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Forests, Food Systems and Livelihoods: Trends, Forecasts and Solutions to Reframe Approaches to Protecting Forests

INSIGHT REPORT

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Foreword

The urgency for action to protect tropical forests and ensure sustainable rural livelihoods has never been greater.

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Does the world really need another report on the state of food systems and tropical forests? So much has already been written, but we have not yet managed to find a way to solve the issue of competing demands on these vital landscapes. Vital in the deepest sense of the word since they provide homes, food, livelihoods, biodiversity stores and environmental services fundamental to all life on Earth.

This document provides new datasets on past trends and future developments – and offers ideas on how to reframe the challenge in a way that can contribute to deeper dialogue, understanding and breakthroughs in this most difficult of sectors.

Everyone knows that food is fundamental to life. Paradoxically, the same food, land and ocean use systems that produce what we need to survive pose one of the greatest threats to life. These systems are responsible for more than 30% of global greenhouse gas (GHG) emissions and put biodiversity, fresh water and the world's forests at risk. In turn, deforestation and forest degradation affects the lives of 1.6 billion people whose livelihoods depend on forests, one billion of whom are among the world's poorest.[1] At the same time, these systems, including their full supply chains, represent around $10 trillion of GDP (12% of global GDP) and up to 40% of employment. [2]

The facts speak for themselves: more than 80% of tropical deforestation occurs in landscapes where agriculture is the dominant driver, and much of this is linked to the production of globally traded commodities, including soy, palm oil, cattle, cocoa, coffee and wood pulp. For the past decade, enormous emphasis has been placed on companies taking responsibility to remove deforestation from their supply chains. While there is absolutely no doubt that greater private-sector ambition and action are urgently needed, the evidence shows that this is insufficient in isolation, and the community must work together to address the root causes, not the symptoms, of tropical deforestation.

This report takes a broad perspective: by looking at global trends and the supply and demand dynamics of the commodities driving deforestation, it uses data to paint a detailed picture of many competing objectives for the same landscapes – how to feed a growing global population, how to sustain and enhance rural livelihoods, how to protect forests and other ecosystems that store carbon, regulate the water cycle and harbour 80% of global biodiversity.

We hope that this information can inform an increasingly sophisticated dialogue to resolve the apparent contradictions, the necessary trade-offs and unintended consequences facing all of us working to achieve a sustainable future.

In the short term, the United Nations Food Systems Summit, COP26 and the Indonesia- and UK-led Forest, Agriculture and Commodity Trade (FACT) Dialogue present immediate opportunities to create a new dynamic for the agenda in the 2020s. In the context of future trends – and particularly in light of the latest Intergovernmental Panel on Climate Change (IPCC) AR6 report on climate change – the urgency for action to protect tropical forests and ensure sustainable rural livelihoods has never been greater.

Executive summary

Commodity-driven deforestation sits at the heart of the challenges facing global food systems.

This report provides a close examination of global trends and the supply and demand dynamics of key commodities produced in the tropics, namely beef, leather, palm oil, soy, wood fibre, coffee and cocoa. It explores how commodity-driven deforestation occurs at the centre of the competing objectives of food security, rural development, global trade and environmental protection.

Protecting tropical forests is possible, and it can happen if stakeholders working to tackle the issue are able to bring their agendas together. In so doing, this will strengthen food systems and enable rural development. The imperative for collective action is made even greater by emerging trends. Existing strategies and interventions to tackle commodity-driven deforestation must be re-evaluated, confronting the rising demand for food, coupled with climate change and other challenges facing agricultural production in the tropics, as well as the shifting importance of trade between fast-growing middle-income countries and the emerging tropical agriculture exporter hubs in Latin America, West Africa and South-East Asia.

Key findings

Globally, the annual consumption of food and agricultural products rose by about 48% between 2001 and 2018.

The past two decades have seen a dramatic increase in demand for agricultural commodities. Globally, the annual consumption of food and agricultural products rose by about 48% between 2001 and 2018, growing at more than twice the rate of increase in the human population.

The increase in demand was largest in Asia, accounting for 60% of total growth in demand, and was largely tied to the expansion in the global middle class, which has more than doubled since 2000.

There has been a significant shift of agricultural production towards tropical regions. Meeting the global demand growth for agriculture, global production also expanded by about 47% in volume. Some 63% of this rise in global agricultural production came from tropical regions, which now represent 50% of global agricultural output, up from 44% in 2001.

This shift in production to tropical regions has increased the importance of trade between fast-growing middle-income countries and the emerging tropical agriculture exporter hubs in Latin America and South-East Asia, including increasing domestic demand in large tropical producer countries, such as Brazil and Indonesia.

Shifts in supply and demand have had a major global impact on nutrition and rural development. Since 2001, 160 million people have been lifted out of undernourishment, and the number of undernourished people globally has declined in absolute terms, even as the population was growing. At the same time, there has been an increase in per capita food consumption, particularly protein, which has risen by 45% globally since 2000. Agriculture has been an important driver of exports and employment in many tropical forest countries. In fact, certain soft commodities are a key part of the rural development strategy because of their importance in the overall agricultural landscape. For example, soybeans are now the most valuable export product for Brazil, and around 16.3 million people (12% of the total workforce) are employed in the palm oil industry in Indonesia.

Tropical forest loss remains stubbornly high, and the majority of this loss is associated with agricultural activities. Global Forest Watch (GFW) shows that since 2002, more than 60 million hectares of primary forest have been lost in the tropics, equivalent to an area the size of France. The vast majority – more than 80% – of tropical deforestation occurs in landscapes where agriculture is the dominant driver. The share that can be directly attributed to expansion of agricultural production is between half and three-quarters of the total deforestation.

Historic deforestation trends differ across commodities, and there are some promising developments, but more action is needed, especially to tackle conversion to pasture. Between 2001 and 2015, 36% of cumulative agricultural tree cover loss was due to conversion to pasture, and 20% was associated with the production of palm oil, soy, cocoa, coffee and wood fibre. However, there are important differences between the deforestation trends of these commodities, which suggests that tailored supply- and demand-side measures are required.

While there is reason to be optimistic, including four consecutive years of reductions in primary forest loss in Indonesia since 2017, tropical deforestation rates remain high, and future trends are uncertain. Crucially, interventions intended to stop commodity-driven deforestation must address the underlying drivers, including land tenure, governance and rural economic development. Private-sector approaches in isolation cannot achieve this.

Demand for key agricultural commodities will continue to grow in the future. The global middle class is expected to continue to increase by a further 1.8 billion between now and 2030, with 89% of the growth driven by Asia. Further economic growth and the expansion of the middle class will continue to push increases in per capita consumption across most emerging markets. Of particular note is the rising importance of domestic demand in large tropical producer countries, especially Brazil and Indonesia, a trend that is only expected to strengthen in the coming decade.

Climate change and demographic shifts are expected to pose a significant risk to agricultural production in the tropics. The Intergovernmental Panel on Climate Change (IPCC) has established that climate change has already had an adverse impact on food security and terrestrial ecosystems, and that the tropics and subtropics are projected to be the most vulnerable to crop yield decline due to climate change. This, coupled with tropical countries facing a shrinking agricultural labour force – by as much as 20 million by 2030 – suggests that the rural development models that have underpinned the expansion of tropical agriculture in the first two decades of the century are coming under increasing pressure from several angles.

Systemic solutions that respond to emerging trends are urgently needed to help reduce tropical forest loss. In the context of rebuilding from the ravages of COVID-19 and the increased urgency in relation to climate and biodiversity action, there is a unique opportunity to harness an even greater momentum for change and advance the broader food and land use transitions that are needed. Keeping forests standing is linked directly to sustaining rural livelihoods, ensuring food security for a growing global population, and supporting economic development. While most specific solutions need to be designed on a commodity-by-commodity and region-by-region basis, there are principles that hold true for addressing deforestation in a way that meets the multiple competing objectives on these critical landscapes.

These include the following areas:

- **A food systems approach holds promise.** Commodity-driven deforestation and the conversion of other critical ecosystems cannot be treated in isolation, as an environmental issue, or a supply chain problem, because it sits at the heart of the challenges facing global food systems.
- **Improving rural livelihoods must be at the centre of solutions.** To solve deforestation linked to commodity production, the livelihoods and resilience of farmers must be enhanced.
- **Finance solutions and incentives are needed to support the transition.** Mobilizing finance to create incentives for farmers to conserve more while producing food is critical, with potential sources coming from both carbon finance and domestic finance for rural credit.
- **Tailored supply- and demand-side measures are required.** It is vital to consider the unique characteristics of the commodities and their countries of origin when developing solutions, and policies must be adapted with these differences in mind.
- **Corporate action must continue.** Leading companies must continue to make ambitious efforts both on individual supply chains and sector-wide transformation to contribute to reduced net deforestation.
- **Greater investment in transparency and improvements in collaborative data frameworks will be a critical enabler.** Tackling these data gaps is crucial as doing so will help to robustly track progress on interventions, as well as highlighting where further efforts are needed.
- **Policy innovation that challenges assumptions and includes producer voices is needed.** Given the complexity of the problem, it is crucial to avoid introducing policies with unintended consequences, as we have already seen with the impact of biofuel mandates on land use.
- **Collective action is crucial to success.** Success can be achieved only through collective action and collaboration, across geographies, sectors and stakeholders, both within and beyond supply chains.

1 A rising tide of demand for tropical commodities

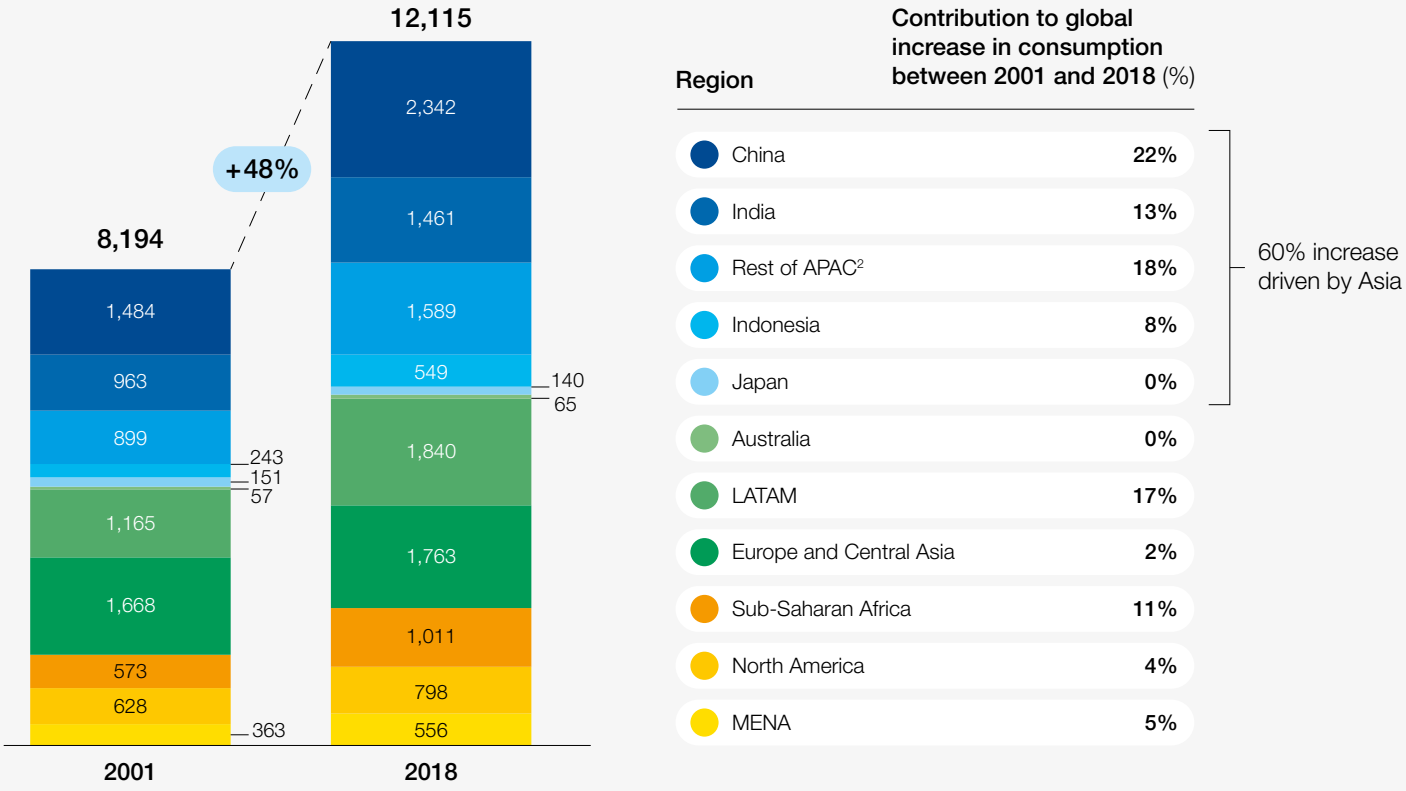
The past two decades have seen a dramatic increase in demand for agricultural commodities, coupled with a shift in agricultural production towards tropical regions. This has had a major impact on livelihoods and land use.

The first two decades of the 21st century saw rapid growth in demand for agricultural commodities. Globally, the annual consumption of food and agriculture products rose by about 48% between 2001 and 2018, growing at more than twice the rate of increase in the human population.

Demand varied significantly across regions; the increase was largest in Asia (accounting for 60% of total growth in demand), where China, India and the rest of Asia Pacific accounted for 22%, 13% and 18%, respectively (Figure 1). The growing Asian demand for agriculture and food products reflects both the size of the continent in terms of population – about 60% of humanity lives in Asia – and the region's rapid economic transformation over the past two decades, lifting per capita food consumption closer to other industrialized countries.

FIGURE 1 **Agricultural demand grew by 48% between 2001 and 2018, with Asia driving 60% of that increase**

Breakdown of global agricultural consumption by region, 2001 and 2018[1]
Million tonnes



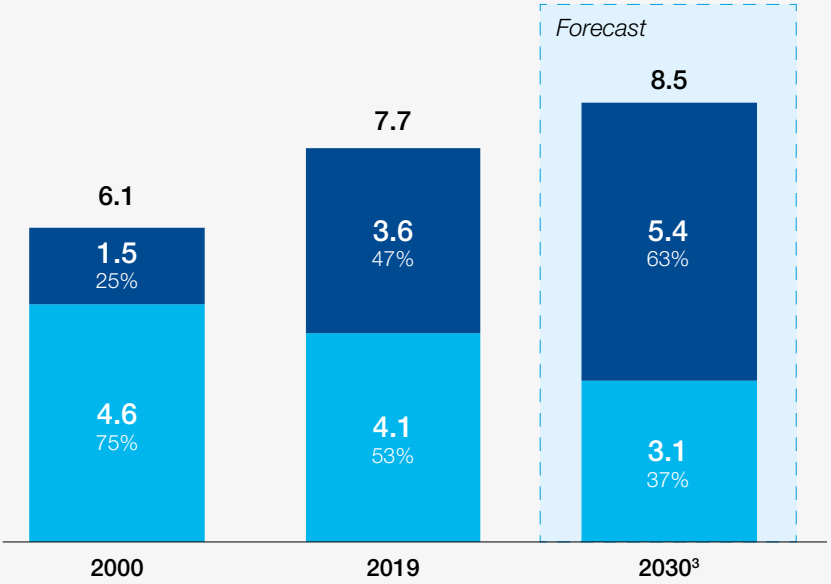
Note: Figures may not sum due to rounding.
1 Includes FAO data on all crops, crops processed, livestock primary and livestock processed present; consumption is production + import – export.
2 Rest of Asia Pacific excludes Australia, China, India, Indonesia and Japan; MENA consists of Middle East and North Africa.

Sources: FAOSTAT; AlphaBeta analysis.

Notably, this growth in demand is largely tied to the expansion in the global middle class, which has more than doubled since 2000 (Figure 2).[3] Currently around 110 million people join the global middle class annually, which is at a scale unprecedented in global history.[4] In the world today, about one person escapes extreme poverty every second; and five people a second are entering the middle class. While the COVID-19 pandemic will slow this growth, the overall trend is projected to continue.

FIGURE 2 | **Growth in consumption is driven mainly by the rapid increase in the global middle class**

Global population, segmented by middle class, 2000 and 2019
Billions of people



Increase in the number of people across categories

	2000–2019	2019–2030
Middle class[1]	+2.1	+1.8
Others[2]	-0.5	-0.9

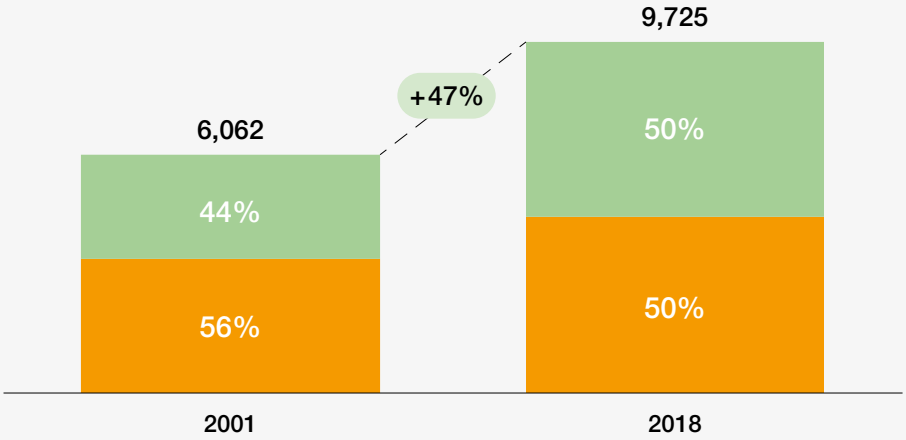
1 Middle class is defined as comprising those households with per capita income between $10 and $100 per person per day (pppd) in 2005 purchasing power parity (PPP) terms (Kharas, 2017; World Bank, 2007; Ernst and Young, 2013; Bank of America Merrill Lynch, 2016). This implies an annual income for a four-person middle-class household of between $14,600 and $146,000. Taking into account inflation, the income range for middle-class families can now be expressed as $11 to $110 pppd in 2011 PPP terms.
2 Others is the rest of the population above and below the middle class.
3 Total population for 2030 is taken from the UN World Urbanization Prospects and middle class from the Brookings forecast.

Sources: Brookings; World Bank; AlphaBeta analysis; UN World Urbanization Prospects.

There has been a significant shift in agricultural production towards tropical regions.
To meet the growth in global demand growth for agricultural products, global production also expanded by about 47% in volume. Some 63% of this rise in global agricultural production came from tropical regions, which now represent 50% of global agricultural output, up from 44% in 2001 (Figure 3). This shift reflects several crucial factors: the general comparative advantage in gross primary productivity of vegetation in tropical regions over temperate ones;[5] lower labour and production costs; the availability of land for agricultural expansion; and the importance of agriculture in the rural development strategies of tropical forest regions.[6] This shift in production to tropical regions has increased the importance of trade between fast-growing middle-income countries and the emerging tropical agriculture exporter hubs in Latin America and South-East Asia, including increasing domestic demand in large tropical producer countries such as Brazil and Indonesia.

FIGURE 3 | **Tropical regions have significantly increased their contribution to global agricultural production from 2001 to 2018**

Global agricultural output production,[1] 2001–2018
Million tonnes



Share of the growth in agricultural output

Tropical countries	63%
Non-tropical countries	37%

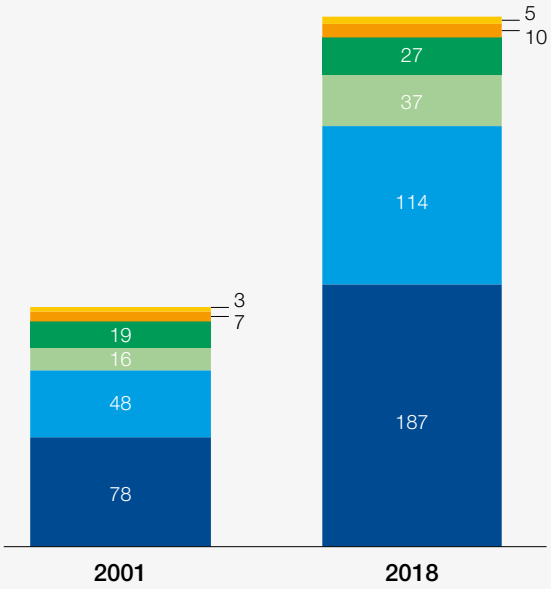
1 Includes all crop commodities, as FAOSTAT does not have data for area harvested for livestock.

Sources: FAO State of the World's Forests 2020; FAOSTAT.

The rapid expansion of production involved all of the soft commodities that are the focus of this report. Their production in tropical forest countries grew at rates similar to or higher than those of the agricultural sector as a whole (Figure 4). For those commodities that are produced in both temperate and tropical regions, tropical production gained a substantial share. For example, tropical production of soy more than doubled between 2001 and 2018, and the tropical share of soy global production rose from 44% to 54% in the same period.

FIGURE 4 | **The production of key agricultural commodities in tropical forest countries increased significantly between 2001 and 2018**

Tropical forest production of the forest risk commodities, 2001 and 2018
Million tonnes



	Percentage growth in tropical forest production 2001–2018	Tropical forest country share of global production 2018
Cocoa	64%	99%
Coffee	40%	98%
Beef[1]	46%	37%
Wood pulp	128%	19%
Vegetable oil	135%	53%
Soy	141%	54%

1 Includes buffalo meat.

Sources: FAO database; AlphaBeta analysis.

These shifts in supply and demand have had a major global impact on nutrition, rural development and land use.

A significant decline in malnutrition

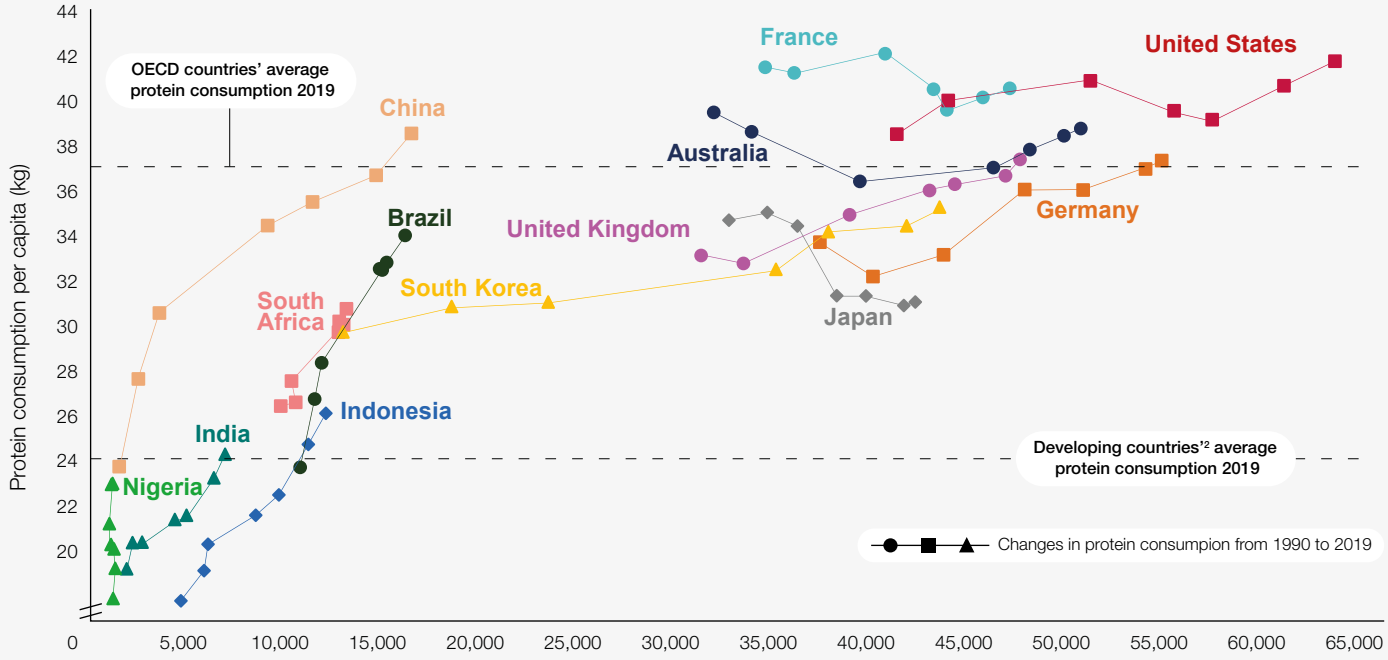
These global trends in part contributed to the tremendous progress in tackling hunger and malnutrition. Since 2001, 160 million people have been lifted out of undernourishment.[7] For what might be the first time in human history, the global number of undernourished people declined in absolute terms, even as the population was growing. This is especially true in Asia, where undernourishment declined by 74% and 42% in China and Indonesia, respectively, during this period. In China, 100 million people were lifted out of undernourishment between 2001 and 2018, with the percentage of undernourished people in the country falling from 10% to 2%. This significant decline in malnutrition is closely linked to reduced poverty.

Increase in per capita food consumption, particularly protein

This rise in the middle class is linked to dietary shifts that bring about increased demand for agricultural commodities, in particular through increases in protein consumption, which grows rapidly with rising incomes. For example, global protein consumption has risen by 45% since 2000, with 22% of the growth coming from China and more than half from Asia. China and India, which both had very low per capita protein consumption in 1990, saw increases of 63% and 27% respectively in 1990–2019. It is important to note, however, that per capita protein consumption in fast-growing middle-income countries is still significantly lower than in Organisation for Economic Co-operation and Development (OECD) countries (Figure 5).

FIGURE 5 **Per capita protein consumption is still significantly lower in many developing countries compared to the OECD average, but it is slowly catching up**

Per capita protein consumption/year, 1990–2019[1]



Sources: FAO; World Bank; AlphaBeta analysis.

1 This includes all protein sources: plant, meat, eggs and dairy, aquaculture, wild-catch fisheries and non-traditional.

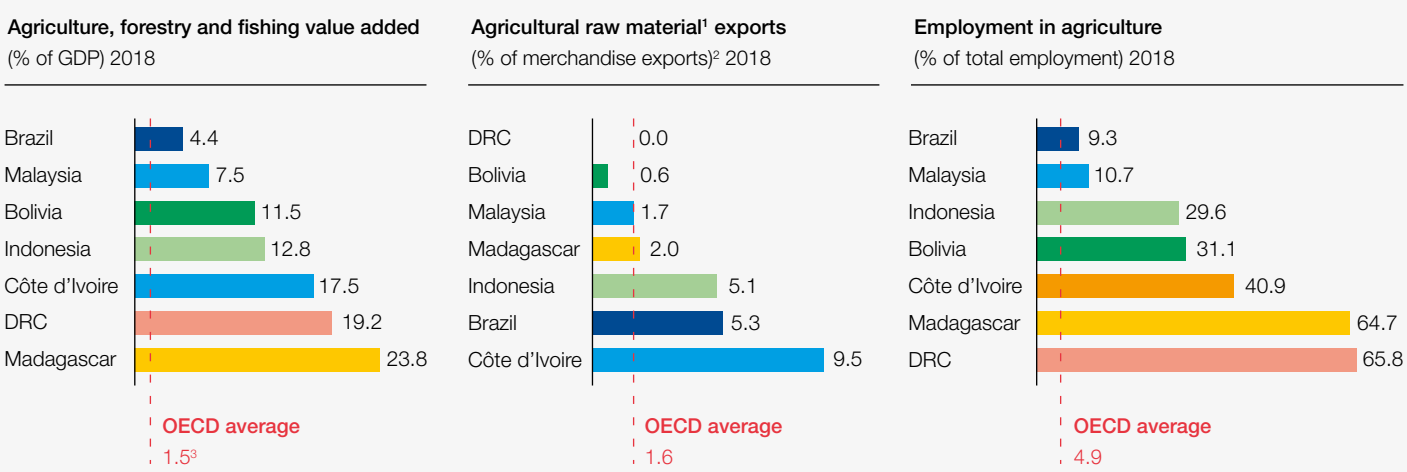
2 Includes lower-income and lower middle-income countries as classified by the World Bank.

Agriculture is driving rural development

The combination of rising prices and of the shift in production towards tropical forest countries has made agriculture an important driver of exports and employment in many of these countries. For example, agriculture represents 30% of total employment in Indonesia, 11% in Malaysia and 9% in Brazil, far higher than the 5% in OECD economies. Similarly, agriculture was almost 13% of GDP in Indonesia, 8% in Malaysia and more than 4% in Brazil, again greater than the 1.5% contribution to GDP on average in OECD economies (Figure 6). Agriculture also represents 9.5% and 5.3% of total merchandise exports in Côte d'Ivoire and Brazil, respectively. Soybeans are now the most valuable export product for Brazil.[8] Certain soft commodities are a vital part of the rural development strategy because of their importance in the overall agricultural landscape. For example, Côte d'Ivoire has 600,000 farmers producing cocoa (7% of the total workforce) and about 6 million people working in the cocoa industry directly and indirectly.[9] Similarly, around 16.3 million people (12% of the total workforce) are employed in the palm oil industry in Indonesia, from farmers and mill workers to service goods suppliers.[10] Crucially, although agriculture is an important source of employment, smallholder farmers make up a significant portion of the world's poor who live on less than $2 a day.

FIGURE 6 **Agriculture is a much more important economic sector in all tropical forest countries compared to the OECD average**

The role of agriculture in GDP, exports and employment in tropical countries



1 Agricultural raw materials comprise SITC section 2 except fuels, including categories such as live animals, meat and meat preparations, cereals, vegetables and fruit, beverages, machinery, pharma etc.
2 Merchandise exports show the f.o.b. (free on board) value of goods provided to the rest of the world.
3 2017 average.

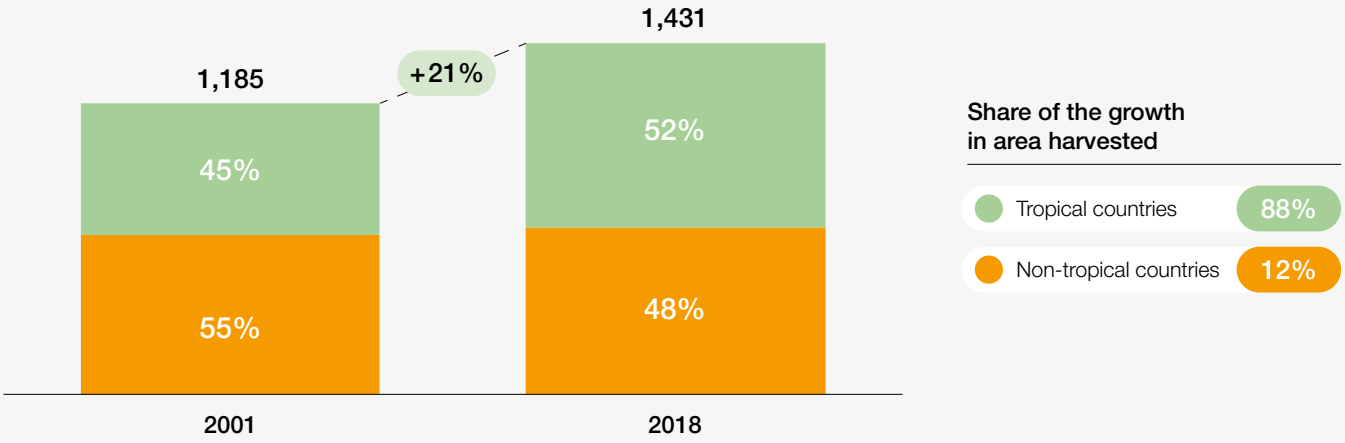
Sources: World Bank data.

There has been an expansion of cultivated land

Although land in the tropics often has a higher-yield potential, the expansion of production in tropical regions has been particularly land-extensive – while tropical regions accounted for 63% of the expansion in production of agricultural crops, they accounted for 88% of expansion of the area under cultivation (Figure 7). This is partly explained by time lags between the conversion of areas to crops and the attainment of high production levels; this is particularly important for perennial crops such as palm oil but it is also true for annual crops, for instance, soy. During periods of rapid expansion, newly established crop areas, which have lower yields until they reach maturity, make up a relatively larger share of the total crop area, reducing average yields.

There is also substantial data highlighting the yield gap between smallholder farmers growing commodities and larger farmers and plantations in many parts of the tropics. For example, Indonesian palm oil smallholders often achieve yields of only 10–15 tonnes per hectare, roughly half of the 20–25 tonnes per hectare achieved by some large plantations.[11] Finally, there is evidence of land speculation with the expectation of future returns, one example of which is expansion for low-productivity cattle grazing in Latin America.

Global area harvested,[1] 2001–2018
Million hectares



1 Includes all crop commodities, as FAOSTAT does not have data for area harvested for livestock.

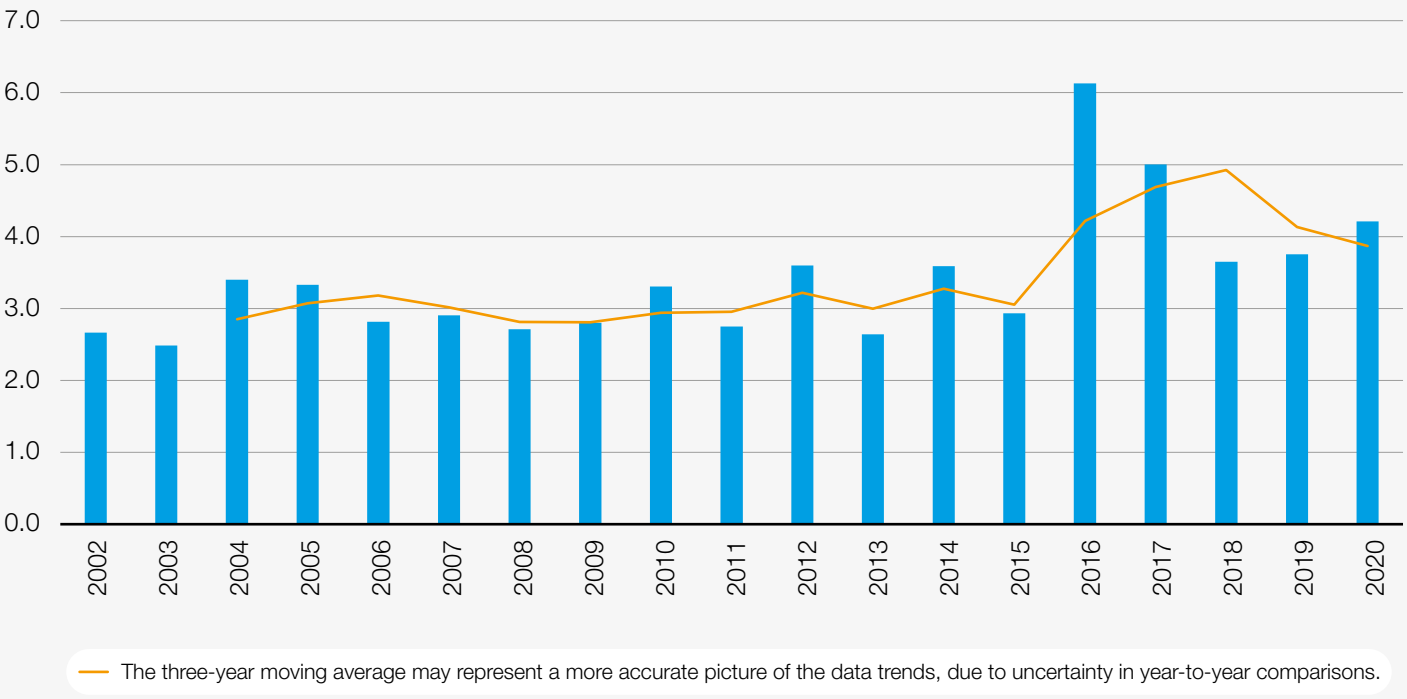
Sources: FAO State of the World's Forests 2020; FAOSTAT.

Tropical forest loss remains stubbornly high and the majority of this loss is associated with agricultural activities.

Analysis of tree cover loss as measured by the University of Maryland from remote sensing data and reported through Global Forest Watch (GFW) shows that more than 200 million hectares of tree cover have been lost in the tropics in the past 20 years – an area roughly the size of Indonesia.[12] Of particular significance is the loss of primary forests in the humid tropics (and subtropics) that are such a rich store of carbon and harbour an estimated 80% of terrestrial biodiversity globally. Primary forest loss in the tropics has exceeded 60 million hectares since 2002, an area the size of France. The loss was 12% higher in 2020 than the year before and was the second year in a row that primary forest loss worsened (Figure 8). This is despite significant efforts and commitments, such as the New York Declaration on Forests, made by governments, the private sector and civil society to curb deforestation over the past two decades.

FIGURE 8 | **Since 2002, more than 60 million hectares of primary forest have been lost in the tropics, equivalent to an area the size of France**

Tropical primary forest loss, 2002–2020
Million hectares



Source: World Resources Institute, Global Forest Watch.

Several factors drive forest loss, including agriculture, forestry, wildfire and urbanization. Agricultural expansion is the dominant direct cause of primary forest loss and deforestation in the tropics. The vast majority – more than 80% – of tropical deforestation occurs in landscapes where agriculture is the dominant driver, but the share that can be directly attributed to expansion of agricultural production is between half and three-quarters of the total deforestation, as a significant portion of deforested land is never used productively for agriculture due to problems with productivity, access to credit, land tenure and land speculation.[13]

Limitations on data related to forest loss

It is important to note that the complex dynamics between agricultural commodity production and deforestation are not fully understood. The data presented is based on satellite imagery of tree cover, which is a useful metric for monitoring changes in forests because it can be easily measured from space using available satellite imagery. However, not all tree cover loss is deforestation. Defined as permanent conversion of forested land to other land uses, deforestation can be identified only at the moment when trees are removed if it is known how the land will be used afterwards. In the absence of a global dataset on land use, it is not possible to accurately classify tree cover loss as permanent (i.e. deforestation) or temporary (e.g. where it is associated with wildfire, timber harvesting rotations or shifting cultivation) at the time it occurs. However, new models analysing spatial and temporal trends in tree cover loss are enabling better insights into the drivers of loss.

The World Resources Institute Global Forest Review provides more detailed definitions and explains these challenges in greater detail. Available at: research.wri.org/gfr/data-methods.

2 Commodity production driving deforestation

More than 80% of tropical deforestation occurs in areas where agriculture is the dominant driver, but there are notable variations in both the trends in demand and the deforestation impacts of commodities in the tropics.

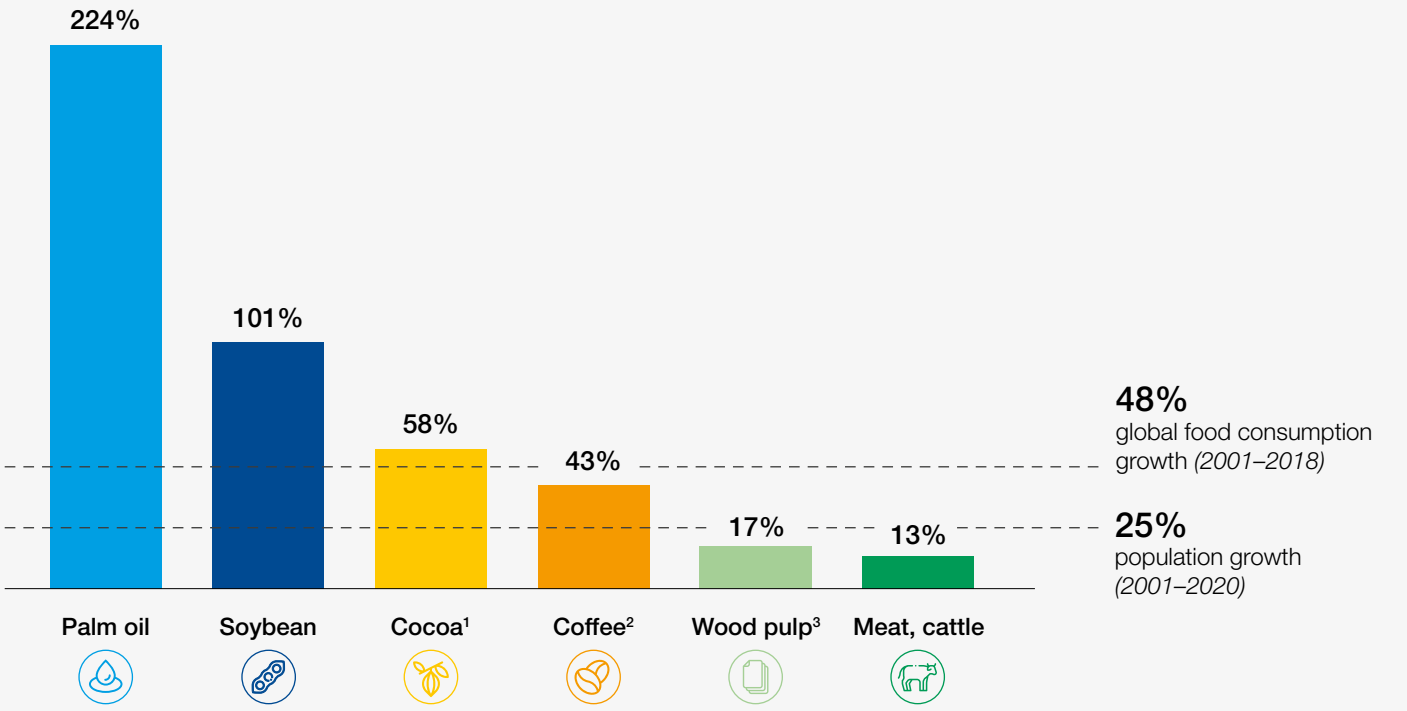
A closer look at specific soft commodities and key producing regions helps shed light on the complexity of the problem. The variability in trends across the commodities and regions suggests that tailored interventions will need to factor in the unique characteristics and conditions of each crop and producing country. However, in order to be effective, such interventions must also address the underlying drivers of deforestation – broader challenges including land tenure, governance and rural economic development.

There are variations in demand trends.
The soft commodities considered to be the leading drivers of deforestation have been exposed to the same global trends that affected agricultural supply and demand dynamics, but there are important differences between them in terms of past demand trends and their relative impact on tropical forest loss.

Annual demand for soybean and palm oil grew by 101% and 224% respectively from 2001 to 2020, which is respectively twice and four times the growth of the overall agricultural sector and four to nine times the growth of the overall population and is linked to the surge in the middle class over the past decade (Figure 9). Demand for coffee and cocoa grew in line with agricultural sector growth, while demand for cattle meat (13%) and wood pulp (17%) rose at a substantially slower pace, even slower than population growth.

FIGURE 9 **Increasing demand for most forest risk commodities is driven by higher per capita consumption, not population growth.**

Global demand for forest risk commodities, 2001–2020



1 Cocoa growth is for 2001–2018 as it uses FAO data, since USDA data is not available.
2 Coffee growth is for 2003–2020, as USDA data for 2001 was incomplete.
3 Wood pulp growth is for 2001–2018 as it uses FAO data, since USDA data is not available.

Sources: USDA; FAOSTAT; AlphaBeta analysis.

As previously noted, growth in Asian GDP, particularly in China, has been a core driver of the increased demand, although with some important differences between commodities. Asian demand has underpinned all growth in demand for wood pulp, and more than half of the demand growth for proteins and vegetable oils, but played a much smaller role in coffee and cocoa, where Europe and the United States remain important as processing centres that add value to the raw commodity. For beef, global demand growth has been driven largely by China and the rest of the Asia Pacific (APAC) region.

Historic deforestation trends differ across commodities, and while there are some promising developments, more action is needed, especially to tackle conversion to pasture.

Although more than 80% of tropical deforestation occurs in areas where agriculture is the dominant driver, a closer look at a range of agricultural activities quickly exposes a much more complex picture. Within the range of agricultural activities, conversion to pasture accounted for 40% of agricultural tree cover loss between 2001 and 2010, and 29% between 2011 and 2015 (Figure 10). The tree cover loss in the tropics associated with the five other globally traded agricultural commodities (soy, cocoa, coffee, palm oil and wood pulp) accounted for 22% of agricultural tree cover loss between 2001 and 2010, and 16% between 2011 and 2015.[14] Importantly, other agricultural activities, including other commodities (e.g. avocado, corn, cotton), local food production, subsistence farming and shifting agriculture,[15] account for 38% of agricultural tree cover loss between 2001 and 2010, and 55% between 2011 and 2015. Preliminary data for 2016–2018 indicates pasture accounting for 23% and the five commodities for 5% of agricultural tree cover loss. These figures are likely to be an underestimate due to a likely time lag between the year in which deforestation occurs and the year when the commodity is established as part of the new agricultural land use.[16]

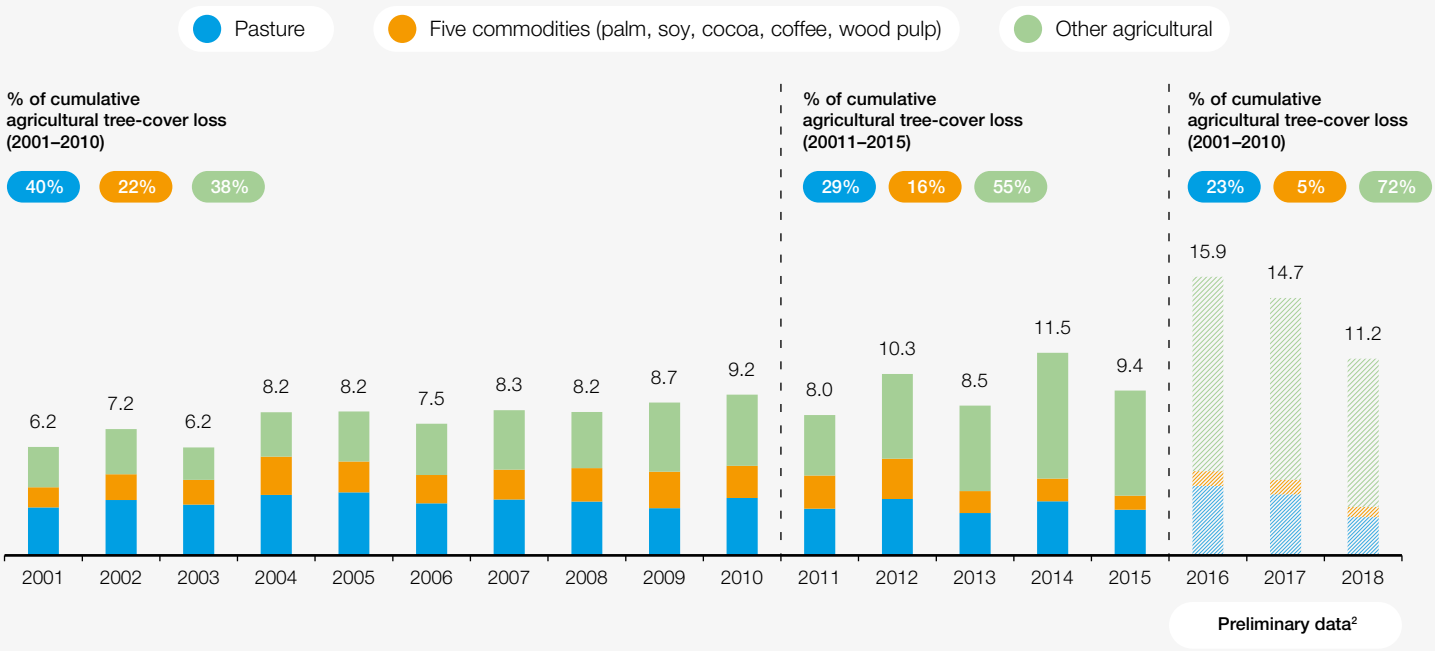
The five commodities (palm, soy, cocoa, coffee and wood fibre) have a smaller impact on forest loss relative to other agricultural activities, but it must be stressed that these are global datasets, and the role that these commodities can play in replacing forests in specific regions, countries or parts of countries can be very significant. In Ghana, for example, conversion of forests to cocoa represents a third of the country's total tree cover loss.[17]

When looking at tree cover loss associated with soy, palm oil, cocoa, coffee and wood pulp, the differences between them quickly emerge (Figure 11).[18]

FIGURE 10 **Conversion to pasture accounts for a significant portion of agricultural tree-cover loss**

Forest loss associated with agriculture in tropical forest regions[1]

Tree-cover loss 2001–2018, million hectares (preliminary data for 2016–2018)



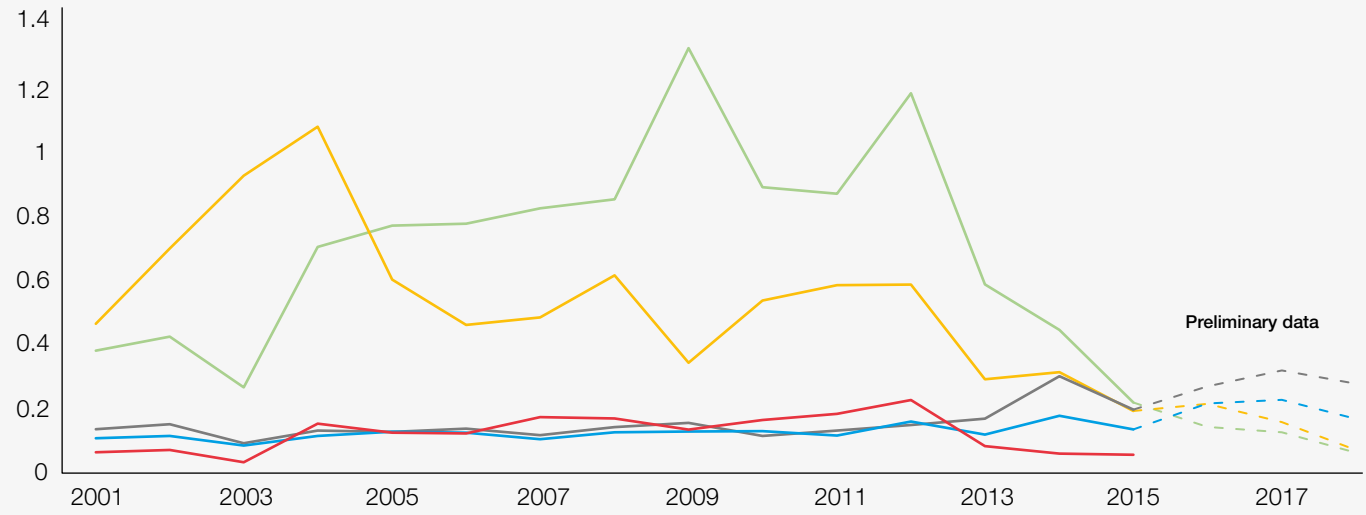
1 The Curtis et al. dataset [Curtis et al. (2018), "Classifying Drivers of Global Forest Loss". Science 361 (6407): 1108–1111] was used to identify total agricultural deforestation (combination of commodity and shifting agriculture), from which data for six commodities was subtracted to obtain other agricultural. The deforestation data of the six commodities is from the Goldman et al. dataset. The other agricultural category includes subsistence farming, other domestic crop production and other shifting agriculture. Data for wood pulp is available only until 2015.

2 The data in the preliminary category is likely to be underestimated. Please refer to the Goldman et al. research for more information.

Sources: GFW, AlphaBeta analysis.

FIGURE 11 | **There is some evidence that the dramatic surge in deforestation and conversion associated with key commodities has declined, but rates remain high and future trends uncertain**

Deforestation linked to commodity production across two decades for tropical forest countries[1]
Million hectares



Percentage change in average deforestation between time periods

	2006–2010 vs. 2001–2005	2011–2015 vs. 2006–2010	2016–2018 vs. 2011–2015
Soy	-35%	-19%	-62%
Palm Oil	83%	-29%	-83%
Cocoa	5%	41%	52%
Coffee	11%	15%	44%
Wood pulp[2]	70%	-20%	N/A

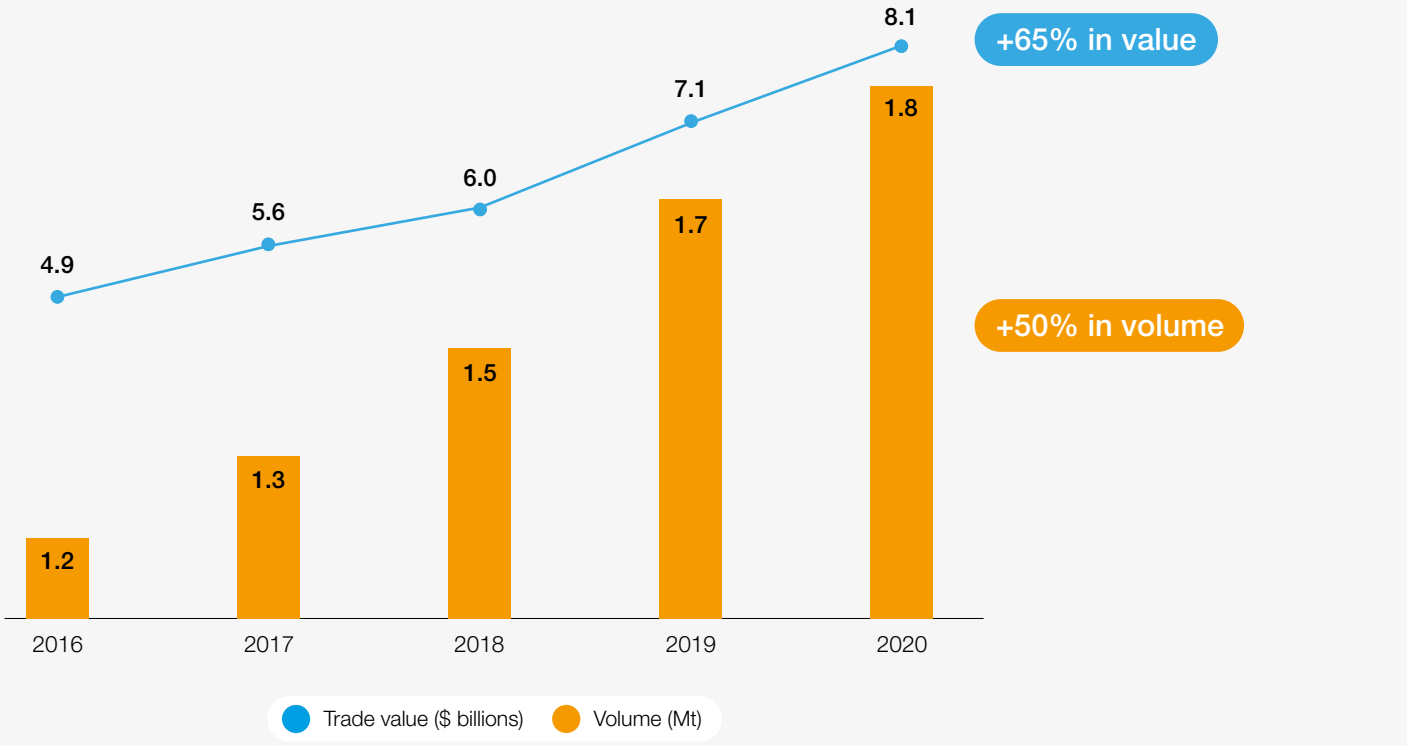
1 The term "deforestation" is used rather than "tree-cover loss" as the analysis assumes that any former area of tree cover now occupied by one of the seven analysed commodities represents a human-caused, permanent change in land use.
2 Data for wood pulp is available only until 2015.

Sources: GFW database; AlphaBeta analysis.

Beef and leather

Brazil boasts the largest commercial cattle herd in the world and is at the forefront of the global production of beef and leather. Although 80% of beef produced in Brazil is consumed domestically, it is highly integrated into international markets.[19] Large multinational retailers and brands play a vital role in the local market and, crucially, Brazil is the world's largest exporter of beef. While domestic consumption is flat or declining, recent figures indicate that exports are on the rise, particularly to Asia. According to United Nations trade statistics, between 2016 and 2020 Brazilian beef exports saw a 50% increase in quantity and a 65% increase in value (Figure 12). Brazil is also the world's second largest producer of leather, accounting for nearly 10% of global production. Between 2018 and 2020, Brazil exported $1.2 billion worth of leather per year on average.[20] Exports of beef and leather represent a significant share of meat packer revenue and play a vital role in the financial viability of the sector. Growing demand from export markets exerts pressure on production, which in turn increases the risk of deforestation and conversion.

Brazilian beef exports, 2016–2020
Quantity of exports in million tonnes (Mt) and trade value in $ billions



Sources: UN Comtrade database.

Between 2001 and 2015, cattle pasture replaced 45 million hectares of forest in the tropics, nearly twice the amount replaced by the five other commodities combined. Pasture accounted for 40% of tree cover loss associated with agriculture in the tropics between 2001 and 2010, and 29% between 2011 and 2015. The impact of cattle production in terms of emissions is also notable: cattle accounts for up to 80% of all emissions from land-use change in Brazil.[21]

Crucially, despite concerted efforts to tackle forest loss in the cattle sector in the past 15 years, the rate at which cattle pasture replaced forest did not change in a noticeable way during this time. In 2009, two supply-chain commitments were initiated in the Brazilian cattle sector: the Terms of Adjustment of Conduct (TAC), which are legally binding commitments to stop purchasing cattle from properties with illegal deforestation in the Amazon, and the G4 Cattle Agreement, which was an agreement signed by JBS, Marfrig and Minerva – the three largest meat packing companies – not to purchase cattle from properties in the Amazon biome where land was cleared after 2009.[22] There is evidence that these measures can encourage changes in behaviour, but they have not led to a meaningful reduction in deforestation. The TAC and G4 have recently merged into a unified protocol to align the two agreements and make monitoring easier.[23] Significant challenges remain due to the limited implementation of the commitments, the lack of traceability to indirect suppliers, the presence of informal markets and leakage to slaughterhouses that do not have monitoring in place.[24]

Land speculation also plays a role in conversion to pasture, and has direct linkages to the cattle industry. Land speculation occurs in areas with high land values, and the value of land is higher when it can be used for cattle ranching. Research shows that deforestation is greatest in areas where cattle ranching operations are easily implemented,[25] and there is evidence that land prices, which drive speculation, are influenced by cattle stocking rates and proximity to cattle markets and meat packing plants.[26] Even in instances where the motive to convert land is to sell it at a profit at a later stage, the links to the cattle industry are strong.[27]

Similar dynamics are at play in other key biomes in Latin America, including the Gran Chaco and the Amazonian Andes. The transition to sustainable cattle production and a reduction in deforestation requires a transformation in both the domestic and export markets, realized through strengthened corporate action in tandem with supportive government policies.

Palm oil

Demand for palm oil grew by 224% between 2001 and 2020, four times the growth of the overall agricultural sector. Relative to other vegetable oils, palm oil constitutes the largest share of demand globally, rising from 26% to 36% of total global vegetable oil consumption between 2001 and 2020.

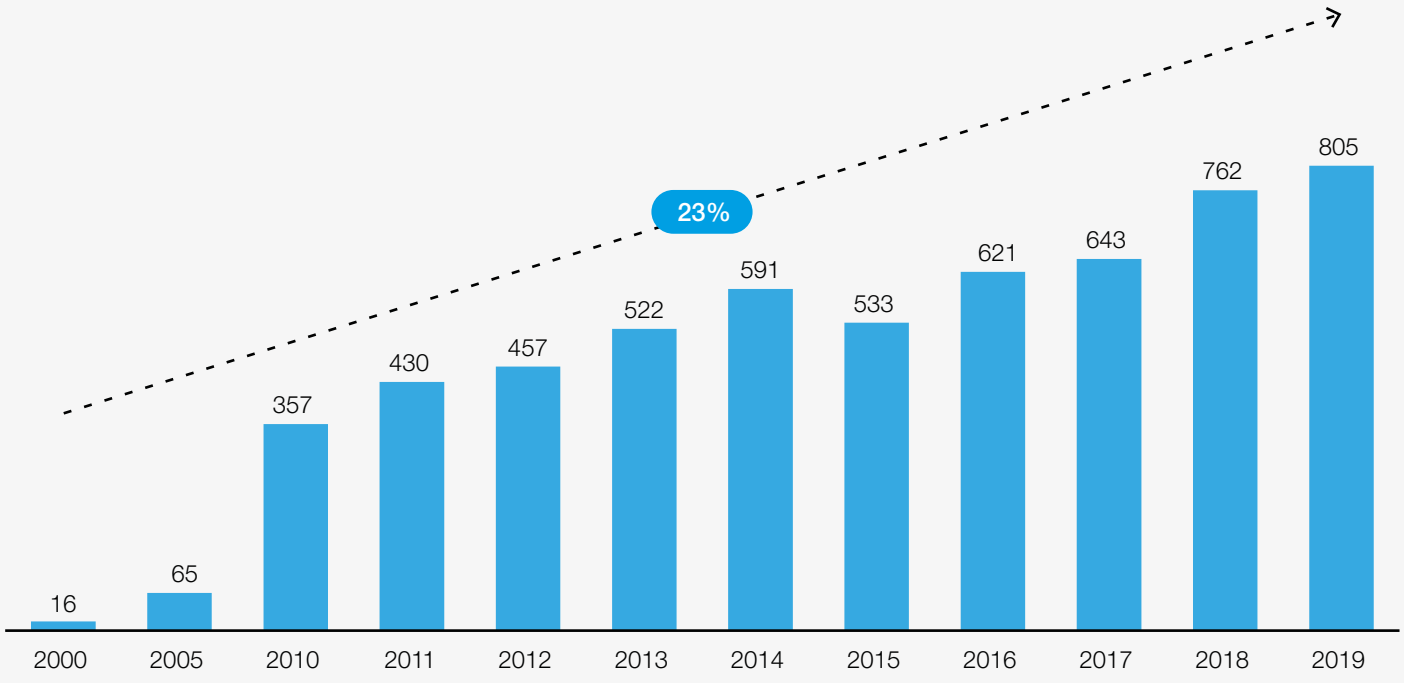
The growth in demand for palm oil (and vegetable oils more broadly) was driven by an increase in per capita consumption across all use categories, including food and non-food applications. Of particular significance was the rising demand for biodiesel reliant on vegetable oil as the primary feedstock. The production of biodiesel globally was only 16,000 barrels per day in 2000 but grew dramatically to 805,000 in 2019 (Figure 13). Notably, the share of palm oil used for biodiesel, a use that was negligible in 2000,[28] increased from 18% in 2011 to around 40% in 2020, driven by policies supporting growth in demand for vegetable oil as feedstock for biodiesel.[29] This increase was driven by key markets including the US, the European Union (EU), Brazil, Argentina, Indonesia, Malaysia and Thailand.

Palm oil is the most efficient vegetable oil on the planet. Relative to other vegetable oils, palm oil is characterized by high yields – up to 10 times more than alternative oil crops. In other words, the land expansion required to meet an increased demand for vegetable oils of 51 million tonnes over the past 20 years, if supplied by rapeseed or sunflower, may have been over 100 million hectares of new land production.

Beyer, R. et al. (2020), "The Environmental Impacts of Palm Oil and Its Alternatives": https://doi.org/10.1101/2020.02.16.951301 (link as of 2/8/21).

FIGURE 13 **Dramatic growth in biodiesel production has underpinned the majority of the overall increase in demand for vegetable oils – for example, in the EU 38% of vegetable oil usage is for biodiesel**

Biodiesel production worldwide, 2000–2019
Thousand barrels per day



Source: US Energy Information Administration.

In absolute terms, 10.5 million hectares of forest were replaced by palm oil between 2001 and 2015.[30] Deforestation linked to palm oil surged between 2000 and 2012, but there was a sharp decline in the rate of deforestation during the period 2013–2018. Preliminary data for 2016–2018 shows a decrease of 80%; Indonesia saw four consecutive years of reductions in primary forest loss in 2017–2020; and the Indonesian Ministry of Environment and Forestry expects this trend to continue until at least 2024.[31]

The decline in deforestation linked to palm oil production has been driven by the increased efforts of governments, supply-chain actors and civil society in tackling forest destruction, including stronger regulation of the palm oil sector (e.g. the 2011 implementation of Indonesia's moratorium on new licences to convert primary forests and peatlands) as well as the implementation of No Deforestation, No Peat and No Exploitation (NDPE) commitments made by supply-chain companies. There are also links to drops in the price of palm oil. Increasingly, deforestation issues are concentrated in smallholder production and outside major concessions. For example, in Indonesia and Malaysia 48% of all deforestation (2017–2019) potentially linked to palm oil occurred outside of known concessions (337,593 hectares), in areas likely to be managed by smallholder and mid-scale farmers. This is particularly important because the per-hectare yields of smallholder farmers are low relative to the yields seen on large-scale plantations, and to compensate for low productivity farmers may clear more land for planting. The risk of deforestation is further increased as the palm trees on smallholder farms reach the end of their life cycle and cease to be productive. Research shows that two-fifths of the total smallholder plantation area in Indonesia – 2.4 million hectares – has reached this stage.[32] Replanting efforts are under way, but these facts highlight the urgent need for solutions that address the root causes of deforestation. Excluding smallholders from supply chains because they pose a higher risk of deforestation will simply exacerbate the problem. Instead, supply-chain and related interventions must be underpinned by smallholder inclusion and address the systemic challenges related to livelihoods, productivity, income diversification and resilience.

Soy

Soy production in the tropics increased significantly between 2001 and 2018. The total area harvested increased by 103% to nearly 70 million hectares, while production increased by 141% to 187 million tonnes. Tropical forest countries increased their share of global production by 10 percentage points. More specifically, Brazil increased soybean production by 211%, Paraguay by 215% and Bolivia by 155%.

Demand for soybeans grew by 101% from 2001 to 2020, two times the growth of the overall agricultural sector and four times the growth of the overall population. The growth of soy has been underpinned by its critical importance as a source of protein for animal feed. The majority – 68% – of harvested soy is processed into soy meal, and 98% of soy meal is used as animal feed. As demand for meat and dairy products has grown in Asia and remained high in the EU, soy production has increased. Significantly, China alone drove 48% of increased demand between 2001 and 2020.

In terms of impact on land use, 8.2 million hectares of forest were replaced by soy globally between 2001 and 2015. Trend lines indicate that, in recent years, soy has replaced less forest than was the case historically, but these declines may not necessarily continue.

In Latin America, the data indicates important differences between the different biomes of the Amazon, Cerrado[33] and Gran Chaco. Deforestation from soy in the Amazon was largely eliminated following the signing of the Amazon Soy Moratorium in 2006, although soy production in the biome increased in the same period by expanding on previously deforested land. The main focus of soy expansion has been in the Brazilian Cerrado and, more recently, the Chaco forests of northern Argentina, Paraguay and Eastern Bolivia. There is no consensus on how much conversion of native habitat is still occurring, but, while the GFW data shows a decline of 19% between the periods 2006–2011 and 2011–2015, broader estimates for the annual expansion of soy range across native vegetation vary between 100,000 and 325,000 hectares per year.

There is one important caveat with regards to soy, challenging the assertion that soy production has begun to decouple from deforestation in Brazil. An increasing body of research suggests that soy contributes indirectly to deforestation:[34] as soy is planted on pasture, the pasture is displaced into forest. This is supported by analyses that suggest that, while soy expansion in Brazil has occurred on existing pasture, the total land area of pasture has remained relatively stable; evidence suggests that for each hectare of soy expansion onto pasture there is at least 1 hectare of forest loss due to pasture expansion to offset the soy encroachment.[35]

Given the extent of degraded or already converted land in the Cerrado, there is scope to shift projected soy expansion to previously cleared land without further conversion of native habitat. Recent research shows that the Cerrado has an area of 23.7 million hectares of degraded pasture that could be converted into more sustainable and productive land use. Of this, approximately 5 million hectares of degraded pasture are suitable for soybean expansion, primarily in the states of Goiás and Mato Grosso. However, producers face challenges in recovering pasture, including lack of technical assistance and difficulties in accessing credit.[36] Collaboration between market actors and governments plus innovation in financial strategies are needed to incentivize farmers to give up their legal right to convert land to pasture and embrace a deforestation- and conversion-free approach. It also requires the tools, finance and incentives to support the transition of degraded land back to productivity.

Wood pulp

> Demand growth for wood pulp is expected to rise, driven by the emergence of new markets for wood pulp such as cellulose for textiles and substitution for single-use plastics for packaging.

Wood pulp refers to the fibrous material prepared from pulpwood, wood chips, particles or residues by mechanical and/or chemical processes. The wood pulp is further manufactured into paper, paperboard, fibreboard or other cellulose products. It excludes recovered paper and pulp made from fibre other than wood.[37] Deforestation surged in the 2000s as large Indonesian companies built out their plantations to support their pulp mills, but it has dropped since 2012.

Demand from Asia has underpinned all growth in demand for wood pulp in the past two decades; it grew at a substantially slower pace than other commodities, and even more slowly than population growth. Global wood pulp consumption has risen by only 17% globally since 2001, with 100% of the growth coming from China (increasing from 5% of the total consumption to 20%), while other developed markets such as Japan and North America have reduced their direct consumption.[38] This increase was driven by demand for packaging, including carton board and case materials, as well as by demand for household and sanitary paper products.

However, the tropical production of wood pulp rose by 128% between 2001 and 2018, and the share of production in tropical forest countries almost doubled from 9.8% to 19.2% in the same period. Deforestation associated with wood pulp grew dramatically in the 2000s, particularly in Indonesia, but deforestation linked to expansion in production dropped by 85% between 2010 and 2019.[39] Despite this progress, there are still challenges associated with meeting the demands of large pulp facilities without putting continued pressure on forests. In Indonesia alone, data from the deforestation data initiative Trase shows that 170,000 hectares were cleared between 2015 and 2019, and plantations on drained peatlands create broader concerns about carbon emissions from oxidizing peat and increased fire risk if not well managed.[40]

Coffee and cocoa

As mentioned above, global demand for coffee and cocoa has grown in line with agricultural sector growth during the past two decades. The data suggests an upwards trend in tree cover loss associated with coffee and cocoa in 2001–2015. In absolute terms, cocoa was responsible for 2.3 million hectares of forest loss and coffee 1.9 million hectares.

Identifying deforestation due to cocoa and coffee is challenging. These crops often grow into the forest and have small-sized farms, which can make deforestation due to their expansion difficult to detect with remote sensing. In fact, a significant amount of deforestation observed in cocoa- and coffee-growing regions may not be linked to these crops at all. While there are considerable uncertainties in recent estimates, the data does raise the possibility that deforestation for cocoa may now be comparable to that for soy or palm.

Coffee

The increased demand has not led to an increase in the overall additional area harvested. However, deforestation associated with coffee has increased despite yield improvements; this is likely driven by the shift in production towards new forest frontiers, influenced in many cases by necessity, with changing weather patterns affecting yield and the viability of the crop for farmers. For example, several of the areas of Colombia in which coffee production is highest today – Huila, Tolima and Cauca – already have moderate levels of water vulnerability and, as climate change intensifies and global demand increases, coffee production is likely to expand to new areas.

Cocoa

Cocoa yields in West Africa have declined (unlike the other commodities examined), so demand has been met by land expansion rather than intensification. Furthermore, 66% of the increase in area harvested is associated with deforestation. Although in absolute terms the overall forest loss footprint for cocoa is smaller than for other commodities, the figures are considerable for some cocoa-growing countries. For example, in Ghana, one third of the country's total tree cover loss between 2001 and 2015 was associated with cocoa.[41]

3

Future projections signal continued pressure on tropical forests

Demand for key agricultural commodities will continue to grow in the future. Tropical agricultural production faces critical challenges, and the pressure on tropical forests is set to continue.

The global middle class is expected to continue to increase by a further 1.8 billion between now and 2030, with 89% of the growth driven by Asia.

As we have seen, demand for agricultural commodities has grown faster than GDP in the past two decades, fuelled by the rise of the global middle class, especially in Asia. The global middle class is expected to continue to increase by a further 1.8 billion between now and 2030, with 89% of the growth driven by Asia; in fact, Asia Pacific's middle class is expected to more than double by 2030, from the 2015 level of 552 million households to roughly 1.2 billion households – even with the temporary shock anticipated due to COVID-19.[42]

Further economic growth and the expansion of the middle class will continue to push increases in per capita consumption across most emerging markets. However, many of the large growing economies are quickly reaching an inflection point at which rising per capita incomes no longer lead to sharp increases in per capita food consumption, particularly with regard to protein (Figure 5).[43] For countries such as China, where per capita GDP and per capita consumption are now at the point where the curve tends to flatten, a marked slowdown in the rise of per capita consumption may be observed, although that will depend significantly on the dietary patterns adopted, particularly in the light of concerns about obesity and other risks to health. For example, per capita protein consumption in China was 38.5kg/person in 2019, compared to 24.2kg/person in India, 19.1kg/person in Nigeria, 38.6kg/person in Australia and 41.7kg/person in the US.

Demand for deforestation-linked commodities is increasingly drawn from middle-income emerging markets, with differences between commodities, a trend that is set to accelerate.

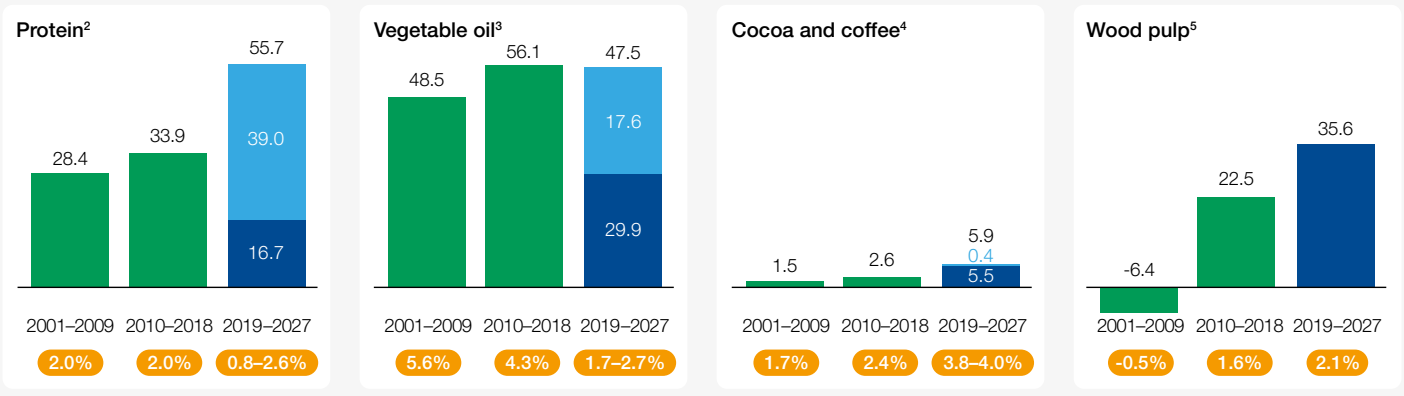
The historic growth in demand was met by increased production in tropical regions, increasing the importance of trade between fast-growing middle-income countries and the emerging tropical agriculture exporter hubs in Latin America and South-East Asia, including domestic demand in large tropical producer countries, especially Brazil and Indonesia. This trend is only expected to strengthen in the coming decade. In absolute terms, China's and India's imports, combined with Brazil's and Indonesia's domestic consumption of soybeans, palm oil, pulp and paper, and beef, could rise by 43% to 264 million metric tonnes (equivalent to 37% of global production) in the decade preceding 2025.[44]

Demand forecasts suggest that, even though future growth rates may be slower than historical growth for most commodities, the absolute demand is still likely to be larger (given the higher starting base of demand today). One possible exception is for vegetable oils, with biofuel policy shifts resulting in lower demand projections. For cocoa and coffee, absolute-demand growth is expected to rise, as it is for wood pulp, driven by both growth in the middle class and the emergence of new markets (e.g. textiles). It is worth stressing that there are some real unknowns that could influence future demand trajectories for all commodities. For example, reducing food waste and shifting diets alone could more than offset the expansion in land needed to meet the same increase in food demand by 2050 under business as usual.[45] The impact on forests depends not only on total commodity demand, but also the form of that demand. For example, we could see a significant substitution of proteins from meat with alternative diversified proteins and plant-

FIGURE 14

Demand for all commodities is projected to increase to 2027: incremental growth will likely be lower compared to the past two decades for protein and vegetable oils but higher for cocoa, coffee and wood pulp

Historical and future incremental demand over an eight-year period by commodities
Million tonnes



1 Compound annual growth rate. **2** Future demand from independent study conducted by FIAL; this includes all proteins – animal, plant, non-traditional etc.
3 Future demand lower limit from FAO OECD Outlook, upper limit from LMC oilseeds report and IMARC; this includes all vegetable oils – e.g. palm, soybean, rapeseed, sunflower etc.
4 Future demand lower limit from Mordor intelligence report and Goldstein research, and upper limit from research and markets report; this includes coffee and cocoa.
5 Future demand from Mordor intelligence report.

Sources: FAO–OECD outlook; literature review; AlphaBeta analysis.xxxxx

based diets, as illustrated in the low-case scenario above (Figure 14).

While many commentators have emphasized the role that alternative proteins could potentially play in mitigating the impact of food demand on forests, the near-term potential for this is likely to be limited. For example, research by Food Innovation Australia Limited (FIAL) has projected non-traditional proteins to grow at the fastest rate of any type of protein at 35% per annum through to 2025. However, their share of total protein demand would still be less than 1% of global demand by 2025, given the low base starting point.[46] Scaling other sources of protein, such as aquaculture, may have more near-term impact on forests, but will require management of other related issues including feedstocks, disease management without excessive antibiotic usage and mangrove destruction.

Current rates of yield improvements are not sufficient to meet expected production growth without further land expansion.

Despite yield improvements in most commodities, the rising contribution of tropical regions to global agriculture production has come with a significant expansion of land under harvest and with associated forest loss. Based on historic trends and demand forecasts, further expansion and conversion can be expected without much more attention on boosting yields to satisfy rising demand.

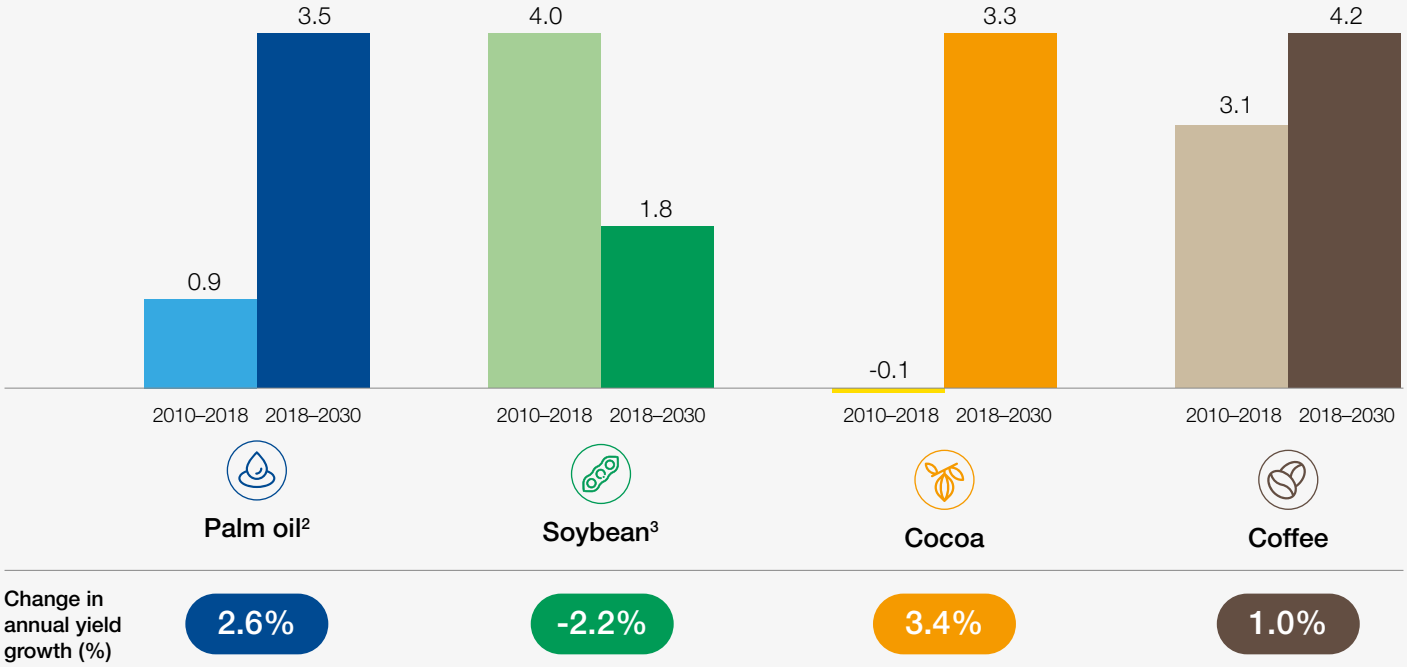
During the past decades, the increase in production of the two fastest-growing agricultural commodities – soy and palm oil – was largely achieved through land expansion rather than through increases in yield, although both commodities saw some degree of yield improvements. From 2001 to 2018, yield improvements accounted for 24% of additional production for soybeans and 21% for palm oil, with average annual yield improvements of 1.7% and 1.2%, respectively.[47] Cocoa saw actual declines in yields at the aggregate global level, and all of its production growth came through a net increase of area under harvest.

Meeting future projected demand of these crops would require even greater gains in productivity in the decade ahead. For example, in palm oil, yield growth rates would need to improve by 2.6 percentage points annually to ensure there was no need for land expansion by 2030, and for cocoa, an improvement of 3.4 percentage points annually would need to be realized (Figure 15). While there are clearly significant opportunities, particularly for smallholders to close current yield gaps, the required gains needed to avoid land expansion are unlikely to be achieved in full, given the significant barriers to increasing yields in practice.

FIGURE 15

Enhancing yields must remain a key strategy, but the rate of yield improvement needed to meet future demand projections is near impossible

Historical yield growth (2010–2018) versus required yield growth for no land expansion by 2030
(based on demand forecast)[1]



1 Forecast of demand of all commodities based on demand growth forecast from literature review, unless otherwise specified.
2 Calculation based on production of oil palm fruit, as area harvested is for the fruit.
3 Forecasted based on overall protein forecast. The overall protein forecast is at 1.8%, and according to the OECD outlook, overall soybean forecast is also at 1.9%.

Sources: FAOSTAT; AlphaBeta analysis.

> Climate change is already affecting yields in specialty crops such as coffee and cocoa that require specific microclimatic conditions, and coffee producers have already had to move production to new areas in response to changes in climate.

Current production models face important demographic challenges.

Due to increased urbanization, the top tropical agriculture countries could see their labour force population shrink by 20 million by 2030.[48] This contraction in the number of farmers in most producing regions is one of the most critical challenges facing such regions. However, it is important to note that since these forecasts are based on historical agricultural labour force changes, they provide a directional trend. Agricultural labour productivity growth would need to increase up to 1 percentage point faster annually than historical rates to offset this decline in farmers. For example, in Mexico this implies a 50% increase in existing labour productivity. Additionally, demographic shifts are putting pressure on farm labour costs, which is particularly problematic for labour-intensive crops such as palm oil. Overall, rising labour costs create opportunities to lift people out of poverty and increase employment; at the same time, these trends are likely to push towards mechanization where possible, to encourage the adoption of more profitable crop choices and potentially force lowest-yield producers to quit the market. Impacts will differ substantially between crops, regions and farm models.

Climate change is expected to pose a significant risk to agricultural production in the tropics.

Research by the Intergovernmental Panel on Climate Change (IPCC) has established with high confidence that climate change has already had an adverse impact on food security and terrestrial ecosystems, and has contributed to land degradation in many regions.[49] Climate change is already affecting yields in specialty crops such as coffee and cocoa that require specific microclimatic conditions, and coffee producers have already had to move production to new areas in response to changes in climate; cocoa has seen almost no increase in average yields in a period when almost all other crops saw substantial yield improvements. The IPCC projects that the frequency, intensity and duration of heat-related events are expected to continue to increase throughout the 21st century, with the tropics and subtropics projected to be most vulnerable to crop yield decline. This year is once again highlighting the reality that extreme weather events are becoming the norm rather than the exception.

Moving forward, some climate-change scenarios predict a further increase in extreme events, such as an increased frequency of strong El Niño Southern Oscillation (ENSO) events. These extreme ENSO events can lead to more severe droughts, and research has found that ENSO-related drought caused a 62% loss of cocoa production compared to the usual levels in Sulawesi.[50] Furthermore, another study found that 48.5% of the total variation in the yield of cocoa in Ghana could be explained by the climate variables considered, including maximum temperature, minimum temperature, precipitation and number of rainy days.[51] Models predict crop-productivity reductions with high confidence under “business-as-usual” climate change by 2030 for many tropical areas, although some might see short-term improvements.[52] There is also evidence for a decline in soybean yields across Brazil due to the intensity of the water deficit.[53]

Overall, these trends indicate that the rural development models that have underpinned the expansion of tropical agriculture in the first two decades of the 21st century are coming under increasing pressure from several angles and will likely influence the extent to which rising global demand is met by growing tropical production, and the extent to which it is met through increases in yield versus expansion of agricultural land.

4 Reframing the food and land use transformation challenge

Systemic solutions and deeper dialogue are urgently needed to reduce tropical forest loss

> Commodity-driven deforestation and the conversion of other critical ecosystems cannot be treated in isolation, as an environmental issue or a supply-chain problem, because it sits at the heart of the challenges facing global food systems.

Commodity-driven deforestation in the tropics is a classic "wicked problem" but, in the context of rebuilding from the ravages of COVID-19, as well as the increased urgency around climate and biodiversity action, there is a pressing need to harness momentum to advance the broader food and land use transitions that are needed. At the same time, there is also a need to fully consider the trade-offs necessary to meet the competing objectives of food security, rural development and environmental protection. Although not easy, there are ways to develop transformative solutions that can temper demand growth, boost resilience and productivity in the face of a changing climate, and incentivize farmers to move towards more sustainable practices.

A food-systems approach holds promise.

No single policy or solution can resolve this challenge. Commodity-driven deforestation and the conversion of other critical ecosystems cannot be treated in isolation, as an environmental issue or a supply-chain problem, because it sits at the heart of the challenges facing global food systems. Keeping forests standing is linked directly to sustaining rural livelihoods, ensuring food security for a growing global population and supporting economic development. These agendas must be brought together. Crucially, the community of action working on this issue must broaden beyond those engaged at the forest frontier and focus on environmental issues to include actors in the food system more broadly, such as farmers, local communities, local businesses and local governments.

Improving rural livelihoods must be at the centre of solutions.

A great deal of the deforestation associated with these soft commodities is not driven first and foremost by demand for these commodities. Instead, it is a consequence of fundamental challenges linked to rural development. To reduce deforestation linked to commodity production, the livelihoods and resilience of farmers must be enhanced.

More effort needs to be applied to boost productivity sustainably, particularly for smallholder farmers in the face of greater climatic stress. Improved technical assistance and new plant material to help increase yields, as well as support with the diversification of income streams, are essential. There are many good examples of support for smallholders at the 10,000 or even 100,000 level, but there are more than 608 million farms globally, and the needs of farmers must be prioritized and brought into the centre of the discussion in order to find solutions. Access to credit and support with securing land tenure are also vital. These will underpin food security and provide better protection for, and restoration of, key landscapes.

Finance solutions and incentives are needed to support the transition.

Finance plays a key role in supporting the transition to sustainable economic development that increases agricultural productivity while avoiding forest loss. Mobilizing finance to create incentives for farmers to conserve and restore more while boosting food production is critical. There are many potential sources of finance, including domestic finance for rural credit, longer-term loans from supply-chain companies and the emerging opportunities presented by carbon finance. For many farmers, clearing trees ensures livelihoods, and in many cases, there are no viable alternatives. Incentives must be offered to farmers that motivate the adoption of sustainable practices by offering economic, not just environmental, benefits. More broadly, financing strategies, such as payments for ecosystem services, instruments that reduce the cost – or increase the pool – of finance, off-take agreements and publicly funded facilities to provide long-term capital can help to overcome investment barriers.

Tailored supply- and demand-side measures are required.

Although commodity-driven deforestation is happening across the tropics, the underlying drivers of forest loss are unique to specific commodities and geographies. Despite demonstrating similar supply-and-demand trends, there are intrinsic differences between the commodities, as well as the political and economic contexts of the producing countries and, indeed, the consumer countries looking to regulate trade. It is vital to consider the unique characteristics of the commodities and their countries of origin when developing solutions; policies must be tailored with these differences in mind. Critically, to achieve system-level change, those intervening need to recognize that a large share of deforestation associated with agriculture is not under active production, reflecting the indirect drivers and inefficiencies of land conversion across much of the tropics. Tackling deforestation therefore requires combining supply- and demand-side measures, as well as market and public policy measures, in more concerted and creative ways. Regulatory action will be essential to change the rules of the game, encourage greater benefits to flow to more sustainable actors and ensure laggards do not provide ongoing markets for products associated with deforestation. Strategies that temper growth in demand, such as dietary diversification (including new sources of feed for livestock as well as more plant-based diets) and reducing food waste (accounting for an estimated one-third of food production globally) will be invaluable, and again need to be tailored to consumers in different markets, many of whom are climbing out of poverty for the first time.

Corporate action must continue.
There is some evidence that supply-chain strategies and market signals are helping to reduce deforestation, but it is clear that supply-chain action is insufficient in isolation. Leading companies must continue to make ambitious efforts both in individual supply chains and sector-wide transformation to contribute to reduced net deforestation. Landscape or jurisdictional approaches, which promote sustainable practices by rooting them in governance systems, offer a practical and impactful way for companies at all nodes of the supply chain to contribute to forest protection. Supporting sustainable livelihoods for smallholders and economic development in key production landscapes is an integral part of the new thinking required. Considering that the demand from deforestation-linked commodities is increasingly coming from domestic and middle-income countries, the strategies deployed by corporates, and civil society organizations advocating for supply-chain action, must be re-evaluated to ensure that they will be effective in these markets, where socioeconomic conditions and consumer behaviour may be different from in OECD countries.

Greater investment in transparency and improvements in collaborative data frameworks will be a critical enabler.
It is impossible to solve a problem that is not fully understood. Unreliable baseline information makes it impossible to judge the true impact of interventions and understand the areas that require the most urgent attention in terms of efforts to halt tropical deforestation. There have been a number of promising innovations in recent years in improving transparency and data quality, especially the use of satellite imagery. However, despite this progress, important gaps remain. These include concession boundary maps, trade and export data, distinguishing between tree cover loss and deforestation, spatial data on crop production, incorporating information on time lags (between deforestation and associated production) and improving the rigour by which drivers of deforestation are understood. It is troubling that, after more than a decade of investment, we still do not have a greater level of understanding in real time of the extent to which specific commodities are driving deforestation. Tackling these data gaps is crucial as this will help to more robustly track progress on interventions, as well as highlight where further efforts are needed.

Policy innovation that challenges assumptions and includes producer voices is needed.
Given the complexity of the problem, it is crucial to avoid introducing policies with unintended consequences, as we have already seen with the impact of biofuel mandates on land use. Similarly, sustainable intensification (that is, increased production efficiencies without expansion) has an important role to play. However, yield growth is not in itself a desirable goal for growers if it comes at the expense of farm profitability (through either increased costs or a reduction in prices) or if it increases the incentive to convert natural habitat. More broadly speaking, meeting forecasted demand for these commodities will require significant productivity increases, creating additional strain between the demand of supply chains and the reality of producers. This could accelerate the transition to a bifurcated market of "clean" suppliers in established landscapes growing through productivity increases and "red" suppliers at the forest frontier growing through land expansion.

Proposed due diligence legislation in the European Union, the United States and the United Kingdom could create a similar divided market, considering that China and other key emerging centres of demand are currently not considering similar mechanisms. There are also concerns that due diligence legislation adds costs and complexity for producers, which could result in more smallholders being excluded from formal markets, further exacerbating social challenges.

Finally, commodity-specific solutions must carefully consider the broader land-use context to prevent unintended consequences such as indirect land-use change, e.g. between soy and cattle pasture. The measure of success must be a contribution to a net decrease in deforestation and conversion, not solely on greening individual supply chains or specific biomes.

Collective action is crucial to success.
Success can be achieved only through collective action and collaboration, across geographies, sectors and stakeholders, both within and beyond supply chains. Over the past decade, particularly in recent years, the community of action has recognized this and has found new ways of working together. In the private sector, companies are joining forces through sector-specific efforts – such as the Consumer Goods Forum Forest Positive Coalition of Action, the Palm Oil Collaboration Group, the Soft Commodities Forum and the Action for Sustainable Derivates, among others – to agree collective targets and engage more deeply with other stakeholders. In producing countries, emerging multistakeholder initiatives that engage local government and producers at jurisdictional or landscape scale have started to show promise. Furthermore, the finance sector has begun to recognize the role it can play in decreasing the financing of commodity production linked to deforestation and increasing the flow of capital towards sustainable commodity production. However, these efforts are still nascent, and there is significant opportunity to build on this momentum and increase pre-competitive collaboration.

Sustainable supply chains are now well represented on the global agenda: the UN Food Systems Summit has designated one of its five action tracks to "Boosting Nature Positive Production at Scale", and the COP26 Presidency has prioritized this issue through the Forest, Agriculture and Commodity Trade (FACT) Dialogue. This could help create a much-needed new dynamic for the agenda in the 2020s. In the context of future trends, the urgency for action to protect tropical forests and ensure sustainable rural livelihoods has never been greater.

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Endnotes

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