illegal Logging and the Related Trade: What Progress and Where Next? *Chatham House Report, London: Royal Institute of International Affairs, p. ix, https://cht.hm/2kitRYQ (accessed 19 Mar. 2019).*

Figure 22: Estimated production of legal and illegal timber in 9 producing countries, 2013



Source: Hoare, A. (2015), Tackling Illegal Logging and the Related Trade: What Progress and Where Next? *Chatham House Report, London: Royal Institute of International Affairs, p. ix, https://cht.hm/2kitRYQ (accessed 19 Mar. 2019).*

Acronyms

CETA	Comprehensive Economic and Trade Agreement
CPTPP	Comprehensive and Progressive Trade Agreement for Trans-Pacific Partnership
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign direct investment
ICT	Information and communication technologies
IFAD	International Fund for Agriculture
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
ISEAL	International Social and Environmental Accreditation and Labelling
ISO	International Organization for Standardization
NCDs	Non-communicable diseases
NDCs	Nationally determined contributions
NGOs	Non-governmental organizations
R&D	Research and development
RCEP	Regional Comprehensive Economic Partnership
RTAs	Regional trade agreements
SARS	Severe acute respiratory syndrome
SDGs	Sustainable Development Goals
SMEs	Small and medium-sized enterprises
SNAP	Supplemental Nutrition Assistance Program
SPS	Sanitary and phytosanitary
TBT	Technical Barriers to Trade
TEEB	The Economics of Ecosystems and Biodiversity
UNCTAD	United Nations Conference on Trade and Development
VSS	Voluntary Sustainability Standards
WFP	World Food Programme
WHO	World Health Organization
WTO	World Trade Organization

Acknowledgments

With thanks to Tim Benton, Duncan Brack, Antony Froggatt, Richard King, Dr Bayu Krisnamurthi and Laura Wellesley, as well as the anonymous reviewers, for their helpful input on earlier drafts of this work. Thank you also to Vera Chapman Browne and Jo Maher for their comments and edits of the various drafts of this research paper. We are grateful, also, to the team at Applied Works for their both diligent and creative approach in bringing this paper to life. Finally, we would like to thank the Food and Land Use Coalition (FOLU) for their financial support for this work.

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Design: Applied Works
Illustration: Nathalie Lees

ISBN 978 1 78413 363 4

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