



Treeprint

Deforestation: outlook, solutions
and the corporate response



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Authors:
Eugène Klerk
eugene.klerk@credit-suisse.com

Akanksha Kharbanda
akanksha.kharbanda@credit-suisse.com

Bahar Sezer Longworth
bahar.sezer@credit-suisse.com

Betty Jiang, CFA
betty.jiang@credit-suisse.com

Phineas Glover
phineas.glover@credit-suisse.com





Executive summary

In some of our previous Treeprint reports, we focused on the impact that consumer behavior has on emission generation and how reforestation or planting trees could help address long-term climate change related challenges. Deforestation, however, remains a key headwind that puts pressure on long term climate change targets. In this report, we review the outlook for deforestation and some of the solutions that we believe can be deployed today to address forest loss. We also review how corporates approach the topic.

Deforestation remains a concern

The rate of deforestation has declined from annual levels of c15-16 million hectares seen between 1990 and 2010 to 10 million hectares per year during the 2015-2020 period. However, even at these somewhat lower levels the annual rate of forest loss still accounts for c40% of the size of the UK. Worse still is that most of this loss occurs in areas where the carbon storage capacity of trees is higher than elsewhere. At the same time, the rate of new forest expansion is declining too and has halved since 2000 to c5million hectares per year, according to the FAO.

Action is required

Deforestation is ultimately the result of two drivers: population growth and per capita consumption patterns. During the next three decades the world's population is set to increase by 59% according to estimates from the UN. This in our view will likely lead to a further conversion of forest land into agricultural land unless action is taken. Another driver for deforestation is the fact that rising average consumer spending power has led to an increase in per capita consumption of key commodities associated with deforestation. We estimate that demand for deforestation-related commodities could increase by up to 279% if consumption patterns across the developed world become the norm. This would require an increase in agricultural land of 114% and underlines our call for the adoption of a wide range of available solutions that reduce deforestation.

Potential solutions include:

This report highlights a number of solutions that together should be able to limit if not reverse deforestation in our view. These solutions include tighter regulation including the need for corporates to adopt Nature-related Financial Disclosures rules. A wide scale adoption of smart agriculture and crop science technologies and the development of vertical farming is key to address growing demand especially in an increasingly urbanized world. Lowering food loss and waste appears an obvious focus for us given that it accounts for c30% of total food production. Related to this is our view that consumer behavior needs to change especially in relation to what and how much consumers eat. Finally we note that greater support is needed for small holder farmers. They account for 84% of total farms, produce 35% of the world's food and importantly are located mostly in the areas where future consumer demand is likely to grow fastest.

The corporate response

In this report we not only focus on solutions that are available but also assess how corporates exposed to the deforestation supply chain engage on the topic. We review engagement with deforestation related organisations and find that Nestle, Unilever, Tesco, Danone and BASF appear most active in Europe.

Nestlé and Unilever tend to receive strong support for their deforestation policies from external agencies. We summarise their deforestation strategies and show their answers to our 45 deforestation-related questions as case studies for those investors wishing to engage with other corporates on the topic of deforestation.

David Bleustein
Global Head of Securities Research

The state of the world's forests

The two most recent IPCC reports showed that forests play a crucial role in reaching long-term climate change targets. However, continued deforestation activity across multiple regions globally suggests that this scenario looks far from certain. Since last November over 140

countries, representing c90% of the planet's forests, signed the Cop26 Leaders Declaration on Forests and Land Use which aims to halt and reverse forest loss and degradation by 2030. We believe that this is promising but that more is needed.

Forest cover through time

Monitoring of forest conditions around the world is not as straightforward as might be expected. Several sources provide data that is useful here, however, each have slightly different and to some degree incomplete definitions. These sources include:

- **United Nations:** The Food and Agricultural Organization of the United Nations (FAO) through their global Forest Resources Assessment (FRA) unit provides data on forest cover. It defines forests as land spanning more

than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10%, or with trees able to reach these thresholds. The FAO's definition excludes tree stands in agricultural production systems such as fruit tree plantations, oil palm plantations and agroforestry systems. Deforestation includes the permanent reduction of tree canopy cover to below the minimum 10% threshold. The data provided is collected through standardized country reports, which are compiled by national correspondents.

- **World Resources Institute (WRI):** The WRI through Global Forest Watch provides data on tree cover. Their data uses a definition of all woody vegetation that was taller than 5 meters and with a canopy density of at least 30% at a 30-meter resolution. It uses Landsat satellite images to map tree cover globally. This definition includes industrial tree plantations and commercial tree crops (such as oil palm or apple orchards) but excludes sparse tree cover such as in the Sahel as well as individual trees in agricultural landscapes. Tree cover loss is defined as the complete removal of tree cover for any reason (i.e. human induced or otherwise) while tree cover gain is defined as an increase in tree cover to at least 50% canopy cover at 30m resolution.

Both of these sources clearly have different views of what constitutes a forest which complicates analysis of tree cover globally. Furthermore we note that both of these sources exclude tree cover on agricultural land which in our view therefore generates forest data that underestimates true global tree coverage. To support our view we note that Zomer et al in 2016 estimated that in 2010 43% of all agricultural land globally had at least 19% tree cover and that this had been increasing by 2% over the previous ten years.

Because of the broad data availability that is provided by the FAO and despite its shortcomings, we will mainly rely on their data in this report to outline some of the recent trends in relation to forest cover and deforestation.

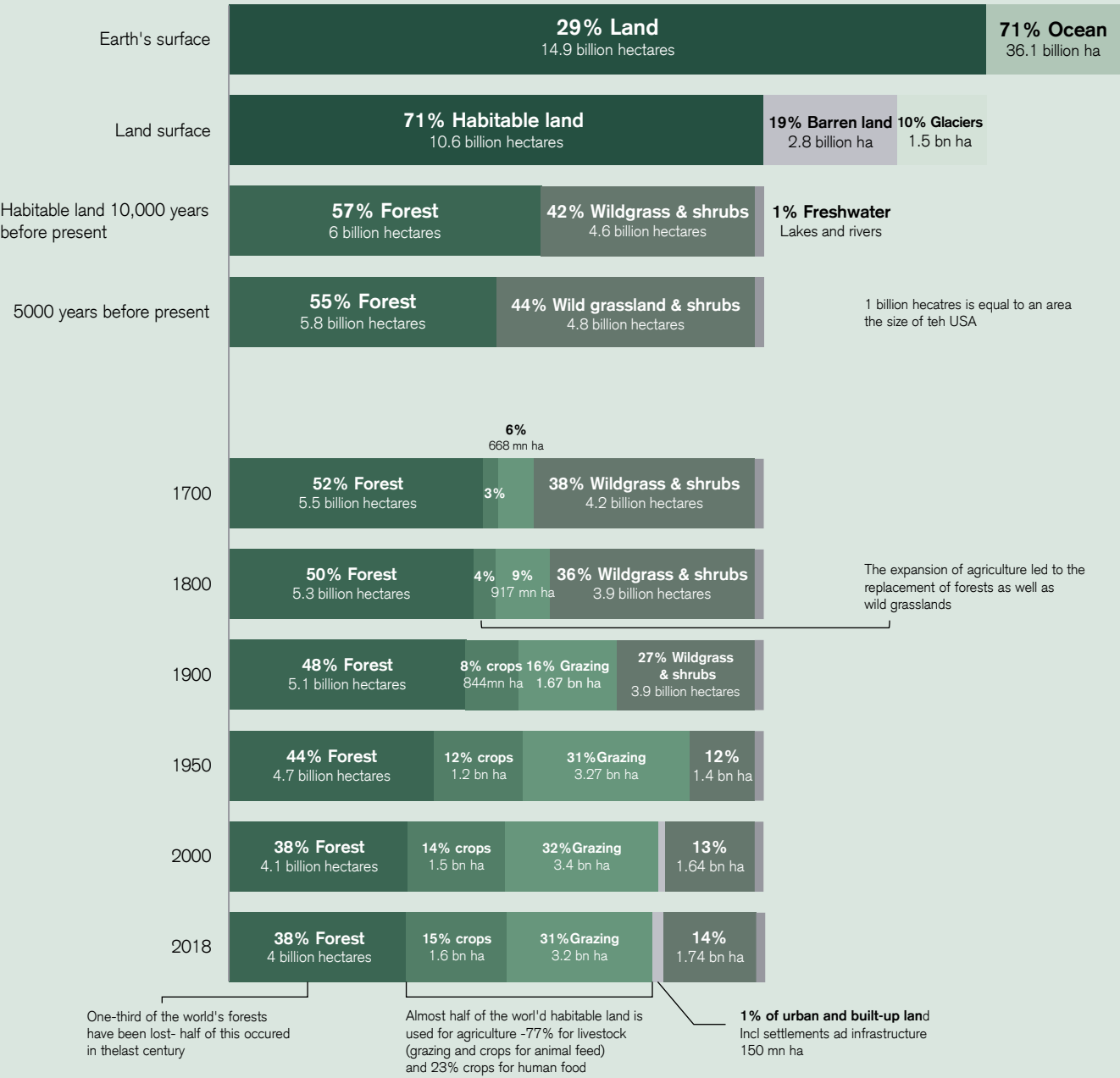
Forest cover continues to reduce

During the past few hundred years total forest cover has substantially declined. In 1700, forests covered c52% of the world's habitable land. By 2018, this has declined to just 38% (Figure 1). In total c1.5bn hectares of forest-land was lost during that period. The key reason for this relates to the growth in agriculture. Total land used for agriculture (crop and animal based) increased from c1bn hectares in 1700 to almost 5bn hectares by 2018 as the world's population rose from c603 million to more than 7.6 billion during the same period.



Figure 1: Forest cover globally during the past 10,000 years

Agriculture Makes up 50% of All Habitable Land
The world has lost one third of its forest since the last ice age



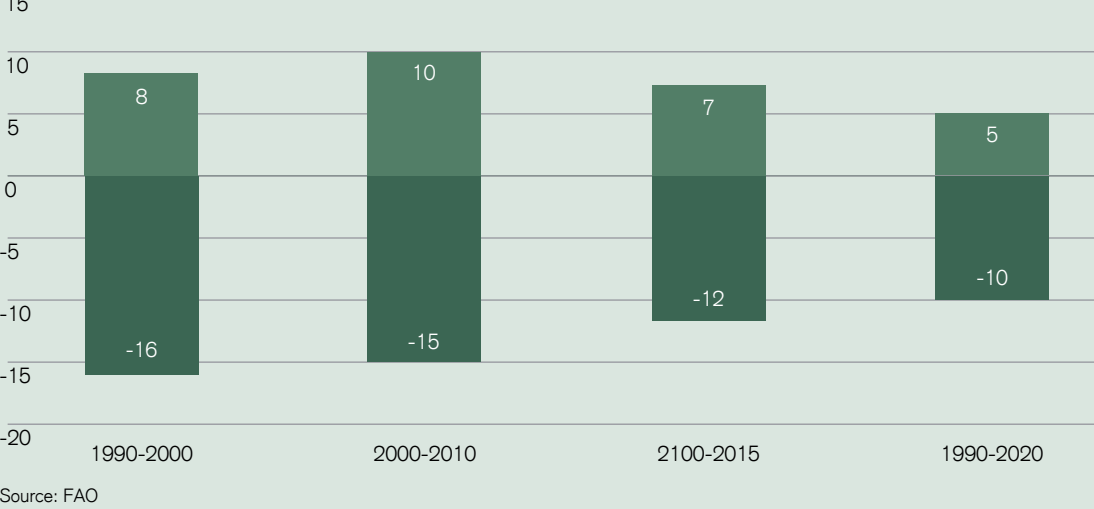
Source: FAO, Williams (2003), Credit Suisse

While these long-term statistics show a clear and negative trend we note that on a global scale the amount of forest area that is lost annually appears to be reducing. During the 1990-2000 period some 7.8 million hectares of forestland was lost annually, however, during the 2010-2020 period this had reduced by c 40% to 4.7 million hectares (Figure 2).

These numbers represent the net change in forest cover or the difference between forest expansion and deforestation. Figure 2 shows that deforestation rates on a global level are reducing, however and worryingly the rate of forest expansion appears to be declining too. This in our view does not seem to reflect the outlook for natural carbon storage that would be in line with longer term climate change scenarios.

Figure 2: Deforestation is reducing but so is forest expansion

Annual rate of forest expansion and deforestation, 1990-2020 (Million ha per year)



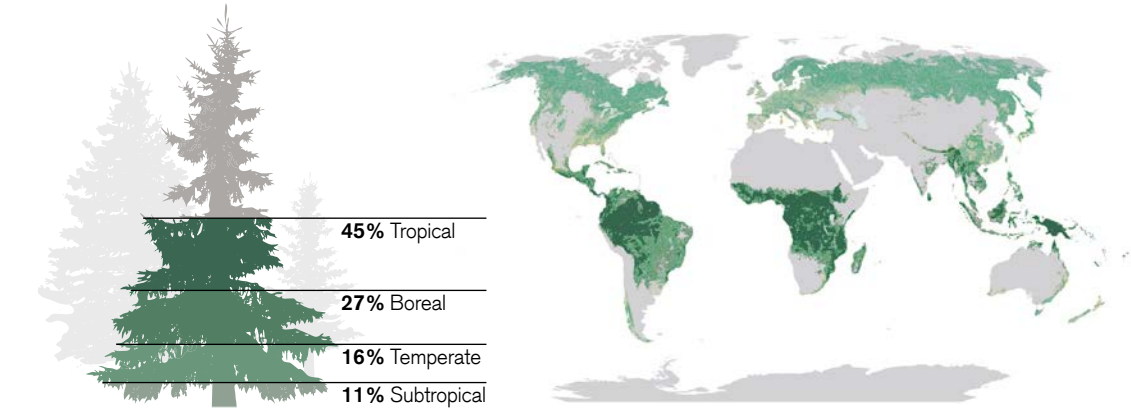
Forest cover by region

Any analysis regarding reforestation and deforestation should not be based on global data in our view as this fails to capture some significant differences by region.

- Firstly we note that the biological characteristics of forests differ substantially across the world. For example tropical forests store more carbon in the trees whereas boreal

forests store more carbon in the soil. At present 45% of the world's forests are in tropical areas while boreal and temperate climate related forests make up 27% and 16%, respectively. Subtropical forests account for 11% according to the FAO. A more granular view of deforestation by climatic region is needed when assessing the impact on carbon storage.

Figure 3: Proportion and distribution of global forest area by climatic domain



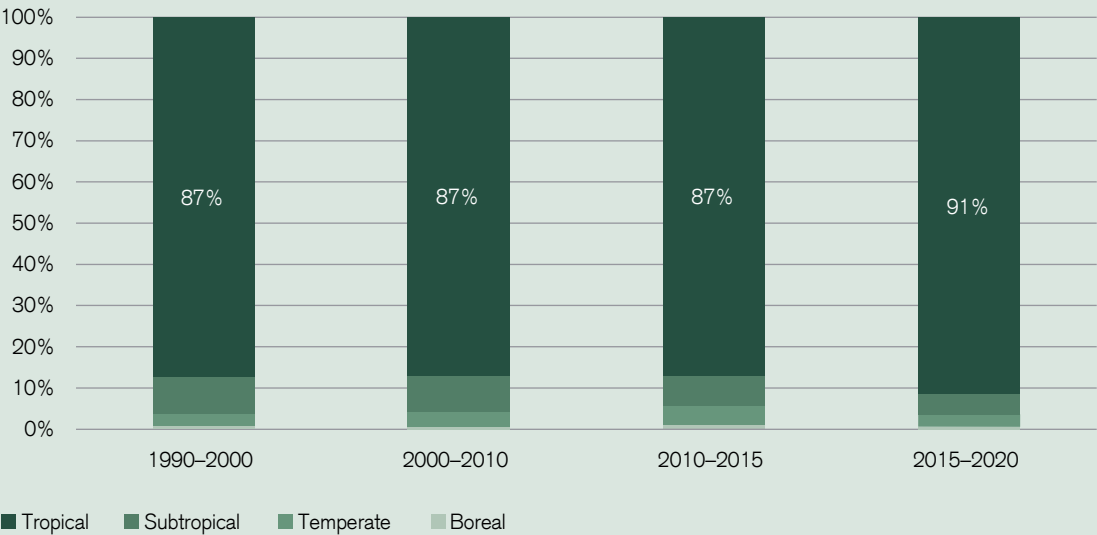
Source: Food and Agriculture Organization of the United Nations



Secondly we note that the impact of reforestation differs by region too. Here we do not refer to carbon storage potential but rather to the fact that planting trees could actually warm the climate and thereby offset the benefit that trees store carbon. Trees are dark and therefore absorb heat. When planted in colder regions or on surfaces that are lighter these newly planted trees might therefore not benefit climate change at all. Work from Bala, Wickett and Mirin showed this in more detail (Combined climate and carbon-cycle effects of large-scale deforestation).

The analysis from Bala, Wickett and Mirin also showed that reforestation would be most effective when taken place in the tropics. Unfortunately, data for trends in forest cover by type of forest shows that this is not happening. In fact, the opposite may be happening as 91% of net deforestation activity during the 2015-2020 period took place in tropical areas. This compares to 87% for the 1990-2000 period.

Figure 4: Deforestation rate by climatic domain

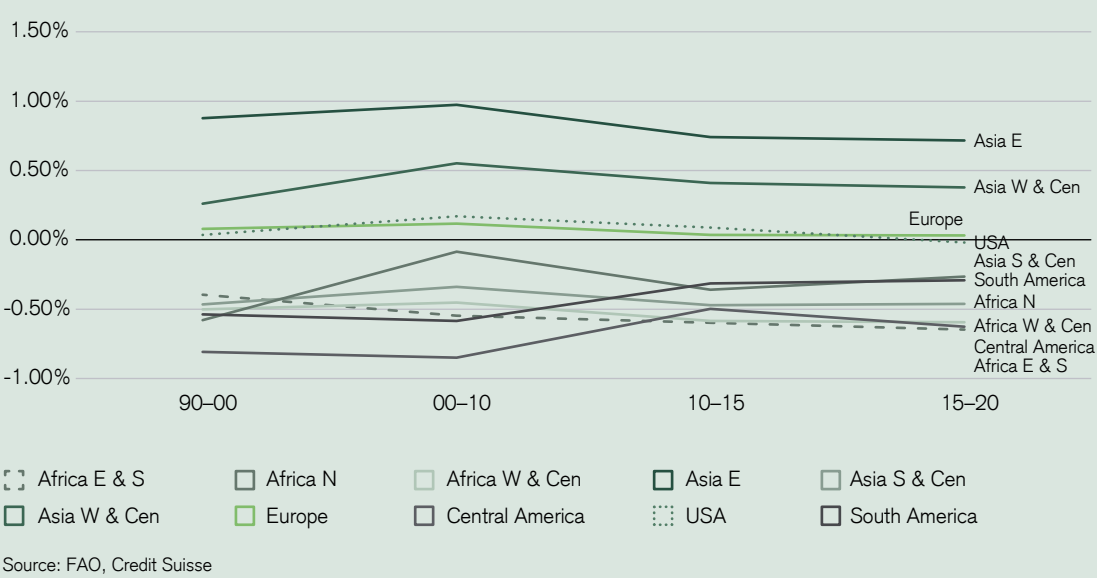


Source: FAO, Credit Suisse

In other words, although total deforestation rates have declined since 1990, the improvement has happened more in boreal and temperate and sub-tropical areas and not in those areas where it benefits climate change most.

In Figure 5 we show annual average changes in forest area by region. This shows that on average all tropical areas indeed continue to lose forest cover at an annual rate of c0.5%. As highlighted the continued decline in forest cover across tropical areas is highly relevant from a climate change perspective given that tropical forests store more carbon than any of the other domains. Work from Harris et al provides more context to this (Global maps of twenty-first century forest carbon fluxes | Nature Climate Change) as it showed that between 2001 and 2020 tropical forests stored almost 7Gt of CO₂ equivalent per year compared to just over 4Gt of CO₂ equivalent per year for temperate forests and even less for subtropical and boreal forests.

Figure 5: Annual average change in forest area by region

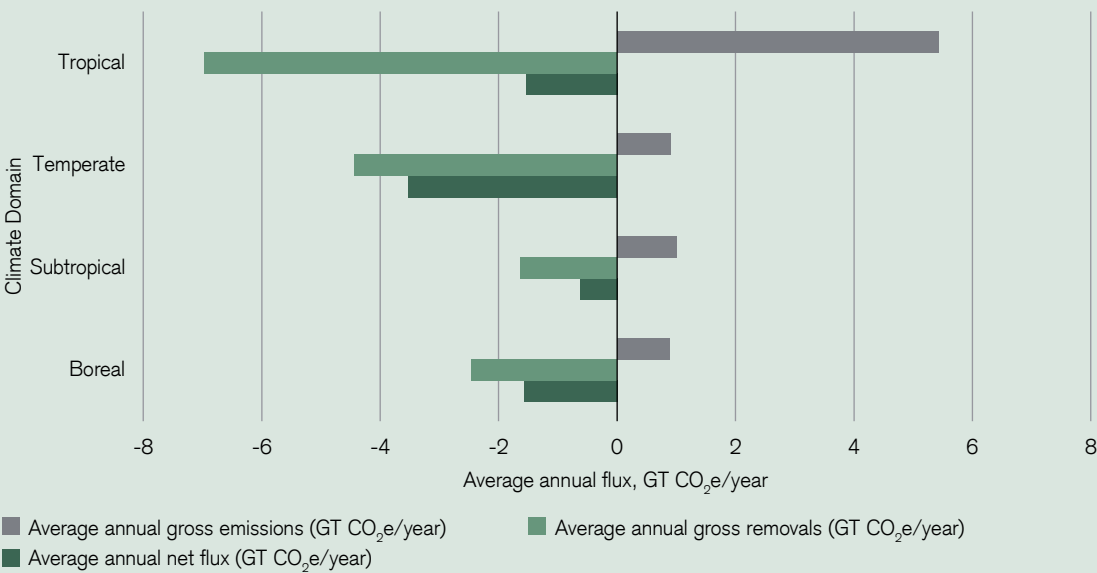


Source: FAO, Credit Suisse

At present tropical forests are still net consumers of CO₂ (Figure 6). However, a continuation of deforestation across the tropics could cause this

to change, which would put the IPCC's scenarios around long-term climate change targets at risk, in our view.

Figure 6: Average annual emission flux by climate domain (2001-2020)



Source: Harris et al (2021), Global Forest Watch, World Resources Institute



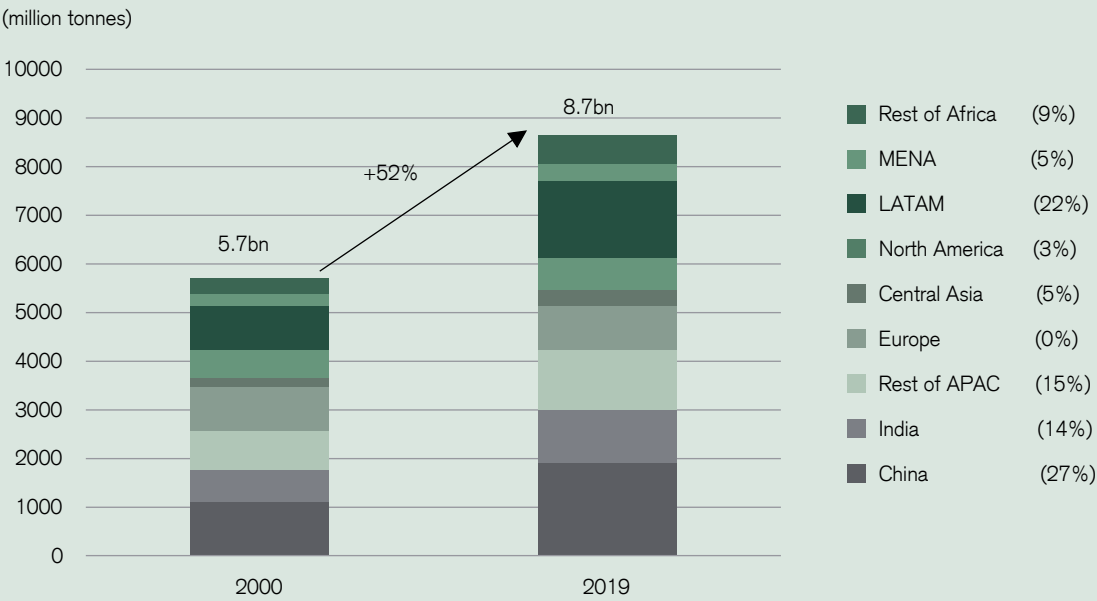


Deforestation: drivers and outlook

As highlighted earlier the expansion of agricultural activity has been the main driver of the reduction in forest cover globally during the past few hundred years. The expansion of the

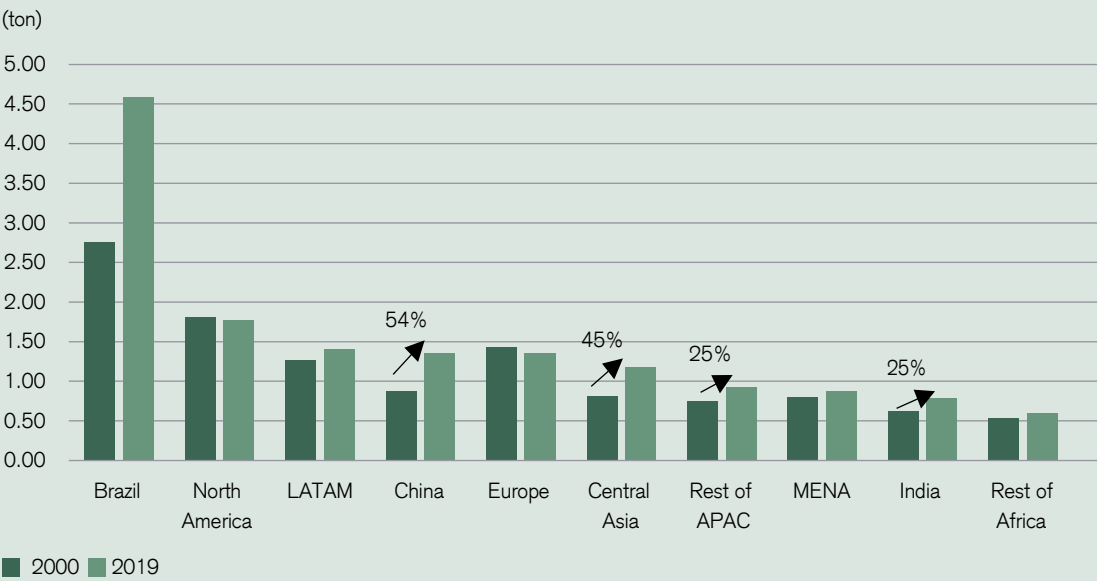
world's population during that period is an obvious driver behind the need for increased food production, however, this is not the whole story.

Figure 7: Consumption of key food products



Source: FAO, Credit Suisse

Figure 8: Consumption of food products per capita



Source: FAO, Credit Suisse

Data from the FAO when combined with population data from the World Bank clearly shows that total consumption of agricultural goods has outpaced population growth during the past 20 years. The world's population increased by c26% since 2000, however, using FAO data for a range of key food products we calculate that consumption of agricultural products globally increased by c52% during the 2000-2019 period (Figure 7).

On a regional and country level our analysis suggests that per capita food consumption increased substantially since 2000 (Figure 8). For example in China and India increases of 54% and 25% were recorded while per capita consumption in the rest of Asia increased between 25% to 45%. Brazil saw a very sharp increase of 67%, however, this is primarily because of the contribution of sugar cane production which during the past 20 years has increasingly been used to produce ethanol rather than for food production.

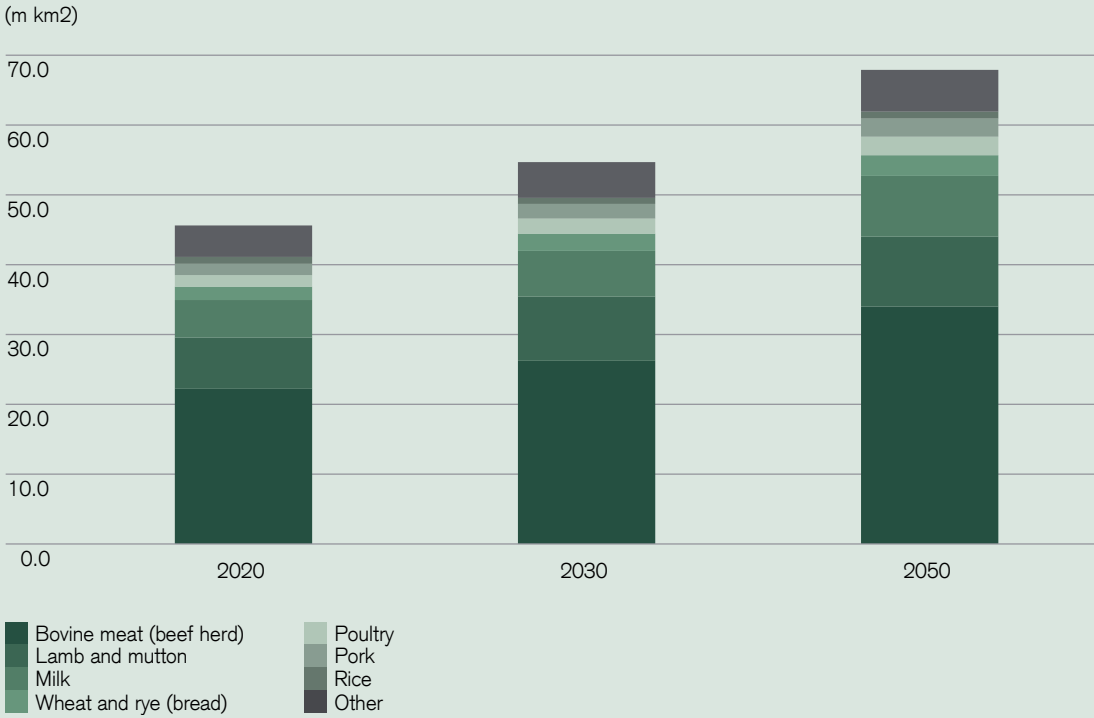
The growth in per capita food consumption is in our view predominantly related to rising income levels globally and especially across the emerging world. Data from the FAO in relation to protein consumption per capita clearly suggest that a continued rise in spending power globally is likely to result in a further increase in per

capita food consumption too (Figure 10). Over and above that we note that population growth is likely to continue to be an upward driver to food demand with estimates from the UN suggesting that the world's population will reach c10bn by 2050 from c7.5bn today.

The combination of income and population growth clearly implies that pressure to further increase agricultural production will remain high going forward which in turn would lead to further deforestation unless action is taken by governments and corporates. To put this in context, we refer to CS's report on sustainable food (Credit Suisse Research Institute: The global food system - Identifying sustainable solutions) in which we outlined that an additional 22 million km2 of agricultural land would be needed to produce the amount of food associated with this scenario. This is an increase of close to 50% from current levels and equates to 56% of the world's current forest coverage.

We can also frame the potential challenge for food production, and therefore by implication reforestation risk, another way. Purely based on current population sizes we calculate that an increase in per capita food consumption globally to US levels would require an increase in total food production globally of 51%.

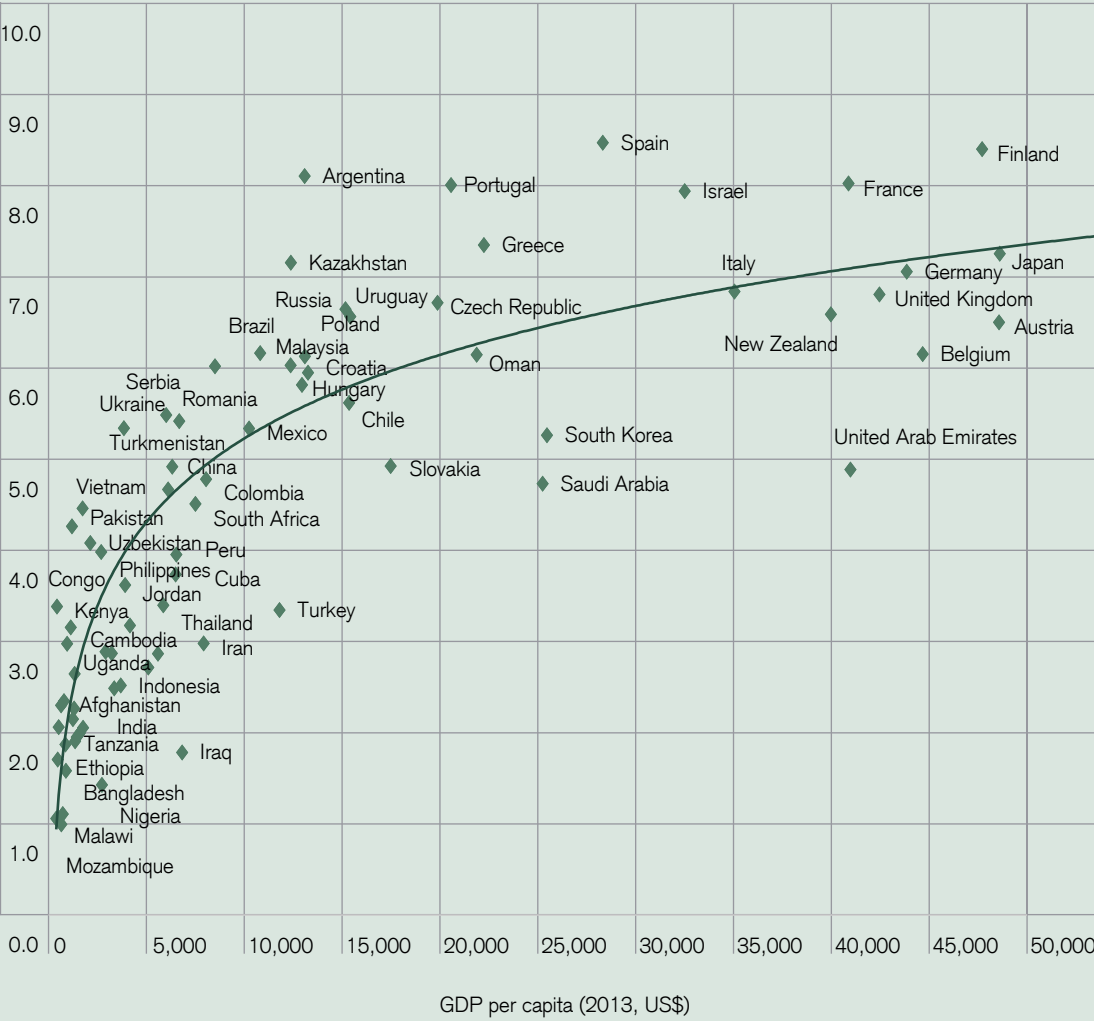
Figure 9: Land demand to feed the global population



Source: Credit Suisse

Figure 10: Animal-based protein consumption vs income

Share of calorie intake from animal food (2013)



Source: FAO, World Bank, Credit Suisse

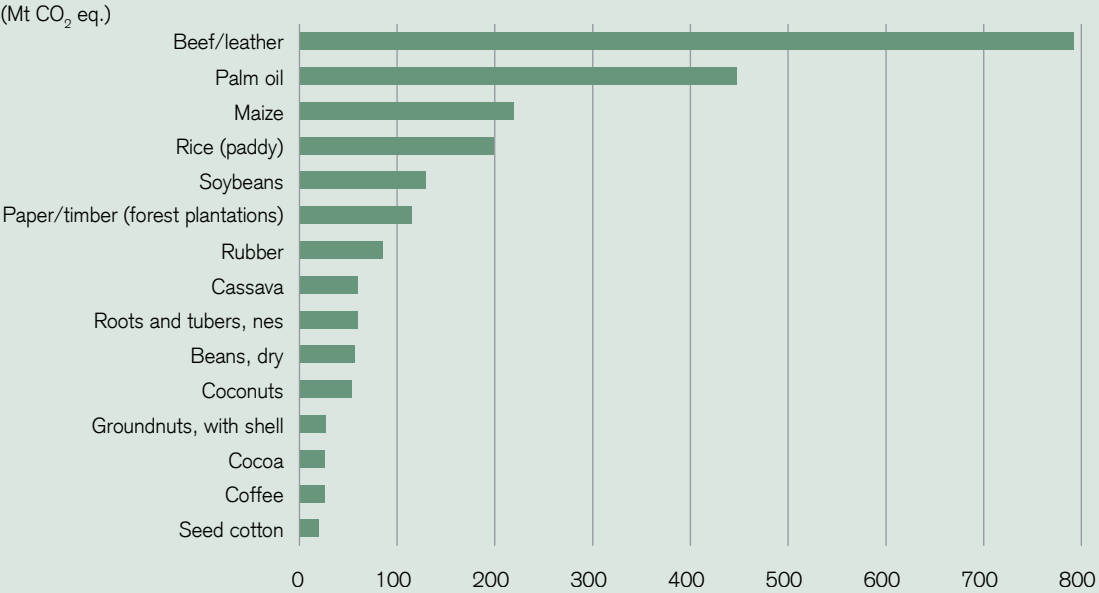
The relevance of tropical forests to the carbon cycle and the fact that deforestation is currently largely taking place across tropical forests implies that a more detailed review of the drivers behind tropical deforestation is needed. Work from [Harris et al, 2021](#) and [Curtis et al, 2018](#) showed that a change in agriculture usage, the production of paper and timber (forestry) and the production of commodities, accounted for the majority of GHG emission release associated with deforestation during the past 20 years (Figure 12).

Work from the IPCC in their 2019 report on Climate Change and Land highlighted that almost 50% of all GHG emissions associated with deforestation were caused by soft-commodity production in the tropics. A number of academic studies have been published that assess which are the most relevant commodities and where these are grown.

Work from Pendrill et al for example ([Agricultural and forestry trade drives large share of tropical deforestation emissions - ScienceDirect](#)) showed that 15 commodities were responsible for c90% of deforestation-related GHG emissions with beef, palm oil, maize, rice and soy beans the most significant. Cattle, Palm oil, Soy, Cocoa, Rubber, Coffee and Wood fiber together accounted for 57% of tree cover loss according to the WRI ([Estimating the Role of Seven Commodities in Agriculture-Linked Deforestation.](#))



Figure 11: GHG emissions from deforestation and peatland drainage in 2017.
Largest 15 contributors



Source: Pendrill et al ('Agricultural and forestry trade drives large share of tropical deforestation emissions', 2019), Credit Suisse Research

Figure 12: Annual global GHG emissions by dominant driver of tree cover loss (2001-20)

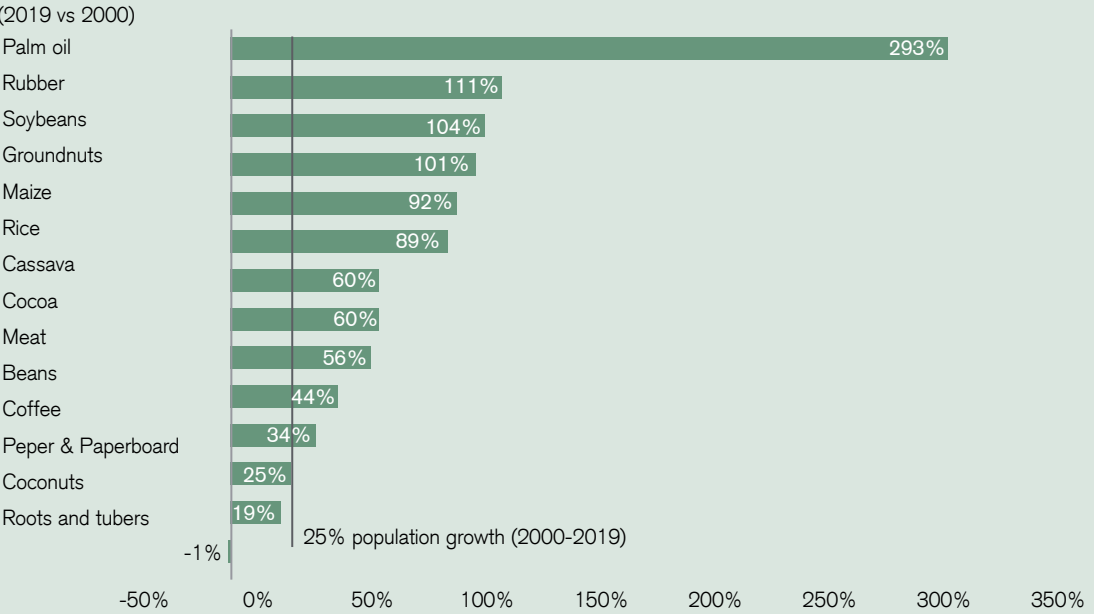


Source: WRI Harris et al, 2021, Curtis et al, 2018

Production data for the most important commodities as highlighted in Figure 13 shows how significant demand has increased for virtually all of them. In fact total production volume growth surpassed global population growth since 2000 for 12 of the 14 commodities

(Figure 13). The slight decline noted for Roots and tubers in Figure 13 is due to the fall in production volume of sweet potatoes in China. In the remainder of this chapter we will review the deforestation related commodities in more detail.

Figure 13: Global production growth in key deforestation related commodities

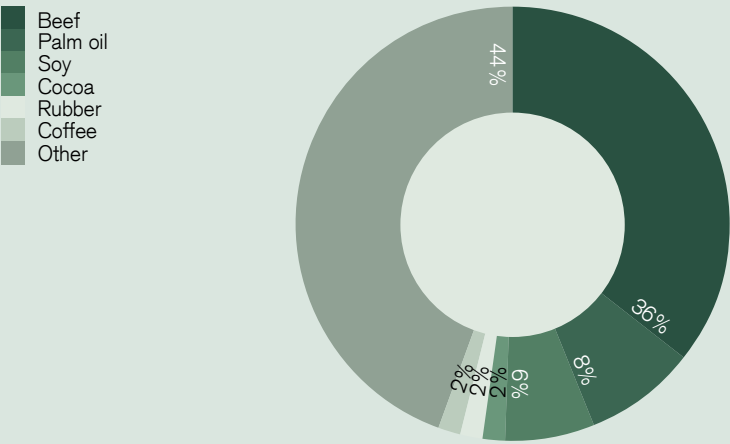


Source: FAO, Credit Suisse



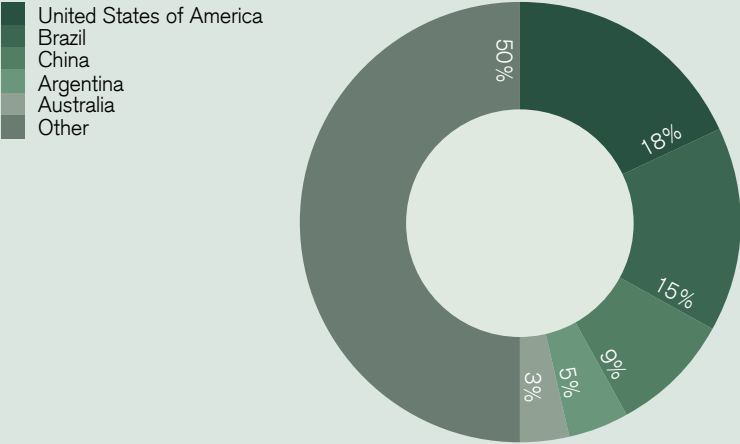
Beef

Figure 14: Share of deforestation ('01-'15) by commodity



Source: WRI, Global Forest Review

Figure 15: Biggest beef producing countries (2019)



Source: FAO, Credit Suisse

Beef production has the greatest impact on deforestation of all key commodities. Data from the WRI, supported by Goldman et al (2020) suggest that between 2001 and 2015 cattle replaced 45.1 million hectares of forest globally. This accounted for 36% of tree cover loss associated with agriculture or was more than the next six commodities combined.

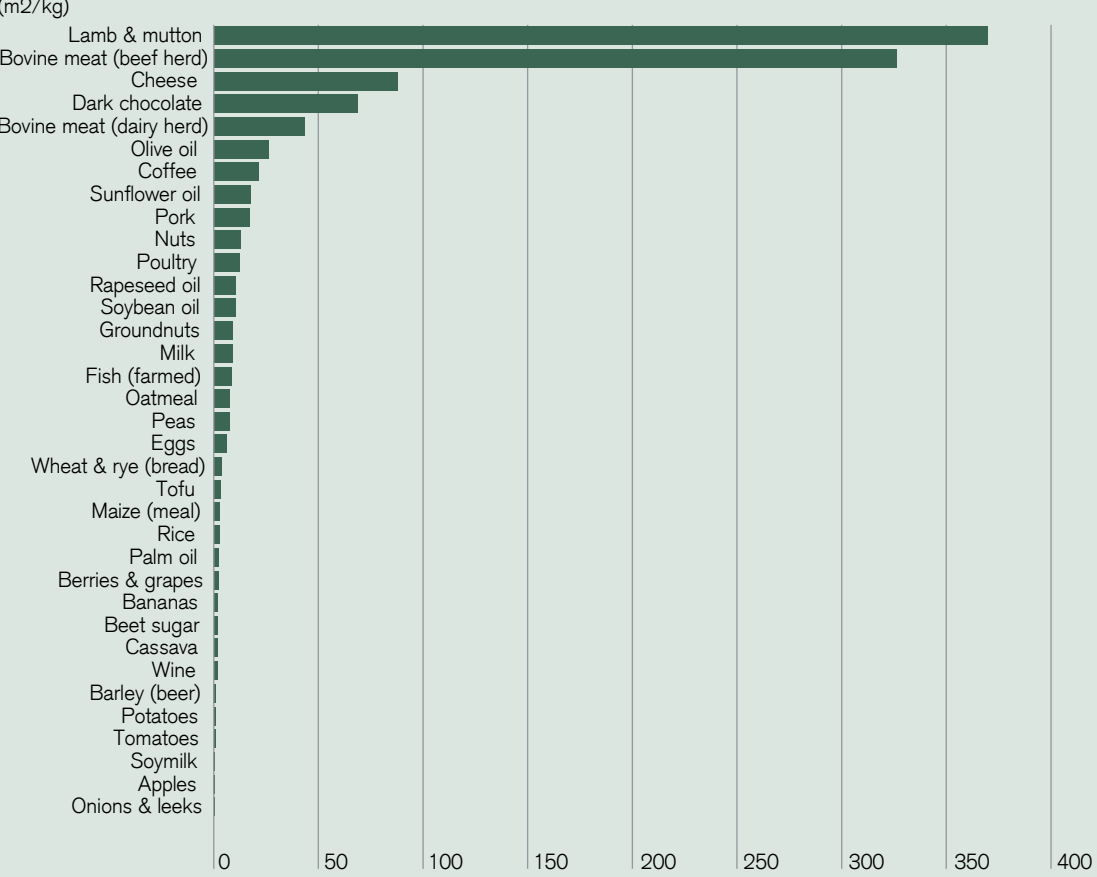
The countries most responsible for cattle-related forest loss were Brazil (almost 50%), Paraguay, Colombia, Bolivia and Argentina. Surprisingly various studies (e.g., [Carrero and Fearnside, 2011](#) and [Davaloe et al, 2014](#)) have shown that profit margins for cattle ranches are low. This might suggest that other factors such as land speculation could be the reason why farmers transform forests into pasture lands. Soy production is sometimes highlighted as a reason for cattle deforestation too. Soy production that uses former pasture land may force cattle farmers to deforest other land for their cattle.

Potential solutions to addressing beef-related deforestation

Reducing beef related deforestation can be achieved in a number of ways in our view. The most obvious is clearly to reduce the consumption of beef going forward. We have argued this in a number of our reports previously and outlined that this would not only reduce

deforestation challenges, but also help reduce the emission of greenhouse gasses and have positive health implications. Although this solution is obvious we recognize that it is far from easy for a few reasons.

Figure 16: Land use requirement

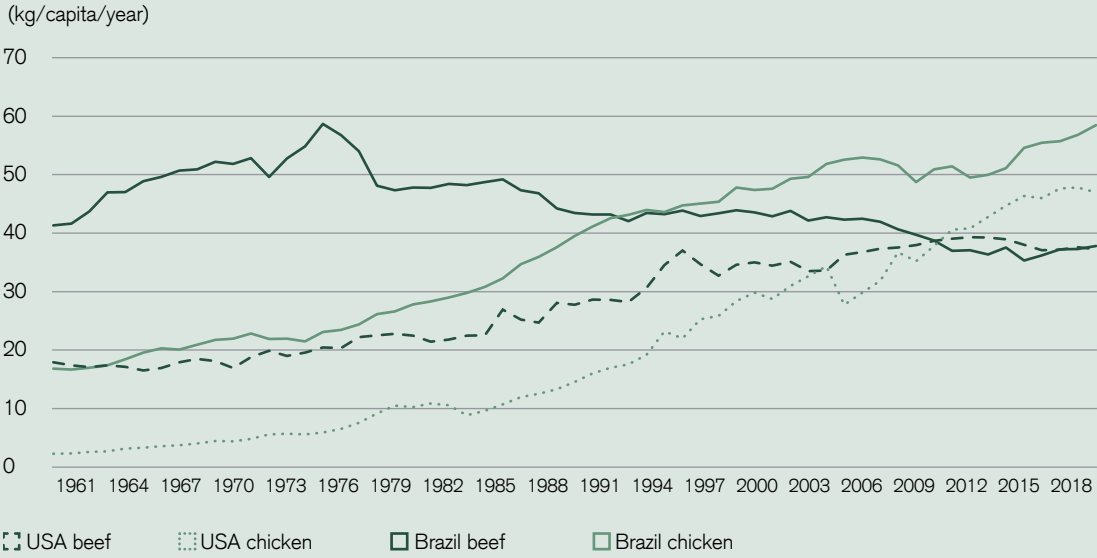


Source: Poore and Nemecek (2018), Credit Suisse

- First, it would require a substantial change in consumer behavior across the developed world. One potential, part solution, might be to convince consumers to switch from beef to other forms of animal protein products including poultry or seafood given that these have lower land use requirements. On a positive note, we find that beef consumption across some of the highest consuming countries on a per capita basis does indeed seem to moderate somewhat (Figure 17).
- Second, it would also mean that consumers across the emerging world who currently consume lower levels of meat mostly because of reduced spending power would have to be convinced that they should not increase meat consumption even if they could afford it. Data for some of the developing countries across Asia suggest that beef consumption has started to rise although they remain well below levels seen across the developed world.

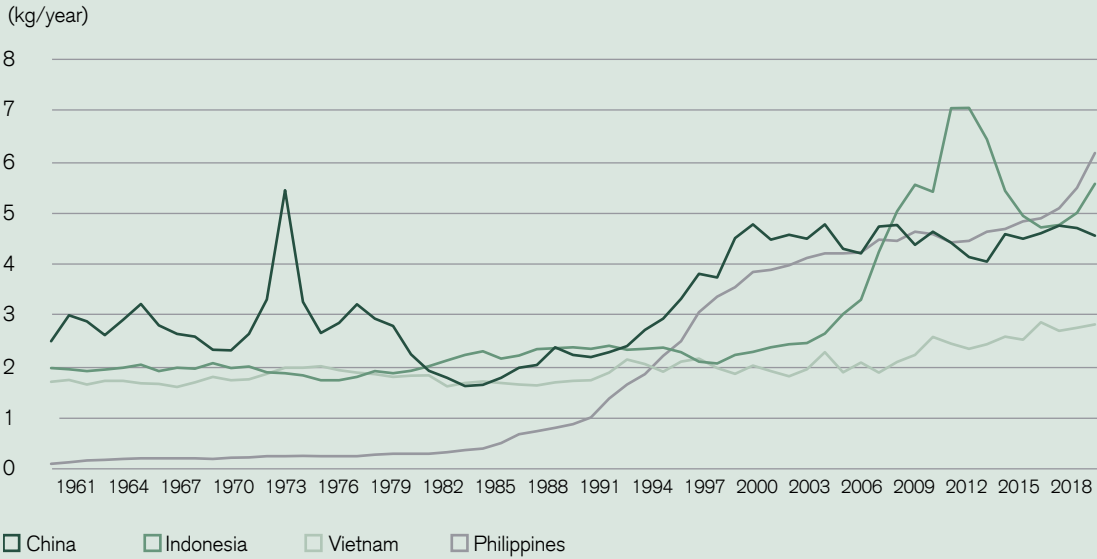


Figure 17: Beef versus Chicken consumption



Source: FAO, Credit Suisse

Figure 18: Beef consumption per capita



Source: FAO, Credit Suisse

Another way to address beef related deforestation is to enhance supply chain related regulation so that only beef is purchased that is not produced on recently deforested land. Supply chain governance, however, appears to be a major stumbling block for ensuring that beef-related deforestation rates decline. In Brazil various government policies such as the Terms of Adjustment of Conduct (TAC) and the G4 Cattle Agreement were put in place in 2009 aimed at reducing cattle related deforestation.

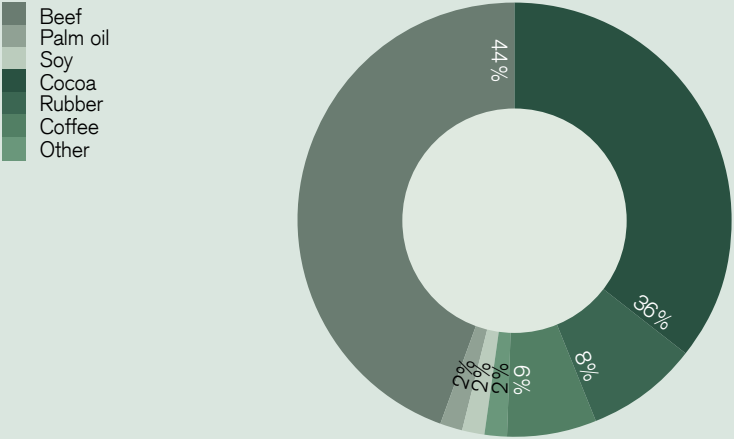
These were subsequently integrated in order to make monitoring easier. Work from Gibbs et al, 2015 ([Did Ranchers and Slaughterhouse Respond to Zero-Deforestation Agreements in the Brazilian Amazon?](#)) shows that some of Brazil's largest meatpackers did respond to these agreements, however, they also note that these agreements are narrow in scope and therefore do not guarantee that cattle-related deforestation will decline.

In November last year the EU proposed legislation aimed at minimizing EU-driven deforestation and forest degradation. The new rules will require companies among others to obtain the geographic coordinates of the plots of land where the commodities that they place on the market were produced. This should enhance traceability and among others help reduce

beef-related deforestation too. While we see this as a positive development, we note that some NGOs have voiced concerns with the EU because they fear that the legislation is too narrow as it does not include processed beef and hides ([Letter-on-missing-products-and-Brazil-leverage.pdf \(fern.org\)](#)).

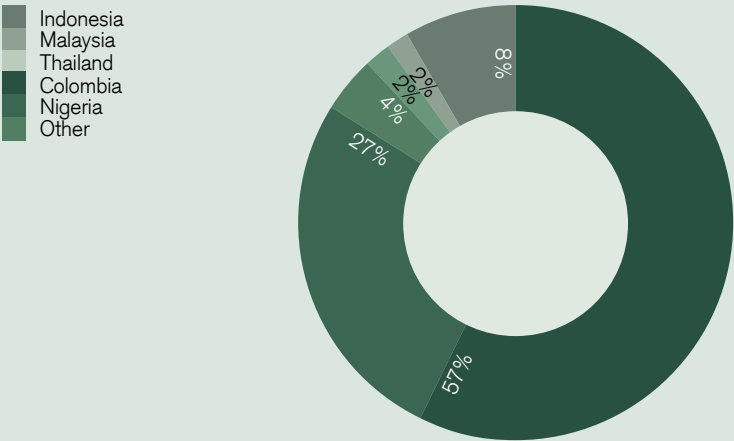
Palm oil

Figure 19: Relevance of palm oil to deforestation



Source: FAO, Credit Suisse

Figure 20: Biggest palm oil producers (2019)



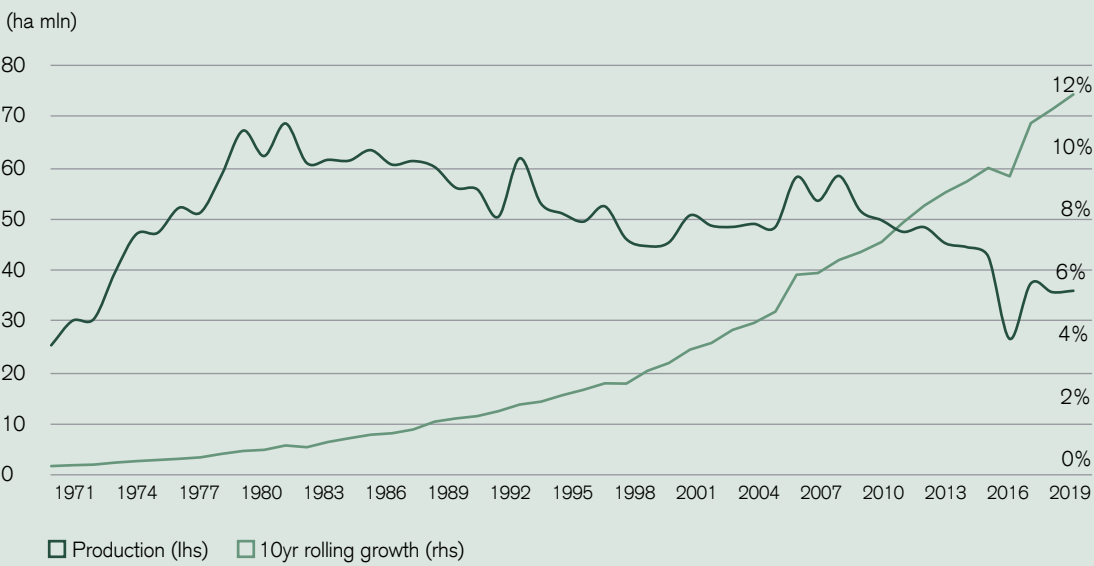
Source: FAO, Credit Suisse



Figure 13 showed that palm oil consumption increased more than any of the other significant commodities associated with deforestation between 2000 and 2019. The WRI estimates suggest that between 2001 and 2015 more than 22 million hectares of forest was cleared to allow

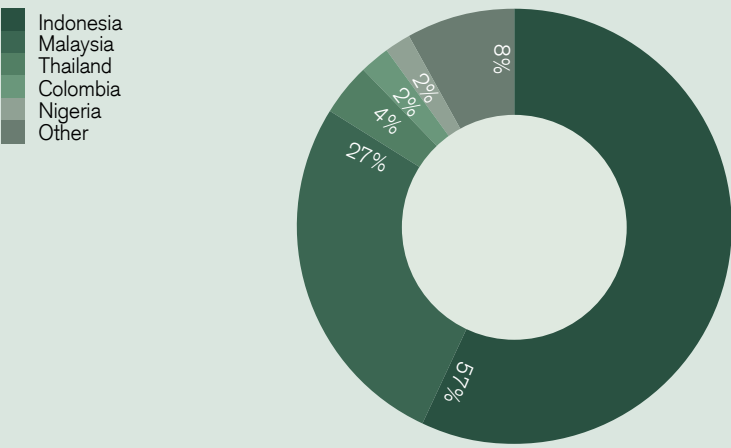
for oil palm plantations. More than two-thirds of all deforested land used for oil palm plantations is in Indonesia and Malaysia. Combined these countries accounted for 84% of oil palm production in 2019 according to the FAO.

Figure 21: Palm oil production



Source: FAO, Credit Suisse

Figure 22: Largest producers of palm oil (2019)



Source: FAO, Credit Suisse

The growth in demand for palm oil is explained by the fact that it is used in a wide range of end markets. For example palm oil is used in numerous food products including chocolate, pizza, bread, cooking oil, noodles and ice cream. Household products such as shampoo, detergents, lipstick and soap make use of it too. Rising consumer spending power globally has been – and continues

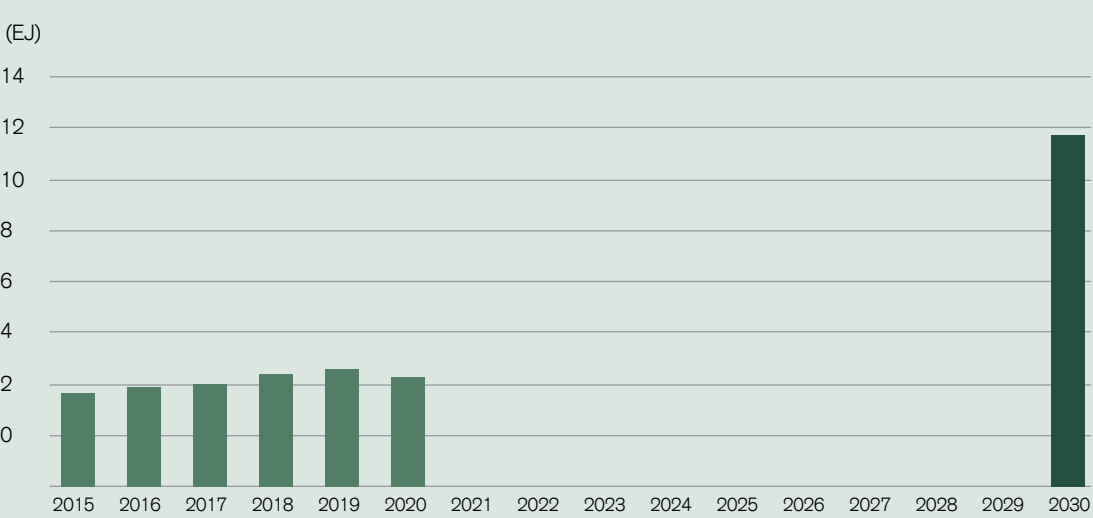
to be – a structural driver behind the demand for these consumer items. We do not think that this will change in the near term. We refer here to work from our European consumer staple team who believe annual growth of c3% is likely (see European Consumer Staples: Navigating the decade ahead: little room for error).

More recently, we note that biodiesel or biofuels has become an additional driver for increased palm oil production considering that it is one of the production inputs. In 2000 only 16,000 barrels of biodiesel was produced daily, according to the IEA. This increased by c23% annually during the next 20 years according to data from the EIA. Global demand for biodiesel is set to grow by 41 billion liters or 28% during 2021-2026 predominantly

owing to government policies associated with longer term climate change targets.

The net zero scenarios from the IEA provide additional context around global biofuel demand. Their estimates indicate that to be in line with longer term net zero targets biofuel demand needs to reach 12EJ in 2030 or more than 3x the levels seen between 2015 and 2020.

Figure 23: Global biofuel demand in the net zero scenario



Source: IEA, Credit Suisse

Figure 24: Palm oil and biodiesel prices have risen sharply



Source: Company data, Credit Suisse



This growth projection for biodiesel is relevant for a number of deforestation-related commodities including palm oil and soy beans. For example in 2018 almost two-thirds of the palm oil imported into the EU was burned as energy.

Some recent analysis around the amount of GHG emissions linked to each of the biodiesel feed stocks used in the EU suggests that it is worse than the emission profile of traditional diesel if emissions related to deforestation are included ([Eco-friendly biodiesel from palm oil?](#) [Can palm-oil biodiesel can reduce greenhouse gas emissions](#)). In response to this, the EU changed its Renewable Energy Directive in 2018 and decided that it will stop counting biofuels from crops such as palm oil towards their sustainable targets from 2030.

The recent rise in palm oil prices have also caused some governments to change their targets related to biofuel policies. For example in Brazil, the National Petroleum Agency lowered GHG targets for the transport sector by 50% in 2020 and reduced its biodiesel blending mandate to 10% from 13% in 2021. Indonesia delayed the introduction of its 40% biodiesel blending mandate from 2021 to 2023. Colombia and Argentina have delayed the implementation of biofuel policies too because of high feedstock prices.

While these delays may temper some of the demand for biofuel related commodities including palm oil in the short term, it remains to be seen whether this is likely to be structural. In fact later in this report we highlight that high commodity prices could lead to an acceleration in deforestation activity.

Certification appears to help

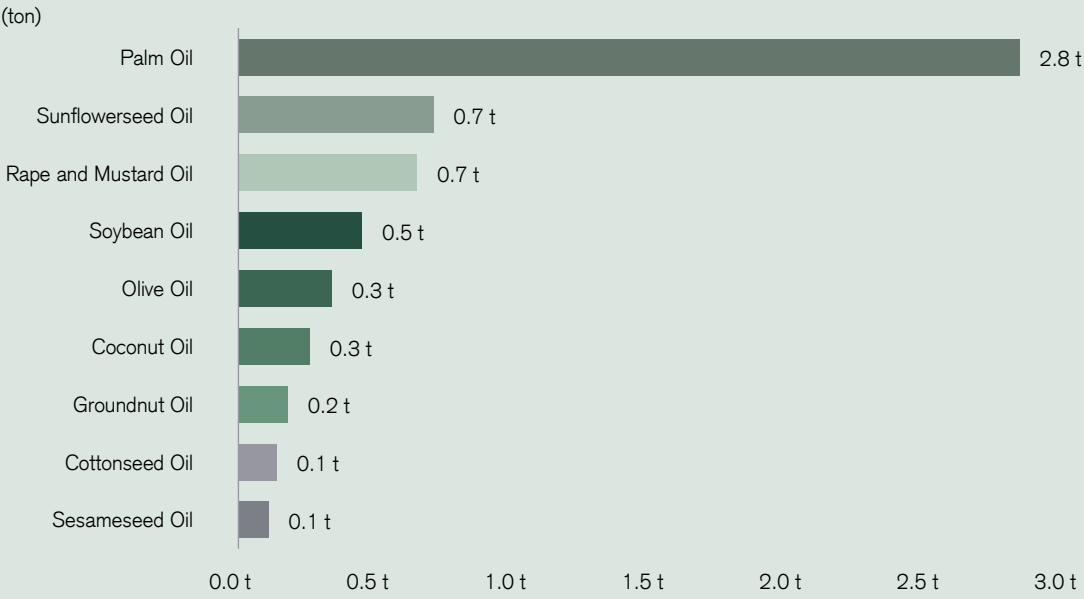
Deforestation rates related to palm oil plantations appear to have slowed substantially during the past few years. For example in 2012 some 1.2 million hectares of forest area was replaced by oil palm plantations, however, this fell to just 0.2 million hectares by 2015. Drivers for this include greater scrutiny from buyers through tighter procurement policies. Sustainability-related certification schemes such as that from the Roundtable on Sustainable Palm Oil (RSPO) appear to have been key in this ([Effect of oil palm sustainability certification on deforestation and fire in Indonesia](#)). However, at present, less than 20% of palm oil produced globally is certified by the RSPO suggesting that to reduce deforestation related to palm oil production further requires greater regulatory scrutiny, in our view.

Alternatives may not be the answer

Aside from reducing palm oil for biodiesel production the question could be asked whether alternatives for palm oil should be considered. This in our view is not necessarily an option. The key reason for this relates to the fact that palm oil has a much higher yield compared to its alternatives. Secondly it is more versatile and therefore can be used in a much wider array of products (food and non-food) than its alternatives. We refer to Figure 25 which shows that the amount of palm oil that can be produced on one hectare is a multiple of all potential alternatives. Figure 26 shows how much land is needed to produce the world's total vegetable oil production if it were generated by one commodity. This clearly suggests that shifting palm oil demand to other commodities could actually lead to more deforestation.

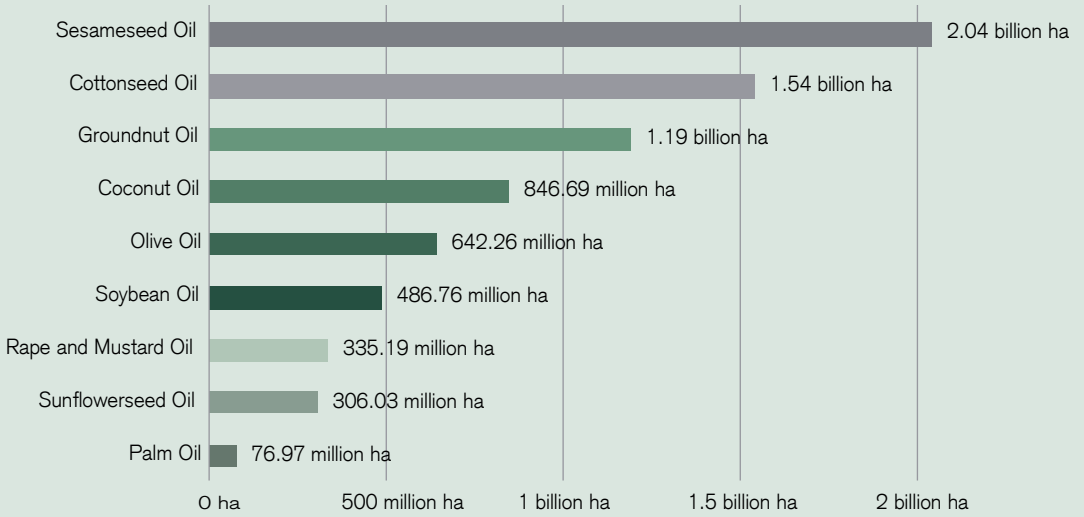


Figure 25: Production per hectare



Source: FAO

Figure 26: Amount of land needed if total vegetable oil was produced from one product



Source: FAO, Credit Suisse

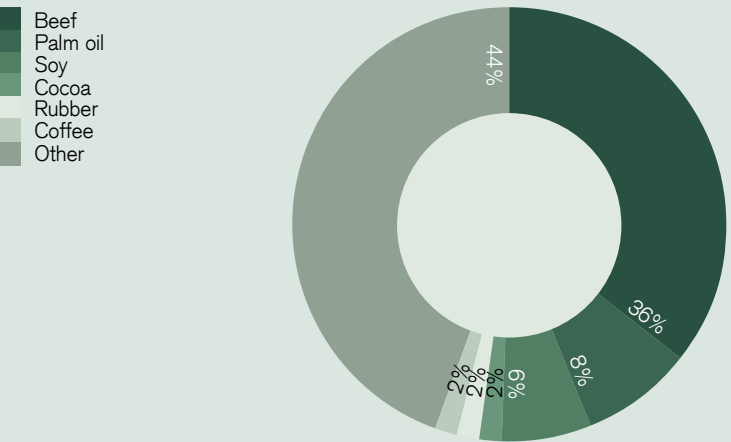
Potential solutions for reducing palm oil related deforestation

Based on our analysis we see a few areas that will help reduce the impact of palm oil production on deforestation. Firstly consumer awareness needs to increase around the impact of palm oil on deforestation and which products make use of this. This would help in reducing overconsumption of palm oil-heavy products. Second this awareness should be accompanied

by campaigns aimed at directing consumer spending towards those products that make use of palm oil certification programs. Thirdly, and this is applicable to all commodities, producers should aim to maximise crop yields through new technologies and products.

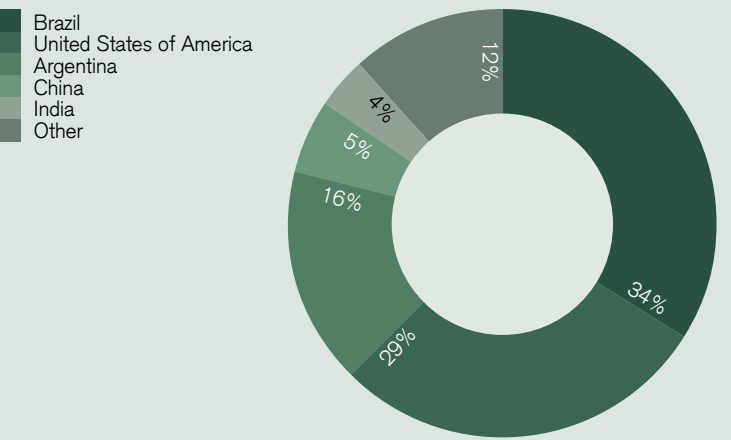
Soy

Figure 27: Share of soy in deforestation (2001-2015)



Source: FAO, Credit Suisse

Figure 28: Biggest soy producers (2019)



Source: FAO, Credit Suisse

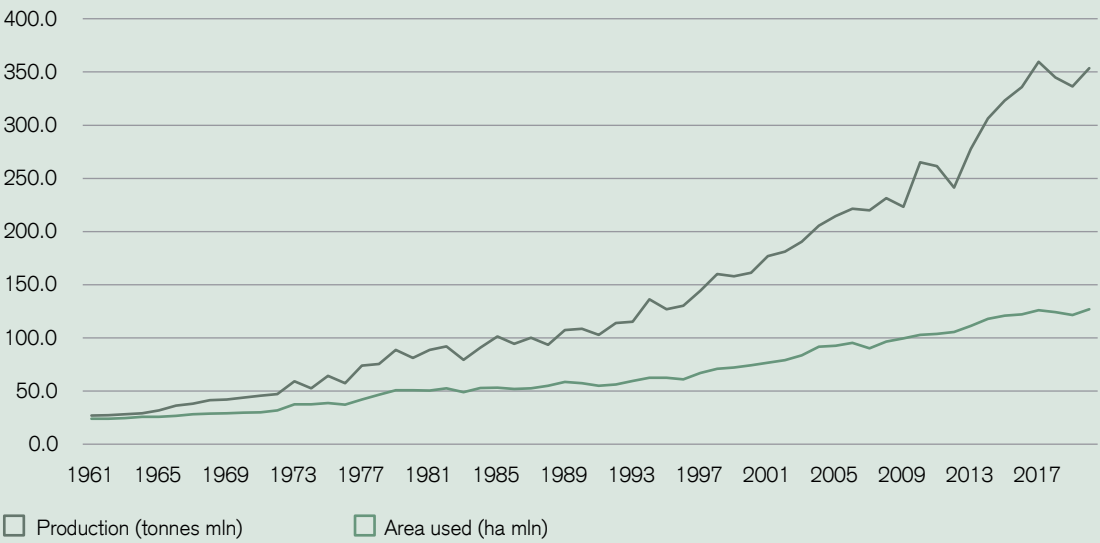
The production of soybeans globally has risen strongly during the past few decades. It more than doubled during the past 20 years according to data from the FAO to more than 353 million tonnes in 2020 and has increased at an annual average rate of c4.5% since 1961. Brazil and the US are the largest producers of soy globally with a share of c33% and 28% in 2019, respectively. Argentina is the third largest producer globally with a share of c16% according to the FAO.

More than 50% of the world's soy is produced

in tropical areas requiring a total area of some 70 million hectares, an increase of more than 100% compared to 2001. Data from the WRI suggest that almost all of soy related deforestation since 2000 occurred in South America with Brazil and Argentina accounting for 61% and 21%, respectively. On a positive note, data from the Global Forest Review shows that soy related deforestation rates

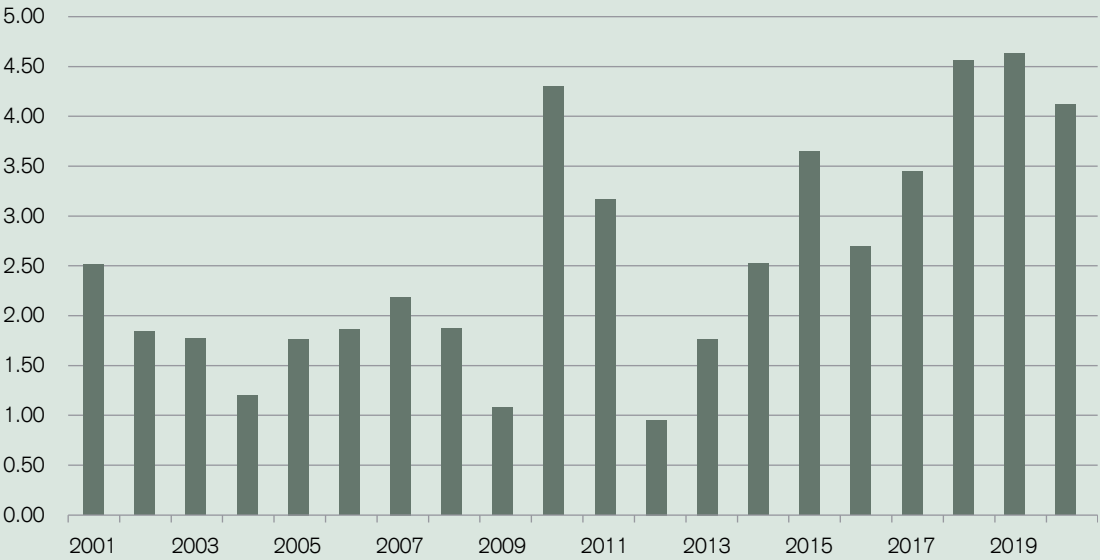


Figure 29: Global production of soybeans



Source: FAO

Figure 30: Change in 5-year moving averages: soybean production versus harvested land use



Source: FAO, Credit Suisse

have started to decline. The first drop occurred in 2005 in Brazil after the country had established a plan in 2004 to reduce deforestation in the Amazon. An industry-led 'soy moratorium' related to recently deforested land was implemented in 2006 which helped to limit soy-related deforestation further. Our calculations using global production data suggest a similar trend. During the past 10 years we note that five year rolling average for soy production has started to accelerate relative to the change in harvested area on a similar five year rolling basis (Figure 30).

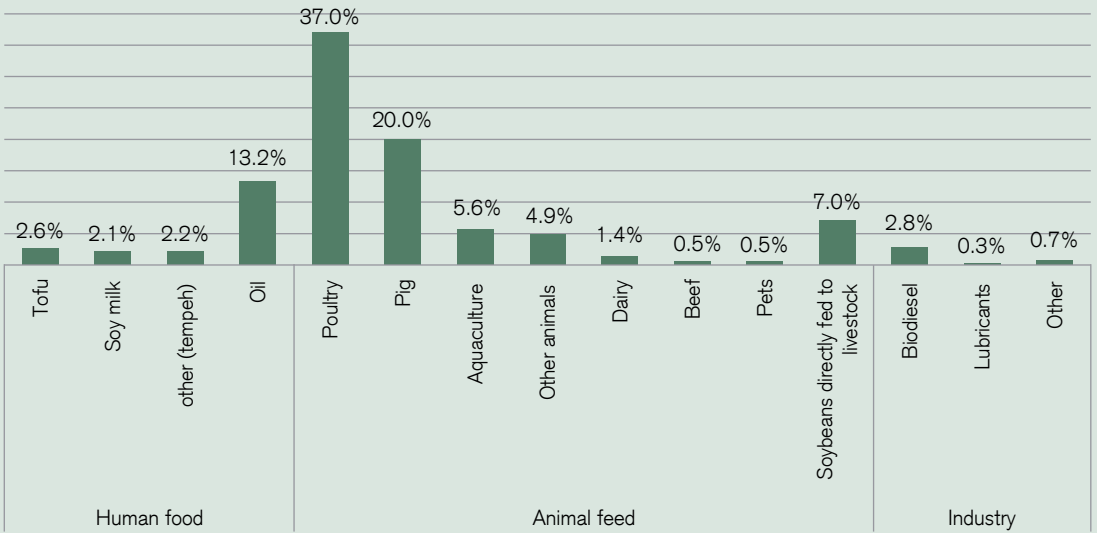
Soy beans are used for a wide variety of products. When processed c78% of soy is turned into so-called soy meal. Soy meal is high in protein (c50% content) and fiber (c25%) and is therefore mostly used as feed for pork, cattle, poultry, fish and pets (Figure 31). Other uses include tofu and soy milk (a dairy alternative), cooking oil, biodiesel and industrial supplies such as paints and cleaners. The decline seen in deforestation rates related to soy production during the past ten

years is positive; however, we make two cautious observations.

- Firstly as noted in our section on beef, soy production is crowding out beef production which in turn forces cattle farmers to deforest other areas for their animals. Soy production therefore may lead to indirect levels of deforestation. Data from Trase Insights ([indirect-land-use-change](#)) for example suggest that for each hectare of soy expansion onto existing pasture there is at least one hectare of forest loss to offset the soy encroachment.
- Second and more difficult to assess is the impact that a potential consumer shift away

from animal protein consumption may have. Reducing meat consumption is a key potential solution to reducing GHG emissions associated with the food system. Given our previous comment that soy is mainly used as animal feed, some might think that reducing meat consumption would reduce soy consumption too. However, the opposite may happen if consumers decide to switch from environmentally intense beef to a combination of lower emission intense animal food such as chicken. The reason for this relates to the fact that soy is mostly used as feed for poultry and pigs, not for beef. Such a shift especially if consumers were to also add soy-based protein supplements to their diet would therefore likely increase overall demand for soy which in turn might lead to increased deforestation risk.

Figure 31: Breakdown of global soy production by end-product (2017-2019)



Source: FAO, Credit Suisse

The need to address soy-related deforestation is increasingly being reflected in policies adopted by industry bodies. For example, the European animal feed organisation (FEFAC) recently published updated soy sourcing guidelines with a focus on conversion-free soy or soy that has not been produced in natural ecosystems that have been converted to agricultural land. The Round

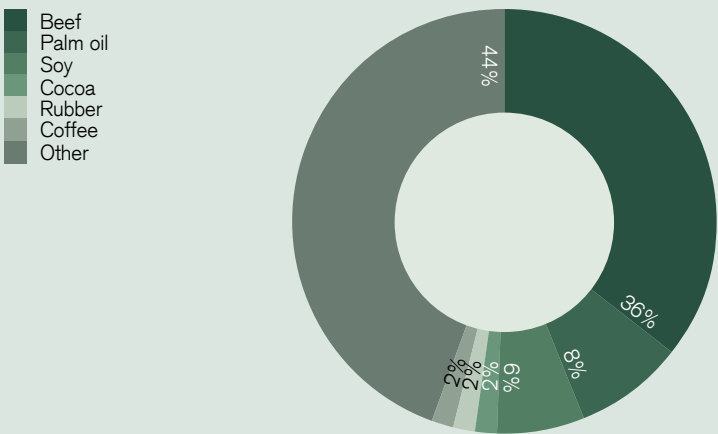
Table on Responsible Soy is an organization consisting of soy producers and industry, trade and financial companies that through soy certification aims to promote the production and trade of sustainable soy. In the US the Soybean Sustainability Protocol (SSAP) has been adopted by the majority of US soybean farmers.





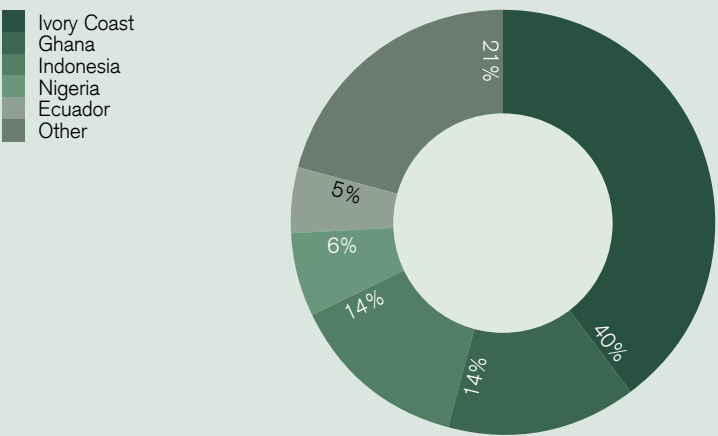
Cocoa

Figure 32: Share of Cocoa related deforestation (2001-2015)



Source: FAO

Figure 33: Biggest cocoa producers (2019)

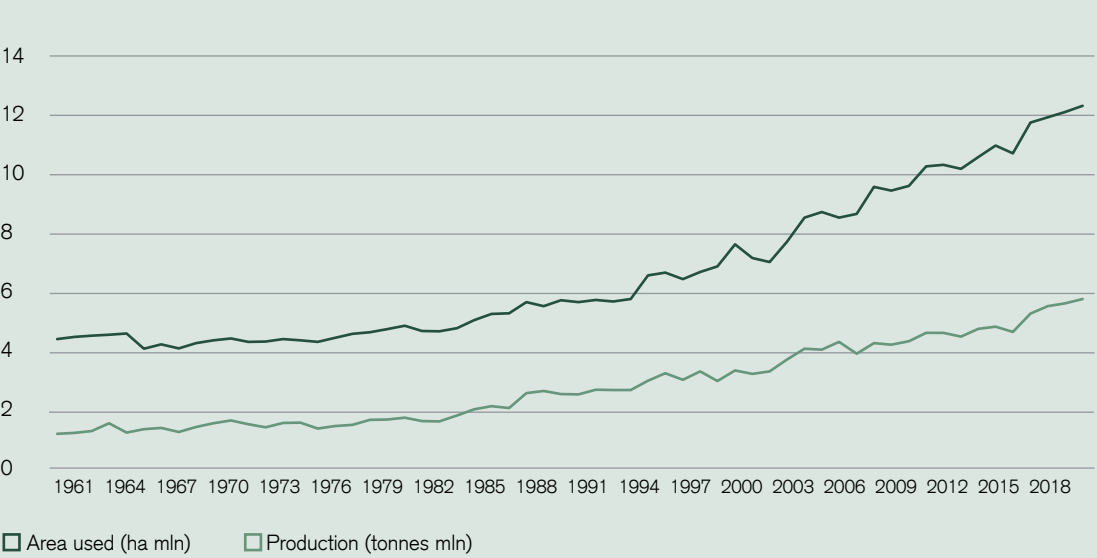


Source: FAO, Credit Suisse

Since the early 1960s cocoa production has increased at an annual rate of 2.7%. However, more recently production has started to increase driven by resilient consumption. Figure 13 showed that global cocoa consumption increased by 60% during the 2000-2019 period or an annual rate of almost 5%.

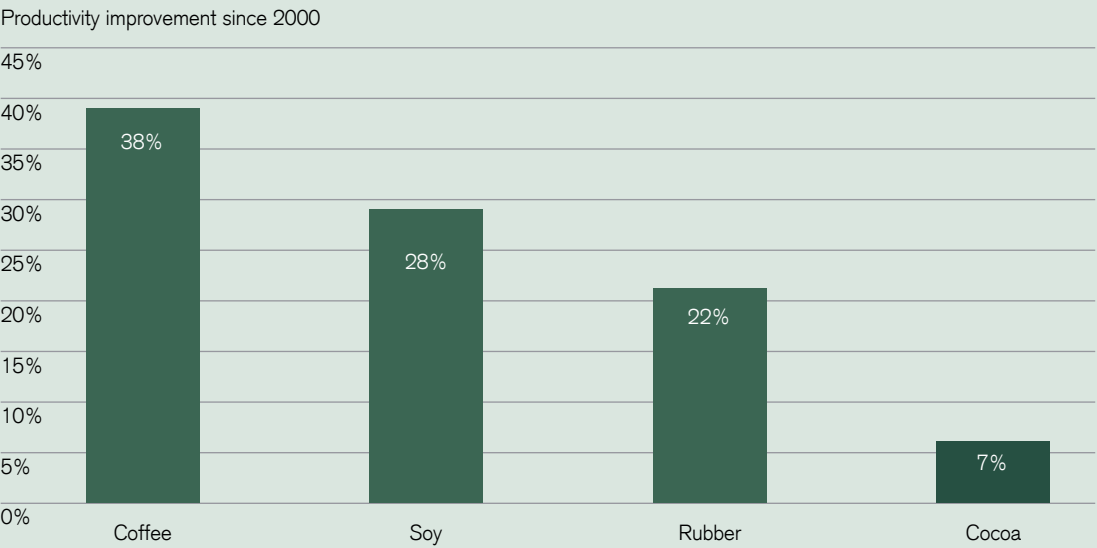
In contrast to some of the other deforestation-related commodities described in this report we highlight that cocoa production has been largely realised by an expansion of land rather than reliance on productivity improvements (Figure 35).

Figure 34: Cocoa production and area used



Source: FAO

Figure 35: Productivity improvement since 2000



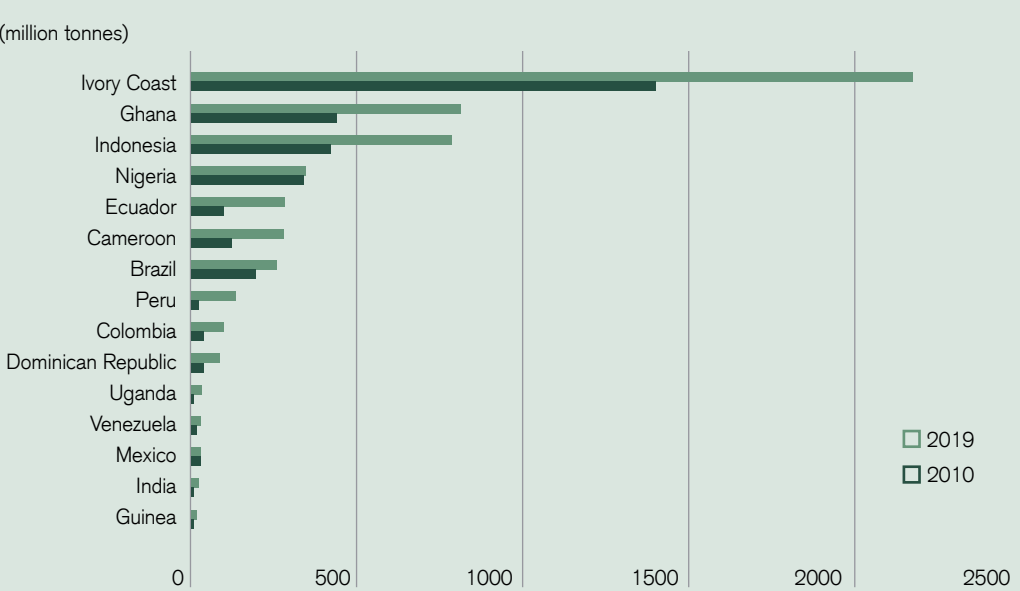
Source: FAO, Credit Suisse

The world's key production areas for cocoa are highlighted in Figure 36. This shows that production has become more concentrated during the past ten years towards countries including the Ivory Coast, Ghana and Indonesia. The Global Forest Review suggests that annual forest area replaced by cocoa production each year increased from c100-150 thousand hectares per year between 2001 and 2012 to between 150-200 thousand since 2013.

Although total forest loss associated with cocoa production substantially lags that of beef, palm

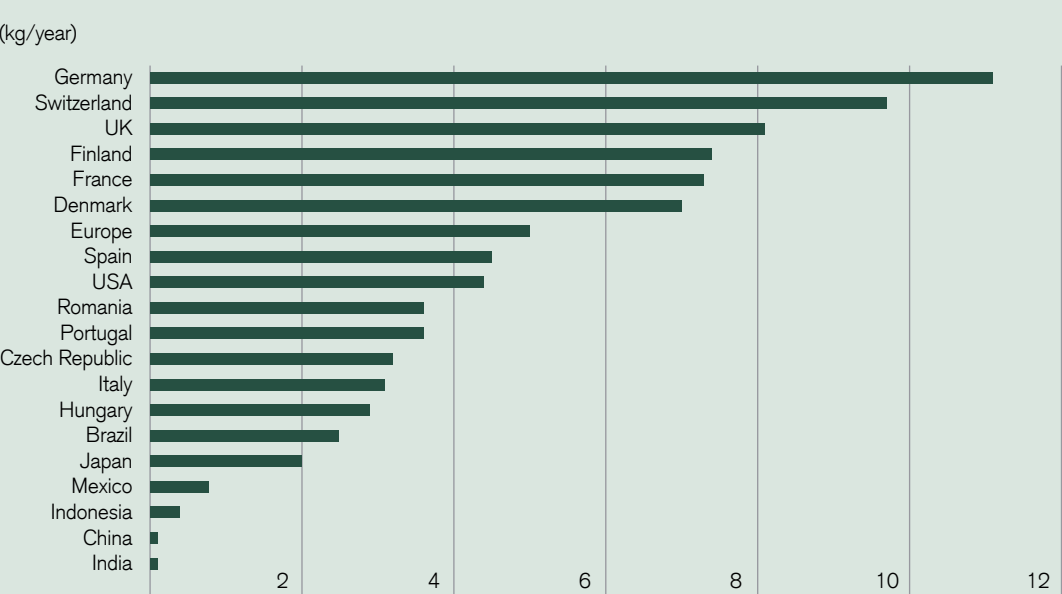
and soy production we do note that pressures to expand appear structural in our view. Figure 37 suggests that current per capita consumption of chocolate across key developing countries such as India, China and Indonesia is a fraction of that of most European countries. To provide context, Indian consumers eat c100 gram of chocolate per year compared to c5 kilogram for the European average according to Figure 37. Rising levels of disposable income over time may act as a trigger for consumers across the emerging world to increase chocolate consumption which could lead to further deforestation.

Figure 36: Cocoa production by country



Source: FAO

Figure 37: Per capita chocolate consumption



Source: FAO, Credit Suisse

Challenges in addressing cocoa related deforestation

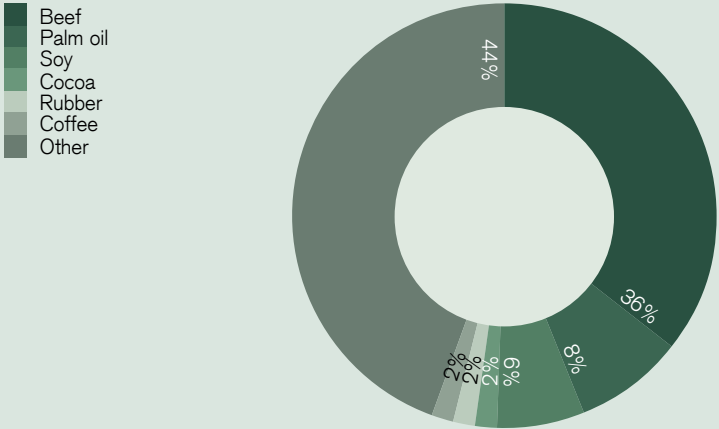
We already highlighted the relatively muted improvement in cocoa productivity during the past 20 years when compared to other commodities. Addressing cocoa related deforestation by raising productivity is challenging not least because some 90% of the world's cocoa beans are harvested on small, family run farms with less than two hectares of land according to Cocoa Life. An additional challenge in limiting further deforestation related to cocoa bean production is the fact that cocoa

requires shade from trees and high rainfall. Small scale farmers may seek to move to other forest areas to grow cocoa if global warming leads to more intense periods of drought. Finally we note that average yields on cocoa lands can be low (On-farm cocoa yields increase with canopy cover of shade trees in two agro-ecological zones in Ghana). Addressing this in order to reduce the risk of further deforestation requires additional tree cover and the use of yield enhancing commodities such as fertilizers.



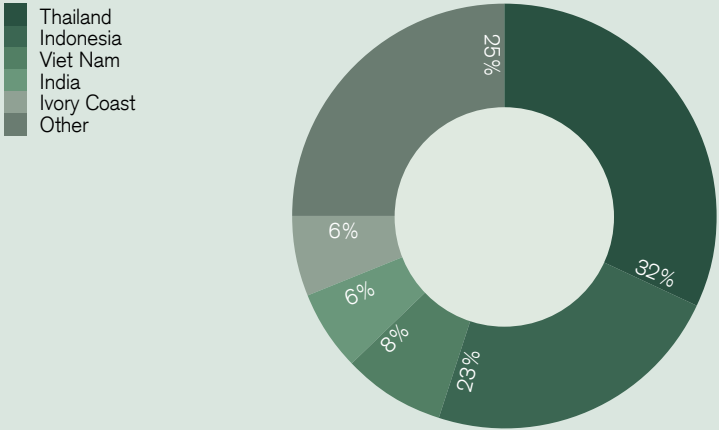
Rubber

Figure 38: Rubber share in deforestation (2001-2015)



Source: FAO

Figure 39: Biggest rubber producers (2019)



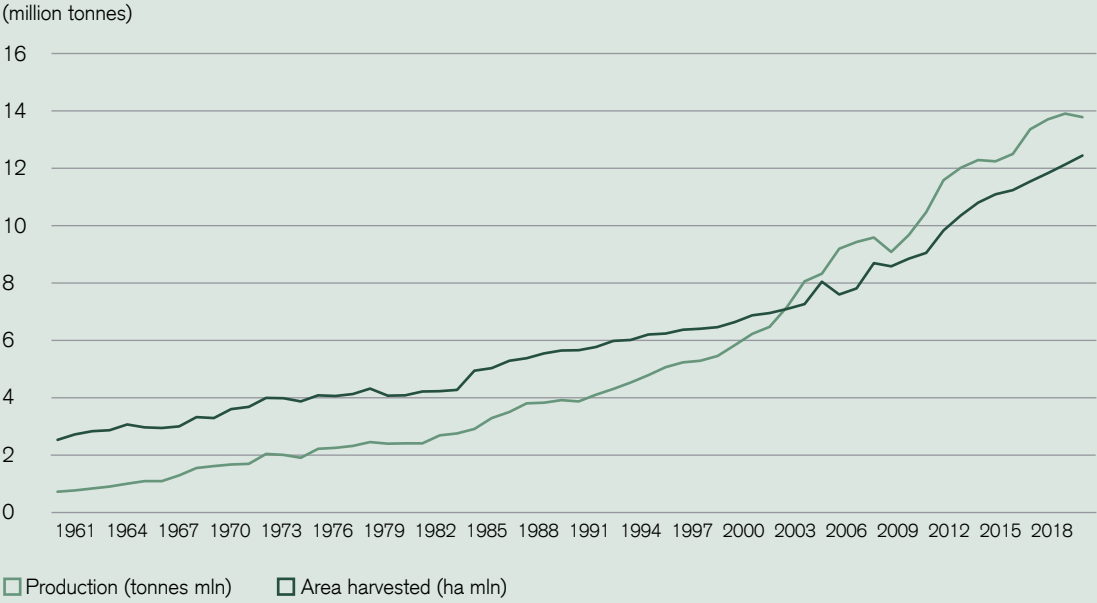
Source: FAO, Credit Suisse

Forest loss associated with rubber production has been estimated by the WRI at over 2 million hectares during the 2001-2015 period making it the 5th largest contributor to tropical forest loss. Since the early 1960s total natural rubber production has increased seven fold to almost 15 million tonnes in 2020. Countries that are the largest producers of natural rubber are Thailand (32% share), Indonesia (23%), Vietnam (8%) and India (6%). Interestingly we note that Malaysia was the third biggest producer of natural rubber in 2000 with a 13% share, however, that has since declined to 3% in 2020.

While production of rubber increased seven fold since 1961, we note that the area needed to

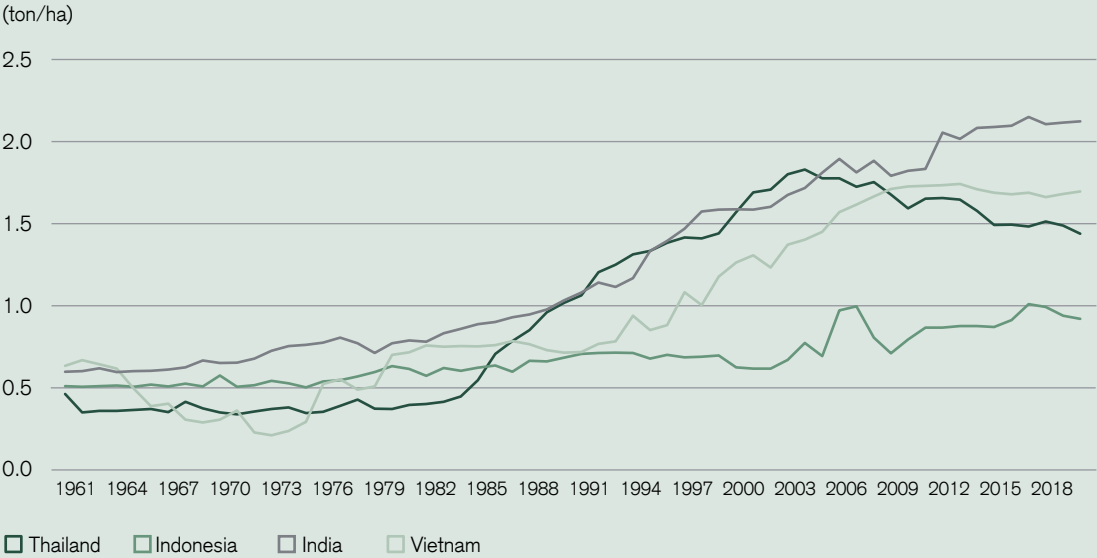
produce this has increased by less than half that rate suggesting that productivity gains have been achieved. In case of the largest four producers we find that the strongest improvements in productivity were achieved in India (+251% since 1961). Rubber productivity increased by a more moderate 79% in Indonesia. We note that overall productivity in Thailand has risen a substantial 207% during the past 60 years, however, it reached a peak in 2004 and has been steadily declining since. This is something that will need to be addressed in our view if future increased rubber demand is to be met without increasing deforestation pressures further.

Figure 40: Rubber production



Source: IEA, Credit Suisse

Figure 41: Rubber productivity for largest producers



Source: Company data, Credit Suisse





The likelihood that rubber demand will increase going forward is high in our view. One key end market that is relevant here is the automotive industry which represents close to 50% of natural rubber usage. Car penetration rates globally are likely to increase in the future as the emerging middle class expands and car ownership converges closer to developed market levels. Related to this is the move to electric vehicles. The reason why this may accelerate demand for rubber is because electric vehicles are heavier than traditional petrol cars and therefore have a higher friction with the road resulting in a more frequent need to replace tires. Thirdly, despite the environmental concerns related to airline travel we expect the global fleet of aircrafts to continue to increase. Most of this is again associated with increased spending power across developing countries. Tires used for aircraft are made out of natural rubber which therefore is likely to increase demand for the commodity. One area that has seen increased demand for rubber relates to latex products (including gloves). The COVID pandemic has increased demand for gloves, which may prove more structural resulting in higher demand going forward.

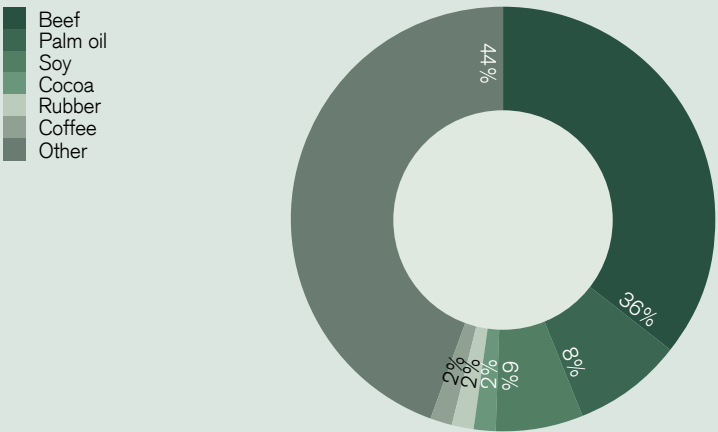
One of the challenges in relation to limiting deforestation risk associated with rubber production is the fact that small scale, independent, farmers produce more than 80% of natural rubber. Improving productivity rates probably requires capital investments something which small scale farmers might not be able to afford.

Self regulation may help

In 2019 the Global Platform for Sustainable Natural Rubber (GPSNR) was set up which currently includes most of the major tire companies and car manufacturers as its members but also small scale rubber producers and a range of environmentally focused organisations such as the WRI and WWF. The aim of the GPSNR is to improve the sustainability of the natural rubber supply chain by focusing on a wide range of environmental, social and economic goals. In the absence of strict government regulation it is feasible that the GPSNR will help to limit rubber related deforestation risk and improve human rights practices too.

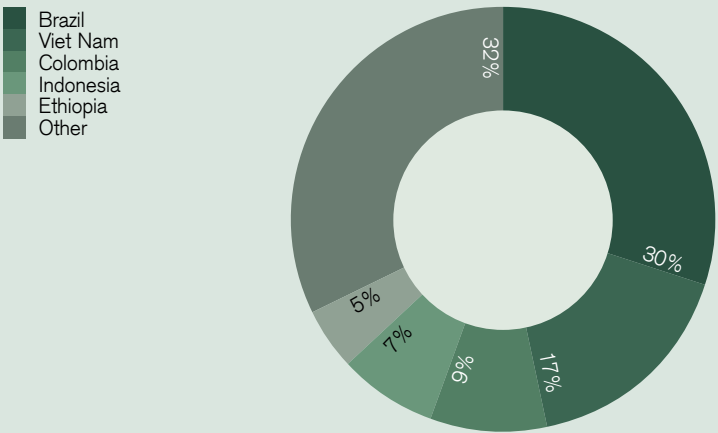
Coffee

Figure 42: Share of coffee related deforestation (2001-2015)



Source: FAO

Figure 43: Biggest coffee producers (2019)



Source: FAO, Credit Suisse

Coffee production remained relatively stable between 1961 and 1977 at around 4 million tons per year. Since then, however, production has started to increase and reached 10.7 million tons in 2020 according to data from the FAO (Figure 43). The largest producers of coffee globally are Brazil (35% share), Vietnam (17%), Colombia (8%) and Indonesia (7%).

The demand outlook for coffee consumption appears strong and driven by a number of factors in our view.

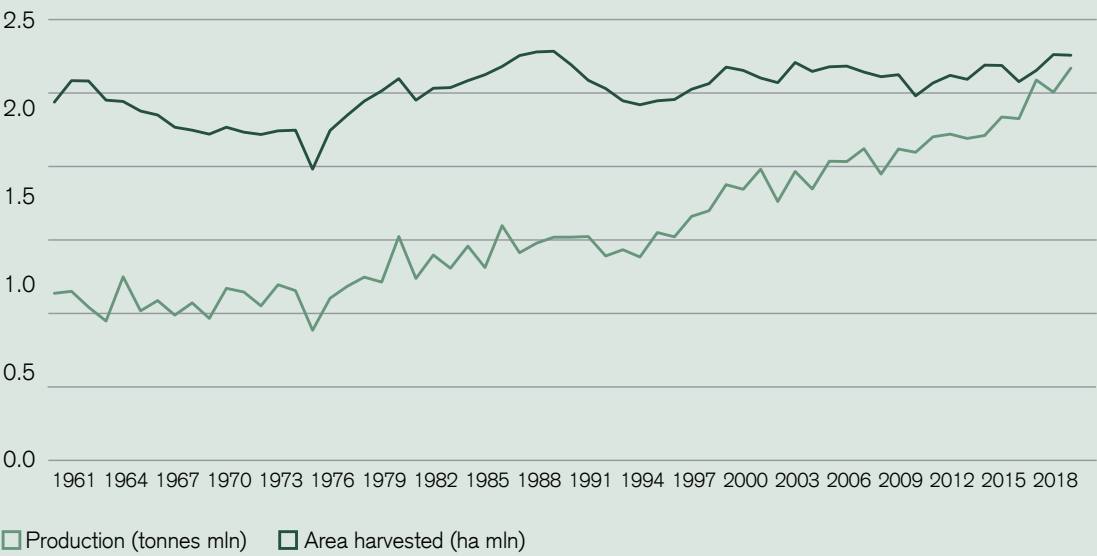
- First, we note that population growth, coupled with the fact that life expectancy globally continues to rise has expanded the potential consumer base for coffee. This factor is unlikely to subside any time soon given that population growth is set to continue for at least another few decades according to US estimates.
- Second, data on coffee consumption by country suggest a positive correlation with average wealth levels (Figure 46). As incomes rise, especially in developing countries, we expect coffee consumption to rise too.



■ Third we note that cultural changes appear to favor coffee over other drinks which more recently has supported a switch towards coffee. For example the Office of National Statistics in the UK reported that weekly purchase per capita of coffee in the UK is now higher than that of tea (Figure 47).

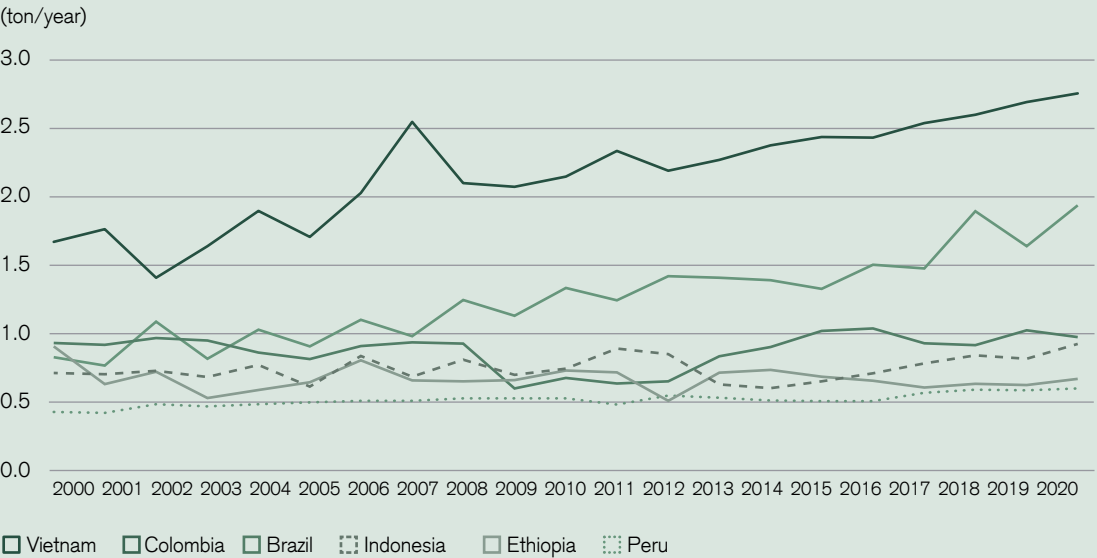
The development of new espresso-based coffee variations, the widespread emergence of coffee shops, and the increasing adoption of coffee products across popular media such as in TV series and movies has enhanced the appeal of coffee.

Figure 44: Coffee production versus production land used



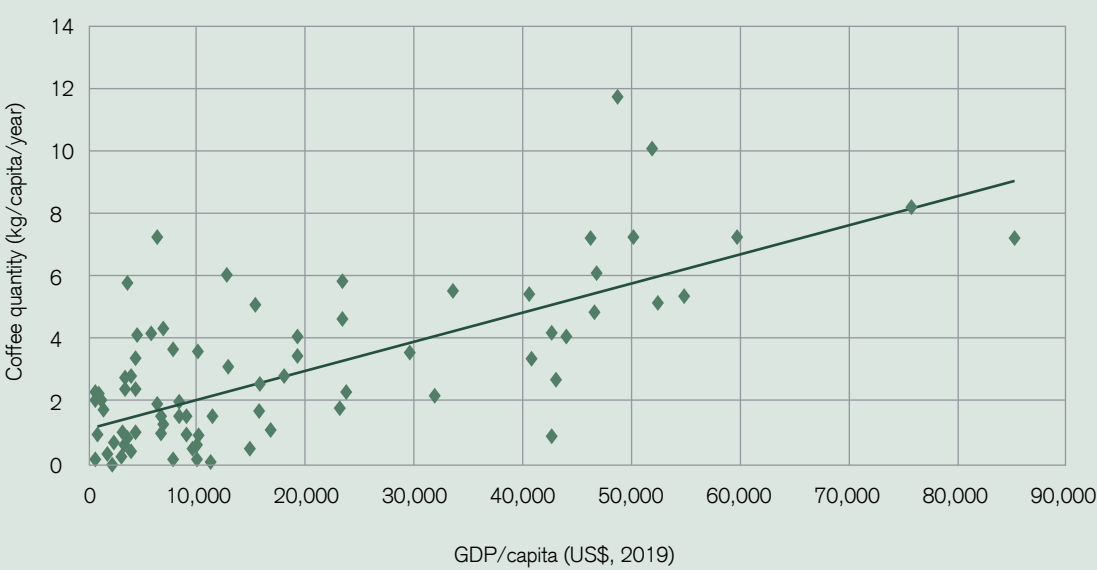
Source: IEA, Credit Suisse

Figure 45: Production per hectare



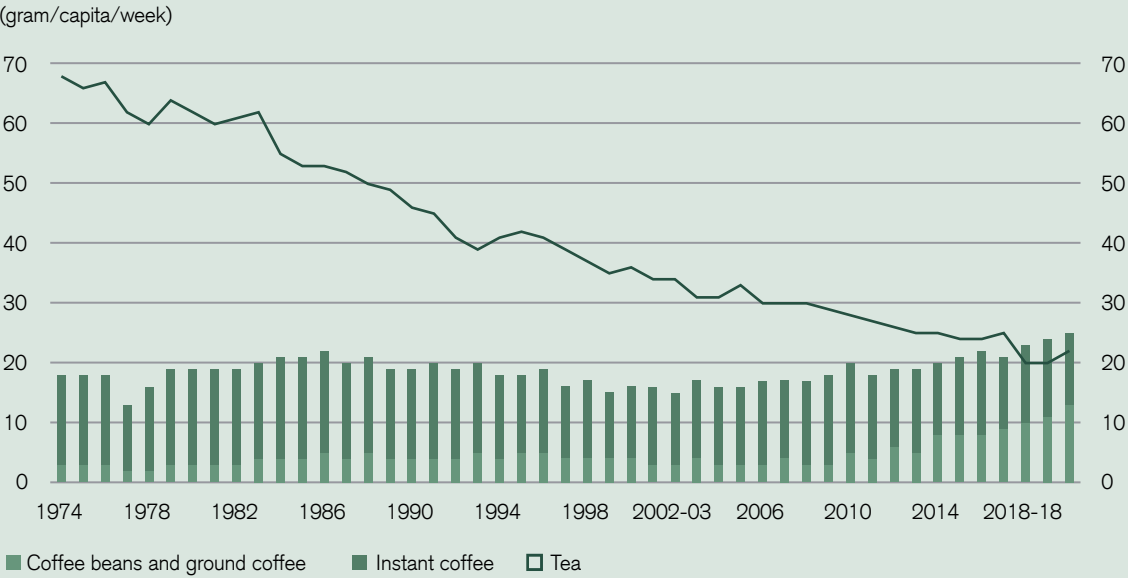
Source: Company data, Credit Suisse

Figure 46: Coffee consumption rises with wealth



Source: IEA, Credit Suisse

Figure 47: Coffee buying has replaced tea in the UK



Source: UK Office for National Statistics, Credit Suisse



What if current trends continue?

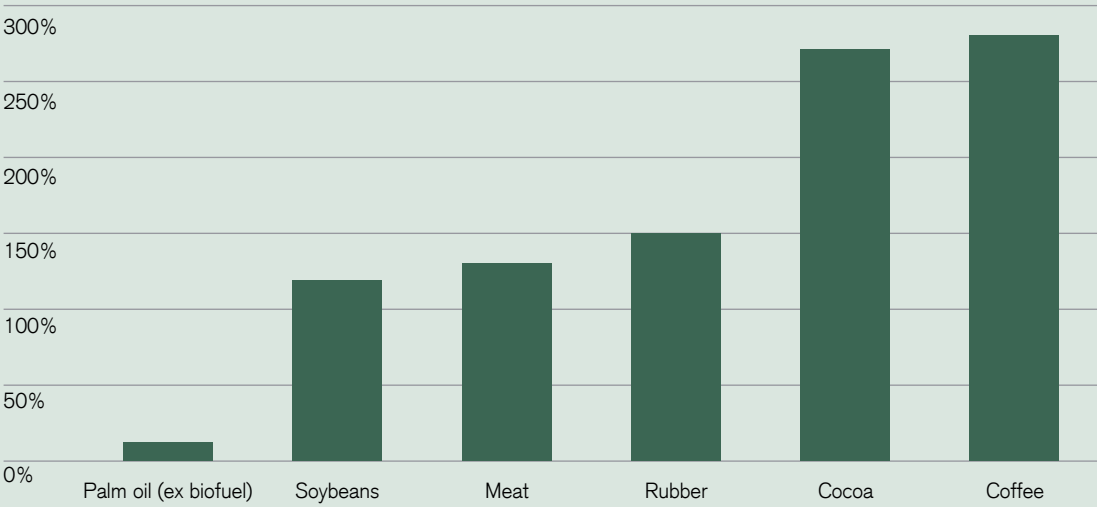
We have run a simple scenario to assess how demand for the key deforestation-related commodities might change going forward as this will give a sense of the potential pressure on deforestation rates in the absence of new technologies or solutions being adopted.

For the purpose of our exercise we mainly assume that current consumption patterns per capita seen across wealthier countries will be adopted in other areas too once they become wealthier. A per capita comparison between countries is adopted for meat, coffee, and cocoa. Our estimates for soy demand are driven partly by direct consumption of soy bean oil but indirectly also by the increase in meat consumption given that c70% of soy is used as animal feed. Our calculations for rubber are driven by using estimates for car penetration given that car tyres are the largest driver for rubber demand. Finally we note that future palm oil demand is driven by three factors. Firstly, food related palm oil consumption. We estimate this to decline by c1% per annum, recognising that on a per-capita basis this

tends to decline as incomes rise. Secondly palm oil is used in non-food household items. We estimate that this will increase by c3% per year as rising income levels are likely to result in growing consumption of these items. Thirdly palm oil is used in the production of biofuels. Given the questions around the sustainability of this we do not assume that palm oil will see an increase in production related to biofuel production in the future.

Overall in Figure 48 we show that with the exception of palm oil all other commodities could see production volumes rise, by 117% in case of soybeans to 279% in case of coffee, if consumptions patterns globally converge. When we covert this into required land use we calculate that in the absence of any productivity increases achieved on current pasture land farmers would need an additional 5,315 million hectares of land to produce the quantities needed. This would represent an increase of 114% over the amount of farm land that is currently used globally.

Figure 48: Cumulative potential production increase for key deforestation commodities if consumptions patterns converge to developed market levels



Source: FAO, Credit Suisse



A person in silhouette is looking out over a city skyline at sunset. The person is in the foreground, and the city is in the background. The sun is low on the horizon, creating a warm, golden glow over the city. The person's hair is blowing in the wind.

Potential solutions

Our assessment of the key commodities associated with deforestation clearly suggests that future demand for them is likely to be robust given the expected further increase in the world's population to c10bn by 2050 and the likely further expansion of the middle class across the developing world. Such a development might lead to increased levels of deforestation considering that more pastureland would be

needed to grow this incremental level of commodities. Total deforestation activity, however, could be even greater than this given that global warming is already affecting the ability for farmers in many countries to grow crops on their existing land due to drought or flooding. With this in mind the question is what solutions exist that might help reduce future deforestation pressures. We would highlight the following:

Stricter regulation is needed

Firstly, we believe that stricter regulation of the entire supply chain for all key deforestation related commodities is needed. Relevant in this regard is not only that regulation is established but importantly that it is enforced too.

We have reviewed nature-related regulatory developments for the key regions and believe

that progress is being made. However, in our view current regulatory proposals or development do not go far enough and it is often unclear how or who is supposed to enforce the rules and what the punishments are in case they are breached. Below we summarise recent developments by region.

EU

During COP26, at least 141 countries, representing c90% of the planet's forests, signed the [COP26 Glasgow Leaders Declaration on Forests and Land Use](#), emphasising the importance of forests, biodiversity and sustainable land. Continuing to build on this theme, in November 2021, the European Commission (EC) proposed a set of new rules that are necessary to make the European Green Deal a reality. The proposed rules ([Regulation to curb EU-driven deforestation and forest degradation](#)) would guarantee that only deforestation-free products are allowed on the EU market.

The regulation, at present, covers six commodities, namely, **beef, wood, palm oil, soy, coffee, cocoa** along with some of their derived products such as leather, chocolate or furniture. As per the Commission, the list of commodities is likely to be extended over time. Under the new rules, companies - regardless of their location - who place products linked to the above-mentioned commodities on the EU market will be required to exercise due diligence and

analyse the risks in their supply chain associated with deforestation. Specifically, companies will be required to:

- Gather information, amongst other things, about commodity, quantity, supplier and country of production; and
- Take adequate measures through use of satellite monitoring, field audits, or isotope testing to confirm the origin of the product, as well as provide geographic coordinates of the plot of land where the commodity was produced.

While it can take up to two years for the regulation to enter into force, the rules will apply retrospectively to all products made after December 2020.

As part of its Fit for 55 program the EU also targets an increase in the share of renewables as part of transport fuels. This is now expected to reach 28% by 2030, up from the current target of 14% and is therefore likely to support increased demand for some key related commodities.

United Kingdom

In December 2021, the UK government launched a [consultation](#) on how to implement new measures in the Environment Act to help tackle illegal deforestation in UK supply chains. The consultation closed in March 2022 and enlisted views on key areas including which commodities and business are in scope of the regulations and how business will be required to report on their due diligence efforts.

United States

Efforts to tackle deforestation and clean up supply chains have also started to take shape in the United States. In October 2021, Senator Brian Schatz (D-Hawaii) and Representative Earl Blumenauer (D-Oregon) introduced the [Overseas Rule of Law and Environmentally Sound Trade \(FOREST\) Act](#).

The FOREST Act builds on the principles of the Lacey Act, which prohibits the trade of wildlife and timber from illegal sources in order to protect biodiversity. The FOREST Act would prohibit agricultural commodities, including palm oil, soy, cattle, rubber, pulp and cocoa, produced on illegally deforested land from entering the US market.

APAC

The [COP26 Glasgow Leaders Declaration on Forests and Land Use](#) has been signed by a number of Asian countries including China, Indonesia and Malaysia. China also signed a [joint statement](#) with the US in which the two governments intend to engage collaboratively in support of eliminating global illegal deforestation through effectively enforcing their respective laws on banning illegal imports. According to ClientEarth, China's amended forest law, which came into effect in 2020, introduces a number of components to protect forests. The law prohibits buying, transporting and/or processing illegally sourced timber, and requires processing companies to establish a data record of raw materials and products.

Indonesia, a global top producer of palm oil, enacted the Palm Oil Moratorium in 2018 for the duration of three years, in an attempt to stop deforestation and increase governance in the

The Environment Act intends to make it illegal for larger business to use key commodities if they have not been produced in line with local laws protecting forests and other natural ecosystems. This will include commodities such as **soy, palm oil, timber, pulp & paper, beef & leather, rubber** and **cocoa**. At this stage it is unknown what the definition for a 'large' business will be and therefore which companies would be excluded from the legislation.

The Renewable Fuel Standard program in the US includes legislation around the use of clean fuels. The Environmental Protection Agency is expected to update targets used in this program for 2023. The use of biofuel in aviation is also supported in the US. The US government has set a target of 11 billion liters of sustainable aviation fuel by 2030.

industry. According to [media](#) reports, the moratorium expired with no indication of extension, raising concerns by environmentalists who say Indonesia is at continued risk of deforestation.

In 2020, Malaysia announced its plans for tougher penalties for illegal loggers in forest law reform, as reported by the [media](#). The revamp of its traditional forestry laws would increase penalties, including fines and jail terms, for those found guilty of cutting down trees without permission.

In Asia, India is targeting 20% ethanol blending by 2025, a target that was originally set for 2030. While China plans to peak GHG emissions before 2030 it has not yet released biofuel-related targets.

LATAM

At COP21, Brazil's Environment Ministry announced its commitment to move forward an existing commitment to end deforestation by two years from 2030 to 2028, according to the [World Resources Institute](#) (WRI). The commitment specifically targets:

- Elimination of illegal deforestation by 2028, decreasing by 15% per year until 2024, 40% in 2025 & 2026, and 50% in 2027;
- Restoring and reforesting 18 million hectares (44.5 million acres approx.) by 2030; and
- Recovering 30 million hectares of degraded pastures (approx. 74 million acres).

According to critics, including the WRI, the agreement is not binding and there are no indicators that the government has begun to address the problems around illegal deforestation.

Furthermore, Brazil's Amazon Soy Moratorium (ASM) is a sectoral agreement under which commodities traders agreed to avoid the purchase of soybeans from areas that were deforested after 2008.

In the table below we highlight some of the key regulatory developments across the main commodity producing and consuming areas globally.



Figure 49: Regulatory developments across the world

Region	Regulation	Date of implementation	Cattle	Cocoa	Coffee	Palm Oil	Pulp & Paper	Rubber	Soy	Timber
European Union	Proposal for a regulation on deforestation-free products mandatory due diligence rules for operators which place specific commodities on the EU market, including soy, beef, palm oil, wood, cocoa and coffee. Those commodities and products are not allowed to have been produced on land deforested or degraded after 31 December 2020.	To be confirmed	x	x	x	x			x	x
United Kingdom	In December 2021, the UK government launched a consultation on how to implement new measures in the Environment Act to help tackle illegal deforestation in UK supply chains. The Environment Act will make it illegal for larger business to use key commodities if they have not been produced in line with local laws protecting forests and other natural ecosystems. This will include commodities such as soy, palm oil, timber, pulp & paper, beef & leather, rubber and cocoa.	To be confirmed (will apply retrospectively from December 2020)	x	x		x	x	x	x	x
United States	The FOREST Act builds on the principles of the Lacey Act, which prohibits the trade of wildlife and timber from illegal sources in order to protect biodiversity. The FOREST act would prohibit agricultural commodities, including palm oil, soy, cattle, rubber, pulp and cocoa, produced on illegally deforested land from entering the US market.	To be confirmed	x	x		x	x	x	x	
China	China's amended forest law, which came into effect in 2020, introduces a number of components to protect forests. The law prohibits buying, transporting and/or processing illegally sourced timber, and requires processing companies to establish a data record of raw materials and products.	2020								x
Indonesia	Indonesia, a global top producer of palm oil, enacted the Palm Oil Moratorium in 2018 for the duration of three years, in an attempt to stop deforestation and increase governance in the industry.	2018 (expired in 2021)				x				
Brazil	"Brazil's Environment Ministry announced its commitment to move forward an existing commitment to end deforestation by two years from 2030 to 2028. The commitment specifically targets the elimination of illegal deforestation by 2028, decreasing by 15% per year until 2024, 40% in 2025 & 2026, and 50% in 2027. Brazil's Amazon Soy Moratorium (ASM) is a sectoral agreement under which commodities traders agreed to avoid the purchase of soybeans from areas that were deforested after 2008.	2008	x						x	

Source: FAO, Credit Suisse



Nature-related Financial Disclosures: TNFD

As we mention a few times in this report one of the key challenges when trying to assess who contributes to deforestation and who is leading in addressing it is a lack of data or disclosure. This needs to improve but we believe that this may happen with a nature-based framework that is currently in the process of being developed.

The Taskforce on Nature-related Financial Disclosures (TNFD), modeled on the lines of the Taskforce on Climate-related Financial Disclosures (TCFD), released a beta version of its nature-related risk and disclosure framework in March 2022. The TCFD and TNFD are helpful tools for investors who wish to understand more about the

material climate- and nature-related (financial) risks of a company including commodity-driven deforestation in the supply chain. The TNFD was officially launched in June 2021, with the aim to create more awareness about the risk and opportunities that exist around the natural ecosystem and ensure financial flows are shifted from nature-negative to nature-positive activities.

The framework is now open for consultations from industry and is set to be modified over the next 18 months, with further iterations to be released in June, October and February. The TNFD hopes to finalise the framework by late 2023.

Figure 50: Core components of the TNFD framework

I. Fundamentals for understanding nature <ul style="list-style-type: none">■ An outline of fundamental concepts and definitions for understanding nature that the TNFD recommends market participants use when assessing and disclosing their nature-related risks and opportunities.■ Examples include: biodiversity, ecosystem, habitat, impact drivers, nature-based solutions, natural-climate solutions and systematic risk.	II. The TNFD Draft Disclosure Recommendations <p>The draft disclosure recommendations for nature-related risks and opportunities in the beta version follow four pillars:</p> <ul style="list-style-type: none">■ Governance: Disclose the organisation's governance around nature-related risks and opportunities;■ Strategy: Disclose the actual and potential impacts of nature-related risks and opportunities on the organization's businesses, strategy and financial planning where such information is material;■ Risk Management: Disclose how the organization identifies, assesses and manages nature-related risks; and■ Metrics and Targets: Disclose the metrics and targets used to assess and manage relevant nature-related risks and opportunities where such information is material.	III. The LEAP process for Nature-related Risk & Opportunity Assessment <p>Guidance for corporates and financial institutions to incorporate nature-related risk and opportunity assessment into their enterprise strategy and risk management processes to inform a range of corporate and capital allocation decisions, including those related to reporting and disclosure:</p> <ul style="list-style-type: none">■ Locate your interface with nature;■ Evaluate your dependencies and impacts;■ Assess your risks and opportunities; and■ Prepare to respond to nature-related risks and opportunities and report.
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Source: Taskforce on Nature-related Financial Disclosures

Sustainable lending needs to improve

In this report we provide context around the topic of deforestation by focusing on production and demand considerations related to relevant commodities. However, we note that these are not the only factors that should be considered. In order to reduce deforestation trends we believe that rural development needs to become a central focus for governments too, both on a local level and across the entire supply chain. Smallholder farmers in particular are relevant in this regard.

Estimates from the FAO suggests that while five out of every six farms in the world consist of less than 2 hectares of land they account for c35% of the world's food production. Most of farming across Africa and Asia is performed by farms with less than 2 hectares of land. According to estimates from IFAD more than 2 billion people globally depend on smallholders who collectively account for c84% of agricultural products. Recent new research (Which farms feed the world and has farmland become more concentrated?) indicated that there are currently more than 608 million family farms around the world. Providing smallholder farmers with the (financial) tools to transition their operations to a more sustainable setting will help address deforestation pressures in our view.

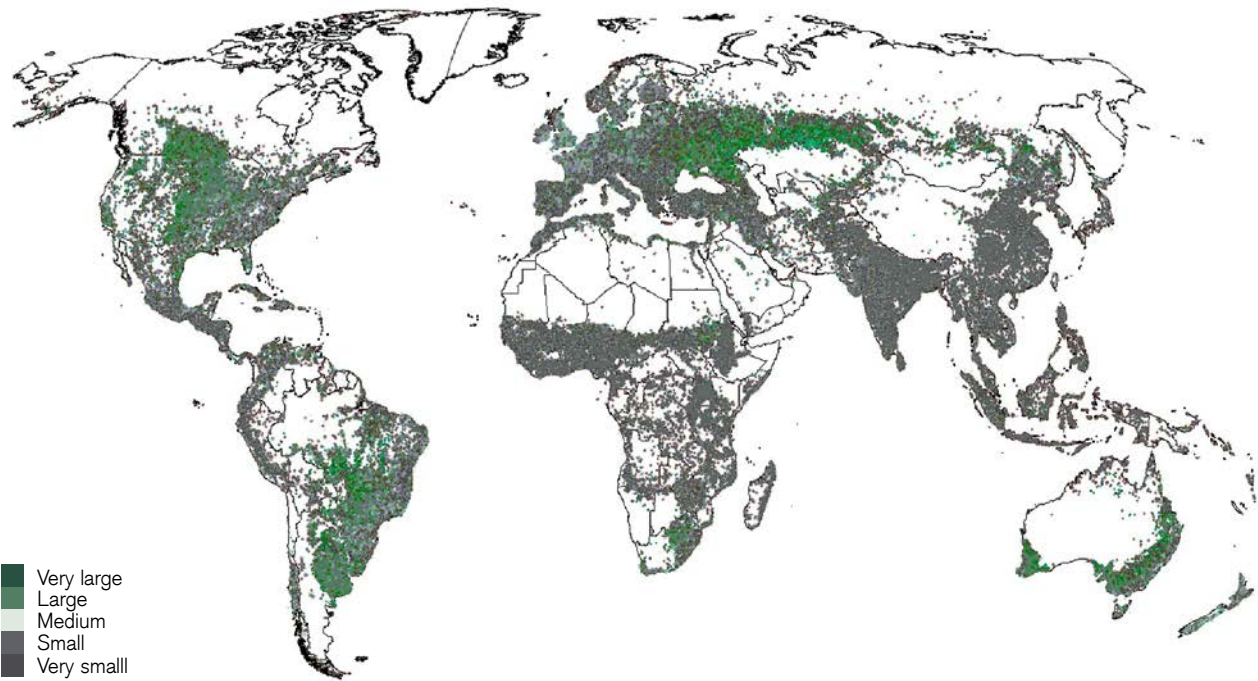
Focusing on smallholder farms is not only needed given their relevance to the production of commodities linked to deforestation but also because a number of SDGs might be achieved by focusing on the resilience of smallholder farms. These include SDG1 (eradicating poverty), SDG2 (zero hunger), SDG10 (addressing inequalities) and SDG12 (achieving more sustainable production patterns).

Climate change has a significant impact on the production yields of smaller farmers. It makes them more volatile, increases the risk of permanent damage to soil quality and may force farmers to move land resulting in more deforestation. In this report we highlight a number of farm-specific solutions that might help address deforestation risk including the use of smart agriculture and yield enhancing products. However, we believe that smallholder farms may often not be able to afford these so more innovative financial solutions are needed in our view.

Access to finance and credit for smallholder farms is a crucial element of any successful program that aims to limit deforestation in our view. Sources of finance vary but include domestic credit lines from banks, longer term loans from companies across the supply chain and also the developing opportunities related to carbon finance. It appears to us that farmers should get access to incentives that not only address environmental issues including deforestation but actually add economic value to these farmers too. Finance structures should be put in place whereby financial links are made to activities that help reduce deforestation or reduce carbon emissions in our view. In 'Global ESG Research: The ROE of a Tree' we showed that such structures can work and be profitable for farmers too.

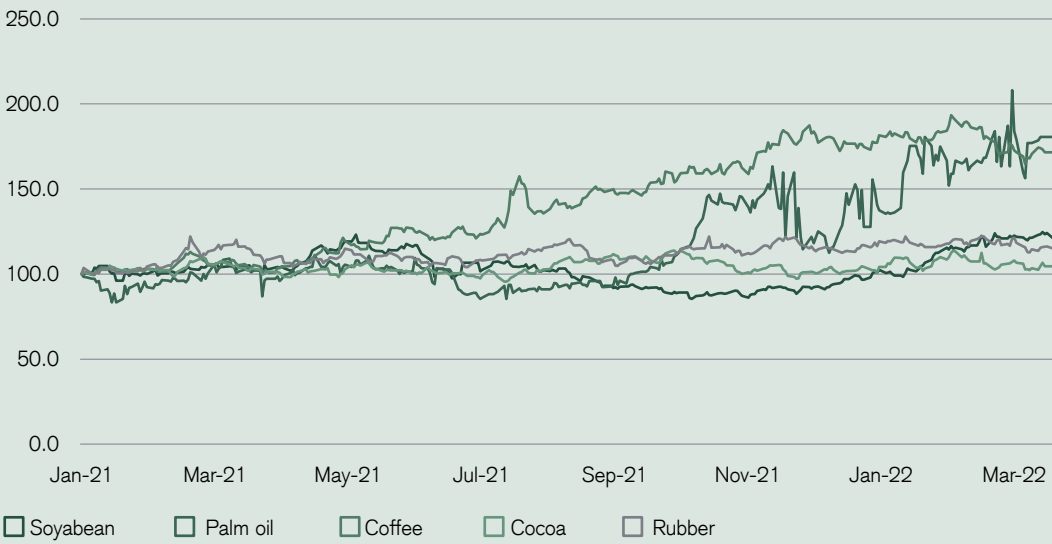


Figure 51: Smallholder farms mainly located in the tropics



Source: Wiley Global Change Biology (2019), ISEAL alliance

Figure 52: Development of commodity prices



Source: Refinitiv, Credit Suisse

Agricultural yields need to increase

In our sections on the individual key commodities we showed that historically production yields for most of them were achieved which limited the need for additional pastureland. Going forward we believe that additional increases in agricultural yields will be needed in order to limit the need for additional land. A number of technologies or products are available that will help farmers achieve this. These include:

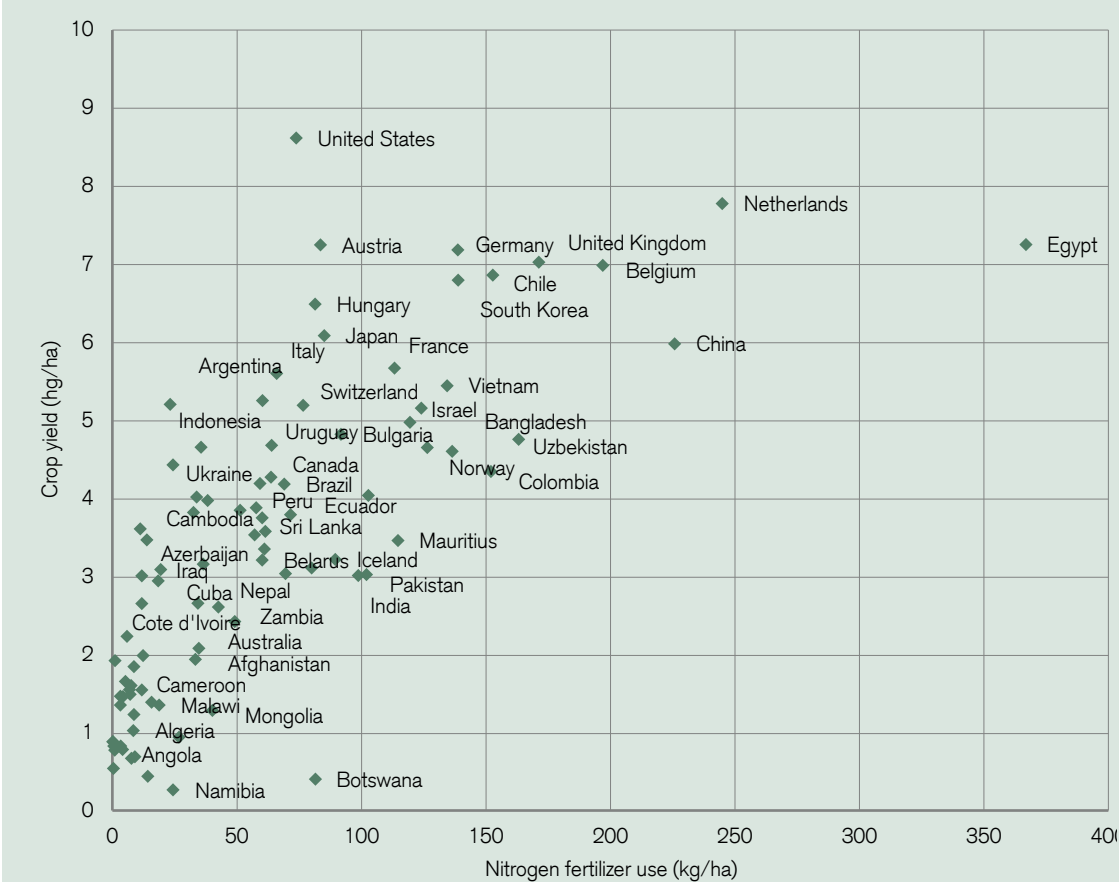
- **Smart agriculture technologies:** A range of technologies exist that help farmers optimise the use of their land. Examples include advanced sensing, disease or early pest warning systems, the use of robots in farming, smart irrigation systems and the use of drones

for precision monitoring and control. In addition to more generic technology firms that produce big data, AI and robotic solutions we note that the larger agricultural machinery companies have aggressively moved into this space too.

- **Crop and seed protection:** These focus on improving the level and reliability of agricultural products. In addition these products also provide pest management solutions. Nanopesticides, herbicides and general soil additives are part of this offering. Optimising the amount of these products used per hectare is key in order to minimise the impact on the soil and ground water quality.



Figure 53: Increased fertiliser use may help crop yield across the developing world



Source: FAO, Credit Suisse

- **Greater use of fertilisers:** Figure 53 clearly shows that increased use of fertilisers correlates with higher agricultural yields. Developing countries in particular could benefit from this. Simultaneously we note that too much fertiliser use can lead to soil degradation. Therefore companies focused on fertilisers as well as the development of enhanced fertiliser products look well placed in our view.
- **Feed replacement:** We already noted that the majority of soy bean production globally is used as animal feed rather than to feed people directly. However, this is not just a soy-phenomenon. Data produced by Greenpeace in

2020 suggested that in 2019 62% of all cereal crops were used to feed animals while just 23% went to feed people directly ([link](#)). The total land use associated with growing animals could be greatly reduced if the type of animal feed was changed. Developments that appear to do just that include those that use insects for animal feed production. Ynsect, one of the companies active in the space of insect-based food ([Ynsect](#)), provides insight into the potential benefit as it claims that to produce 2lb of insect-based protein requires only 1% of the land that a traditional farm would need to produce the same amount.

Widespread use of vertical farming can help

One of the solutions that has strong long term potential in our view is vertical farming. The idea here is that agricultural products (currently mainly crops) are produced in tightly controlled inhouse settings. In a recent report we provided more context around the topic of vertical farming and outlined that funding into vertical farming companies had strongly increased during the past few years (see 'Vertical farming showing healthy growth').

The attractions of vertical farming appear obvious in our view. Production is more stable as weather variability plays no role and yields can be up to

30x higher than traditional land-based crop production. Furthermore, land requirements are obviously much lower, water usage can be 90% lower than for traditional farming and there is no need for pesticides.

At present vertical farming-related products are more expensive largely due to a lack of economies of scale and the need for electricity (lighting and airconditioning related). We believe that both these issues will reduce over time as vertical farming capacities increase and they increasingly adopt a renewable energy-led approach to production.



Eliminating food waste would be a big help

Food loss and food waste combined account for c30% of the world's total food production. In 'The global food system - Identifying sustainable solutions' we noted that addressing this would have a substantial impact on food supply which therefore reduces the need to make more land available for food production and therefore reduces deforestation pressures. For example, household food waste in the US and Europe alone represent c10% of the world's food supply.

One obvious way to reduce food waste is by getting consumers to only buy what they need. Companies that help achieve this are those active in the preparation of pre-prepared meals.

In Europe, we note that Hello Fresh claims that its service reduces food waste by 21%.

Beyond this, we note that food is often wasted because it is not eaten before the end of its useful life. Cooling and storing technologies can be especially effective across developing countries where the combination of a warmer climate and generally a lack of cooling tends to drive food loss. In developed economies these factors may be somewhat less, however, here we see a role for sustainable smart packaging solutions that allow consumers to store that goods for longer.

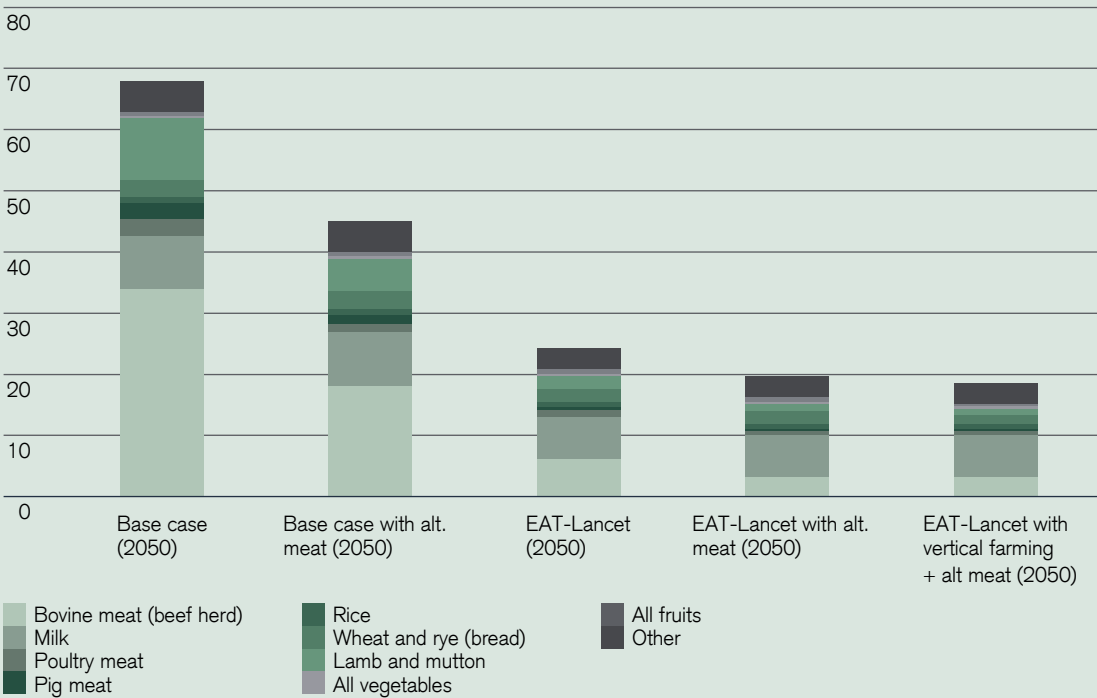


Changing consumer behavior will be key

In 'The global food system - Identifying sustainable solutions' we showed that the current food system accounts for well over 20% of GHG emissions (the FAO recently estimated this to be over 30%). In addition we also showed that rising levels of calorie consumption globally, coupled with more sedentary lifestyles has resulted in rising levels of obesity across the world. In the same report we also outlined what the impact on land use and emissions would be if consumers across the emerging world were to adopt consumption profiles similar to those seen in the west. The bottom line was that this would be an unsustainable scenario. We note here that this not only relates to health or global warming but also to the impact on deforestation.

The solution that addresses all these challenges and does so with the greatest and most direct impact relates to a change in consumer behavior. In 'Global ESG Research: The ROE of a Tree' we showed that total land use needed for agricultural purposes could fall by more than 65% from a base case scenario (Figure 54) if consumers switch away from a meat-based diet and if alternative production technologies are adopted. While this calculation was made in relation the impact on emissions, it is obviously very relevant for the topic of deforestation too. In fact the scenarios as highlighted in Figure 54 do not include the indirect impact of lower meat consumption on the need for soy as this is mainly used for animal feed.

Figure 54: Land demand scenarios



Source: Credit Suisse

Near-term challenges: rising commodity prices

One of key challenges in relation to deforestation in the near term is the fact that prices for some of the key commodities have rallied aggressively during the past year. For example coffee prices are up 67% on a 12-month basis while prices for palm oil and soy beans have risen by 74% and 18% on a 1-year basis (Figure 52). The price increases for the latter two have been particularly strong on a more recent basis with year-to-date increases of 41% and 28% for palm oil and soybeans respectively. The rally in both palm oil and soybean prices appears to be correlated strongly to the development in the crude oil market (Figure 55 and Figure 56).

The reason these commodity price increases matter is that they may create the perception of scarcity, which might cause farmers to try and expand their land in order to benefit from this. Such a development would be more likely in our view if commodity prices stay elevated for longer. We believe that the risk of this has increased given current market estimates for medium-term oil prices.

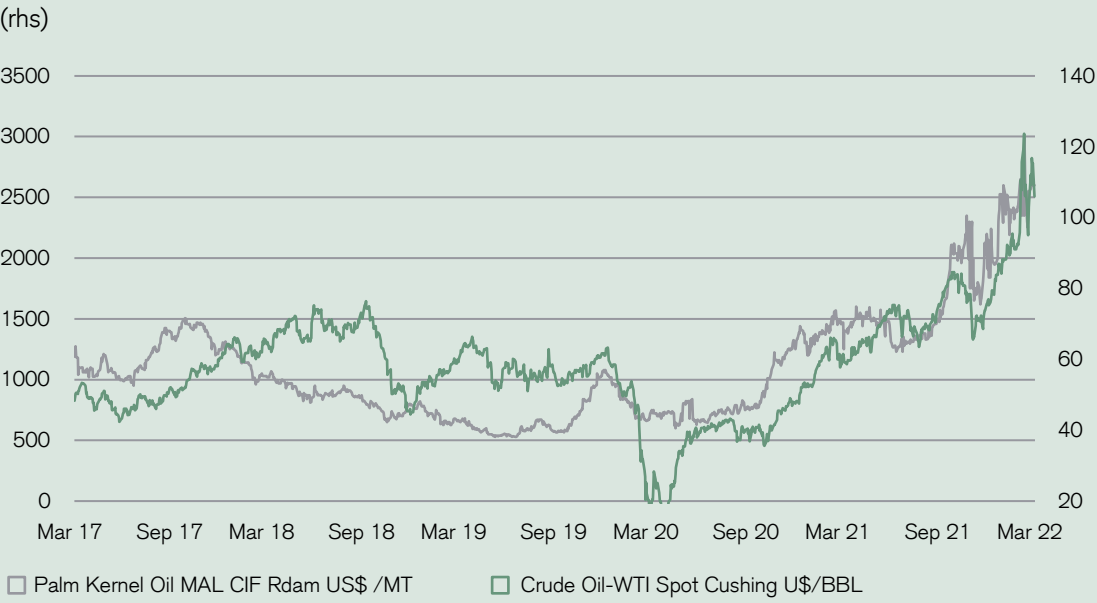
Given the relevance of rising oil prices and prices for soy and palm oil we note that our CS commodity price forecasts suggest that oil prices are likely to remain. For example our 2022 and 2023 Brent price forecasts are US\$100 and US\$85 compared to a pre-2021 price level of around US\$60 per barrel.

Research into the link between commodity prices and the rate of deforestation suggest that the recent increase in prices for soy, palm oil and potentially coffee may indeed have negative implications for deforestation. For example Harding et al ([Commodity prices and robust environmental regulation](#)) show that in case of the Brazilian Amazon, every 1% increase in commodity prices appears correlated with a 0.47% increase in the rate of deforestation.

Some investors might wonder whether stricter regulation focused on specific commodities might help to counteract such trends. We note that such an approach might not be as effective given that it could result in indirect effects. In their work, Harding et al also showed that after the Soy Moratorium in Brazil had been introduced the link between deforestation rates and commodity prices did indeed reduce, however, at the same time they noted that substitution effects strongly increased. In other words a moratorium on one commodity resulted in farmers switching aggressively to another.

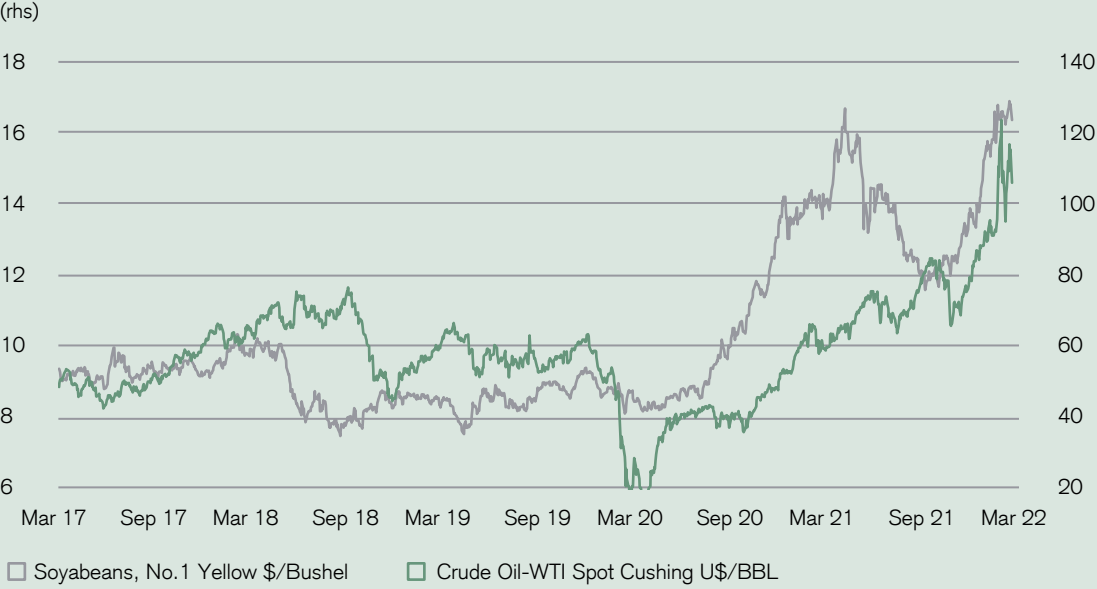


Figure 55: Palm oil versus crude oil



Source: Refinitiv, Credit Suisse Research

Figure 56: Soybean versus crude oil



Source: Refinitiv, Credit Suisse Research

Rising fertiliser prices provides another challenge

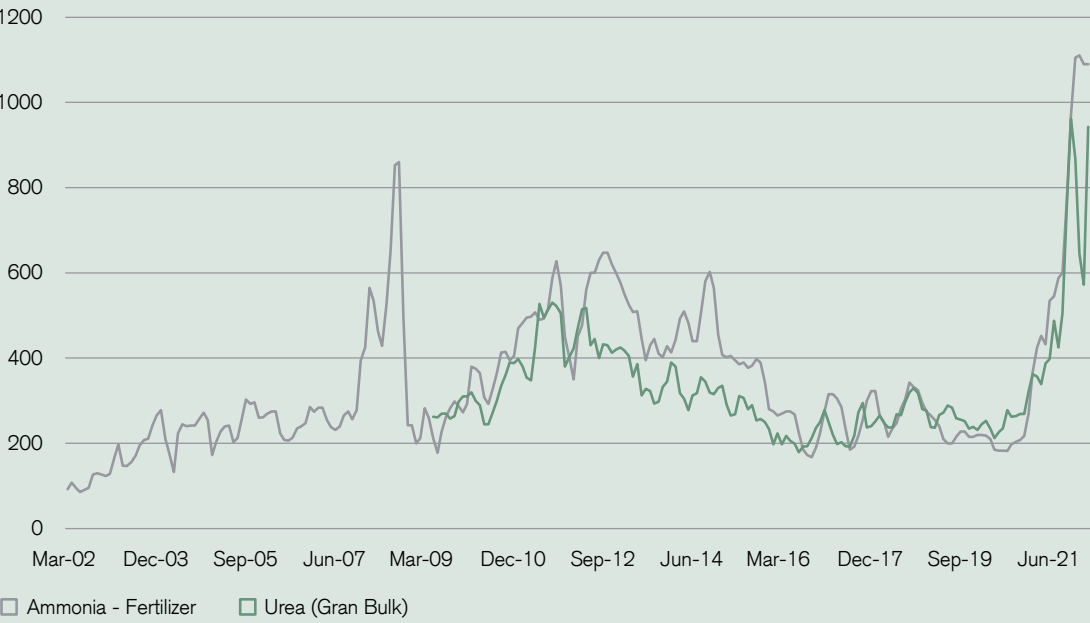
A number of factors have caused fertiliser prices to rally sharply during the past 12 months. Higher gas prices, reduced supplies out of Russia and Belarus, an export ban imposed by China and a rail strike in Canada have all hit the fertiliser market. As a result prices for a range of the raw materials that are used have risen sharply to levels not seen for more than 20 years (Figure 57).

Some of the larger farmers across the developed world might be able to adopt crop rotation strategies, different soil tilling techniques or make greater use of animal litter (e.g. chicken

litter) as a fertiliser alternative. It is unclear whether these strategies would be available for smaller farmers or those located across the developing world.

The impact of this on farming is significant as it directly affects the cost of farming. A prolonged period of sharply higher fertiliser cost would clearly have a negative impact on the ability for farmers (especially smaller ones) to buy fertilisers and increase the production yield on their land. It would therefore put pressure on deforestation related targets and scenarios.

Figure 57: Fertiliser raw materials have seen very sharp price increases



Source: Refinitiv, Credit Suisse Research





Deforestation and the corporate response

So far in this report we have highlighted the developments around deforestation, the potential outlook for related commodities in case current trends continue, and what solutions might exist to help address the challenges. One area, however, that we have so far not reviewed is the role played by sectors that buy the commodities related to deforestation either directly or indirectly.

In Figure 58 we show how a wide range of industries are ultimately part of the deforestation related supply chain and which commodities they are exposed to.

Figure 58: Sectors with exposure to commodities that might cause deforestation

Sector	Industry	How Exposed	Beef	Palm oil	Soy	Paper/ timber	Rubber	Cocoa	Coffee
Consumer Staples	Food Products	A range of commodities associated with deforestation are used by food producing companies. For example beef, coffee and cocoa are frequently used. In addition palm oil and soybean are products used too. Some of these commodities are not only sold as end product but are also used as feed stock for meat production creating embedded deforestation related emissions in these products too.	√	√	√	√		√	√
	Household and Personal Products	Palm oil and its derivatives are often used in the production of soap, detergents and makeup products. Cocoa butter is also used in personal care products.		√		√	√	√	
	Food & Staples Retailing	Food distributors and retailers sell all products that are associated with deforestation. In addition they also use paper for packaging and shipping.							
Consumer Discretionary	Textile, Apparel & Luxury Goods	Footwear and luxury goods companies source leather and rubber for their products. Textile and apparel companies use woven fiber from wood pulp, sourced from deforested areas, into products such as rayon, viscose and modal fabrics.	√			√	√		
	Household Durables	Leather and timber is often used in household furnishings.	√			√			
	Hotels, restaurants & leisure	Paper and a range of deforestation-related food products are sourced and sold through these companies. Furnishings used by these can be produced using leather and timber.	√	√	√	√		√	√
	Autos & Aerospace	Car OEMs and aircraft manufacturers buy tyres from suppliers that source rubber for their products. In addition leather is also used in the manufacturing of their products.	√				√		
	Internet and direct marketing	Internet and direct marketing companies sell products that contain commodities that drive deforestation (e.g. food products, apparel, textile). In addition these companies also use paper for their shipping operations.	√	√	√	√	√	√	√
Materials	Containers & Packaging, Paper & Forest Products	Packaging companies are a major driver for deforestation. Their forest plantations are used for wood pulp which functions for the production of paper and cardboard				√			
Energy	Oil, Gas & Consumable fuels	Soybean and palm oil are used for the production of biodiesel		√	√				
Utilities	Power and Renewable Electricity Producers	Biomass power plants burn wood pellets. Some scientists claim that this process is not carbon neutral (e.g. Van Ypersele et al, 2018)				√			
Financials	Banks	Financial institutions are enablers to deforestation if they provide financing to companies in the sectors that are either direct or indirect contributors.	√	√	√	√	√	√	√

Source: Credit Suisse Research

Considering the wide range of sectors that are exposed to the topic of deforestation we want to assess how engaged companies are in addressing these issues. This is not straightforward given that there is a general lack of disclosure around this topic.

Industry associations related to deforestation

During the past 20 years a wide range of organisations were established with the aim to improve the sustainability of various commodity supply chains which in turn should also help reduce deforestation. Figure 59 provides examples of organisations and the key commodities that they are focused on.

The approach taken by the various organisations differs mostly in relation to how strict companies are required to enforce standards into their daily operations. We note for example that not all organisations apply certification programs to their products or processes.

Figure 59: Key organisations that aim to address deforestation

Organization	Description	Bamboo	Cattle	Cocoa	Coffee	Cork	Palm Oil	Pulp & Paper	Rubber	Soy	Sugarcane	Tea	Textiles	Non-Timber Forest Products	Established	Certification
Bonsucro	Bonsucro is an international not for-profit, multistakeholder governance to promote sustainable sugar cane. Its stated aim is to reduce 'the environmental and social impacts of sugarcane production while recognising the need for economic viability.										√				2008	√
Earthworm	Earthworm Foundation is a non-profit organisation built on values and driven by the desire to positively impact the relationship between people and nature.			√			√	√	√		√		√		1999	
Forest Stewardship Council	The FSC is an international, non-governmental organisation dedicated to promoting responsible management of the world's forests.	√				√		√	√				√	√	1993	√
Global Coffee Platform	GCP brings coffee producers, roasters, retailers, traders, governments, donors, and NGOs together to multiply efforts, collectively act on local issues, and scale successful sustainability initiatives across the sector.				√										2016	
Global Platform for Sustainable Natural Rubber	The GPSNR is an international membership driven platform set up to define sustainability for the natural rubber value chain.								√						2017	
Global Rountable for Sustainable Beef	The GRSB mission is to advance, support, and communicate continuous improvement in sustainability of the global beef value chain through leadership, science, and multi-stakeholder engagement and collaboration.		√												2012	
ProTerra foundation	The ProTerra Foundation is a not-for-profit organisation that advances and promotes sustainability at all levels of the feed and food production system.		√							√			√		2006	√
Rainforest Alliance	From fighting deforestation and climate change to building economic opportunities and better working conditions for rural people, the Rainforest Alliance is working to solve urgent environmental and social challenges.			√	√		√					√		√	1987	√
Round Table on Responsible Soy Association	The RTRS is a non-profit organisation promoting the growth of production, trade, and use of responsible soy. It works through cooperation with those in, and related to, the soy value chain, from production to consumption.									√					2006	√
Roundtable on Sustainable Palm Oil	The RSPO is a not-for-profit that unites oil palm producers, processors or traders, consumer goods manufacturers, retailers, banks/investors, and environmental and social non-governmental organisations (NGOs), to develop and implement global standards for sustainable palm oil.						√								2004	√
Textile Exchange	Textile Exchange is a global nonprofit that creates leaders in the preferred fiber and materials industry. By 2030, their goal is to guide the textile industry to achieve a 45% reduction in greenhouse gas emissions within fiber and raw material production.												√		2002	√
The World Business Council for Sustainable Development	The World Business Council for Sustainable Development (WBCSD) is a global, CEO-led organization of over 200 leading businesses working together to accelerate the transition to a sustainable world.		√				√			√					1995	
Tropical Forest Alliance	The TFA is a multistakeholder partnership platform established to support companies through the ongoing global transition to deforestation-free supply chains for commodities including palm oil, soy, beef, and paper/pulp.		√				√	√		√					2012	
World Cocoa Foundation	The World Cocoa Foundation (WCF) is a non-profit international membership organization whose vision is a thriving and sustainable cocoa sector, where farmers prosper, communities are empowered, and the planet is healthy.			√											2000	

Source: Credit Suisse Research



One way to assess which companies or sectors are more pro-active in terms of addressing deforestation is by identifying whether they are members of one or more of these organisations. For European companies we have reviewed which are members of one or more of these organisations. In Figure 60 we show the results.

Figure 60: Membership of key deforestation related organisations from our European coverage universe

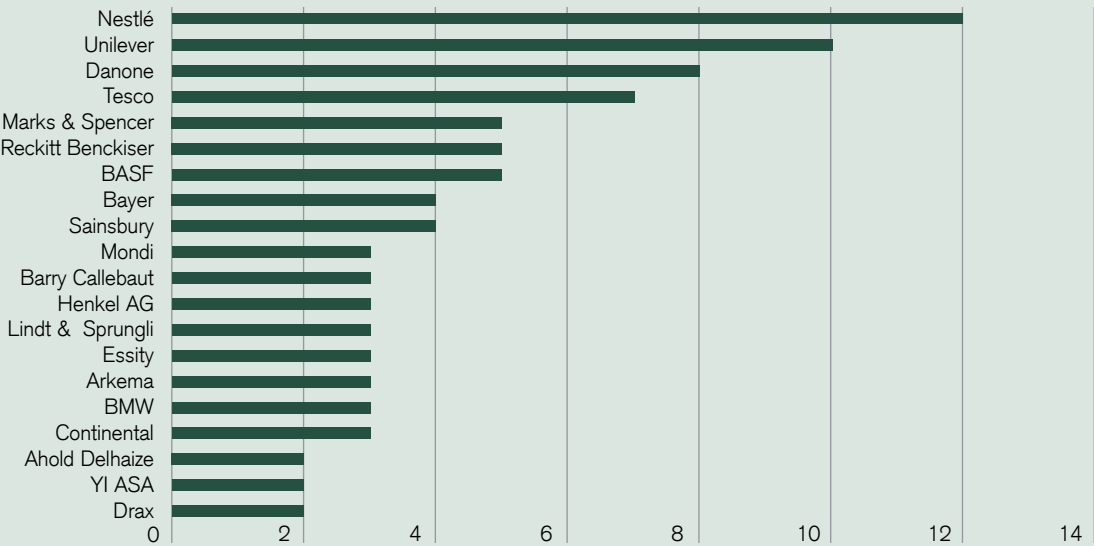
Forest Stewardship Council	Global Rountable for Sustainable Beef	ProTerra foundation	Rainforest Alliance	The Global Coffee Platform	Tropical Forest Alliance	Global Platform for Sustainable Natural Rubber	Earthworm Foundation	Bonsucro	Round Table on Responsible Soy Association	Palm Oil Collaboration Group	World Cocoa Foundation		Roundtable on Sustainable Palm Oil	Textile Exchange	The World Business Council for Sustainable Development
Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name
DS Smith	Ahold Delhaize	Barry Callebaut	Nestle	JDE Peet's	ABN AMRO Bank	BMW	Drax	Bayer	Danone	BASF	ABF	Carrefour	Alfa Laval	Adidas	Acciona
Mondi	Merck	Danone	Unilever	Tesco	Ahold Delhaize	Continental	Givaudan	Danone	Bayer	Danone	Barry Callebaut	Danone	Arkema	Arkema	Arcelik
		Nestle	Emmi	Nestle	Henkel	Renault	Lindt & Sprungli	Diageo	Unilever	Neste	BASF	Essity	ABF	ASOS Plc	ArcelorMittal
		Unilever	Marks & Spencer	Yara Inter.	Kerry Group	Volkswagen	Nestle	Essity	Nestle	Nestle	Lindt & Sprungli	Neste	Barry Callebaut	Bureau Veritas	Arkema
			Coca-Cola			Marks & Spencer		Reckitt Benckiser	Mondi	Sainsbury	Reckitt Benckiser	Marks & Spencer	Nestle	BASF	Hennes & Mauritz
			Tesco			Nestle		Nestle	Tesco	Unilever	Migros	Reckitt Benckiser	BNP Paribas	Inditex	Bayer
			Danone			Unilever		Pernod-Ricard	BASF		Nestle	Sainsbury	Bayer	Kering	BMW
						Yara Inter.		Unilever	Bureau Veritas		Sainsbury	Sodexo	Clariant	LVMH	BNP Paribas
									Santander		Tesco	Tesco	Croda Inter.	Marks & Spencer	Clariant
											Unilever	Unilever	Danone	Next	Continental
													Essity	Orion	Covestro
													Givaudan	Puma SE	CRH
													GSK	Sappi Limited	Danone
													Henkel	Tesco	Drax
													Hennes & Mauritz	Zalando	Enel
													HSBC		Evonik
													L'Oreal		Henkel
													Marks & Spencer		Holcim
													Nestle		Iberdrola
													Ocado Group		Kering
													Reckitt Benckiser		Kone Corporation
													Sainsbury		Mercedes-Benz
													Tesco		Mondi
													UBS Group AG		Nestle
													Unilever		Novartis
													UBS Group AG		Philips
													Lindt & Sprungli		Roche
															Reckitt Benckiser
															Santander
															Schneider Electric
															Sika
															Smurfit Kappa
															Solvay
															Stora Enso
															Swiss Re
															Symrise
															Unilever
															Volkswagen

Source: Credit Suisse Research



Out of the 83 European companies that we identified we found that 16 feature in more than two of these organisations. Companies with the greatest number of memberships are Nestle (12), Unilever (10), Danone (8) and Tesco (7) (Figure 61).

Figure 61: Companies by number of memberships



Source: Credit Suisse Research

Assessment of exposure by external companies

To make a detailed assessment of a company's exposure to deforestation and its response to it would require insight into its procedures and policies related to deforestation and key commodities. Furthermore, data would need be available for all of its suppliers, their corporate strategies as well as data on the relevance of various commodities to a company's business.

At present, this data is typically not available for our coverage universe. The developments around reporting standards such as the TNFD, GRI and SASB may provide better insight in the future but that does not help investors right now. As an interim solution investors could use findings from some external bodies that have looked into the topic of deforestation. These include FAIRR, the World Benchmarking Alliance, the Forest 500

list, analysis from the Carbon Disclosure Project (CDP) or data from the World Wildlife Fund in relation to palm oil.

We understand from talking to companies exposed to deforestation that some reservations can be made regarding the approach for each of these external verifying companies. For example, the Forest 500 assessment typically involves a more limited engagement with the companies assessed and rather relies more extensively on web scraping. The WWF work around palm oil is not only focused on just one commodity but is also heavily weighted towards the use by corporates of palm oil certification. Questions regarding the usefulness of certification focus on uncertainty around supply chain auditing and the fact that it does not give a real time picture.



CDP's assessment is seen by companies as very broad and thorough, however, it can take six months for companies to provide the data to CDP and then up to six months again for CDP to report their findings. The result therefore can relate to a situation that is 12 months old which again provides limited real time information of a company's performance.

We have reviewed the most recent update of the Forest 500 list in order to see how 350 companies and 150 financial institutions deal with deforestation, the conversion of all natural ecosystems and associated human rights abuses. Their conclusions suggest that much work needs to be done.

For example, only seven companies have made commitments on all three of these issues for at least one of the commodities reviewed. However, no company had made such commitments for all. Furthermore, 72% of the 350 companies do not have a deforestation commitment for all of the deforestation related commodities in their supply chain while one third had no deforestation commitment at all in 2021.

As far as the 150 financial institutions is concerned that were reviewed as part of the 2021 Forest 500 report, Global Canopy notes that none of those with exposure to deforestation had a so-called strong policy that covers all relevant deforestation related areas for any of

the commodities that they are exposed to. Only 31 of the 150 had a climate commitment that applied to their financing activities.

What becomes apparent is that only ten companies score above average (50%) while only three have a score of more than 70%. These are large caps Nestle and Unilever and small cap Sipef.

We note that five of the six companies in Figure 61 that are a member of at least three organisations also score above average within their respective sectors with Forest500.

On a sector level we find that the financials (banks, insurance and asset managers) have the lowest scores at 31%, 13% and 8% respectively. Financials have a strong indirect-exposure to deforestation as they are seen as enablers, however, the Forest 500 data suggest that this has as yet not been incorporated enough into policies and targets.

In addition to the earlier comment regarding the lack of engagement that Forest 500 has with companies assessed we also note that they only track 350 companies and 150 financial firms. This clearly means that this is a limited subset of the listed equity space both globally and therefore is likely to fall short of helping investors navigate deforestation risk across their entire portfolios.

Screening our global coverage universe

As highlighted when trying to compare companies in relation to deforestation investors suffer from a lack of disclosure. With this in mind, we used a slightly different approach to assess the relative likelihood that a company is exposed to deforestation.

We have reviewed whether companies have adopted general ESG policies that are indirectly linked to deforestation as this might indicate whether a company is likely to be mindful of the negative implications of deforestation too. The ESG policies that we have used for our review relate to the following areas:

- **Emissions:** Deforestation increases emissions. With this in mind we review whether a company has policies established to monitor emissions and whether it has established specific targets for various emissions levels.
- **Deforestation policy:** We include companies that have a deforestation policy or policies related to the commodities that influence deforestation.
- **Biodiversity:** Deforestation has a clear negative impact on biodiversity. We look for companies that have announced policies in relation to biodiversity and whether they report on the impact of its business on endangered species.

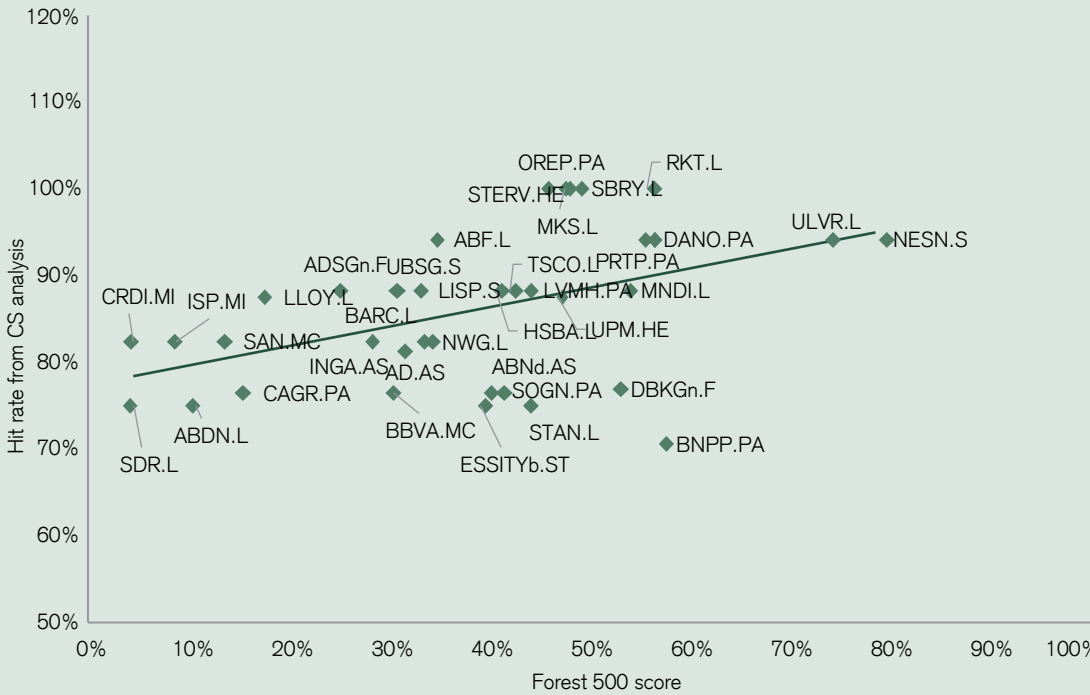
- **Waste:** A company's approach to waste management provides an indication of how it views the impact of its operations on environmental and ecological issues more broadly.
- **Water:** Deforestation puts greater challenges on water supply and quality. We look for companies that have established policies in relation to improving the efficiency of their operations in relation to water usage.
- **Sourcing and supply chain:** For a lot of companies deforestation is more likely a supply chain issue as the related commodities are part of their input products. We look for companies that have policies related to i) sustainable packaging, ii) environmental material sourcing and iii) environmental supply chain management.
- **Human rights:** Deforestation can infringe upon human rights both in terms of the impact it has on the livelihood of indigenous people as well as workers' rights. We look for companies that have established human rights policies as well as policies that focus on the human rights policies adopted by its suppliers.

For the purpose of this report we reviewed the sectors outlined in Figure 58 to see which companies have policies or targets associated with the areas described above.

It is important to highlight that our approach does not suggest that a company that does not meet all of our filtering criteria does not care about deforestation. We merely suggest that companies that have policies or targets on the highlighted areas are, all else being equal, more likely to care about deforestation in relation to their operations too than companies that do not.

When we compare our analysis with the outcome of the Forest 500 approach, we find that there is a reasonable relationship (Figure 62). Broadly speaking it suggests that companies with a broad range of ESG policies and targets tend to be better on deforestation-related policies and targets too.

Figure 62: Relationship between our approach and the Forest 500 outcome



Source: Forest 500, Refinitiv, Credit Suisse Research



Deforestation approaches: case studies

Nestlé

Nestlé, the world's largest food and beverage company, frequently receives among the highest ratings from external deforestation focused rating companies. For example the company currently has the highest 'A' rating from CDP for its climate change policies while it received a 'B' score for all four deforestation related areas (Cattle, Palm Oil, Soy and Tiber). The company recently received the second highest score (78%) of all 500 companies assessed by Forest 500. In this section we assess how Nestlé approaches deforestation and how it manifests itself in the company's daily operations.

After acknowledging the risk of deforestation in its agricultural- and forest commodity supply chains, Nestlé in June 2021, launched the Forest Positive strategy. With this strategy, which also forms parts of [Nestlé Net Zero Roadmap](#), the company aims to not only manage deforestation risk in its supply chains but importantly moves beyond that and help create a positive impact on broader sourcing landscapes.

What is Nestlé's Forest Positive strategy?

Nestlé's Forest Positive strategy focuses on a number of key components:

Deforestation-free supply chains

Nestlé has identified 14 raw materials that present higher environmental and/or social risk. For these raw materials, Nestlé works closely with direct suppliers to conduct supply chain mapping and carry out farm assessments in their upstream chain with partner organisations. The company has pledged to achieve 100% deforestation-free meat, palm oil, pulp and paper, soya and sugar primary supply chain by 2022, and by 2025 for coffee and cocoa. To address challenges in its supply chains, Nestlé collaborates with various industry partners to develop action plans and define milestones. These include:

- Roundtable on Sustainable Palm Oil (RSPO)
- Bonsucro
- Earthworm Foundation
- Round Table on Responsible Soy Association
- Rainforest Alliance
- Tropical Forest Alliance

Long-term forest conservation and restoration in supply chains

To help keep forests standing and restore degraded forests and natural ecosystems, Nestlé has vowed to take proactive action whilst respecting the rights of Indigenous Peoples and Local Communities. To do so, Nestlé has pledged to grow 200 million trees in and around their supply chains by 2030 through the Global Reforestation Program. This is roughly equal to restoring the surface area of Luxembourg. Actions Nestlé will take include:

- Obtain commitments from suppliers to identify and conserve standing forests
- Recognise and respect the land rights of Indigenous Peoples and Local Communities
- Use satellite data to map their forest footprint and future risk areas
- Invest in forest conservation and restoration projects in and around their supply chains
- Support sustainable livelihoods, by purchasing goods at a premium and buying bigger quantities from sustainable suppliers
- Co-invest in regenerative agriculture practices like agroforestry and intercropping
- Partner with industry-wide coalitions to conserve high-value ecosystems.

Sustainable landscapes

Nestlé not only has committed to preventing deforestation and restoring forests within its supply chains, the company also recognises the need to support the transformation of the wider landscapes it sources its raw materials from. By 2023, Nestlé will support 15 sustainable landscape initiatives. Actions Nestlé will take include:

- Support landscape initiatives in their strategic procurement origins
- Focus sourcing on landscapes demonstrating Forest Positive practices
- Support active conservation and restoration initiatives in priority landscapes
- Support smallholder livelihood initiatives in priority landscapes
- Participate in the development of sustainable finance mechanisms

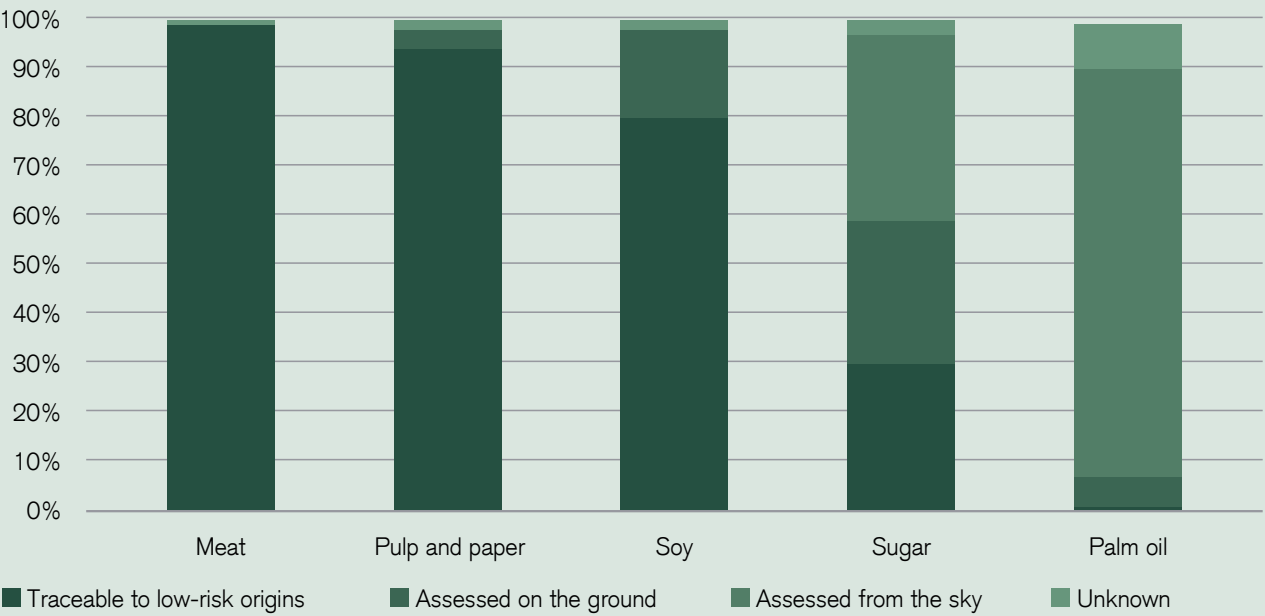
What progress has been made so far?

Nestlé, first committing to zero deforestation in its supply chains in 2010, has achieved 97.2% deforestation-free materials in their primary meat, palm oil, pulp and paper, soy and sugar supply chains in 2021. This is the highest for meat for which 99% has been assessed as deforestation-free (or 243 kilotonnes), followed by pulp and paper (1238 kilotonnes), soy (521

kilotonnes), and sugar (1864 kilotonnes) each at 98%. More progress is still required for palm oil at 90% or 423 kilotonnes.

To date, Nestlé’s Global Reforestation Program has secured a total of 24.6 million trees for planting in regions in and around its supply chains, with 9.3 million tonnes of CO₂ equivalent of removals initiated over the project lifetimes. In total Nestlé has secured 8.6 million trees for planting in Nicaragua, 7.5 million trees in Colombia and five million trees in Honduras.

Figure 63: Nestlé’s progress toward deforestation-free primary supply chains (2021)



Source: Nestlé

How does Nestlé promote sustainable livelihoods and human rights?

Sustainable livelihoods and respecting the rights of Indigenous Peoples and Local Communities in and around the supply chains form part of [Nestlé’s Human Rights Framework and Roadmap](#). Human rights have been mainstreamed into 22 policies and procedures across Nestlé’s global business. Since 2013, Nestlé has also been implementing a Living Wage Initiative to ensure all direct employees, including temporary ones, earn a living wage. Nestlé identifies the living wage threshold in each country and identifies and addresses cases where legal minimum wages do not fulfill basic needs.

Indigenous Peoples, Local Communities and Afro-descendant peoples make up approximately

2.5 billion people globally and claim almost half of the world’s lands and forests. Yet, they have less than 20% of legal rights to this land. Nestlé’s policies to safeguard the land rights of Indigenous Peoples and Local Communities include the following:

- Requirements for land rights and free, prior and informed consent (FPIC) are included in Nestlé’s Responsible Sourcing Standard. Nestlé has also released a [Commitment on Land & Land Rights in Agricultural Supply Chains](#) in 2014. Since then, the company has piloted various tools to help assess and address land rights risks in and around its supply chain.
- Through the Forest Positive strategy, Nestlé is focusing on how to increase direct engagement with local communities and leverage their influence to secure land rights for indigenous peoples and local communities.

Reviewing Nestlé’s approach through 45 questions

Nestllé’s approach to deforestation as highlighted above shows a clear and strong commitment by the company. In order to provide a better understanding of their broader approach we also asked the company 45 deforestation related Yes/No questions. The Figure 64 shows these questions and Nestllé’s response.

- **Approach and commitment:** We conclude that Nestlé’s commitment to addressing deforestation both within its own company and its supply chain is very high. The only area of improvement here relates to biodiversity although the company notes that this is primarily due to uncertainty over which metrics to use. Furthermore we note that C-suite responsibilities and pay-structures are linked to deforestation too which we see as positive.
- **Reporting and disclosure:** Nestlé’s openness in relation to its deforestation

policies and targets is strong. The only area where disclosure is not available relates to the amount of hectares lost to deforestation in its supply chain. We take comfort from the fact that Nestlé does engage with non-compliant suppliers to ensure improvement. Furthermore we believe that the company’s increasingly active approach to data analysis probably allows it to become more aware of deforestation across the supply chain going forward. This should make it possible to report on this and equally important engage with suppliers even more.

- **Social policies:** Nestlé’s social policies in relation to deforestation are good although we do note that for a number of the questions asked the company has a prime focus on its own operations. Improvement here might be greater engagement with the supply chain around remediation where deforestation has caused social or environmental harm. Also engagement with suppliers around the potential impact that their acquisitions of new land or resources have on indigenous people would be another area of focus for Nestlé in our view.

Figure 64: Assessing Nestlé’s approach to deforestation via 45 questions

Question	Nestle Response
Approach and commitment	
Do you have a commitment to exclude production or procurement of products originating from natural forests, other natural ecosystems and/or high conservation value areas or a commitment to produce and/or procure sustainably produced commodities?	Y/N - not land use change but from sourcing our ingredients
Does the commitment apply to all of your company's sourcing regions or operations?	Y - a few products are out of scope (e.g. meat by-products due to difficulty in establishing end-2-end traceability) - this is disclosed in CDP Forests
Do you have a target date for full implementation of your company's commitment towards deforestation and related policies?	Y
Pulp and paper: Does your company have a commitment to reduce the amount of virgin wood fibre content used for paper and board materials.	Y
Palm oil: Do you have a commitment to exclude products originating from new developments of palm oil on high carbon stock (HCS) areas and/or peatlands of any depth?	Y
Soy Beans: Does your company have a commitment to reduce the amount of soy beans originating from new developments on HCS areas and/or peatlands?	Y
Meat: Does your company have a commitment to reduce the amount of meat originating from new developments on HCS areas and/or peatlands?	Y
Does your company have a commitment to develop and implement supply chain traceability systems in relation to deforestation-related commodities and products?	Y
Does your company have a company-wide commitment to achieve deforestation-free and/or conversion-free production and/or procurement for all high risk commodity supply chains?	Y
Does your company have a company-wide commitment to reduce the impact of its operations on biodiversity?	Not yet (no industry consensus on metrics yet)
Does your company have a company-wide commitment to target waste reduction?	We are part of Champion 12.3 initiative
Is your company a signatory to or member of voluntary initiatives seeking to end or reduce soft commodity driven deforestation	Y
Does your company identify deforestation as a business risk?	Y
Does your company’s board have a committee or is there a high-level management position that is formally focused on deforestation-related issues?	Y
Does your company link executive compensation to deforestation-related issues?	Y



Does your company have a target to reduce GHG emissions from Land use change in their operations and the supply chain?	Y
Does your company disclose the total amount of GHG emissions in metric tons of CO ₂ -equivalent arising from land use change?	Y/N - not land use change but from sourcing our ingredients
Does your company disclose how many hectares of conservation area are being supported or facilitated by your company on land it does not own or manage?	N - not yet, so far our target is number of trees planted; we are looking for a hectare target
Does your company report how many hectares of reforestation or restoration are being or have been conducted or facilitated by your company?	N - same as above
Does your company have a climate target including at least scope 1 and 2 emissions?	Y
Reporting and disclosure	
Does your company report progress on the implementation of all its commitments?	Y
Is your company progress reporting on the commitment implementation verified?	Y (via EY + Bureau Veritas also provide assurance)
Does your company require its suppliers to be aligned with or committed to deforestation and conversion-free standards across all of their operations,not just those volumes supplying your company?	
Does the commitment specify a cut-off date for deforestation,conversion,or other actions that would be considered non-compliant? (commodity specific)	Y
Does your company report on their participation in collaborative actions to advance sustainability in agriculture commodity production with multiple stakeholders or jurisdictional partners?	Y
Does your company conduct commodity-specific risk assessments related to forest risk?	Y
Does your company conduct assessments to ensure that their operations and supply chains comply with all applicable laws?	
Does your company have grievance mechanisms in place to identify and remedy adverse social and environmental impacts linked to their operations and/or supply chain?	Y
Does your company report the volume of commodity production or usage?	
Does your company disclose the proportion of its total commodity volume which is third-party verified to be compliant with either the deforestation or conversion commitment?.	Y - assessed deforestation free (not necessarily third party verified)
Does your company monitor the compliance of production or primary processing operations that it owns,manages,or otherwise controls,or its supply chains with its commitments on labour rights and FPIC?	Y
Does your company conduct or facilitate environmental and social impact assessments for new site development or land acquisition?	
Does your company publicly report their suppliers?	Y
Does your company monitor compliance of production or primary processing operations that it owns,manages,or otherwise controls with its commitments on deforestation and conversion?	Y
Does your company report how many hectares of deforestation and/or conversion have occurred since the commitment cut-off date on land owned,controlled,or managed by your company?	N - we don't own plantations
Does your company monitor compliance of its supply chain with its commitments on deforestation and conversion?	Y
Does your company report on how many hectares of deforestation and/or conversion have occurred since the commitment cut-off date within your company's supply chains?	N
Does your company engage non-compliant supplier operations and suppliers in order to address and remedy non-compliance?	Y
Does your company disclose how many suppliers or producers are engaged,or excluded from their supply chains?	Y for palm
Social related policies	
Does your company commit to respect internationally-recognized labour rights in their operations and supply chain?	Y
Does your company offer support to smallholder producers to help them enter responsible supply chains and/or achieve compliance with commitments?	Y
Does your company commit to address gender equality issues in their operations and supply chain?	Y - focus own operations and Tier 1 + some commodities like cocoa and coffee
Does your company commit to taking measures to provide remediation where it has caused or contributed to social or environmental harm related to deforestation or conversion?	N - we ask the suppliers to do so
Does your company commit to securing the Free, Prior and Informed Consent (FPIC) of potentially affected indigenous peoples and/or local communities prior to acquiring new interests in land or resources and prior to new developments or expansions?	Y (own operations)
Does your company commit to refrain from land acquisition or development until any existing land conflicts have been resolved in their own operations?	Y

Source: Company data, Credit Suisse research

Unilever

Unilever has for a number of years been classified by deforestation related companies as a leader. For example CDP in their latest review awarded Unilever their highest ‘A’ rating for climate change, forests and water security. Some of its subsidiaries such as Hindustan Unilever were awarded an A rating for their forest related policies too. Forest 500 gave Unilever a 73% score which is the fourth highest score across all 500 companies and the highest score of all household and personal goods companies assessed by Forest 500.

Unilever has for a number of years been outspoken about its view on the role that the

company has in the world. It believes that its purpose is to make sustainable living commonplace. The way Unilever does this is by developing policies and commitments including those aimed at i) climate action, ii) protect and regenerate nature, iii) creating a waste-free world, iv) improve healthy nutrition as part of a sustainable global food system, v) address health inequalities and social exclusion globally, vi) promote equity, diversity and inclusion, vii) help raise living standards and viii) respecting human rights. The company has reviewed the areas that it focusses on as part of its Planet & Society strategy and believes that these are linked to a wide number of SDGs too. We summarise these in Figure 65.

Figure 65: Unilever’s Planet and Society strategy touches on many of the SDGs

Unilever's Planet & Society strategy: Areas of focus										
SDGs	Climate action	Protect and regenerate nature	Waste-free world	Positive nutrition	Health and wellbeing	Equity, diversion, inclusion	Raise living standards	Future of work	Respect human rights	Responsible business
1	No poverty						√		√	
2	Zero hunger			√					√	
3	Good health and well being								√	
4	Quality education									
5	Gender equality					√			√	
6	Clean water and sanitation	√			√					
7	Affordable and clean energy									
8	Decent work and economic growth						√	√	√	
9	Industry innovation and infrastructure									
10	Reduced inequalities					√	√		√	
11	Sustainable cities and communities									
12	Responsible consumption and production	√	√							
13	Climate action	√	√	√						
14	Life below water		√							
15	Life on land		√							√
16	Peace, justice and strong institutions								√	
17	Partnerships for the goals			√					√	

Source: Company data, Credit Suisse Research



Unilever’s protect and regenerate nature strategy might be seen as the obvious area of focus when it comes to deforestation, however, we believe that a number of other strategies matter too. Social areas such as ‘Equity, diversion and inclusion’, ‘Raise living standards’ and ‘Respect human rights’ are also very relevant given that deforestation is mainly linked to small farmers across developing countries where equality and human rights are not always secured.

Protect and regenerate nature

r’s protect and regenerate nature strategy, the company is focusing on a wide array of sustainability goals. Fundamentally, Unilever has committed to achieving a deforestation-free supply chain and, in doing so, is first focusing on palm oil, paper and board, tea, soy and cocoa. The supply chains for these commodities contribute more than 65% of the company’s total impact on land (i.e. an agricultural footprint of 3 million hectares) and are the crops that are most often linked to deforestation and conversion of natural ecosystems to farmland. Unilever is also aiming to preserve and protect water and to make product formulations biodegradable by 2030. Specifically, Unilever’s protect and regenerate nature strategy includes the following set of goals:

- 1. Deforestation-free supply chain by 2023 (palm oil, paper and board, tea, soy and cocoa)
- 2. Help protect and regenerate 1.5 million hectares of land, forests and oceans by 2030
- 3. 100% sustainable sourcing of key agricultural crops
- 4. Empower farmers and smallholders to protect and regenerate farm environments
- 5. Implement water stewardship programmes in 100 locations in water-stressed areas by 2030
- 6. 100% of ingredients will be biodegradable by 2030

To achieve the above-mentioned goals, Unilever’s plan of action includes a number of **partnerships and frameworks**.

First of all, the protect and regenerate nature goals are supported by Unilever’s [Climate & Nature Fund](#). The company’s brands are investing a total of €1 billion in the fund, which will be used over the next few years to take action achieving its sustainability targets.

At COP26, Unilever, together with the United States Agency for International Development (USAID), United Nations Food and Agriculture Organization (FAO), World Resources Institute (WRI), NASA and Google, announced the creation of the [Forest Data Partnership](#). According to Unilever, the partnership will allow everyone access to consistent, open-source and validated geospatial data to monitor, verify and disclose progress in reducing deforestation and restoring degraded land. In 2020, Unilever became the first company to use Google Earth Engine for commercial sustainable sourcing, and was one of the first companies to work with Orbital Insight, using geolocation technology to trace palm oil and soy supply chains.

Finally, the People and Forest First strategy outlines three pillars for ending deforestation in supply chains: (1) raw materials origins to get a deep understanding of the impact of sourcing by working with technology firms and start-ups; (2) creating partnerships with suppliers and industry partners to create traceable and transparent supply chains; and (3) using digital capabilities to help improve how Unilever monitors, predicts and responds to situations where deforestation is likely to occur.

What progress has been made so far?

By the end of 2020, 96% of directly purchased paper and **board packaging** materials were made from recycled fibre or came from certified sustainable managed forests. Unilever is the world’s biggest tea company, buying around 10% of the world’s **black tea** and, by the end of 2020, 86% of all Unilever’s tea was sustainable certified by Rainforest Alliance.

By the end of 2020, over 90% of Unilever’s **soybean oil** originated in places with a low risk of deforestation, like the US, or in places that are certified deforestation-free. This number was up from 69% in 2019. Unilever also buys around 1.5% of the global production of cocoa, mainly sourced from Ivory Coast and Ghana. 100% of Unilever’s cocoa (and 99% of cocoa for Magnum) is sourced through certification schemes (e.g. Rainforest Alliance, UTZ and Fairtrade).

Finally, Unilever has also listed its progress with its approach to sustainable **palm oil**. By the end of 2020, 99.6% of core volumes of palm oil was sustainably sourced and 94.3% of palm kernel oil came from a number of physically certified sources.

Unilever’s focus on data is pivotal in our view

During the past few years, Unilever has brought about a number of changes to its approach regarding deforestation. We see three drivers behind the company’s current strategy:

- Firstly, Unilever used to assess the business risk from deforestation by taking a commodity-by-commodity approach. More recently, the company changed this by incorporating a more inclusive approach realising in part that these commodities are often interlinked and therefore should not be reviewed in isolation.
- A second observation that is relevant when trying to assess Unilever’s approach to deforestation is that the company has some reservations about the workings of external deforestation related rating companies such as WWF, CDP and Forest 500. For example the company notes that Forest 500’s approach does not rely extensively on engaging with corporates but rather mostly on web scraping. This therefore might provide conclusions that miss nuances. Furthermore if a company does not report on certain areas deemed relevant by Forest 500 it would score lower on their approach despite the fact that this might not mean that the company is not engaged with that area. In case of CDP



Unilever feels that the process is highly intense which suggests that it can take up to 6 months for corporates to provide the required data before CDP starts analysing the input. The end conclusion or view therefore is often made public with a significant time lag which reduces the relevance according to Unilever. In case of WWF Unilever notes that it only focuses on palm oil but more importantly is weighted heavily by whether a company adopts certain certification standards. Unilever does not believe that certification is the best way forward when trying to measure deforestation performance or indeed addressing the topic.

- The third driver behind Unilever’s current approach to deforestation can in our view be linked to the company’s assessment of regulatory changes. Unilever is highly supportive of some of the developments taking place in the EU, UK and the United States. We highlighted these earlier in this report. However, the company believes that some of this legislation might place unreasonable pressure on smallholder farms. For example if smallholder farms use recently converted forest land for growing their products some regulation might make using these farmers illegal. Unilever believes that smallholder farms should be treated differently and that instead the supply chain should engage with these farmers so that their approach improves. This would also limit the risk of these farmers offering their products to buyers that care less about some of this legislation which would in turn maintain current deforestation policies.

In order to be as effective as possible in addressing deforestation risk Unilever has during the past few years made a conscious decision to invest in data-related solutions. The company believes that by teaming up with a number of large and specialised data analytics companies it is able to develop a real time insight into deforestation trends which in turn will allow the company to engage with all key stakeholders across the supply chain much more quickly and effectively.

We believe that the increasing collaboration between the world’s largest food and beverage and household good companies with data analytics firms is a potential game changer as far as environmental and social impact analysis is concerned. Unilever appears to be at the forefront of this in our view.

Reviewing Unilever’s approach through 45 questions

Unilever’s Planet and Society strategy covers a wide range of highly relevant areas in relation to deforestation. Furthermore, we believe that the company’s engagement with external data companies is innovative and has the potential to substantially improve insight into deforestation trends and make the topic much more real time than is currently the case. Based on our review we are not surprised to find that Unilever does score well with external agencies in terms of its climate change, social and deforestation policies. Nevertheless as with Nestle we also asked Unilever a range of questions related to different areas of deforestation. In Figure 66 we show the company’s answers. We believe that the answers provide a very strong level of support for why Unilever tends to score well with external agencies. Unilever is in agreement with 40 of the 45 highlighted areas and is in the process of adding 2 more. This shows very strong commitment towards deforestation in our view.

- **Approach and commitment:** Of the 20 questions regarding the approach and commitment to deforestation Unilever already has policies and commitments to 18. The question related to Meat is not relevant for Unilever. The only metric that the company does not report on relates to emissions arising from land use change.
- **Reporting and disclosure:** Here again Unilever is engaged with all relevant areas. The company’s development of deforestation free reporting will add yet more information which is positive, in our view.
- **Social policies:** Unilever has commitments and policies associated with all of our social related questions.

Figure 66: Unilever response to our 45 questions

Question	Unilever response	Comment
Approach and commitment		
Do you have a commitment to exclude production or procurement of products originating from natural forests, other natural ecosystems and/or high conservation value areas or a commitment to produce and/or procure sustainably produced commodities?	Y	
Does the commitment apply to all of your company's sourcing regions or operations?	Y	
Do you have a target date for full implementation of your company's commitment towards deforestation and related policies?	Y	
Pulp and paper: Does your company have a commitment to reduce the amount of virgin wood fibre content used for paper and board materials.	Y	
Palm oil: Do you have a commitment to exclude products originating from new developments of palm oil on high carbon stock (HCS) areas and/or peatlands of any depth?	Y	
Soy Beans: Does your company have a commitment to reduce the amount of soy beans originating from new developments on HCS areas and/or peatlands?	Y	
Meat: Does your company have a commitment to reduce the amount of meat originating from new developments on HCS areas and/or peatlands?	NA	Meat is not a material risk ingredient for Unilever and we have a commitment to increasing turnover in plant based foods
Does your company have a commitment to develop and implement supply chain traceability systems in relation to deforestation-related commodities and products?	Y	
Does your company have a company-wide commitment to achieve deforestation-free and/or conversion-free production and/or procurement for all high risk commodity supply chains?	Y	
Does your company have a company-wide commitment to reduce the impact of its operations on biodiversity?	Y	
Does your company have a company-wide commitment to target waste reduction?	Y	
Is your company a signatory to or member of voluntary initiatives seeking to end or reduce soft commodity driven deforestation	Y	
Does your company identify deforestation as a business risk?	Y	
Does your company's board have a committee or is there a high-level management position that is formally focused on deforestation-related issues?	Y	
Does your company link executive compensation to deforestation-related issues?	Y	
Does your company have a target to reduce GHG emissions from Land use change in their operations and the supply chain?	Y	Through our Net Zero target and CTAP - not a stand alone land use target
Does your company disclose the total amount of GHG emissions in metric tons of CO ₂ -equivalent arising from land use change?	N	
Does your company disclose how many hectares of conservation area are being supported or facilitated by your company on land it does not own or manage?	Y	1.5m hectares goal and individual project level reports
Does your company report how many hectares of reforestation or restoration are being or have been conducted or facilitated by your company?	Y	1.5m hectares goal and individual project level reports
Does your company have a climate target including at least scope 1 and 2 emissions?	Y	
Reporting and disclosure		
Does your company report progress on the implementation of all its commitments?	Y	Compass reporting in progress, various public reporting via CDP, DJSI etc.
Is your company progress reporting on the commitment implementation verified?	Y	External assurance of select metrics / Independent verification is included in our policies
Does your company require its suppliers to be aligned with or committed to deforestation and conversion-free standards across all of their operations,not just those volumes supplying your company?	Y	
Does the commitment specify a cut-off date for deforestation,conversion,or other actions that would be considered non-compliant? (commodity specific)	Y	
Does your company report on their participation in collaborative actions to advance sustainability in agriculture commodity production with multiple stakeholders or jurisdictional partners?	Y	
Does your company conduct commodity-specific risk assessments related to forest risk?	Y	
Does your company conduct assessments to ensure that their operations and supply chains comply with all applicable laws?	Y	



Does your company have grievance mechanisms in place to identify and remedy adverse social and environmental impacts linked to their operations and/or supply chain?	Y	
Does your company report the volume of commodity production or usage?	Y	Yes - For example in the CDP assessment
Does your company disclose the proportion of its total commodity volume which is third-party verified to be compliant with either the deforestation or conversion commitment?.	In progress	Deforestation free reporting
Does your company monitor the compliance of production or primary processing operations that it owns,manages,or otherwise controls,or its supply chains with its commitments on labour rights and FPIC?	Y	Through our human rights reporting
Does your company conduct or facilitate environmental and social impact assessments for new site development or land acquisition?	Y	
Does your company publicly report their suppliers?	Y	
Does your company monitor compliance of production or primary processing operations that it owns,manages,or otherwise controls with its commitments on deforestation and conversion?	Y	
Does your company report how many hectares of deforestation and/or conversion have occurred since the commitment cut-off date on land owned,controlled,or managed by your company?	NA	We are not an agricultural land owner or manager
Does your company monitor compliance of its supply chain with its commitments on deforestation and conversion?	Y	
Does your company report on how many hectares of deforestation and/or conversion have occurred since the commitment cut-off date within your company's supply chains?	In progress	Deforestation free reporting
Does your company engage non-compliant supplier operations and suppliers in order to address and remedy non-compliance?	Y	
Does your company disclose how many suppliers or producers are engaged,or excluded from their supply chains?	Y	
Social related policies		
Does your company commit to respect internationally-recognized labour rights in their operations and supply chain?	Y	
Does your company offer support to smallholder producers to help them enter responsible supply chains and/or achieve compliance with commitments?	Y	
Does your company commit to address gender equality issues in their operations and supply chain?	Y	
Does your company commit to taking measures to provide remediation where it has caused or contributed to social or environmental harm related to deforestation or conversion?	Y	
Does your company commit to securing the Free, Prior and Informed Consent (FPIC) of potentially affected indigenous peoples and/or local communities prior to acquiring new interests in land or resources and prior to new developments or expansions?	Y	
Does your company commit to refrain from land acquisition or development until any existing land conflicts have been resolved in their own operations?	Y	



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