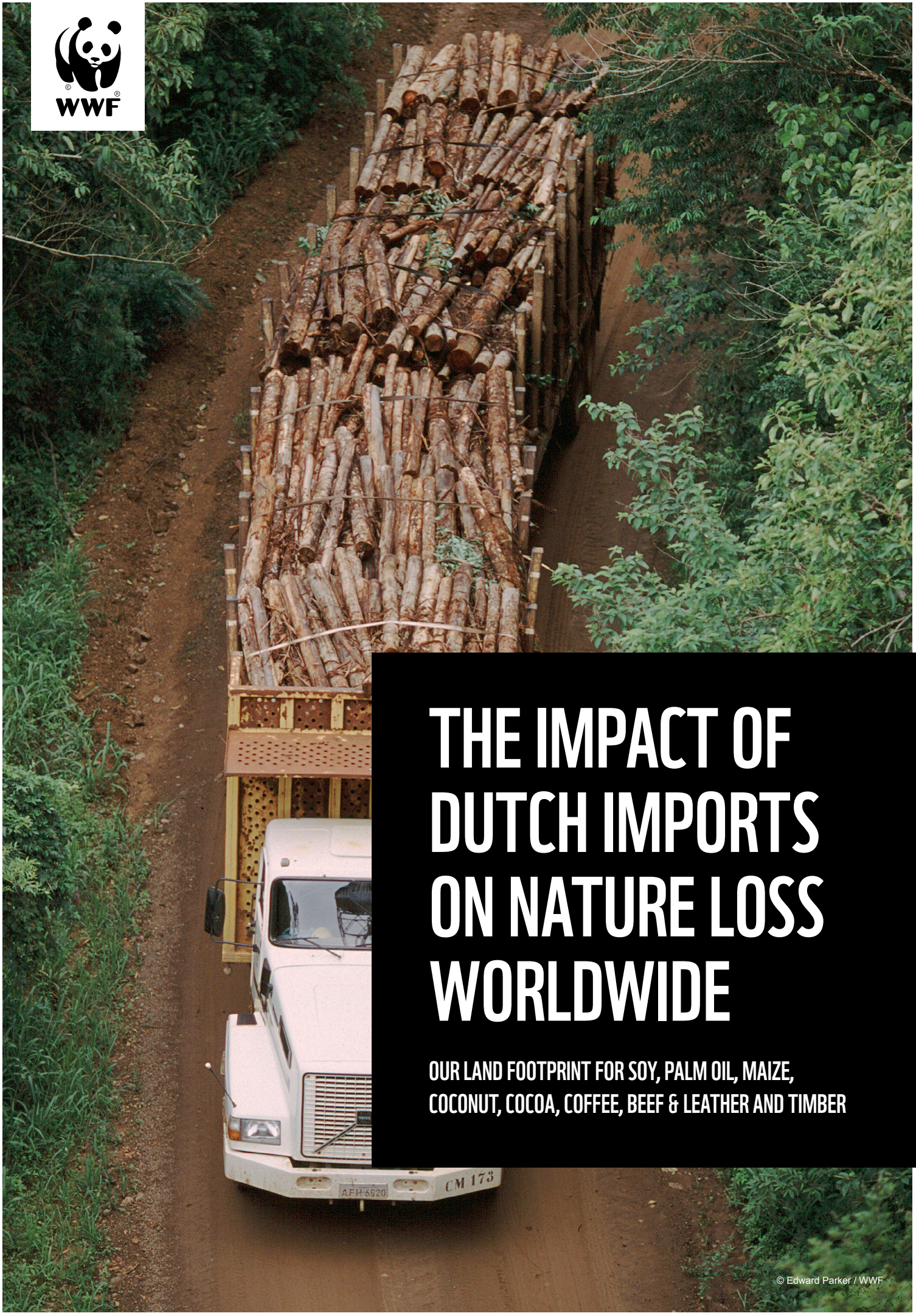

THE IMPACT OF DUTCH IMPORTS ON NATURE LOSS WORLDWIDE

OUR LAND FOOTPRINT FOR SOY, PALM OIL, MAIZE, COCONUT, COCOA, COFFEE, BEEF & LEATHER AND TIMBER

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EXECUTIVE SUMMARY

We are in an era of unprecedented global environmental change, driven almost entirely by human activities. The climate crisis, disruption of biogeochemical cycles, conversion of natural ecosystems, overfishing and pollution are driven by overconsumption, unsustainable extraction rates, and by the methods we use to produce the goods we consume.

One of the major drivers of the biodiversity and climate emergencies is the conversion of natural ecosystems. Eighty percent of deforestation results from agriculture which produces the commodities we consumers take for granted and increasingly demand.

Stopping the destruction of nature and protecting and restoring natural ecosystems is vital in securing wildlife habitats, reversing biodiversity loss and addressing climate change. It is also critical for securing resilient agricultural supply chains – for example, maintaining the provision of essential ecosystem services such as carbon sequestration and clean water. Furthermore, the conversion of natural ecosystems often results in local and indigenous peoples losing their customary land, and along with it, part of their traditional livelihoods and cultural reference.

These problems have been understood for some time. In fact, progressive companies and governments have made time-bound commitments to halt deforestation since 2010 (including through actions such as certification, market incentives and support for sustainable agriculture). Despite this, rates of deforestation and land conversion – and the greenhouse gas emissions that result from conversion of natural ecosystems – remain high, and so do the associated negative impacts on local people and nature. The Netherlands, as a major global trading hub of agricultural and forest commodities, is at the heart of supplying this demand within the EU and beyond.

The European Commission is developing legislation making it mandatory for companies to conduct due diligence on deforestation and degradation associated with the commodities they place on the European market. As it stands now, this regulation will have a profound effect on companies operating in the Netherlands – obliging them to be truly vigilant and transparent about the environmental harms embedded within their global supply chains. However, the proposed EU legislation does not go far enough: it only includes deforestation and not conversion of all ecosystems (see Section 4.1 for an example) and excludes a number of commodities that are associated with deforestation and conversion. A robust legal framework is an important starting point to motivate businesses to reconsider their impact on deforestation and conversion, yet they should not stop at meeting the bare minimum legal requirements of this regulation and use this opportunity to eliminate deforestation, conversion and human rights abuses from their supply chain and that of their suppliers.

This report assesses the quantity and provenance of the Netherlands' imports and consumption of eight deforestation and conversion risk commodities: soy, palm oil, maize, coconut, cocoa, coffee, beef & leather and timber. It estimates the area of land required to supply these imports, the risk of deforestation, conversion and social issues associated with that land footprint, and the resulting greenhouse gas emissions.

KEY FINDINGS

The Netherlands' external land footprint for imports of just eight commodities is an estimated 17.3 million hectares a year. This is equivalent to four times the Netherlands' land area.

The largest contributions to the Netherlands' external land footprint are imports of timber (5.1 million hectares each year), beef & leather (3.9 million hectares), soy (2.7 million hectares) and cocoa (2.5 million hectares, Figure A). The Netherlands is a significant global actor in the trade of many of these commodities. For example, it imports 23% of the cocoa produced globally.

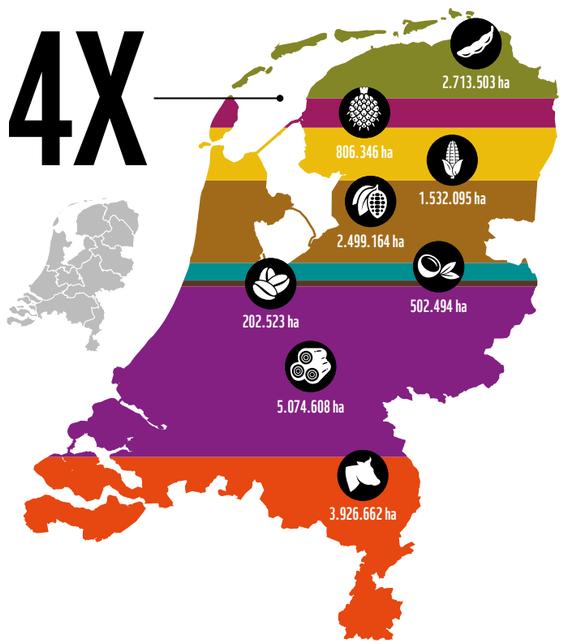


FIGURE A:
AVERAGE ANNUAL LAND FOOTPRINT REQUIRED TO SUPPLY THE NETHERLANDS' CONSUMPTION AND EXPORTS OF EIGHT AGRICULTURAL AND FOREST COMMODITIES

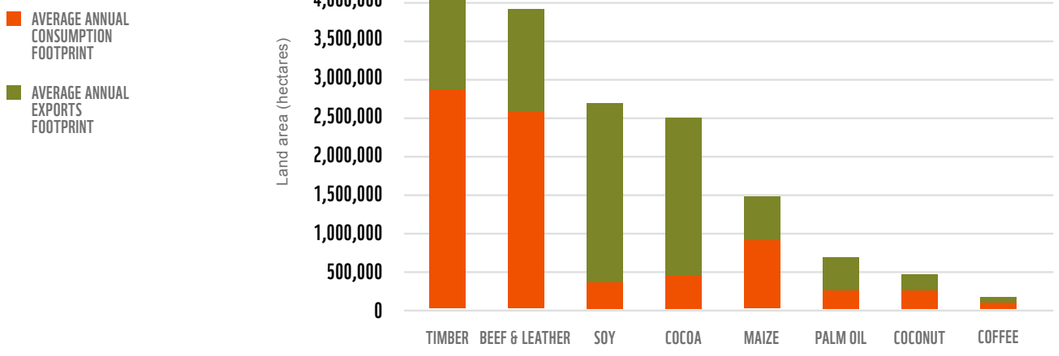
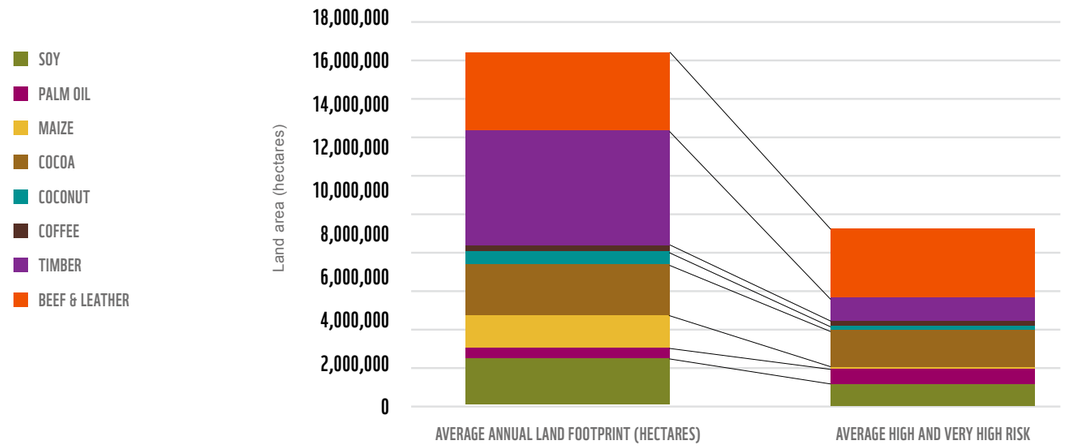


FIGURE B:
AVERAGE ANNUAL LAND FOOTPRINT FROM COUNTRIES WITH A HIGH AND VERY HIGH RISK OF DEFORESTATION FOR EIGHT AGRICULTURAL AND FOREST COMMODITIES

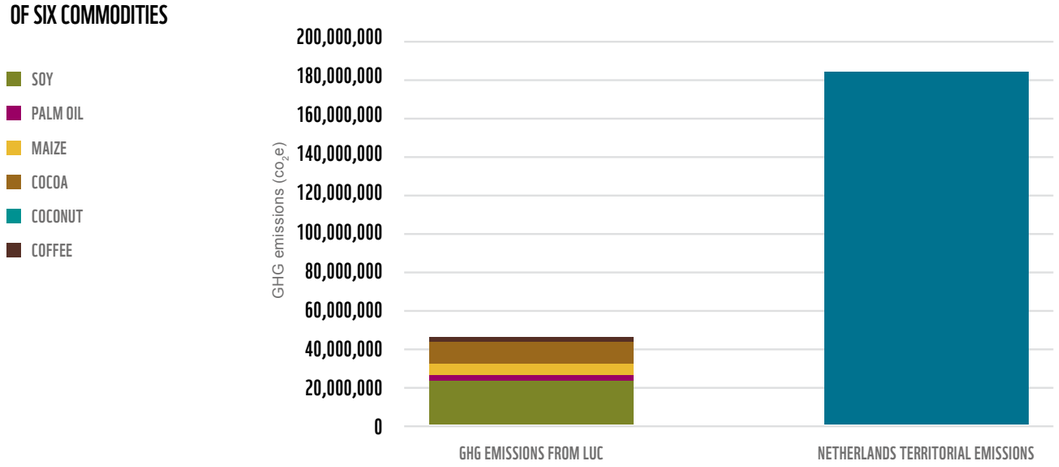


Forty-two percent of this external land footprint – over 7 million hectares – is from countries that have a high or very high risk of deforestation, poor rule of law and a poor record of labour rights. The majority of imported palm oil (86%), cocoa (80%) and coffee (69%) is produced by countries assessed to have a high or very high risk (Figure B). Large areas of land in high-risk countries are also required to supply the Netherlands with commodities such as maize and coconuts, which have received less attention for their environmental impacts. Imports from countries such as Argentina (soy), Brazil (soy, beef & leather, coffee, maize), Cameroon (cocoa), China (timber products), Indonesia (palm oil, coconuts), Nigeria (cocoa) and the Russian Federation (timber products) present a high risk of environmental and social damage.

The greenhouse gas emissions associated with the conversion of natural ecosystems and changes in land cover for the production of just six commodities (soy, palm oil, maize, cocoa, coconut and coffee) amounted to an average of around 43.6 million tonnes of CO_2-equivalent each year between 2017 and 2021 (Figure C). This is equivalent to 24% of the Netherlands' domestic greenhouse gas emissions in 2019. Three commodities, soy (50%), cocoa (26%) and maize (16%), are responsible for over 90% of these greenhouse gas emissions.

FIGURE: C

ESTIMATED AVERAGE ANNUAL GHC EMISSIONS FROM LAND USE CHANGE FROM IMPORTS OF SIX COMMODITIES



The Netherlands exports a high proportion of these imported commodities to other countries. With the exception of timber and maize, over half of imports (or imports plus domestic production where applicable) are exported, often after additional processing and (in the case of soy) used as animal feed for exported animal products. For example, 85% of soy imports are exported to other countries, emphasising the Netherlands' critical role in international trade, and the country's global responsibility for ensuring that commodities are free from environmental and social harm.

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TABLE OF CONTENTS

1. INTRODUCTION 10
1.1 THE ISSUE 10
1.2 ABOUT THIS REPORT 13
2. FINDINGS FOR EACH COMMODITY 14
SOY 15
PALM OIL 20
MAIZE 24
COCOA 28
COFFEE 34
COCONUT 38
BEEF AND LEATHER 42
TIMBER 48
3. COMMODITY IMPACTS ON THREE KEY SOURCING LANDSCAPES 54
3.1 SOY IN THE BRAZILIAN CERRADO 55
3.2 COCOA IN CAMEROON 62
3.3 PALM OIL IN RIAU PROVINCE, SUMATRA, INDONESIA 68
4. CONCLUSIONS 78
5. METHODS 82
5.1 COMMODITY FOOTPRINTING 82
5.2 RISK ASSESSMENT 85
6. ANNEXES 88
6.1 SUMMARY OF MAJOR IMPORTING COUNTRIES 88
6.2 RISK INDEX 90
6.3 CONVERSION FACTORS USED FOR SOY 92
6.4 CONVERSION FACTORS USED FOR PALM OIL 93
6.5 CONVERSION FACTORS USED FOR MAIZE 95
6.6 CONVERSION FACTORS USED FOR COCOA 96
6.7 CONVERSION FACTORS USED FOR COFFEE 97
6.8 CONVERSION FACTORS USED FOR COCONUT 98
6.9 CONVERSION FACTORS USED FOR TIMBER 101
6.10 CONVERSION FACTORS USED FOR BEEF & LEATHER 102
6. NOTES AND REFERENCES 104

INTRODUCTION

1.1 The issue

Up to eighty per cent of all deforestation and land conversion is caused by commercial agriculture and forestry[1], in order to produce commodities that are either consumed directly, used in the manufacture of products, or fed to livestock which form part of our diets. This includes commodities such as cocoa, palm oil, soy and timber that are imported into the EU in huge volumes despite being directly implicated in deforestation and conversion[2].

The loss of forests and other critical natural ecosystems results in significant environmental, climatic, economic and social impacts[3]. Loss of these habitats has an immediate and direct impact on the species that live within them and the ecosystem services that these habitats provide. It also affects the two billion people that depend, directly or indirectly, on forests and other ecosystems to fulfil their needs for food, fibre and shelter[4]. Deforestation and conversion also have impacts beyond the immediate area that has been converted. Agriculture, forestry and other land activities contribute to nearly a quarter of global man-made GHG emissions[5]. Put simply, if we are to overcome the twin challenges of biodiversity loss and climate change, agriculture and forestry has to become decoupled from deforestation and conversion.

This imperative has been recognised – at least on paper. Building the New York Declaration on Forests[6] and the UNFCCC Paris Agreement[7], major consumer country governments, including the Netherlands, signed the Amsterdam Declaration on Deforestation in 2015, which signalled their continued commitments to preserve forests and other critical ecosystems through responsible supply chains[8]. More recently, political leaders committed to end deforestation at the UNFCCC CoP in Glasgow[9] and, on 17 November 2021, the European Commission presented a "proposal for a regulation on deforestation-free products" requiring companies to conduct due diligence to ensure that certain products placed on the EU market are not driving deforestation[10].

The European Commission's proposal for a regulation on deforestation-free products, will, if adopted, require companies to conduct due diligence to ensure that certain products placed on the EU market are not driving deforestation. This is an important and welcome step in eliminating some of the worst environmental impacts from supply chains.

However, the proposed regulation is likely to be insufficient in their current form: it only refers to deforestation rather than covering deforestation and conversion of all natural ecosystems. This loophole will allow the ongoing destruction and degradation of some of the most threatened, biodiverse and carbon rich habitats on earth[11]. Secondly, the proposals currently relate only to soy, cattle, cocoa, coffee, palm oil and timber, and some products that contain or have been fed with these commodities. This means that commodities such as coconut can continue to be imported even if they are responsible for deforestation. It is difficult to see how the EU's environmental aspirations -

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to have a neutral or positive environmental impact[12] and to become carbon neutral by 2050[13] - could be achieved if non-forest ecosystems and the full suite of commodities and products are excluded from the regulations.

Many companies have also made commitments and efforts to remove deforestation from their agricultural and forestry commodity supply chains. For example, a decade ago, the Consumer Goods Forum, which includes some of the largest companies in the world, adopted a resolution to achieve zero net deforestation across all commodity supply chains by 2020[14].

Despite such pledges, there has been relatively little progress towards turning deforestation and conversion-free supply chain commitments into a reality. As the periodic investigations of commodities that have been produced through deforestation getting into the supply chains of major companies show[15], the complexity and lack of transparency in supply chains hinders even the most well-meaning company. In fact, rates of deforestation and conversion remain high: the world lost 24.2 million hectares of tree cover in 2019, of which around 3.8 million hectares occurred within humid tropical primary forests (a 3% increase compared to 2018)[16]. Global estimates of the conversion of non-forest ecosystems are not available, however, specific biomes show that conversion of ecosystems has been rapid in many parts of the world. For example, more than half of Brazil's Cerrado was converted between 1985 and 2017[17] and more than 9% of the great plains grassland in the USA has been converted in the decade between 2009 and 2019[18]. Irrespective of the precise formulation of the forthcoming EU legislation, reversing the climate and biodiversity crises will require a scaling up of efforts by companies to exclude all deforestation and conversion from their operations and supply chains for all commodities and for their suppliers todo the same.

1.2 About this report

This report focuses on eight deforestation and conversion risk commodities: soy, palm oil, cocoa, maize, beef & leather, timber, coffee and coconut. It provides estimates of the quantities imported and critically, given the Netherlands' role as a major trading nation, the quantities that are subsequently exported (often after further processing) and consumed. It estimates the land area required to supply the Netherlands with its demand for imports, and the GHG emissions from land use change of those imports.

'Three case studies show the impacts of the expansion of palm oil, soy and cocoa in Riau province, Indonesia, the Cerrado in Brazil and Cameroon respectively.' The linkages between trade to the Netherlands – and where data is available, with specific companies – is shown. All three commodities are imported in vast quantities to the Netherlands, all are associated with destruction of nature in the case study areas, and all contain extraordinary but increasingly threatened biodiversity.

2. FINDINGS FOR EACH COMMODITY

2.1 SOY

Global production and use

The Americas dominate the production of soy, with Brazil expected to surpass the USA as the world's largest producer of soy in the coming years. Meanwhile, in terms of consumption, China and Indonesia currently import the largest quantities of soy globally[19]. The Netherlands is the third largest importer globally, re-exporting a significant proportion to other EU countries and beyond[20].

The main uses of soy are:

- Soy meal (or 'cake'): This is the material remaining from oil extraction, which can contain up to 49% protein. The meal is 'toasted' (steam treated) and ground and then is almost entirely used in livestock feed.
- Soy oil: Soybeans contain approximately 18% oil, which is refined and used as vegetable oil for cooking, in a wide variety of processed foods, and also in the production of biofuels.
- Direct human consumption: Soy is used directly in a range of food – especially in China, Japan and Indonesia – including soy sauce, tempeh, tofu, soy flour, soymilk, textured vegetable protein, and edamame.

Netherlands imports, exports, consumption

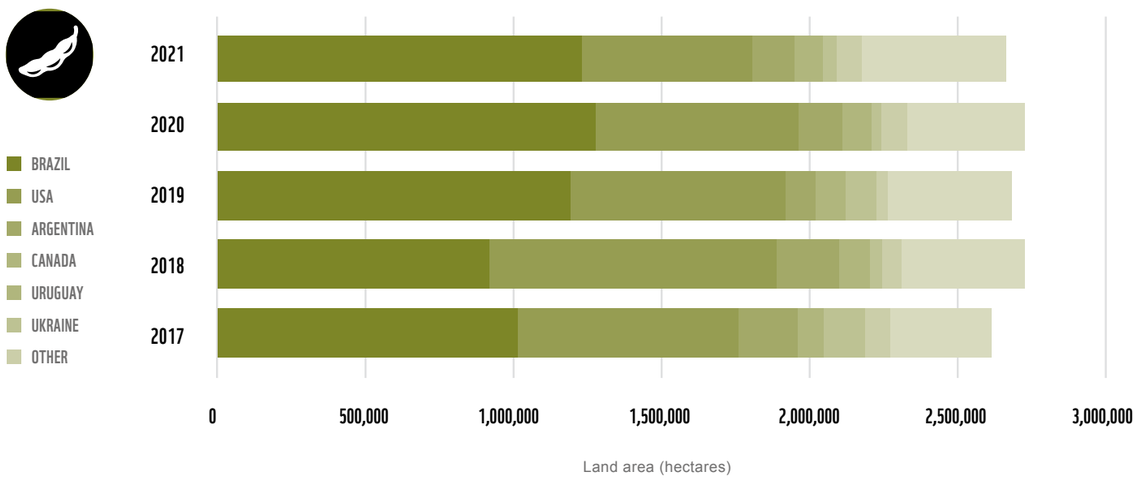
From 2017 to 2021, the Netherlands imported on average 8.1 million tonnes of soy per year, as soybeans, meal, oil and embedded within meat (especially poultry and pigs) and livestock products (e.g. milk and eggs)[21]. Eighty-five percent of this was re-exported. The Netherlands adds value to these exports by processing soybeans into meal: an average of 4.2 million tonnes of beans, 2.3 million tonnes of soy meal and 0.15 million tonnes of soy oil are imported, whereas an average of 2.3 million tonnes of beans, 4.2 million tonnes of soy meal and just under 1 million tonnes of oil are exported. Further value is added through significant exports of biodiesel and poultry, which have an estimated 0.84 and 0.27 million tonnes of embedded soy per year respectively. Both imports and exports have remained fairly stable over the period.

The world's land footprint for soy averaged 124 million hectares between 2017 and 2020[22] or roughly one-third of the size of the European Union. The Netherland's imports account for about 2.2% of this land footprint. Between 2017 and 2020, the land required to produce the volume of soy imported was on average 2.7 million hectares, an area nearly two-thirds the size of the Netherlands.

The GHG emissions from land-use change resulting from the Netherlands' soy imports are an estimated 21.9 million tonnes CO_2e per year between 2017 and 2021 – equal to around 12% of the Netherlands' domestic emissions from all sources[23].

Most of the soy imported to the Netherlands comes from Brazil (47%), the USA (31%) and Argentina (6%). These countries account for 42%, 28% and 6% of the land footprint of the Netherlands' imports of soy respectively (Figure 1). Our analysis of risk assigned Brazil and Argentina to very high and high risk scores due to high deforestation and conversion rates and poor social indicators, meaning that a total of 48% of the land footprint of the Netherlands' imports come from high or very-high risk sources (Figure 2). It should be noted that the expansion of soy production from the Great Plains in the USA is one of the main drivers of ecosystem conversion there, alongside maize and wheat[24].

FIGURE 1:
ESTIMATED EXTERNAL LAND FOOTPRINT REQUIRED TO SUPPLY THE NETHERLANDS' SOY DEMAND, BY COUNTRY (2017-21)



The overwhelming use of the soy imported – and consumed – by the Netherlands is as animal feed. Soybean contains around 38% protein (double that of pork and treble that of eggs), a wide range of essential amino acids, a high proportion of unsaturated fat, and produces more protein per hectare than any other major crop. This high protein content has resulted in soy being a major animal feed ingredient: it is estimated that at least 88% of the combined volume of soybeans, meal and oil consumed in the Netherlands is used to feed livestock[25]. It is principally used to feed monogastric species including poultry and pigs, but also in aquaculture and in intensive beef and dairy production systems.


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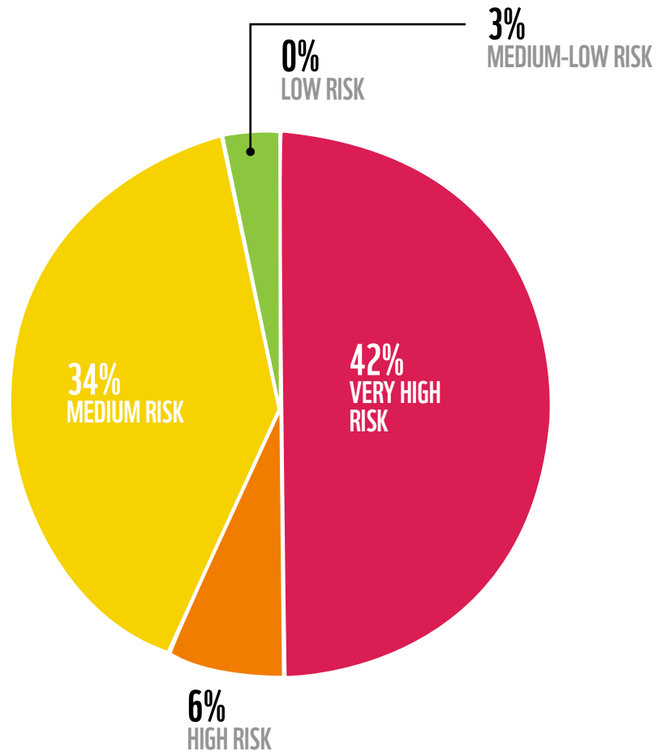
FIGURE 2:
RISK PROFILE OF THE LAND FOOTPRINT OF THE NETHERLANDS' SOY IMPORTS

(note that soy of unknown provenance has not been assigned a risk)

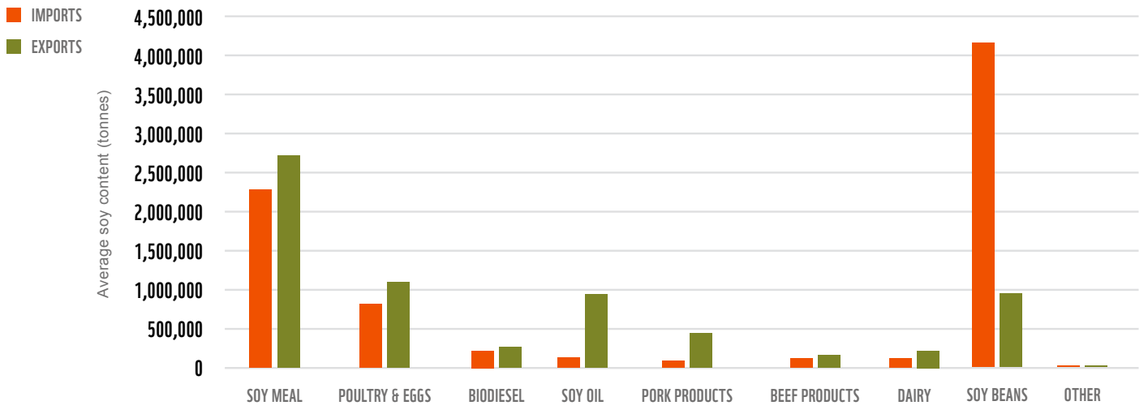


The Netherlands' imports are dominated by soybeans (52%) and soy meal (28%), with 14% embedded in meat and livestock products (Figure 3). Exports paint a different picture: here, soymeal dominates (39%) and the soy embedded in exports is twice that of imports (28%), demonstrating the processing of imported beans into meal and oil, and the subsequent export of meal, oil and livestock products that have been fed on meal. Soybean exports are less than a quarter of imports and would be expected to be predominantly converted into meal and oil in other countries.

The picture is clear: the overwhelming demand driver for the soy imported, consumed, and exported by the Netherlands is animal feed.

Seventy-five percent of all exports are to the EU, predominantly Germany (41%), Belgium (19%) and France (4%), with a further 9% exported to the United Kingdom.

FIGURE 3:
SOY CONTENT OF IMPORTS AND EXPORTS, BY PRODUCT TYPE (AVERAGE 2017-21)

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Sustainability

The expansion of soy production in South America has been strongly associated with deforestation and other natural habitat destruction. Soybeans and derived products were estimated to be responsible for 4.4 million hectares of the 9 million hectares of deforestation embodied in crop and livestock products imported into the EU between 1990 and 2008[26]. Soy can also act as an indirect driver of deforestation, displacing cattle ranching towards the forest frontier[27] and driving up the price of converted land[28].

The expansion of soy cultivation has led to land rights issues with local communities and indigenous groups, sometimes escalating into violent conflict. Soybean expansion has been associated with poor labour conditions and violations of human rights in Brazil[29] and Paraguay[30]. The fertilisers and pesticides used in soy cultivation can pose health risks to people living near soy farms[31].

Certification schemes have proliferated within the soy sector. Perhaps the most prominent scheme is the Roundtable on Responsible Soy (RTRS). The scheme includes a standard with independent third-party verification, and chain of custody arrangements that include segregation, mass balance or a credit system. Since 2009, the RTRS standard precluded the conversion of any natural vegetation from June 2016 onwards. Approximately 1% of global soy production is certified by RTRS[32].

A second certification scheme, the ProTerra Certification Program, was created in 2006. The requirements of the standard are broadly similar to that of RTRS, other than that it excludes genetically modified soy (RTRS has an optional non-GMO module). About 95% of the volume of certified ProTerra soy is from Brazil. The area of ProTerra certified soy production was 1.2 million hectares in 2017[33].
In addition to these soy-specific multi-stakeholder standards, there are numerous proprietary standards which include third party verification (e.g., ADM's Responsible Soy Standard, Cargill's 'Triple S' standard, the Certified Responsible Soya (CRS) standard owned by Cefetra), the European Feed Manufacturers' Federation guidelines (which benchmarks standards), and the Feed Materials Assurance Scheme which is in essence a food quality benchmark with an add-on responsible soy module).

Proprietary standards typically focus on legal compliance, good agricultural practice, and legal treatment of workers. Their provisions regarding deforestation and social issues are typically weaker than those of RTRS and ProTerra. For example, FEFAC compliant standards need only exclude illegal deforestation, thus allowing legal deforestation, and the ADM and Triple S standards do not demand that workers have freedom of association and collective bargaining. Proprietary standards also tend to be significantly less transparent than RTRS and ProTerra, with no publicly available copies of audit reports, and in some cases the standard not being readily available (e.g. CRS).

The European Soy Monitor claims that all of the soybean meal available for domestic consumption in the Netherlands is certified deforestation free[34]. However, this claim does not include other forms of soy, refers only to soy consumed for animal feed (not traded soy), and is based largely on 'credits' that provide no physical link between the soy used and deforestation free production. The evidence provided here shows that the soy traded in the Netherlands is far from being free from the risk of deforestation and conversion.

2.2 PALM OIL

Global production and use

India, China, Pakistan and the EU are currently the major importers of palm oil globally, while Indonesia and Malaysia dominate global production[35]. The latter two countries are also major consumers of palm oil.

The current annual global demand for vegetable oil, of which palm oil accounts for 40.5%, is 211.7 million tonnes[36]. The annual global demand for palm oil is expected to increase to between 264-447 million tonnes by 2050, due to growing demand for food and biofuels[37]. While the largest growth in production is expected to occur in Indonesia and Malaysia, it is also expected to increase in the frontier areas of Latin America and Africa (mainly Colombia and Nigeria, respectively)[38]. This is especially important given both the high forest cover and presence of other key highly biodiverse habitats (e.g. savannahs and grasslands) in these regions.

Oil palm fruit is processed into three main raw materials:

- Palm oil: which is extracted from the pulp of the fruit that has been sterilised by heating and pounded mechanically (known as digestion) followed by mechanical pressing. It is typically further refined and used as a cooking oil, and as an ingredient in manufactured foods including biscuits, baking, ice cream, margarines, snacks, confectionary, dairy products and dairy replacers. It is estimated that approximately 15% of palm oil is used as biofuel feedstock globally, but in 2019, the European Commission introduced measures to phase out palm oil in biofuel due to concerns over the sustainability of its production.
- Palm kernel oil: is extracted from the seed of the fruit by mechanical crushing to remove the shells, steam cooking and pressing. It is used in the oleochemical industry for making soap, detergent, toiletries and cosmetics, and for industrial uses.
- Palm kernel meal: is the residue from palm kernel oil extraction. It is both nutritious and contains a high fibre content, making it an appropriate feed for ruminants[39]. It is also used for energy generation

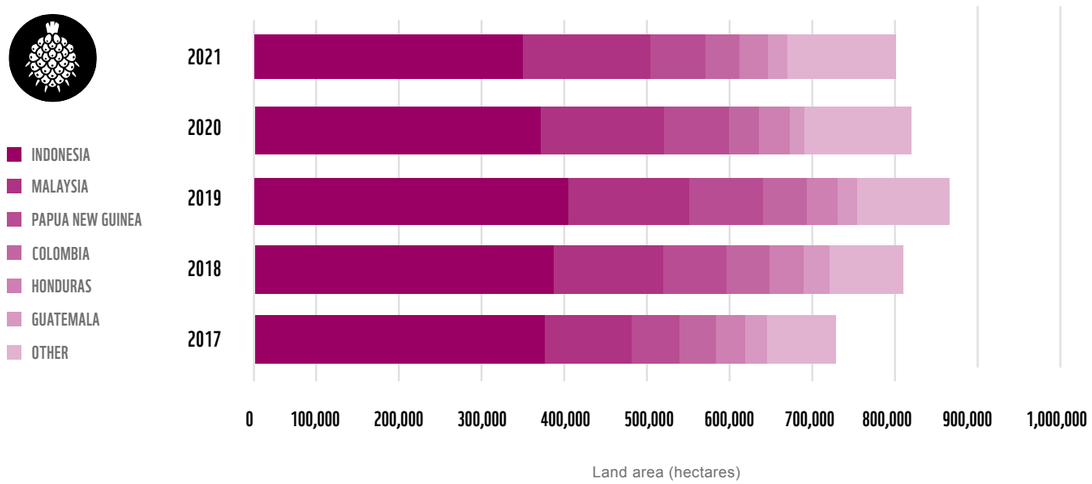
Netherlands imports, exports, consumption

On average 5.59 million tonnes of palm oil was imported into the Netherlands every year between 2017 and 2021. Imports increased by around half a million tonnes during the period (5.07 million tonnes in 2017 to 5.56 million tonnes in 2021). An estimated 41% (2.29 million tonnes) was consumed within the Netherlands, the remainder was exported.

The world's land footprint for palm oil is about 28 million hectares[40]. The overseas land required to supply the Netherlands' palm oil demand between 2017 and 2021 was on average 0.81 million hectares per year, about 2.9% of the world's harvested area of palm oil, and almost equivalent to the combined land area of the Dutch provinces of North Brabant and Friesland. The estimated GHG emissions from land use change of palm oil imported to the Netherlands were 2.85 million tonnes CO_2e per year – equal to around 2% of the Netherlands domestic GHG emissions[41].

In common with most other palm oil importing countries, Indonesia (42%) and Malaysia (21%) dominate the Netherlands' palm oil footprint, but there is a noticeable supply from the Americas – Colombia (6%), Honduras (6%) and Guatemala (4%) in particular (Figure 4). All of these countries are high or very-high risk locations due to high rates of tree cover loss (especially Colombia, Indonesia and Malaysia[42,43]), a high proportion of natural forest loss[44], poor rule of law[45] and record of workers' rights[46]. As a result, at least 86% of the palm oil imported by the Netherlands was from high risk countries.

FIGURE 4:
ESTIMATED EXTERNAL LAND FOOTPRINT REQUIRED EXTERNAL TO SUPPLY THE NETHERLANDS' PALM OIL DEMAND, BY COUNTRY (2017-21)



Indonesia has experienced somewhat lower rates of deforestation and land conversion since 2017, with annual tree cover loss dipping below one million hectares in 2020 for the first time since 2003[47]. Rates nonetheless continue to be high by international standards. The relative contribution of deforestation driven by large-scale oil palm plantations has declined since the early 2000s, from ~50% to ~25%[48]. In contrast, deforestation and land conversion due to small-scale agriculture/plantations (including to smallholder oil palm) has markedly increased. The decline in the role of large-scale oil palm plantations in driving deforestation may have been influenced by increased adoption of sustainability standards by large companies[49]. Sustainability standard levels amongst smallholders are typically much lower, despite the fact they are responsible for over a third of the country's palm oil production[50] and will be contributing to the Netherlands' imports.

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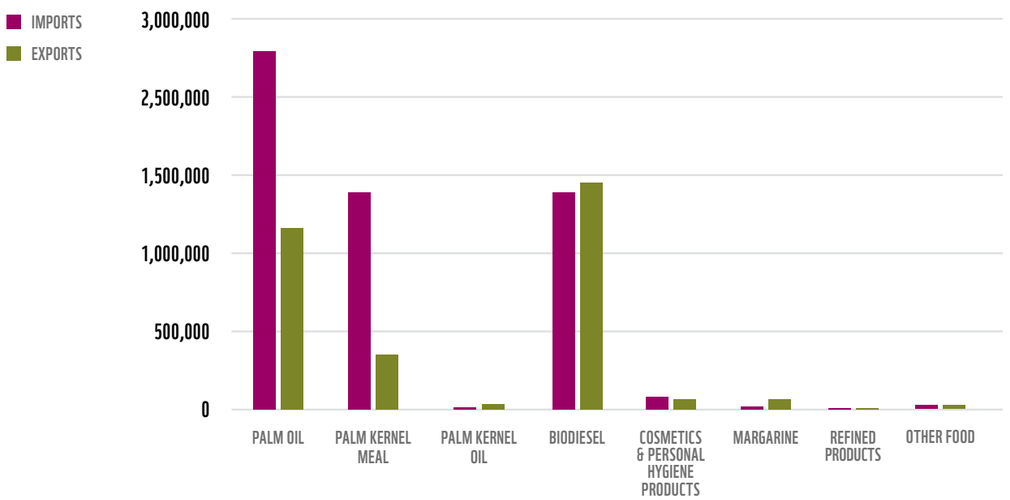
FIGURE 5:
PALM OIL CONTENT OF IMPORTS AND EXPORTS, BY PRODUCT TYPE (AVERAGE 2017-21)



The Dutch Alliance for Sustainable Palm Oil estimated that in 2020, 90% of the palm oil processed for food in the Netherlands for the domestic and export markets was certified by the Roundtable on Sustainable Palm Oil (RSPO)[51]. However, this estimate only included less than 300,000 tonnes of palm oil, less than 11% of the palm oil imported into the Netherlands in that year, and less than 6% of all palm oil, palm kernel oil, palm kernel meal, refined and embedded palm oil that was imported. Furthermore, 33% of the certified imports were certified under 'book and claim' and mass balance supply chain models, neither of which provide a guarantee that the material is physically deforestation-free.

The majority of the Netherlands' imports, in terms of weight, are palm oil (49%), palm kernel meal (24%) and biodiesel (21%, Figure 5). Forty-one percent of the imported oil palm products (including palm oil, palm kernel oil, palm kernel meal, and palm oil as an ingredient or embedded in other products) is consumed within the Netherlands. Exports only exceed imports for food products and biodiesel.

AT LEAST 86% OF THE PALM OIL IMPORTED BY THE NETHERLANDS WAS FROM COUNTRIES WITH A HIGH RISK OF DEFORESTATION AND HUMAN RIGHTS ISSUES

Sustainability

A recent and comprehensive analysis of the environmental, social and economic impacts of palm oil cultivation is given in Barthel et al. (2018)[52].

The expansion of palm oil cultivation has resulted in deforestation, particularly in Indonesia and Malaysia. Remote sensing studies of a subset of plantations in 20 countries suggests that around 45% of oil palm plantations in Southeast Asia came from areas that were forested in 1989. In other regions, the planting on forested areas appears to have been lower: 31% in South America, 7% in Africa and 2% in Central America[53]. This high rate of deforestation in Southeast Asia – with plantations replacing previously logged and unlogged forest – has led to a significant loss of biodiversity and is a globally significant source of greenhouse gas emissions.

The economic and social impacts of palm oil are complex and contradictory. Oil palm cultivation has improved the incomes for many rural people, including smallholder farmers. It has also supported the development of rural economies and the growth of national economies of producer countries. However, oil palm production has often been associated with land use rights issues (particularly in Indonesia, but also in other producer countries), forced and child labour (especially Indonesia and Malaysia), and issues relating to the terms and conditions of labour, (such as wages, health and safety and gender discrimination)[54].

The two major global certification schemes for palm oil are the Roundtable on Sustainable Palm Oil (RSPO), which is used principally in consumer goods, and the International Sustainability and Carbon Certification (ISCC), which predominates in the biofuel sector.

RSPO has been conspicuously successful in achieving scale when compared to sustainability certification schemes in most other commodities. The RSPO has more than 4,000 members and RSPO certified growers accounted for approximately 19% of global production. The RSPO Principles and Criteria prohibit the conversion of High Conservation Value Areas and High Carbon Stock forests and exclude planting on peat soils of any depth. However, there have been significant and recurrent doubts as to whether the RSPO's principles and criteria are sufficiently robust, whether the quality and transparency of the auditing system is adequate, and on its ability to include smallholder producers. High profile investigations of certified plantation companies have revealed actions that are in direct contradiction of the RSPO standard, including land grabs, deforestation, and illegal working conditions[55].

A major drawback in the RSPO system is the lack of controls on the uncertified portion of mass balance certified palm oil. This is likely to be the major source of deforestation-associated palm oil in many European markets, where certification levels are high, but are dominated by mass balance certified material.

Indonesian Sustainable Palm Oil Foundation (ISPO) was established in 2009 to implement a certification policy system designed by the Indonesian Ministry of Agriculture. The ISPO system is intended to be mandatory for all palm oil growers in Indonesia, from large plantation companies to smallholders, although requirements for each vary. ISPO audits have been conducted by independent certification bodies since May 2012. The Malaysian Sustainable Palm Oil (MSPO) standard is a national certification standard created by the Malaysian government and developed with input from various stakeholders in the palm oil industry. It was first launched in November 2013, and officially came into implementation in January 2015. It is important to note that both the ISPO and MSPO standards coverage of ecosystem conversion and biodiversity have a strong focus on legality but have limited requirements beyond legal compliance. For example, the ISPO acknowledges High Conservation Value areas, but the criteria and indicators are less rigorous than those in the RSPO standard. Plantations can be developed on peat less than 3 meters in depth, and conversion of forest is permitted so long as it is legal (e.g. outside areas classified as forest in Indonesia's land classification) forest.

2.3 MAIZE

Global production and use

The United States and China are the predominant producers of maize, accounting for 33% and 23% of global production respectively[56]. The largest importers are Japan, Mexico, China and the Republic of Korea. The war in Ukraine – historically the world's fifth largest producer of maize – has created significant uncertainties in global maize markets[57].

Maize is the third largest plant-based human food source (after wheat and rice), is a major animal feed and biofuel feedstock, and is widely processed for edible oil, refined sugars and for numerous chemical purposes. Within the EU, the predominant use of maize is animal feed, with over 57 million tonnes used as feed, which is 70% of all maize used within the bloc[58].

Netherlands imports, exports, consumption

The Netherlands imported an average of 10.1 million tonnes of maize each year between 2017-21, as maize, as products derived from maize (e.g. vegetable oil, high fructose corn syrup) or products in which maize is embedded in production (e.g. ethyl alcohol). The country's own production averaged 0.13 million tonnes per year over the same period – equivalent to 1.3% of imports. An average of 3.7 million tonnes were exported each year (36% of the combined domestic production plus imports). The overall trend is a decline in imports and rise in exports.

The global harvested area of maize averaged 186 million hectares between 2017-20[59]. The land required to supply the Netherlands' maize imports was on average 1.53 million hectares between 2017-21, about 0.8% of the global harvested area of the crop and equivalent to over one third of the Netherlands' total land area. The estimated GHG emissions from land use change for those imports was 6.9 million tonnes CO_2e per year, equal to approximately 4% of the Netherlands' domestic emission in 2019[60].

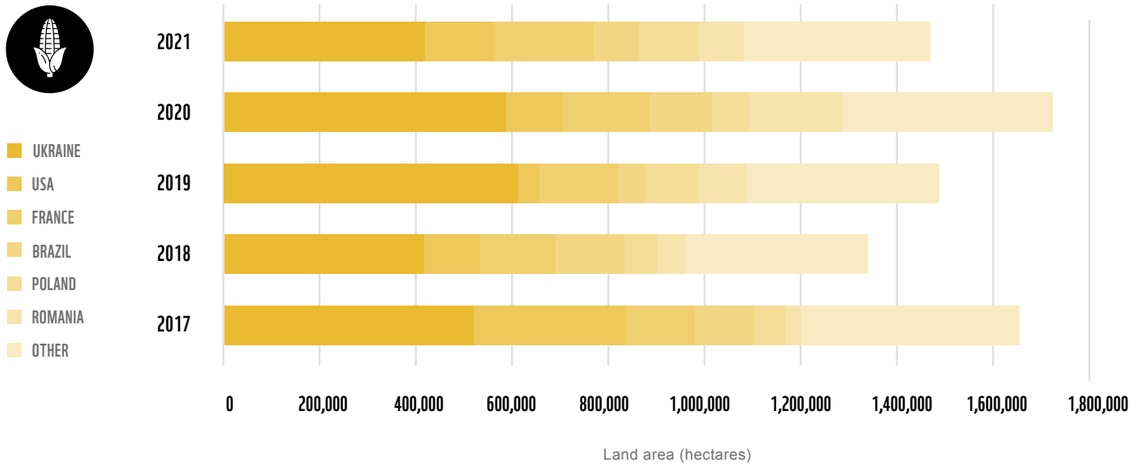
The Netherlands' imports are predominantly from two geographies: Europe and the Americas. One third of the land area required to supply the Netherlands with its demand for imports was in Ukraine (33%), with a further 11% in France and 9% in the United States (Figure 6).

Sustainability

Maize has drawn less scrutiny for its environmental and social impacts than many other crops. However, recent research based on modelled trade and deforestation ranked it the third highest cause of embedded deforestation of any agricultural crop imported into the UK, behind only palm oil and soy[61]. As the UK has broadly similar sourcing patterns to the Netherlands, similar issues would be expected.

There is no sector-specific certification system for maize that operates at a significant scale[62], nor significant overarching efforts to reduce the deforestation and conversion impacts of the crop (although some of maize's products, such as ethanol used in biofuels, are covered by The EU Renewable Energy Directive (Directive 2009/28/EC) (EU RED) and certification schemes designed to verify compliance with EU RED, such as the ISCC certification system).

FIGURE 6:
ESTIMATED AVERAGE ANNUAL LAND FOOTPRINT REQUIRED EXTERNAL TO SUPPLY THE NETHERLANDS' MAIZE DEMAND, BY COUNTRY (2017-21)



The only major supplier of maize to the Netherlands that ranks as very high risk is Brazil (7% of total external land area, Figure 7). In Brazil, maize is often cropped alternately with soy, meaning that it has a significant role in conversion of natural ecosystems and the resulting GHG emissions from land use change in that country. However, maize is also one of the main drivers of the conversion of the Great Plains ecosystem in the United States: approximately 70% of the conversion of grasslands between 2018-2019 was for three crops: maize (25%), soy (22%), and wheat (21%)[63].

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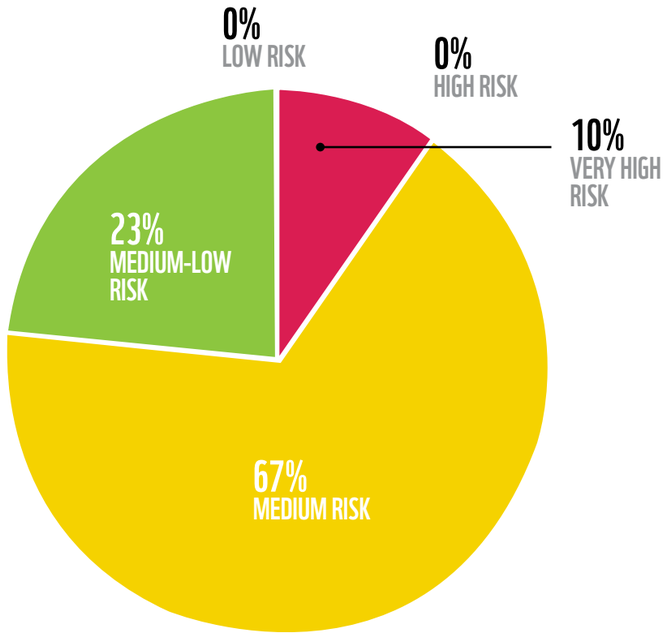
FIGURE 7:
RISK PROFILE OF THE LAND FOOTPRINT OF THE NETHERLANDS' MAIZE IMPORTS

(note that maize of unknown provenance has not been assigned a risk)

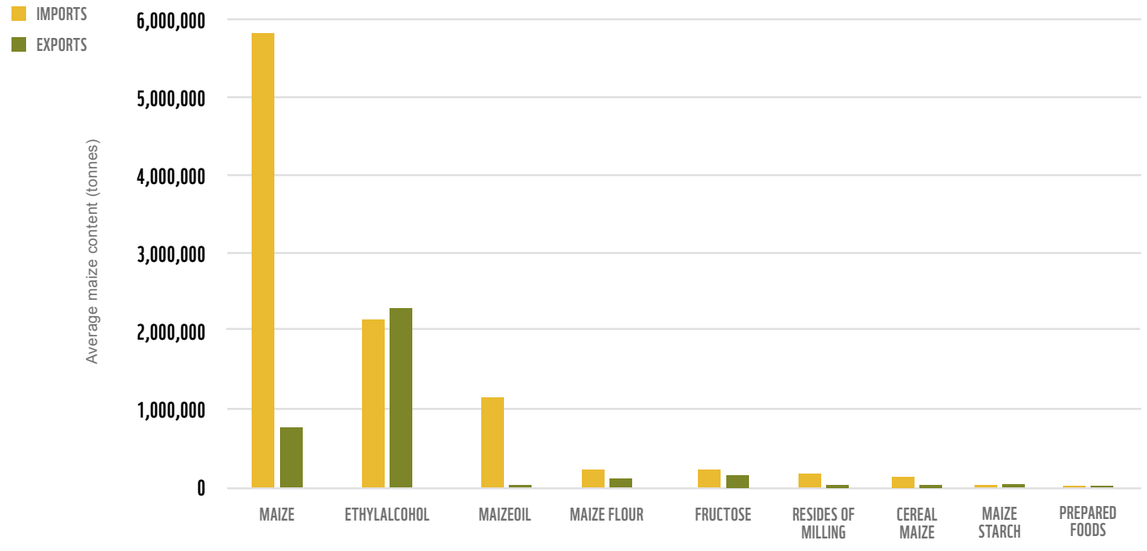


The majority of the Netherlands' imports of maize, in terms of the estimated quantity of maize within them, are maize (56%), ethanol (21%) and maize oil (11%). Imports exceed exports for all product groups except for ethyl alcohol. Bioethanol production in the Netherlands began increasing dramatically in 2009 and has continued to grow thereafter[64], with Rotterdam now hosting Europe's largest bioethanol refinery, which is dedicated to producing bioethanol from maize[65]. It is notable that exports of maize average just 0.77 million tonnes per year (average 2017-21), which is just 13% of the combined production and imports of maize. This reflects the demand for feed from the Netherlands' large livestock sector.

MAIZE IS A MAJOR DRIVER OF ECOSYSTEM CONVERSION AND THE RESULTING GREENHOUSE GAS EMISSIONS IN BRAZIL AND THE USA


© Gareth Bentley / WWF-US

FIGURE 8:
MAIZE CONTENT OF IMPORTS AND EXPORTS, BY PRODUCT TYPE (AVERAGE 2017-21)



2.4 COCOA

Global production and use

The world's cocoa land footprint is about 12 million hectares[66], or an area nearly three times the size of the Netherlands. The Netherlands, the United States and Germany are the major global importers of cocoa, while Côte d'Ivoire and Ghana are the major global exporters[67]. Global demand for cocoa is expected to rise in the coming years, with a predicted market increase of 3.5% per annum between 2019 and 2025[68]. The majority of cocoa is produced by smallholders, with more than 90% of global cocoa production originating from farms covering only 2-5 hectares.

The principal end use of cocoa beans is chocolate and chocolate products which are manufactured from the intermediate products of cocoa beans: cocoa paste (also known as cocoa liquor), cocoa butter and cocoa powder, with cocoa butter also used in cosmetic products:

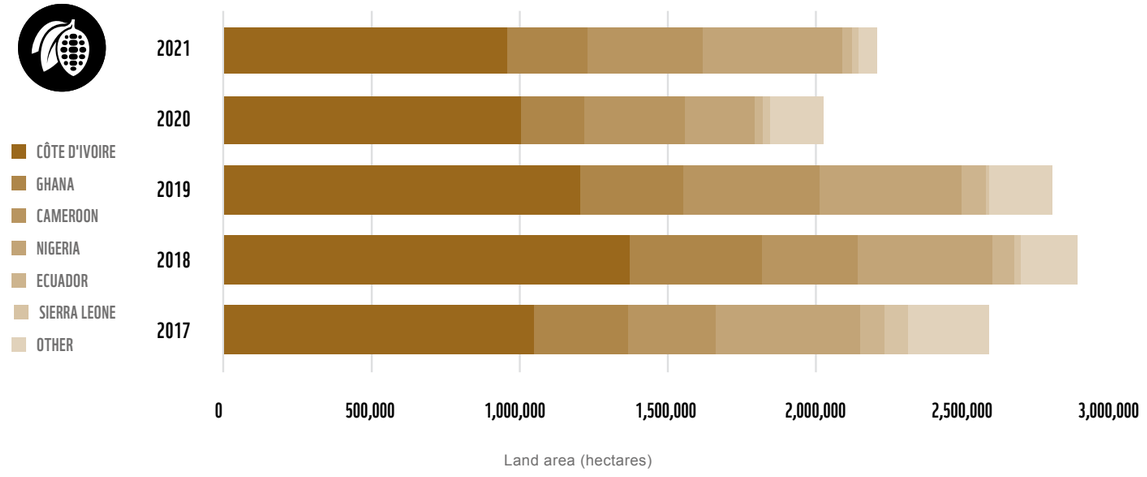
- Cocoa paste: Cocoa paste is the result of roasting and grinding cocoa nibs (the cocoa beans with their outer shell removed), and is either processed straight into chocolate, or pressed to make cocoa butter and cocoa powder.
- Cocoa butter: Cocoa butter is extracted through pressing cocoa paste and is usually combined with pure cocoa paste to be made into chocolate. Cocoa butter destined for cosmetic use is typically made from diseased pods, or beans that have germinated during drying, and is a relatively small-scale use.
- Cocoa powder: Cocoa powder is the resulting by-product from pressing cocoa liquor to extract cocoa butter. It is used in baking and the manufacture of other chocolate goods.

Netherlands imports, exports, consumption

The Netherlands is the world's largest importer of cocoa beans and the world's second largest cocoa processor[69]. On average between 2017 and 2021, the Netherlands imported 1.29 million tonnes of cocoa each year, in the form of cocoa beans, primary processed products of cocoa (cocoa butter, paste and powder) or as ingredients in imported food (especially chocolate). This is equivalent to 23% of global production. An estimated 1.05 million tonnes were exported each year, meaning that 81% of imports were exported and just 19% of imports were consumed within the Netherlands. This puts per capita consumption at 13.7 kg (including chocolate, cocoa, cocoa within bakery and dairy products, and in cosmetics and personal hygiene products), a higher per capita consumption than in the UK[70], but lower than in Belgium[71].

The land required to produce the Netherlands' cocoa imports was on average 2.5 million hectares per year – equivalent to about 21% of the world's land footprint for cocoa. The estimated GHG emissions attributed to the Netherlands' cocoa land footprint between 2017 and 2021 were around 11.3 million tonnes CO_2e per year – equivalent to over 6% of the Netherlands' domestic emissions in 2019[72].

FIGURE 9:
ESTIMATED AVERAGE ANNUAL LAND FOOTPRINT REQUIRED EXTERNAL TO SUPPLY THE NETHERLANDS' COCOA DEMAND, BY COUNTRY (2017-21)



The Netherlands' sourcing is heavily focused on West Africa: 45% of the Netherlands' land footprint was in Côte d'Ivoire, followed by Nigeria (17%), Cameroon (14%) and Ghana (13%, Figure 9). With the exception of Ghana, all of the other major sourcing countries rate as high or very-high risk on account of very high deforestation rates, poor records on workers' rights and low levels of rule of law. As a consequence, at least 80% of the Netherlands' imports come from high or very-high risk countries (Figure 10).

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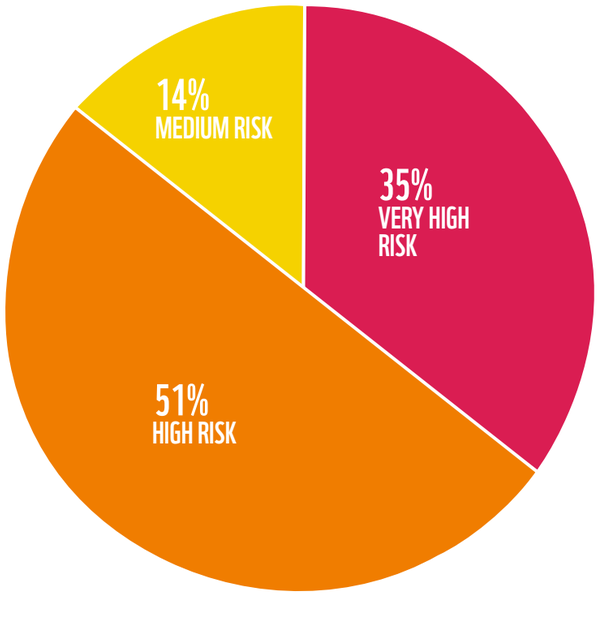
FIGURE 10:

RISK PROFILE OF THE LAND FOOTPRINT OF THE NETHERLANDS' COCOA IMPORTS

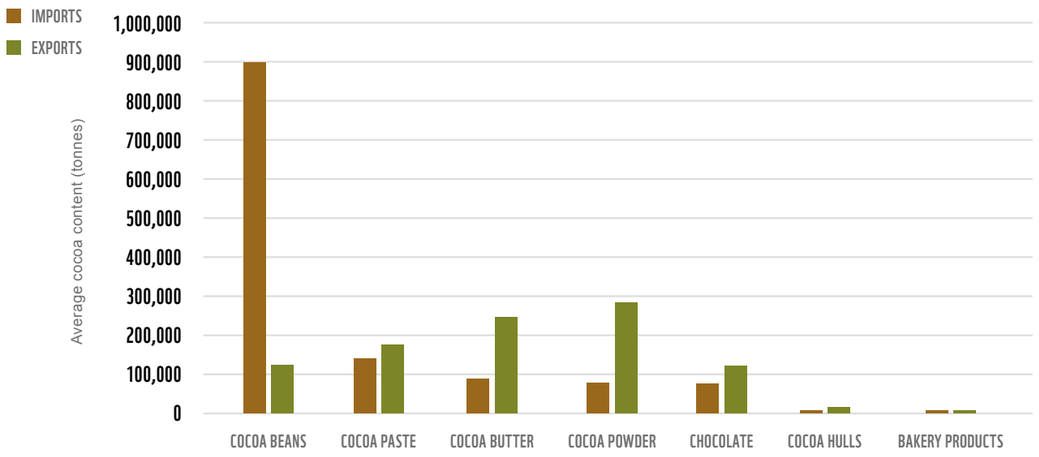
(note that cocoa of unknown provenance has not been assigned a risk)



Most of the cocoa imported to the Netherlands is in the form of cocoa beans (70%, Figure 11). The Netherlands adds significant value to these imports by processing. Exports of cocoa paste, butter, powder and chocolate are all significantly higher than imports.

THE NETHERLANDS IS THE WORLDS LARGEST IMPORTER OF COCOA BEANS AND THE SECOND LARGEST COCOA PROCESSOR

FIGURE 11:
COCOA CONTENT OF IMPORTS AND EXPORTS, BY PRODUCT TYPE (AVERAGE 2017-21)



Sustainability

As a crop that needs shade, cocoa can be produced in agroforestry systems. However, despite the potential for cocoa to be grown in agroforestry systems, cocoa production is actually driving deforestation in major producing countries in West Africa, including Ghana and Côte d'Ivoire, as well as in Latin America and Indonesia[73]. Global forest loss driven by cocoa expansion is estimated to be around 2-3 million hectares from 1998-2008, accounting for roughly 1% of all forest loss during this period[74]. This deforestation is in part because of low investment in farmers (financially, and in terms of skills and management training), and in part because ageing trees have lower yields, which means that farmers expand production by cutting down trees for new cocoa fields.

Cocoa cultivation provides a livelihood for millions of smallholders in countries such as Côte d'Ivoire, Indonesia, Ghana, Cameroon and Nigeria. However, there are high levels of child labour in the cocoa sector, sometimes associated with human trafficking. The US Department of Labour includes cocoa from seven countries on their List of Goods Produced by Child Labour: Brazil, Cameroon, Côte d'Ivoire, Ghana, Guinea, Nigeria, and Sierra Leone. Côte d'Ivoire and Nigeria are also on the list for forced labour[75]. Child and forced labour are endemic in the sector, particularly in some West African countries. It is estimated that a total of 1.56 million children – the majority of who are exposed to hazardous working conditions[76] – worked illegally in the cocoa sector in Ghana and Côte d'Ivoire during the 2018-19 season[77]. The incidence of child labour is increasing.

Cocoa farmers receive a small percentage of overall cocoa price – between 3 and 5% of the value of a chocolate bar. Low income combined with difficulties in obtaining high yields mean that cocoa farmers often rely on loans and are unable to save money[78]. Farmers are also susceptible to changes in the world price for cocoa, which directly affects their income. During the global 2016-2017 price decline in cocoa, the value of cocoa fell by over a third and farmers in producing countries such as Côte d'Ivoire saw their income decline by as much as 30-40% from one year to the next. In response, the concept of a 'living income' has gained prominence in discussions over the cocoa supply chain.

However, there is an overall lack of concrete commitments towards a living income, either by individual companies, by governments, or by sector-wide initiatives.

There are numerous certification schemes aimed at mandating minimum sustainability standards for cocoa producers. These include voluntary standards schemes (Rainforest Alliance, Fairtrade and organic) as well as the proprietary schemes of manufacturers and traders including Mars Wrigley, Mondelez, Barry Callebaut, Cargill and Nestlé. The global area of cocoa certified by one or more of the voluntary standards schemes more than doubled between 2013 and 2017 (+115% in the period, and +19% between 2016 and 2017), reaching 25% of the global cocoa area (23% of the global cocoa area is Rainforest Alliance certified)[79].

The above schemes include criteria with varying levels of protection against deforestation. While Fairtrade contains criteria that includes the protection of areas of high conservation value (HCV), it does not eliminate other deforestation and conversion, unlike the Rainforest Alliance standard. It maintains a cut-off date of 2014 for destruction or conversion of any natural habitat. This means Rainforest Alliance (now merged with UTZ) is effectively zero deforestation, while Fairtrade is not. However, the widespread use of mass balance supply chain systems within the Rainforest Alliance means that material bought as certified may also contain non-certified material that has been produced at the expense of forests. By contrast, Fairtrade is the only certification scheme that has a minimum price for cocoa as well as a fixed premium of US $400 per tonne of cocoa. This helps provide farmers with greater financial security during periods of price volatility and decline on the world market for cocoa.

Globally, the World Cocoa Foundation[80] is a grouping of cocoa industry actors that was set up to improve environmental and social sustainability within the sector. It created the Cocoa and Forests Initiative (CFI) in 2017, with the aim of ending deforestation and restoring forests in Côte d'Ivoire and Ghana. The group includes the governments of those two countries, along with 35 leading cocoa and chocolate companies[81].

The Dutch cocoa sector increased its use of sustainable cocoa from 21% to 30% between 2014 and 2016[82]. In addition, the Cocoa Origins programme has a stated ambition for all cocoa consumed on the Dutch market – noting that the Netherlands plays a far greater role as a trader than a consumer of cocoa – to be sustainable by 2025[83]. The Dutch Initiative on Sustainable Cocoa – a collaboration of business and civil society – aims to end deforestation associated with Dutch cocoa sourcing by 2025[84]. The above suggests increasing efforts by cocoa traders and chocolate companies, but these have so far failed to drive meaningful change in the industry, as cocoa production continues to be linked to deforestation, child and forced labour and farmer poverty.

2.5 COFFEE

Global production and use

The world's coffee land footprint is about 10.8 million hectares[85], spread across nearly ninety tropical and sub-tropical countries. Brazil and Viet Nam are the world's largest producers, with a 32% and 16% share of global production respectively[86], whilst the United States, Germany, Italy, Japan and Spain rank as the main importing countries[87]. Coffee consumption has been rising steadily around the world, increasing at an estimated rate of 2.5% each year since 2012[88]. Though Europe has traditionally dominated the global market for coffee, emerging demand for coffee is coming primarily from Asia-Pacific[89]. If the current pace of growth continues, global production of coffee will need to double or triple by 2050[90]. However, all forecasts must be viewed against the coffee sector's history of production and price volatility and long-term price decline[91].

The primary end use for coffee beans is for the coffee beverage, though there is a small but growing use of coffee extract in food products and green coffee bean extract (which is high in chlorogenic acid) for weight loss and dietary supplements. Green coffee beans purchased for coffee production are first tasted for quality before they are roasted to either a light, medium, or dark roast level. The roasted coffee beans are finally ground either to varying levels of coarseness or sold as whole beans to consumers.

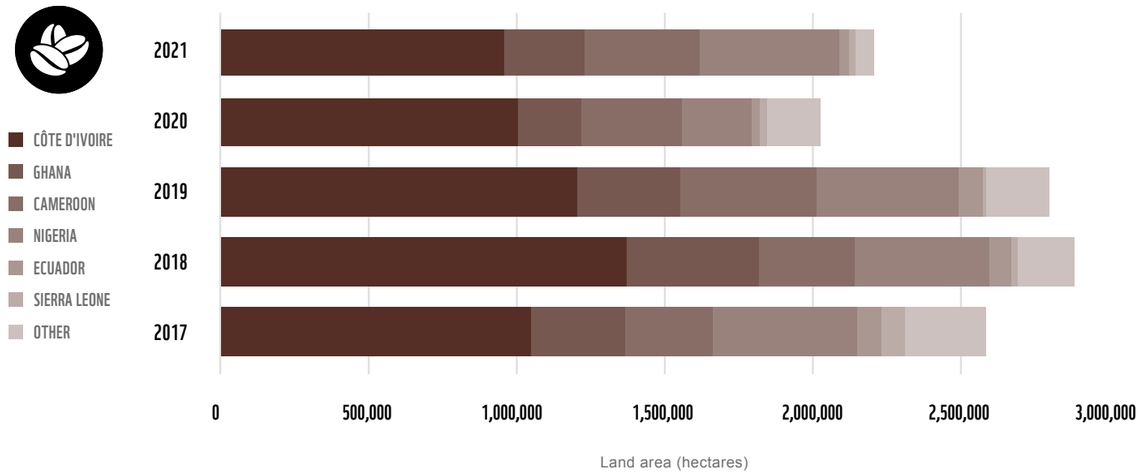
Netherlands imports, exports, consumption

On average between 2017 and 2021, the Netherlands imported 0.29 million tonnes of coffee, in the form of coffee beans, roasted and/or decaffeinated coffee, or extracts and food preparations with coffee as a major ingredient. This is equivalent to 2.9% of global production. An estimated 0.15 million tonnes were exported each year, meaning that an estimated 47% of imports were consumed.

The land required to produce the Netherlands' coffee imports was on average 203,000 hectares per year – equivalent to about 2% of the world's land footprint for coffee and almost the same land area as the province of Limburg. The estimated GHG emissions attributed to the Netherlands' cocoa land footprint between 2017 and 2021 were around 0.198 million tonnes CO_2e per year.

Viet Nam apart, the Netherlands' sourcing is heavily focused on South and Central America: 35% of the Netherlands' land footprint was in Brazil, followed by Viet Nam (20%), Honduras (9%), Colombia (7%) and Guatemala (2%, Figure 12). All of these countries rank as high or very high risk as a result of rapid deforestation, with the exception of Ghana, poor labour rights and low rule of law scores. As a consequence, at least 69% of the Netherlands' imports come from high or very-high risk countries (the remainder is the portion that has not been assigned a provenance).

FIGURE 12:
ESTIMATED AVERAGE ANNUAL LAND FOOTPRINT REQUIRED EXTERNAL TO SUPPLY THE NETHERLANDS' COFFEE DEMAND, BY COUNTRY (2017-21)



Most of the coffee imported into the Netherlands is in the form of coffee beans or roasted coffee (Figure 13). The largest exports are of roasted coffee, showing the importance the Netherlands as a roaster in the European market: the Netherlands is the third largest exporter of roasted coffee in the world, supplying European countries especially France, Germany and Belgium[92]. Companies such as Ahold Delhaize Coffee Company and JDE Peet's are major in the European context. Unlike most of the other commodities assessed in this report, a large volume of coffee imports (40%) come via the port of Antwerp rather than entering the country directly, with a further 23% arriving via Germany.

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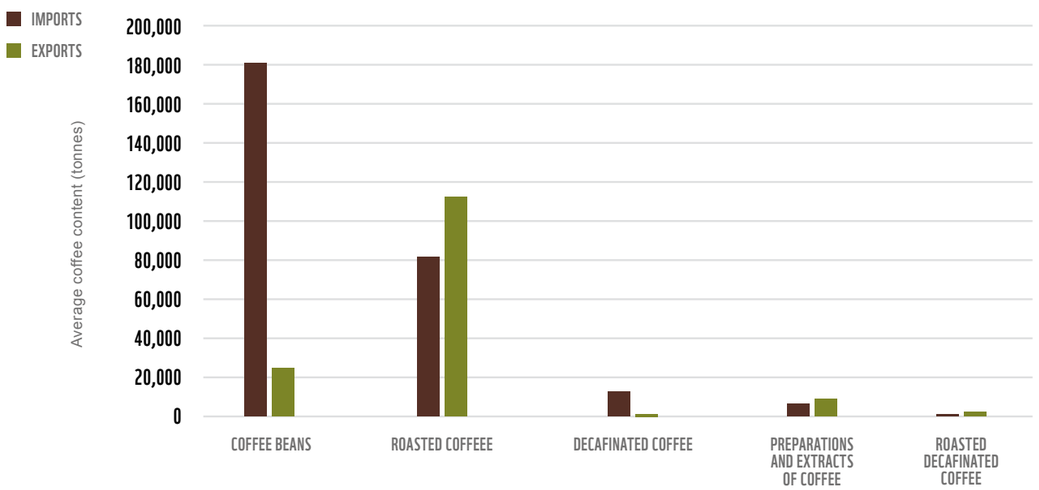
FIGURE 13:
COFFEE CONTENT OF IMPORTS AND EXPORTS, BY PRODUCT TYPE (AVERAGE 2017-21)




© Jürgen Freund / WWF

Sustainability

Coffee is traditionally grown under shade trees, which shield the coffee bushes from direct sunlight and create a natural barrier against pests. The use of shade trees provides a multitude of ecosystem services, including carbon sequestration, watershed protection, and a habitat for wildlife. However, in the 1970s, a movement began in Central America towards open-sun coffee production systems to increase yields. Accompanying this move away from shade management was also an uptake in the use of agrochemical inputs (e.g. pesticides) to combat pests and diseases. In regions that switched to intensified forms of coffee production, a decline in biodiversity and increase of deforestation resulted[93]. The expansion of coffee cultivation led to an estimated loss of 0.60 million hectares of forest in Southeast Asia, and 0.21 million hectares in Central America between 1990-2008[94]. More recent land use data also indicates that many countries where coffee production is rapidly expanding (e.g. Viet Nam, Indonesia, Ethiopia, and Peru) create new land for coffee through deforestation, using lightly shaded or full-sun production systems[95].

Climate change poses a substantial risk to coffee production. Changes in temperature and rainfall will both increase pressure from pests and diseases and decrease the area suitable for coffee cultivation. In particular, the largest coffee producing countries, Brazil and Viet Nam, are expected to experience substantial reductions in the area of land suitable for coffee by 2050[96]. The increasing likelihood of damages to coffee production caused by climate change will pose a large threat to smallholder farmers, who rely on coffee as their main source of livelihood.

There are also significant economic and social issues surrounding coffee production. World coffee prices have fallen by two-thirds since the early 1980s, and the earnings of coffee farmers have halved during that time. This reduction in income, combined with decreasing yields, directly threatens the livelihoods of smallholder coffee farmers, and it is becoming questionable whether coffee is still a profitable crop. The majority of the value produced by coffee goes to major retailers and brands rather than the farmers, and it is estimated that farmers only receive 7–10% of the retail price of coffee[97].

Given the pressure to cut economic costs, there are increasing reports of exploitation in coffee production. This includes accounts of debt bondage, child labour, exposure to deadly pesticides, a lack of protective equipment, and workers without contracts from several producing countries, especially Brazil[98]. In 2016, two of the largest coffee companies, Nestlé and JDE Peet's, admitted that the coffee they sourced from Brazil may come from plantations where forced labour is practiced[99]. While the two companies claim to not purchase directly from blacklisted plantations with a history of labour violations, they do purchase from exporters and middlemen who might be sourcing the beans from these plantations.

2.6 COCONUT

Global production and use

The world's coconut land footprint is about 11.6 million hectares[100], with Indonesia (28% of production), the Philippines (24%) and India (23%) sharing three quarters of global production[101]. China (29% of global trade), Thailand (16%) and Malaysia (13%) are the largest importers. Within the EU, the Netherlands is the predominant importer, importing almost twice the quantity of the next largest importer, Germany[102].

Coconut is used for a large variety of end products: fresh coconut and coconut water are major uses in producer countries, with desiccated coconut and coconut milk the other uses for human consumption; coconut oil (derived from dried coconut meat, called copra) and its derivatives are predominantly used in personal care products (in which coconut milk is sometimes also used); and coir (the fibres from the coconut husk) is used to make carpets, twine and matting. Global demand, driven by an increasing demand for coconut oil, and also for coconut milk and coconut water in western countries[103], is expected to rise significantly over the coming years. This is likely to result in ongoing expansion of the global coconut plantation area.

Coconut fruits comprise a thick, fibrous husk around a large nut with a brittle, hairy shell. Within the shell is the coconut endosperm or kernel which is initially soft when the coconut is immature but becomes firm as the coconut matures. The central cavity of unripe coconuts contains a liquid called coconut water. In countries where coconuts are grown almost every part of the coconut and its palm are used.

Historically, much coconut was traded as copra, the dried kernel flesh. However, the majority of coconut now traded internationally is in a number of processed forms, most of which are produced from the kernel:

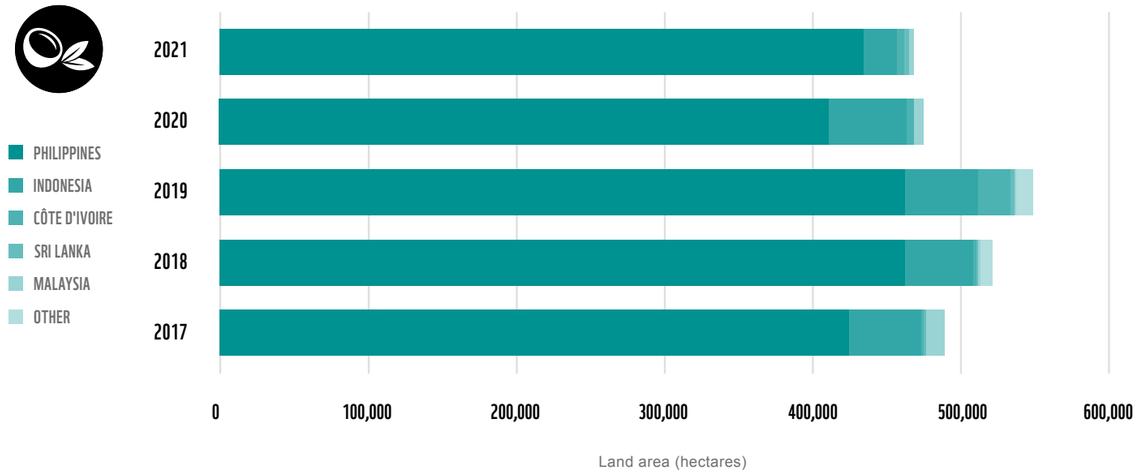
- Coconut milk or cream: extracted by squeezing fresh coconut meat (kernel) from mature coconuts, and either mixed with water to produce milk or centrifuged to produce cream. Commonly used as a cooking ingredient in Asian and African cuisines and increasingly popular in Europe.
- Coconut oil: extracted from copra. High quality oil can be used as cooking oil or in the manufacture of margarine, milk and ice cream. The oil is also processed into soaps, shampoos, paints and varnishes whilst remnant fatty acids and alcohols are used as components of emulsifiers and surfactants.
- Desiccated coconut: finely shredded and dried coconut kernel.
- Coconut water: extracted by tapping unripe or immature coconuts. Drunk as a beverage which is increasingly popular on international markets due to reported health benefits.

Netherlands imports, exports, consumption

On average between 2017 and 2021, the Netherlands imported 2.1 million tonnes of coconut equivalent, predominantly in the form of crude coconut oil. This is equivalent to 3.5% of global coconut production. An estimated 1.3 million tonnes were exported each year, meaning that an estimated 63% of imports were exported.

The land required to produce the Netherlands' coconut imports was on average 0.5 million hectares per year – equivalent to about 4.3% of the world's land footprint for coconut and an area the size of the Dutch province of Gelderland. The estimated GHG emissions attributed to the Netherlands' cocoa land footprint between 2017 and 2021 were around 0.43 million tonnes CO_2e per year.

FIGURE 14:
ESTIMATED AVERAGE ANNUAL LAND FOOTPRINT REQUIRED EXTERNAL TO SUPPLY THE NETHERLANDS' COCONUT DEMAND, BY COUNTRY (2017-21)



The Netherlands' sourcing is overwhelmingly from the Philippines (82% of the quantity, but 87% of the land area, Figure 14). Indonesia (9% of land area) and Côte d'Ivoire (2%) make the majority of the rest of the Netherlands' external land footprint. The Philippines is ranked as medium risk: rates of tree cover loss and natural forest loss are relatively low, although it rates poorly on rule of law and labour rights. The other main sourcing countries rate as high or very-high risk. As a consequence, 11% of the Netherland's coconut sourcing is from high or very high risk countries (Figure 15).


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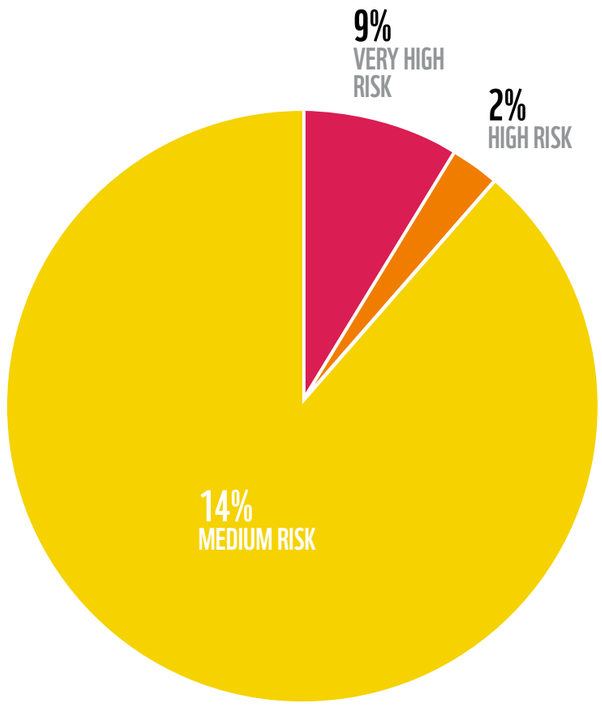
FIGURE 15:
RISK PROFILE OF THE LAND FOOTPRINT OF THE NETHERLANDS' COCONUT IMPORTS

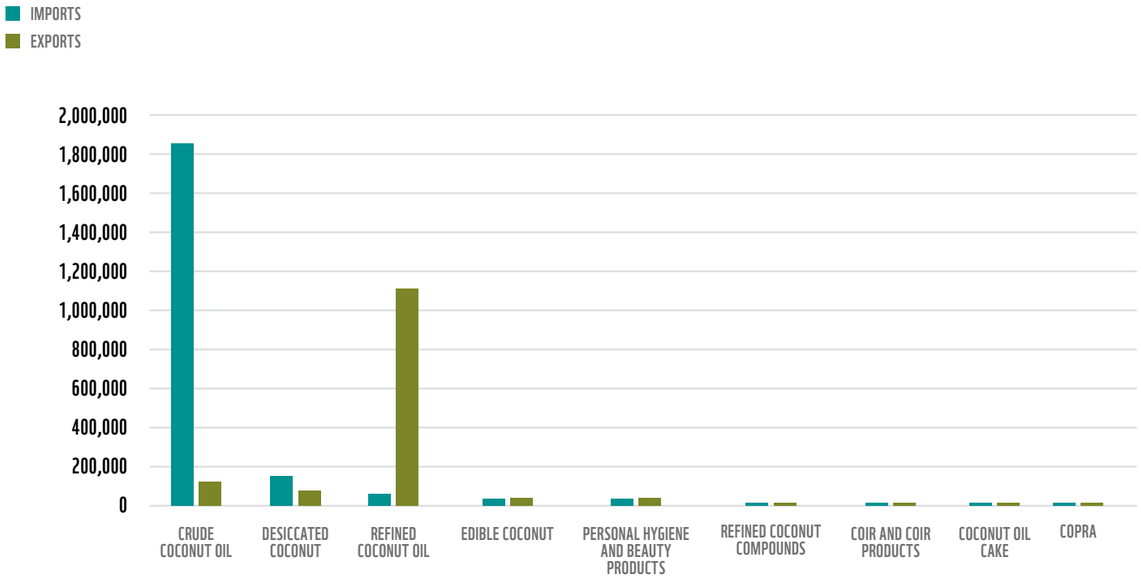
(note that coconut of unknown provenance has not been assigned a risk)



Most of the coconut imported into the Netherlands is in the form of crude coconut oil, which is refined and used in the food and cosmetics sectors. By contrast, exports are dominated by refined coconut oil.

ON AVERAGE BETWEEN 2017 AND 2021, THE NETHERLANDS IMPORTED 2.1 MILLION TONNES OF COCONUT EQUIVALENT, PREDOMINANTLY IN THE FORM OF CRUDE COCONUT OIL

FIGURE 16:
COCONUT CONTENT OF IMPORTS AND EXPORTS, BY PRODUCT TYPE (AVERAGE 2017-21)



Sustainability

A recent paper suggests that coconut oil has the largest impact on biodiversity of any vegetable oil[104]. The analysis has been criticised as potentially misleading, as the methodology is biased towards small island nations that have high levels of endemic and threatened species, but which produce little coconut oil for the international market[105], but the central point – that the expansion of coconut production is not without ecological consequence – remains valid.

Incomes from coconut farming are very low. For example, the majority of the 3.5 million coconut farmers in the Philippines live below the poverty line, earning less than $1 per day[106]. Low incomes also encourage the use of unpaid or child labour and coconut production is listed on the US Department of Labour's list of goods produced by child labour or forced labour in the Philippines, which is the second largest producer of coconuts globally[107].

2.7 BEEF & LEATHER

Global production and use

The world's land footprint for beef & leather (i.e. the grazing area dedicated for cattle globally, excluding dairy cattle) encompasses an estimated 1.6 billion hectares[108] – more than one and a half times the area of the European continent. After years of continuous growth, this footprint has levelled off and even declined in some countries (particularly in North America, Europe and Australia, as well as Brazil and China) between 2000 and 2016, largely due to increasingly intensive production methods[109]. However, there are signs that the trend may reverse with one recent prediction estimating that the global pasture area for cattle could expand by around 73 million hectares by 2050, most notably within the Middle East and Africa – a scenario that would ultimately offset all of the global reductions in the area occupied by cattle since 2000[110].

The majority of beef is purchased and consumed as fresh or frozen cuts, e.g. steaks, mince and roasting joints. However – like most meats – it is also found in a range of food products, e.g. burgers, ready meals, and pastry products. Nearly half of all bovine leather is used to manufacture shoes, with a further 17% used in automobile seats. Furniture upholstery, clothes, and various leather goods make up the rest.

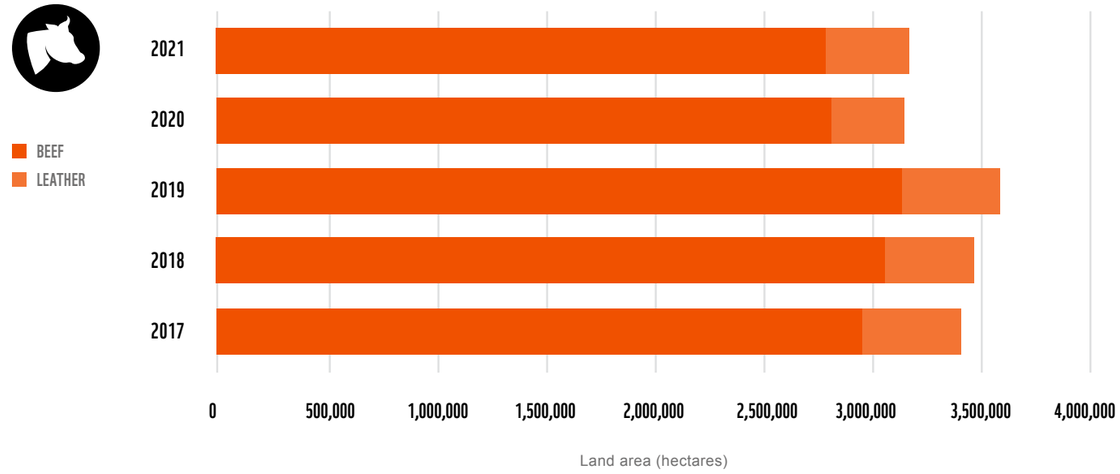
Netherlands imports, exports, consumption

The Netherlands imported an average of 382,000 tonnes of beef (Carcass Weight Equivalent) each year between 2017-21. The majority is imported in the form of fresh or chilled beef (55%) and live animals (32%). Over the same period, the Netherlands imported 110,000 tonnes of bovine leather, predominantly as raw hides (64%) and manufactured leather cases and bags (20%). This compares with an average annual domestic production of 290,000 tonnes beef and 38,000 tonnes leather over the same period. Exports were on average 399,000 tonnes of beef per year and 123,000 tonnes of leather. Consumption averaged 274,000 tonnes of beef per year and 26,000 tonnes of leather.

The Netherlands' external footprint for beef & leather is equal to 3.9 million hectares each year, or approximately 0.2% of the world's beef cattle grazing footprint, an area equivalent to nearly 90% of the Netherlands. The majority of this, 78% of the land area, was for beef (Figure 17).

It was not possible to quantify the GHG emissions of the beef & leather imported by the Netherlands (see Section 6). However, beef cattle are one of the major drivers of deforestation worldwide – in fact some research indicates it as the single largest cause of deforestation and conversion[111] – and hence the greenhouse gas emissions from land use change associated with the Netherlands' imports are likely to be significant.

FIGURE 17:
ESTIMATED AVERAGE ANNUAL LAND FOOTPRINT REQUIRED EXTERNAL TO SUPPLY THE NETHERLANDS' BEEF & LEATHER DEMAND, BY COUNTRY (2017-21)



The EU dominates the Netherlands imports of beef, with 75% coming from Belgium, Poland, Germany, France, Ireland and Italy alone. A small proportion comes from South American countries including Brazil (4%), Uruguay (2%) and Argentina (3%). As these countries have comparatively extensive beef systems compared with the EU, they dominate the land footprint (combined 58%, Figure 18). Brazil and Argentina are rated high and very-high risk respectively, resulting in 42% of the external land footprint of the Netherlands' imports being from high or very high risk countries (Figure 20).

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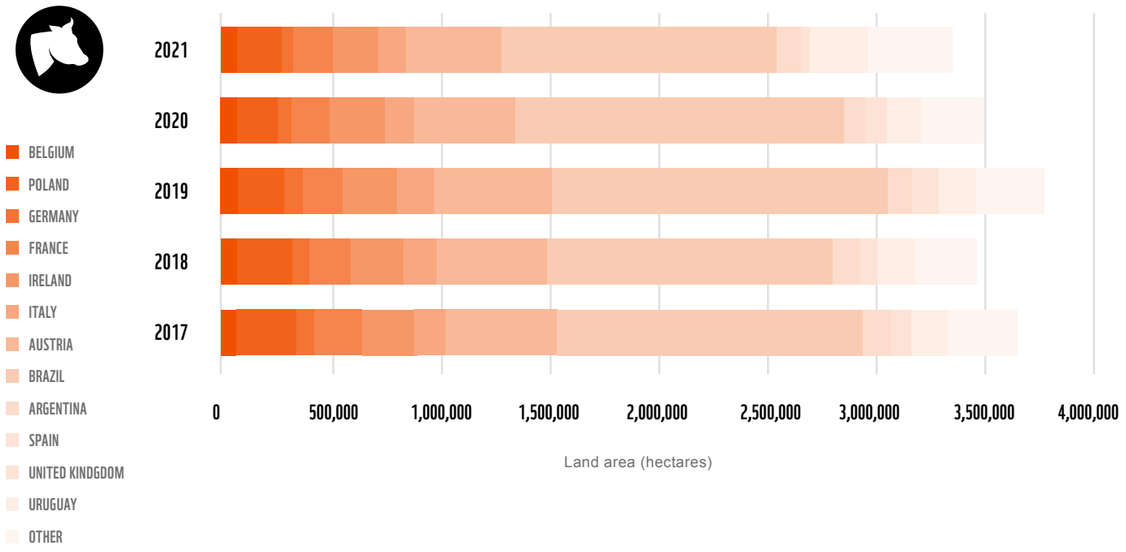
FIGURE 18:
LAND AREA REQUIRED FOR THE NETHERLANDS' IMPORTS OF BEEF, BY MAJOR SOURCING COUNTRY 2017-21



Whilst imports of leather are also dominated by the EU, China and Viet Nam are also significant sourcing countries (Figure 19). China dominates the land area required, due to its low productivity per hectare, and is largely responsible for 44% of the external land footprint of the Netherlands' imports being from high or very high risk countries (Figure 21).

FIGURE 20:
RISK PROFILE OF THE LAND FOOTPRINT OF THE NETHERLANDS' BEEF IMPORTS

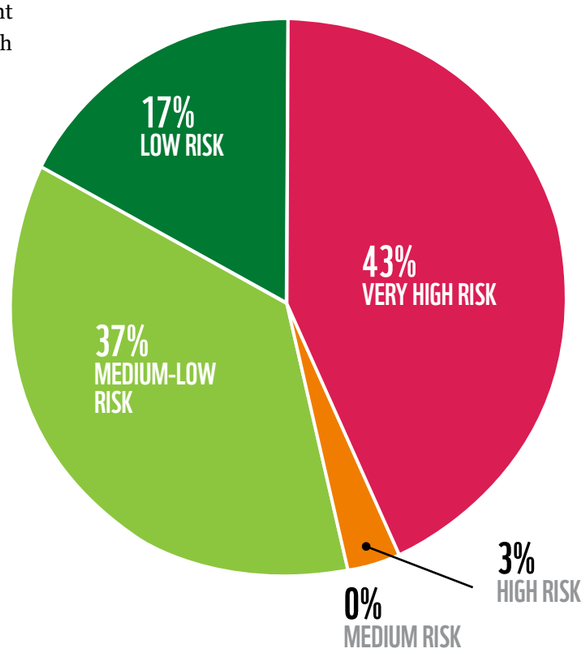


FIGURE 19:
LAND AREA REQUIRED FOR THE NETHERLANDS' IMPORTS OF LEATHER, BY MAJOR SOURCING COUNTRY 2017-21

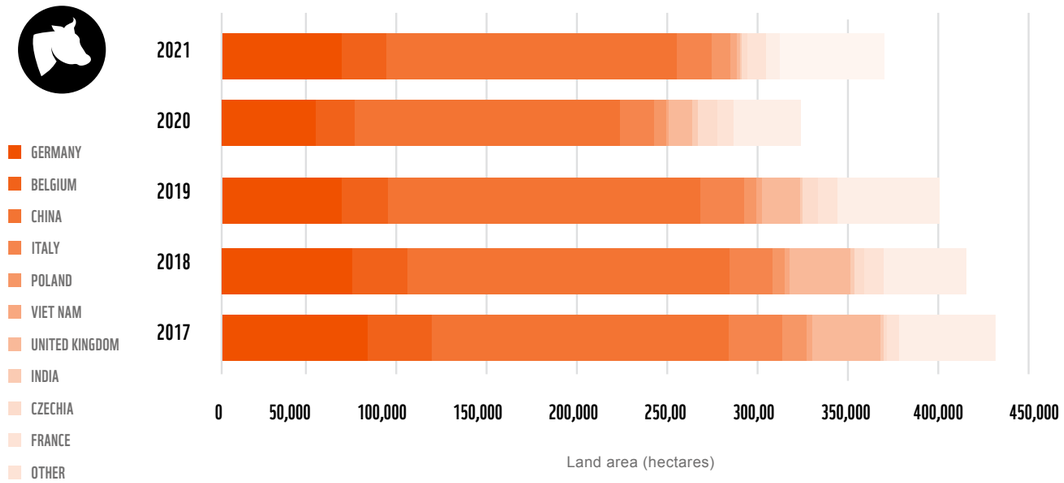
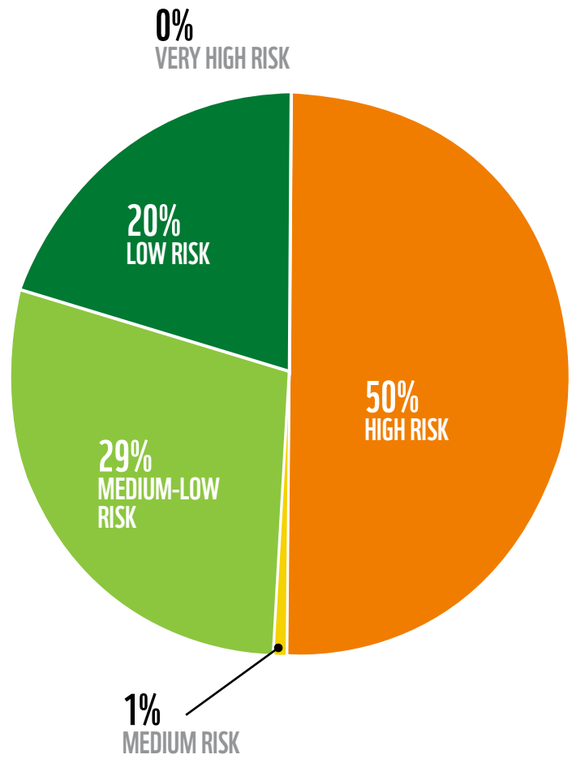


FIGURE 21:
RISK PROFILE OF THE LAND FOOTPRINT OF THE NETHERLANDS' LEATHER IMPORTS



Sustainability

Cattle production is the dominant agricultural driver of deforestation globally, accounting for more than 45 million hectares of deforestation between 2001-2015[112]. It is the predominant land use following deforestation in WWF Priority Places such as the Amazon, Cerrado and Pantanal. According to the research by Gibbs et al. (2016): *"Cattle ranching occurs on over two-thirds of deforested land in the Brazilian Amazon ... The large-scale expansion of the cattle herd into the Brazilian Amazon has come at great environmental cost, as large expanses of tropical forests have been cut, burned, and converted to pastures."*[113]

According to the International Labour Organisation, some 62% of slave labour in Brazil is employed in livestock farming-related businesses[114].

There are limited options available for companies (or consumers) wishing to purchase sustainable beef & leather. The Sustainable Agriculture Network (SAN) Standard for Sustainable Cattle Production Systems (Rainforest Alliance) has had very limited uptake[115], and the Global Roundtable for Sustainable Beef have developed a standard but the process of verification and uptake are not clear[116]. Deforestation is against the ethos of organic standards, and may be prohibited in some national standards, but it is not explicitly forbidden under EU regulations for either production within the bloc or for imports.

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2.8 TIMBER PRODUCTS

Global production and use

There are two major production systems for timber: plantations and natural forest. Around 31% of the world's forests (almost 1.2 billion hectares) are designated as production forest, with a further 28% (over 1 billion hectares) designated as multiple use, i.e. serving multiple functions including timber production.

India, the USA, Brazil and the Russian Federation are the largest producers of wood globally, with the USA and the Russian Federation exporting the greatest quantity in terms of weight (and noting the majority of production in India is used domestically as fuel). The USA and China dominate global imports. China also accounts for 22% of the value of exports: the disparity between China's leading position in value and its lower proportion of weight of timber exports reflects the degree of value addition that China gains on timber products[117].

Wood is extremely versatile and has a wide variety of end uses, including:

- Fuel: Globally, 49% of harvested wood is used for fuel, with fuel being a major use of timber in developing countries and increasingly in some European countries[118].
- Construction: Timber is widely used as a construction material in house frames, flooring (solid wood; laminate or parquet blocks), window frames, doors and doorframes, skirting, decking, garden buildings, telegraph poles, fencing, boat building, railway sleepers, etc. Particle, chip and fibre (MDF) boards are also commonly used in construction.
- Furniture: Varying from softwood furniture (e.g. pine) and plywood/laminate flat pack furniture, to luxury hardwood (e.g. mahogany, teak). Particle, chip and fibre (MDF) boards are also commonly used in furniture.
- Various: Musical instruments, tool handles, decorative items, packaging (e.g. pallets), etc.
- Industrial processes: Wood is used in electricity generation, principally in the form of wood pellets, and in food processing (smoking), etc.
- Paper and paperboard: used in magazines, books, stationery, office paper, boxes, packaging, tissues, and labels. It can be coated with a wide variety of materials for specific uses such as printing photographs, pressure sensitive papers, or heat sensitive papers. The cellulose fibres are derived directly from pulp grade logs, from wood chips, wood reclaimed from other manufacturing processes (e.g. furniture making), and from recycled paper. Note that the analysis presented below does not include pulp and paper, as this has separate supply chains.

Netherlands imports, exports, consumption

The land area required to supply the world's demand for timber is about 1.7 billion hectares[119] – equivalent to the size of Russia. The Netherlands' external timber footprint, though only 0.3% of the world's timber footprint, is the largest in absolute area of all the commodities studied in this report, averaging 4.6 million hectares each year. This is larger than the land area of the Netherlands, and there are signs that it may be increasing (Figure 22).

On average, 22.2 million m^3 of wood raw material equivalent (WRME) were imported to the Netherlands every year between 2017 and 2021. The Netherlands produced an average of 7.1 million m^3 each year over the same period[120]. 15.5 million m3 was exported each year, meaning that on average 62.5% of all imports and domestic production were consumed within the Netherlands.

The majority of the Netherlands' imports are from the EU, with only China, the Russian Federation and the USA being the only non-EU countries to supply at least 2% of the Netherlands' imports. EU countries have generally low deforestation rates, good rule of law and labour rights. Nonetheless, at least 25% of the Netherlands' land footprint for timber imports is from high and very-high risk countries: China and the Russian Federation (Figure 23). In practice, the proportion is likely to be significantly higher than this: the Netherlands imported timber and timber products from 152 countries between 2017-21, and a total of 23% of the volume of products comes from countries that supplied less than 2% of the total.

25%

OF THE NETHERLANDS' LAND FOOTPRINT FOR TIMBER IMPORTS FROM HIGH AND VERY HIGH RISK COUNTRIES

FIGURE 22:
LAND AREA REQUIRED FOR THE NETHERLANDS' IMPORTS OF TIMBER, BY MAJOR SOURCING COUNTRY 2017-21

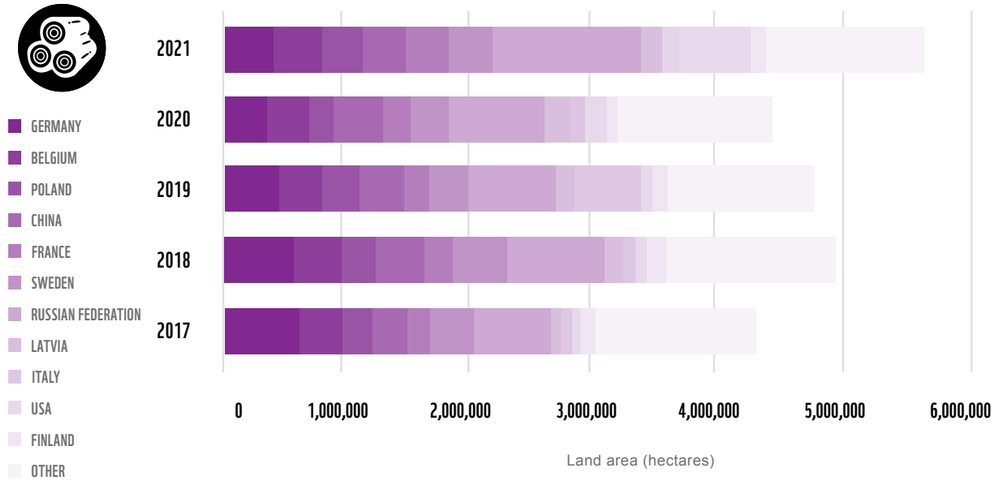
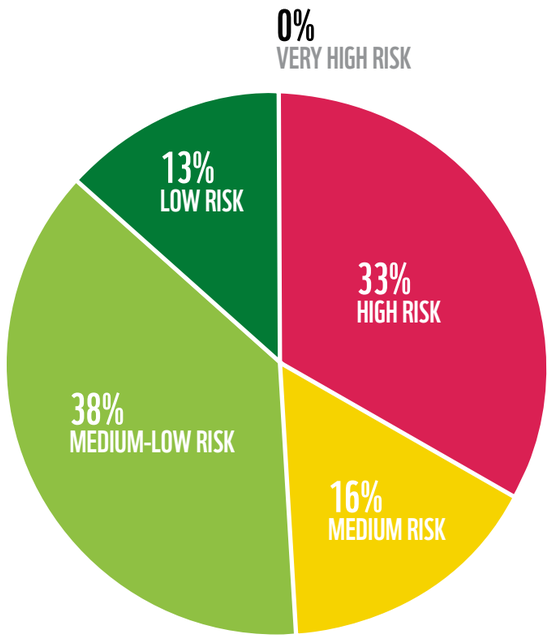


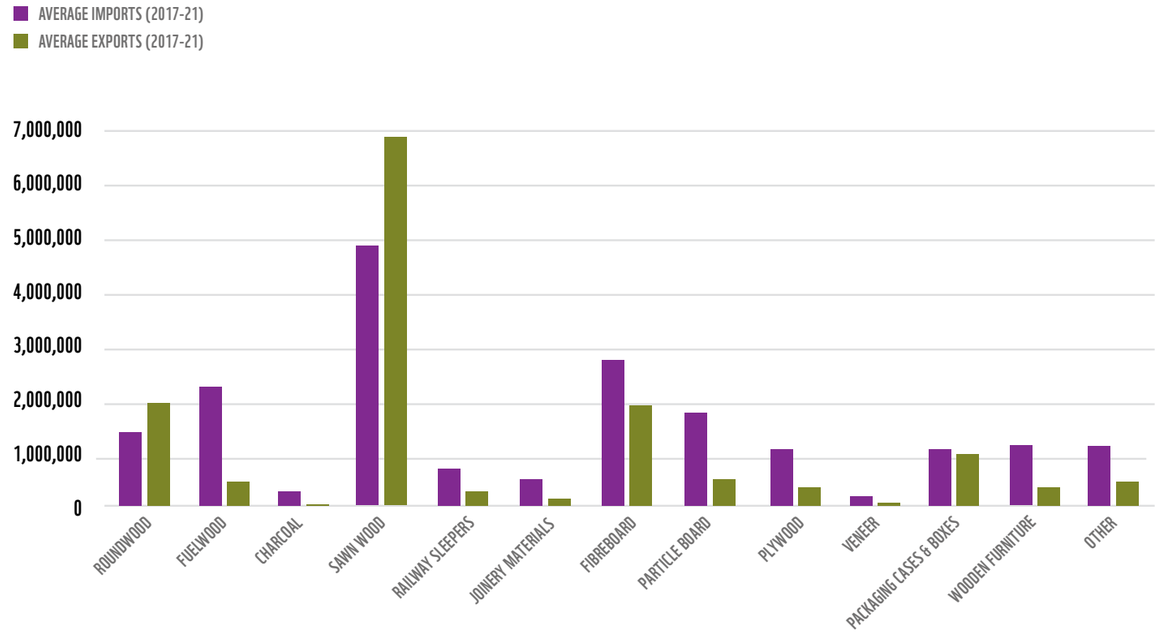
FIGURE 23:
RISK PROFILE OF THE NETHERLANDS' TIMBER IMPORTS



The largest proportion of timber imported to the Netherlands between 2017 and 2021 consisted of sawn wood (22%), fibreboard (17%) and fuel wood (11%). Fuelwood has shown a dramatic increase over the period, from 0.87 million m^3 in 2017 to over 4.5 million m^3 in 2021 and is largely responsible for the increased imports in timber over the period. This increase is likely to be linked to policies to increase the share of renewable sources in the Netherlands' energy mix[121]. Imports exceed exports for all categories, with the exception of sawn wood and roundwood, where exports exceed imports due to the Netherlands' own production of timber (Figure 24). This indicates that the Netherlands is in general not adding significant value to its imports (i.e. imports of sawn wood and roundwood are not being converted into furniture and other high value products and exported at scale).

THE AREA OF LAND REQUIRED TO SUPPLY THE NETHERLANDS' IMPORTS OF TIMBER IS LARGER THAN THE LAND AREA OF THE NETHERLANDS

FIGURE 24:
TIMBER CONTENT OF IMPORTS AND EXPORTS, BY PRODUCT TYPE (AVERAGE 2017-21)



Sustainability

The trade in timber and timber products has long been linked with deforestation and forest degradation[122]. The most obvious direct impact of the timber industry is when natural and semi-natural forest is replaced by tree plantation monocultures. However, timber harvesting also plays an indirect role in deforestation. One well-documented example is the illegal harvesting of mahogany *(Swietenia macrophylla)* in the Brazilian Amazon. Illegal loggers create earth roads to access high value mahogany trees in inaccessible areas, which are then used by smallholder colonisers who deforest small patches for agriculture. These holdings are then consolidated with further deforestation by cattle ranchers[123].

Beyond conversion, forest management for timber production can play a significant role in environmental degradation. In tropical rainforests – where a typically small proportion of trees are harvested – the impacts of harvesting are debated. The impact of harvesting primary tropical forest on biodiversity is mixed, with selectively logged forests supporting, on average, 84% of the bird species richness of unlogged forest, but with little impact on plants, mammals and invertebrates[123], even after more intensive selective logging[125].

Within the forestry sector, there are two main forest certification schemes covering timber: the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). By mid-2013, these initiatives had together certified 23% of the world's managed forests[126]. Canada, the United States, Russia, Finland and Sweden were the top five countries in terms of certified forest area. PEFC has more than 330 million hectares of forests certified globally[127], with the FSC having an additional 217 million hectares certified[128].

The FSC and PEFC standards have broadly similar requirements, although the FSC is regarded as having more rigorous requirements on some key outcome requirements (e.g. maintenance of High Conservation Values, workers' rights) and process aspects (e.g. multi- stakeholder engagement and formulation of audit teams)[129]. The FSC also has a greater certified area in the tropics than PEFC and is supported by leading environmental NGOs. The FSC Principles and Criteria exclude certification of plantations established on areas converted from natural forest after November 1994, unless the plantation is a small part of the certified area, or if the management organisation was not responsible for the conversion. The PEFC standard is broadly similar, with a cut-off date of 2010.

A recent survey of Netherlands Timber Trade Association (VVNH) members estimated that nearly 99% of softwood and 67% of hardwood (including tropical species) imported into the Netherlands in 2020 was FSC or PEFC certified[130]. The survey covered 2 million m^3 of timber, which is less than 10% of total imports, and it is not clear whether the survey results are more broadly applicable.

3. COMMODITY IMPACTS ON THREE KEY SOURCING LANDSCAPES

KEY FINDINGS

3.1 Soy in the Brazilian Cerrado

- The Cerrado in Brazil is a biome of international importance, which has suffered high rates of conversion to agriculture in recent years and is highly threatened. The expansion of soy production is one of the major drivers of this conversion of natural habitat.
- The Netherlands imported more than 1.75 million tonnes of soy in 2018 from the Cerrado. Although a reduction from previous years, it still represents 45% of the Netherlands' direct imports of soy from Brazil.
- Between 2009-2018, the Netherland's soy imports have been associated with the conversion of a total of 41,000 hectares of Cerrado, with cumulative greenhouse gas emissions from land use change of 5.95 million tonnes CO_2e.
- Eight companies were responsible for importing at least 82% of soy from the Cerrado in 2018. Just half of these imports (52%) was covered by corporate zero deforestation commitments. Despite this, imports of all of the major traders were associated with conversion of the Cerrado. Of equal concern is that one third of the imported deforestation and conversion (34%) was from soy that is ostensibly covered by corporate zero deforestation pledges.

A biome under threat

The Cerrado is a complex ecosystem of savannahs, grasslands, and forests in Brazil, with an original extent of over 2 million hectares (Figure 25). More than half of its area has already been cleared of its native vegetation, most of which has occurred since the 1970s[131,132]. Rates of conversion, driven largely by expanding soy and cattle production, have surpassed those of the Amazon in both absolute terms and as a proportion of remaining vegetation: 850,000 hectares were converted in 2021[133].

With limited public protection, it is ranked amongst the most threatened biomes in South America[134]. An estimated 15 million hectares of Cerrado vegetation exists on legal reserves within private landholdings[135] and which is considered suitable for soy cultivation could be converted legally for soy[136].

Conversion due to soy and cattle are often linked: the demand for land to cultivate soy drives up land prices and clearing land for pasture is often the simplest way of asserting ownership for later sale.

The Cerrado has global importance due to its high biodiversity and endemism[137] and its role in regulating regional climate[138]. It contains about 5% of the world's biodiversity, including 12,070 plant species, 856 species of birds and 466 species of reptiles and amphibians – roughly a third of all species found there are endemic, which means they can only be found in this region[139]. Examples of endemic species are the giant armadillo (Priodontes maximus), the northern tiger cat (*Leopardus tigrinus*), and the maned wolf (*Chrysocyon brachyurus*). Unfortunately, only about 8% of the Cerrado is protected in reserves and conservation areas[140], and only 3% has strict protection[141].
The Cerrado also contains 8 out of 12 of Brazil's watersheds[142], and these rivers are crucial for regulating both the quality as well as the quantity of water supplies to major cities in Brazil[143]. Around 25 million people live in the Cerrado, including over 80 indigenous groups[144].

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FIGURE 25:
MAP OF THE CERRADO, BRAZIL.

Soy production and trade in the Cerrado

Soy production has expanded dramatically in the Cerrado, partly driven by the success of the Amazon Soy Moratorium[145,146]. The Moratorium has dramatically reduced deforestation due to soy production in the Amazon, but at the expense of soy-driven land conversion in the Cerrado. In particular, a large expansion of soy plantations took place in the state of Mato Grosso, with a ~60% increase in cropland area between 2006 and 2017[147], with the current conversion frontier in the 'MATOPIBA' states of Maranhão, Tocantins, Piauí and Bahia[148].

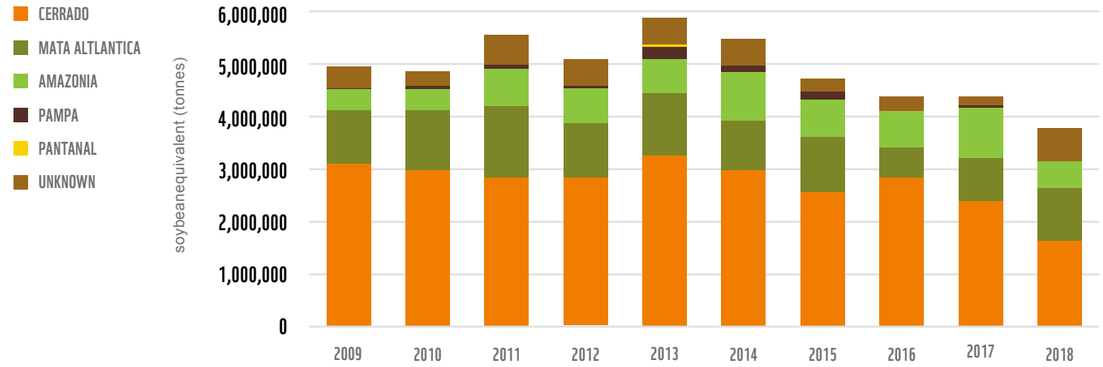
In 2018, over 47 million tonnes of soy equivalent were produced in the Cerrado, equivalent to 40% of Brazil's entire soy production[149] and the biome now accounts for 52% of national production. More than half of this was used domestically (54%). Ninety-three percent of the estimated 61,462 hectares of natural habitat converted as a result of the expansion of soy cultivation in 2018, occurred in the Cerrado.

The Netherland's imports from the Cerrado

Four percent of the Cerrado's soy was exported directly[150] to the Netherlands (1.75 million tonnes) in 2018, which accounts for 45% of the Netherlands' direct soy imports from Brazil[151]. This reflects a decrease in both absolute and relative terms over recent years, with the ten-year average of imports from the Cerrado being 2.8 million tonnes of soybean equivalent and accounting for 57% of all soy imported directly from Brazil between 2009-18 (Figure 26). The Netherlands' direct imports of soy from the Cerrado are highly concentrated, with 85% coming from just two states, Mato Grosso and Goias. Both states are also centres of deforestation and conversion, together accounting for 23% of the area of habitat loss attributed to soy in Brazil.

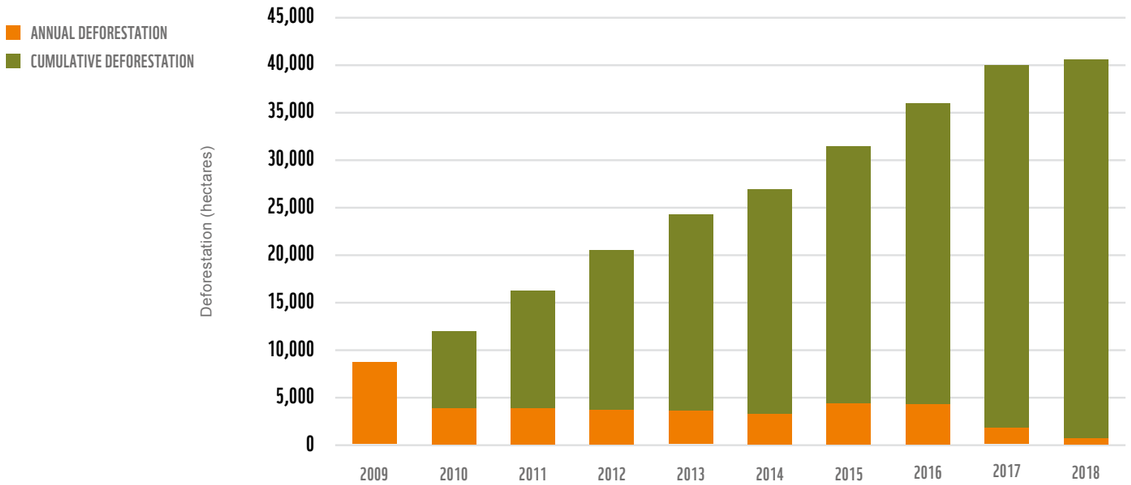
IN 2018, OVER 47 MILLION TONNES OF SOY EQUIVALENT WERE PRODUCED IN THE CERRADO

FIGURE 26:
THE NETHERLANDS' IMPORTS OF SOY FROM BRAZIL'S MAJOR BIOMES[152]



Over the period 2009-18, the total extent of conversion in the Cerrado associated with the Netherland's direct imports is nearly 41,000 hectares (Figure 27), with cumulative greenhouse gas emissions of 5.95 million tonnes CO_2e[153].

FIGURE 27:
YEARLY AND CUMALATIVE DEFORESTATION AND CONVERSION ASSOCIATED WITH THE NETHERLANDS' IMPORTS OF SOY FROM THE CERRADO

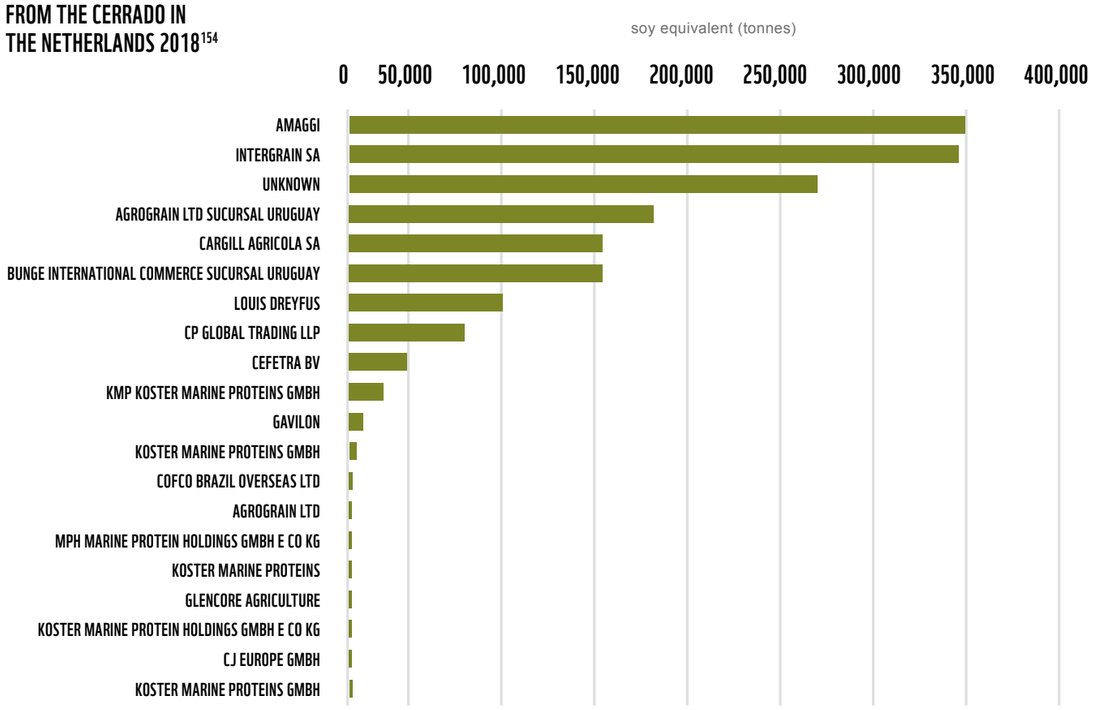


Companies trading soy from the Cerrado to the Netherlands

A total of nineteen companies are known to have imported soy directly from the Cerrado to the Netherlands in 2018, with the importing company unknown for 15% of the total quantity imports. Just eight companies were responsible for at least 82% of all imports (presumably more if some of the unknown portion was also imported by these companies, Figure 28). They include subsidiaries of some of the largest global grain and oilseed traders, such as Cargill, Bunge, and Louis Dreyfus, as well as large Brazilian producers and traders (e.g. Amaggi).

THE NETHERLANDS' DIRECT IMPORTS OF SOY FROM THE CERRADO ARE HIGHLY CONCENTRATED, WITH 85% COMING FROM JUST TWO STATES, MATO GROSSO AND GOIAS

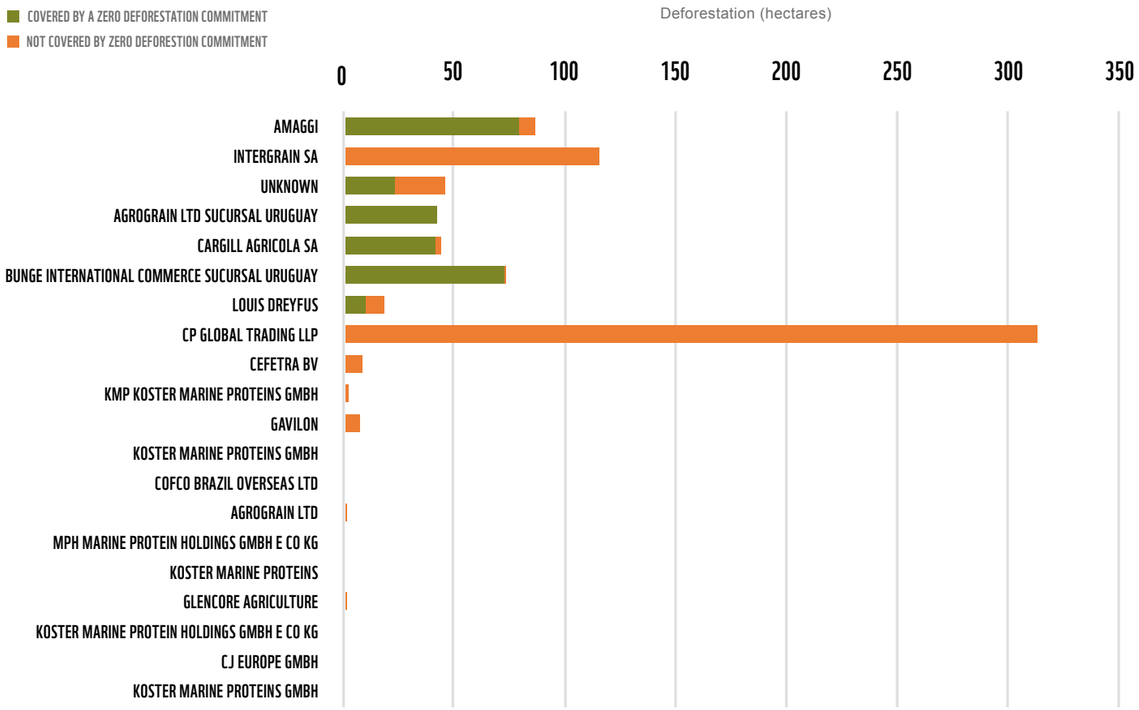
FIGURE 28:
COMPANIES IMPORTING SOY DIRECTLY FROM THE CERRADO IN THE NETHERLANDS 2018[154]



Just half of these imports (52%) were covered by corporate zero deforestation commitments[155]. Despite this, imports from all of the major traders were associated with conversion of the Cerrado (Figure 29), with one company, CP Global Trading, alone responsible for over forty percent of all of the deforestation embedded in the Netherlands' soy imports. No information is available on which companies in the Netherlands are supplied by CT Global Trading. Of equal concern is that one third of the imported deforestation and conversion (34%) was from soy that is ostensibly covered by corporate zero deforestation pledges.

ONE THIRD OF THE IMPORTED DEFORESTATION AND CONVERSION (34%) WAS FROM SOY THAT IS OSTENSIBLY COVERED BY CORPORATE ZERO DEFORESTATION PLEDGES

FIGURE 29:
DEFORESTATION ASSOCIATED WITH COMPANIES' IMPORTS SOY TO THE NETHERLANDS FROM THE CERRADO[156]



KEY FINDINGS

3.2 Cocoa in Cameroon

- The Netherlands imports 23% of the world's cocoa production (1.29 million tonnes), including an average of 168,000 tonnes per year from Cameroon, equivalent to 56% of Cameroon's national production.
- Some of the largest cocoa traders globally, including ADM Cocoa, Cargill and Olam have cocoa operations in the Netherlands, along with Dutch companies that are part of the Swiss headquartered ECOM group, which include Dutch Cocoa, Daarnhouwer and Theobroma.
- High incidences of poverty, child labour and other social issues are associated with cocoa production in the country.
- Cocoa production in Cameroon is associated with deforestation, which directly threatens the country's critical Congo Basin forests, such as cross-border Tri-National Dja-Odzala-Minkébé (TRIDOM) forest.
- The forests of Cameroon provide a habitat for endangered species such as elephants, chimpanzees and gorillas. Many species are endemic to the country, including 516 plant species, 11 bird species and 8 mammals.
- Given the scale of imports from Cameroon, the Netherlands therefore has a disproportionate influence on, and responsibility for, the environmental and social issues associated with cocoa production in the country.

Cocoa production in Cameroon

Cameroon was overtaken by Ecuador as the 5th largest cocoa producing nation in 2020 but remains the fourth largest in West Africa behind Côte d'Ivoire, Ghana and Nigeria. It produced 290,000 million tonnes of cocoa beans in 2020[157].

The area of cocoa harvested in Cameroon has almost doubled since the early 1960s, from around 380,000 hectares in the early 1960s to nearly 700,000 in 2020. Production of cocoa beans has increased at nearly four-fold over the same period (Figure 30), and cocoa is the third largest export by value behind crude oil and timber[158]. The country has ambitions to more than double cocoa production in the next decade[159]. There is also significant volatility in production from one year to the next, caused by weather conditions amongst other factors.

MANY SPECIES ARE ENDEMIC TO THE COUNTRY, INCLUDING 516 PLANT SPECIES, 11 BIRD SPECIES AND 8 MAMMALS

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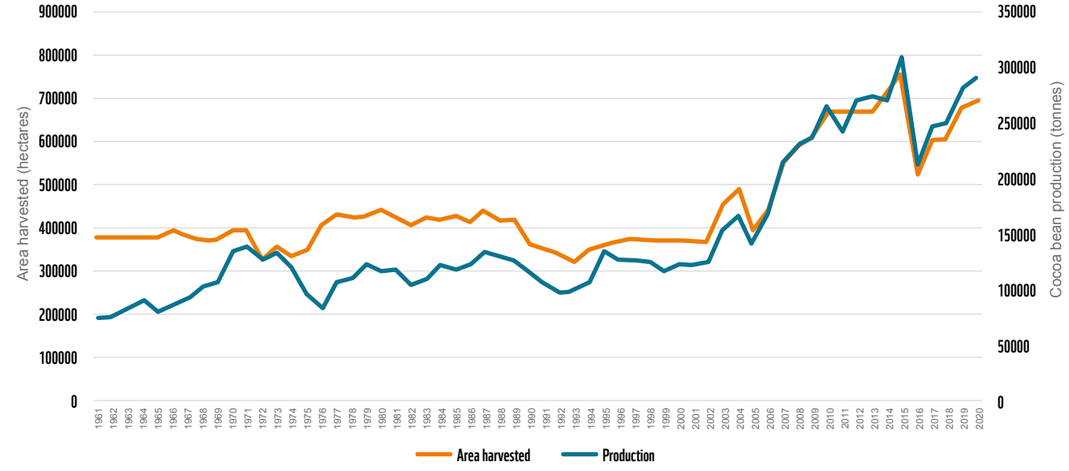
FIGURE 30:
CAMEROON'S PRODUCTION OF COCOA BEANS AND AREA HARVESTED FOR COCOA 1961-2020[160]



Over 290,000 households are involved in cocoa production in the country, 99% of them smallholders. Smallholders account for an estimated 89% of production[161]. The net income from cocoa for the largest smallholder group, those that produce in forest ecosystems without support (who are 34% of all households involved in cocoa), is on average less than the minimum wage[162].

Although the government of Cameroon has made advances in eliminating the worst forms of child labour, it is still prevalent in the cocoa sector[163], in common with many West African countries. Unlike some of these countries, forced labour appears to be less common in the cocoa sector in Cameroon[164].

Although sub-national data is somewhat unreliable, the Centre and South West are the main producing regions (Figure 31), with the Centre region apparently having displaced the South West as the largest producer in recent years[165]. Cocoa cultivation is predominantly in the forest zone (mostly shade grown cocoa), but it also occurs in the mangrove and savannah ecosystems.

The quality of Cameroon's cocoa has declined in recent years, with reduced government support cited as a major reason[166]. As a consequence, Cameroon's cocoa no longer fetches a premium price, and may have driven many cocoa farmers to expand their cultivated area at the expense of natural vegetation as a way of trying to raise income[167].

Cocoa and deforestation

Cocoa is one of the major drivers of deforestation and biodiversity loss in Cameroon. Since 2001, the cocoa harvested area has increased by 330,000 hectares, whilst the nation has lost almost five times that area of tree cover (1.6 million hectares). The trajectory of tree cover loss and changes in harvested area are broadly tied, with a dip (or increase) in tree cover loss shortly followed by a dip (or increase) in harvested area (Figure 32).

A roadmap towards deforestation-free cocoa was signed by the Government of Cameroon, international development partners, businesses and civil society in January 2021. It is hoped that this agreement will decouple cocoa production from deforestation by driving more sustainable production and forest protection while ensuring social inclusion[169].

FIGURE 31:
COCOA PRODUCTION FROM THE REGIONS OF CAMEROON[168].

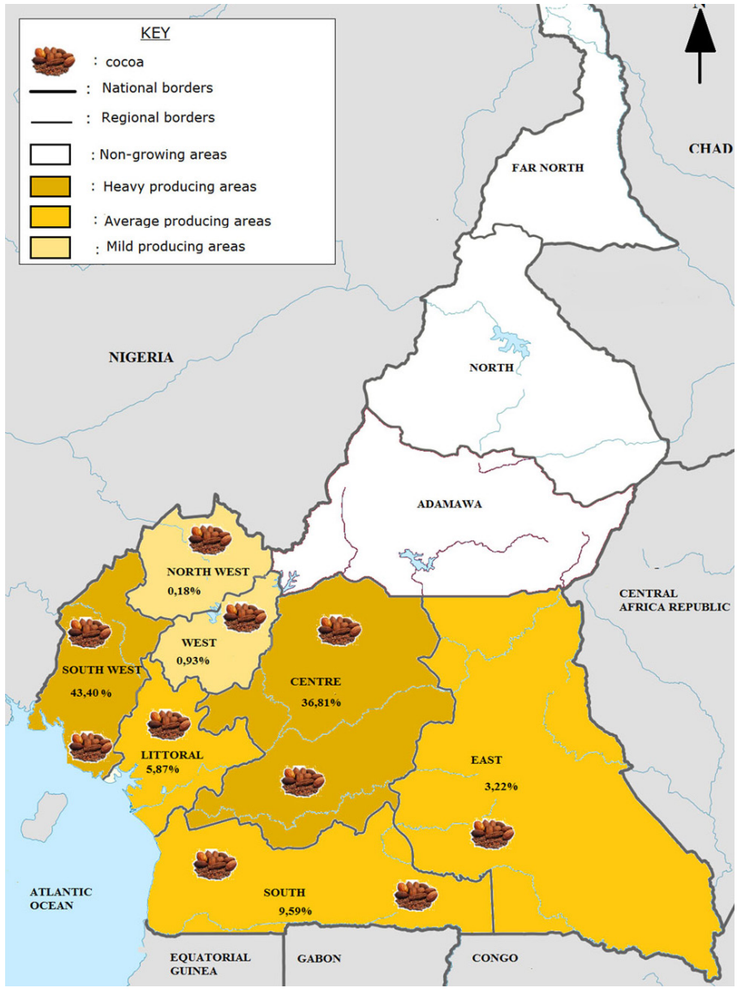
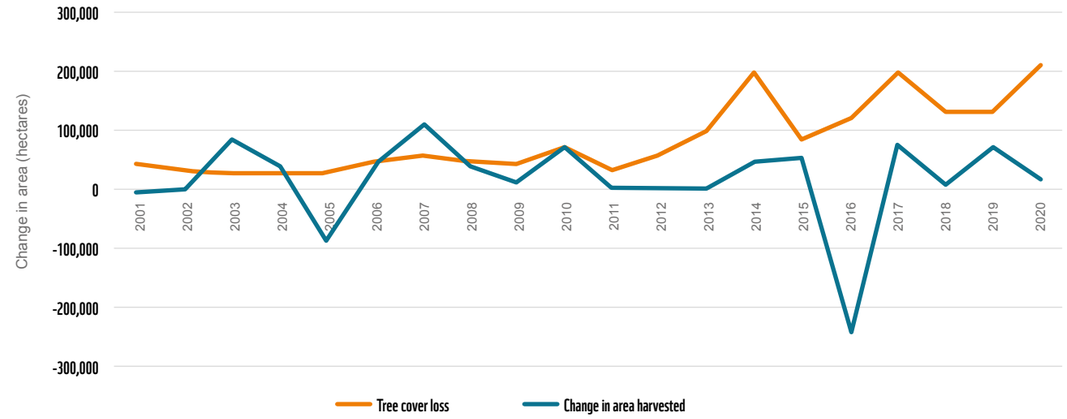


FIGURE 32:
TREE COVER LOSS[170] AND IN HARVESTED COCOA AREA[171] IN CAMEROON, 2001-2020

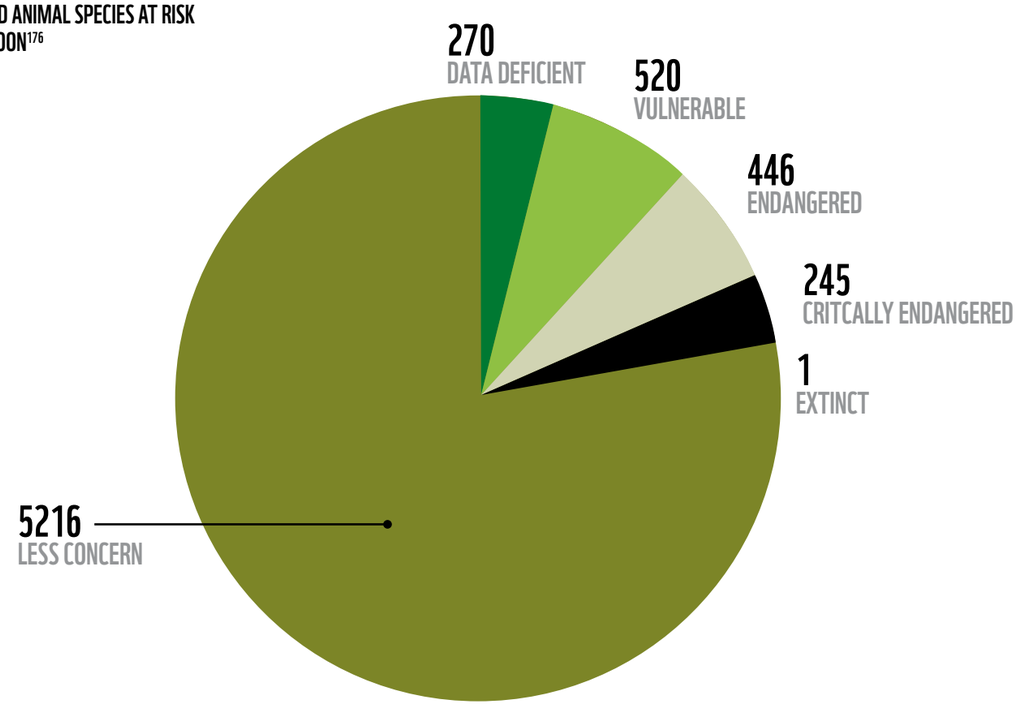


Cameroon's biodiversity

Cameroon is one of the most biodiverse countries in Africa. Some of the more iconic species include the western lowland gorilla, the chimpanzee, the forest elephant, grey parrot, giant pangolin, and leopard. Nineteen percent of the 6,428 plant and animal species recorded in Cameroon are endangered (1,212 species, Figure 33)[172]. Many species are endemic to the country, including 516 plant species[173], 7 endemic breeding bird species[174] and 14 mammals. The country includes part of the critical cross-border Tri-National Dja-Odzala-Minkébé (TRIDOM) forest, which it shares with the Republic of Congo and Gabon, and which covers 178,000 square kilometres. Ninety-seven percent of the TRIDOM area is forest. The area provides a habitat for elephants, chimpanzees and gorillas but is threatened by illegal logging, large-scale mining, poaching, and forest conversion for commodity crops[175].

19% OF THE 6,428 PLANT AND ANIMAL SPECIES RECORDED IN CAMEROON ARE ENDANGERED

FIGURE 33:
PLANT AND ANIMAL SPECIES AT RISK IN CAMEROON[176]



The Netherlands and Cameroon's cocoa

The EU is by far the biggest consumer of cocoa, responsible for 60% of global imports[177]. The Netherlands alone imports 23% of the world's cocoa production, before exporting the equivalent of 81% of those imports (Section 3.4). Amongst these imports are an average of 168,000 tonnes per year from Cameroon, equivalent to well over half of Cameroon's national production[178]. The Netherlands therefore has a disproportionate influence on, and responsibility for, the environmental and social issues associated with cocoa production in the country. Some of the largest cocoa traders globally, including ADM Cocoa, Cargill and Olam have cocoa operations in the Netherlands, along with Dutch companies that are part of the Swiss headquartered ECOM group, including Dutch Cocoa, Daarnhouwer and Theobroma[179]. Cargill and Olam are globally the second and third largest traders and grinders of cocoa beans[180].

The cocoa sector has little supply chain transparency, with as yet largely unfulfilled promises to improve the situation[181]. Imports of cocoa from Cameroon to the Netherlands are no different, and so it is not possible to directly match imports as a whole or those of individual companies to specific incidents of deforestation.

THE EU IS BY FAR THE BIGGEST CONSUMER OF COCOA, RESPONSIBLE FOR 60% OF GLOBAL IMPORTS

KEY FINDINGS

3.3 Palm oil in Riau Province, Sumatra, Indonesia

- Riau province, Sumatra, Indonesia, is a major focus of global palm oil production.
- Oil palm cultivation has expanded rapidly in the province and has been the main driver of deforestation, which has resulted in biodiversity loss and globally significant greenhouse gas emissions.
- Assessment of the lists of mills that supply four companies with major operations in the Netherlands shows that all of them source palm oil from Riau. Olenex and Bunge Loders Croklaan both publish lists of mills that supply their facilities in Rotterdam. Thirteen and fifty-four mills in Riau supply these companies in Rotterdam respectively (equivalent to 6% and 25% of all palm oil mills in the province). None of Riau's mills supplying Olenex's, and only 5 supplying Bunge Loders Croklaan have a certification status that gives a reasonable assurance of sustainability.
- Cargill and AAK provide only lists of mills supplying their global operations. In the absence of transparent information, it should be assumed that material from Riau could be imported by them to the Netherlands. Two hundred and thirteen mills in Riau (98% of Riau's mills) supply Cargill, and 182 (84%) supply AAK. Only 14 and 15 of these mills respectively are certified to segregated and identity preserved models, which provides the only independent assurance of sustainable production.
- A fifth company, the Dutch headquartered Viterra, does not provide a list of the sources of the palm kernel meal it trades. It is therefore unknown whether they purchase material from Riau.
- Amongst the four companies that have public mill lists, only Bunge Loders Croklaan are not supplied by at least one mill that has been shown to procure illegal fresh fruit bunches from within Tesso Nilo National Park.

Palm oil production in Riau

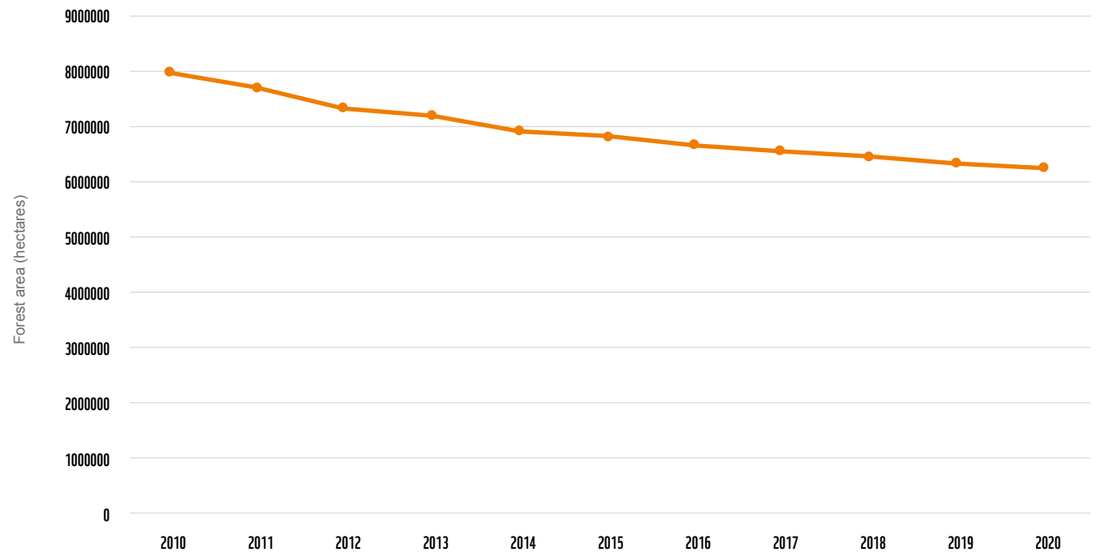
Indonesia produces approximately 60% of the world's palm oil[182]. One fifth of that comes from Riau Province on the island of Sumatra[183]. The rate of increase in Riau's oil palm area and palm oil production has been astonishing: in 2008 there were 1.38 million hectares of oil palm, producing 4.8 million tonnes of crude palm oil. By 2020 this had increased to 2.74 million hectares (a quarter of the province's land area) and 9.5 million tonnes[184].

The growth of the palm oil sector has made a significant contribution to Riau's gross regional domestic product and created jobs. Taxes from exported palm oil have contributed to the Indonesian government's income. It also provides many smallholders with an income above the minimum wage[185]. However, poverty and unemployment rates have changed little, and the incidence of public health hazards such as fires (sometimes lit deliberately to clear land for new plantations) and the associated air pollution have increased[186]. The expansion of oil palm plantations onto land that had customary or indigenous rights has generated conflict[187].

Palm oil and deforestation in Riau

Riau lost more than 1.7 million hectares of forest between 2011 and 2020[188] (Figure 34). Most analyses of the links between the expansion of oil palm plantations and deforestation have been conducted at a national, rather than provincial level. For example, Gaveau et al. (2022) concluded that oil palm was responsible for one-third of Indonesia's loss of old-growth forests between 2001 and 2019[190]. Vijay et al. (2016) estimated that 54% of Indonesia's palm oil plantations in 2013 were established on areas that had been forest in 1989[191]. The rate of oil palm plantation expansion slowed after 2012, at least partly due to reduced palm oil prices[192]. Other major causes of deforestation in the province include industrial timber plantations for pulp and rubber.

FIGURE 34:
FOREST COVER CHANGE IN RIAU PROVINCE, INDONESIA[189]



Of particular concern in Riau is the conversion and degradation of peat swamp forest. Since 1990, 70% Riau's peat swamp forests have been cleared and the majority of the remaining forests in 2019 have been degraded[193]. Oxidation of the organic matter in drained peat swamps results in carbon dioxide emissions, and drained peat is highly flammable: once alight, peat fires can burn for months or even years. Between 1997 and 2006, peatland fires in the Indo-Malayan region are estimated to have caused average yearly carbon dioxide emissions of 1,400 million tonnes, with 90% of this originating in Indonesia, mostly from Riau Province[194].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On October 23, 2015, Indonesian President Joko Widodo announced a moratorium on new peatland concessions and a cancellation of existing concessions that had not been developed. The moratorium appeared to slow down the conversion of Indonesia's peat swamp forest[195], but encroachment by smallholder palm oil plantations continues[196]. The Moratorium has now in effect been replaced by the Omnibus Law, which provides less protection for forests and peatlands.

A large proportion of the oil palm estates in Riau have been developed without the correct permits and are in effect illegal[197]: including up to 2 million hectares of the province's palm oil area[198]. The Indonesian government has made significant efforts to verify the legality of oil palm plantations, through the introduction and subsequent revision of the Indonesian Sustainable Palm Oil (ISPO) standard. While ISPO certification can provide an indication of whether legality has been met, it does not give any indication of whether this was given to a management unit that had been or is currently deforesting or that has adopted a zero-deforestation commitment in its supply chain.

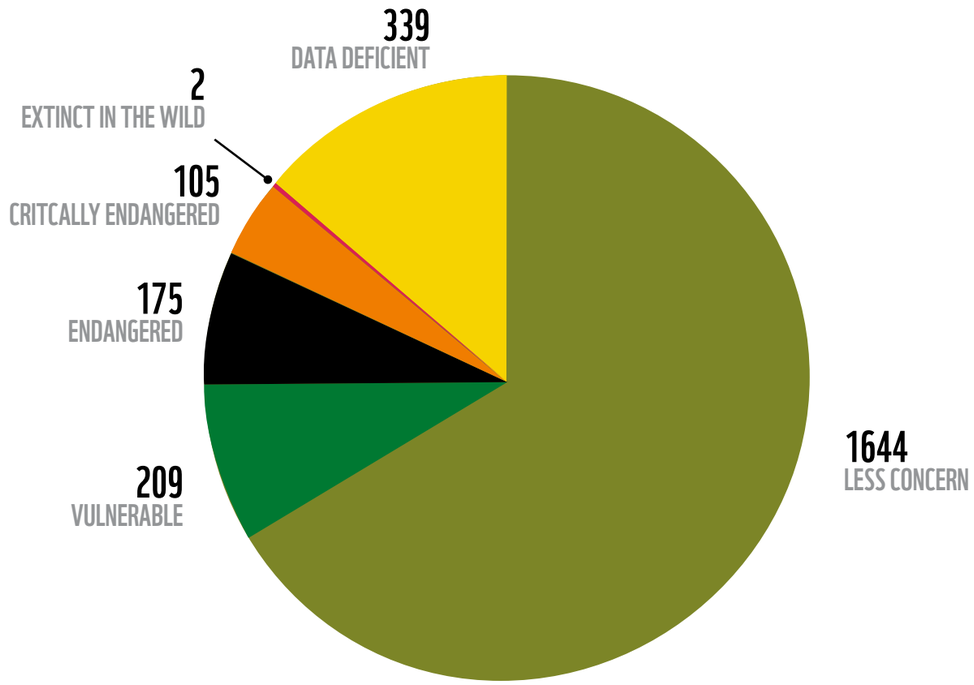
Riau's biodiversity

The natural ecosystems of the island of Sumatra, and Riau province within it, are amongst the most biodiverse places on earth. For example, the Tesso Nilo forest in Riau has possibly the highest diversity of vascular plants of any tropical forest in the world[199]. However, natural ecosystems have been extensively converted or degraded. For example, Riau's tropical dry lowland forests now barely exist, and hill forest, mangrove, peat swamp forest and lowland tropical rainforest cover only a fraction of their former areas, with what little exists is now often severely degraded[200].

Twenty percent of the 2475 plant and animal species recorded in Sumatra are endangered (491, Figure 35)[201]. Some of the more iconic species include Sumatran tiger, Sunda pangolin, sun bear, Sumatran rhinos, and Asian elephant.

Tesso Nilo National Park was established in Riau in 2004 and at the time included some of the largest contiguous areas of lowland rainforest remaining in Sumatra. An estimated 75% of the area of the national park is now occupied by oil palm plantations[202], and with 50 mills operating in the area[203]. Oil palm mills that supply some of the largest palm oil companies in the world, Wilmar, Musim Mas, Golden Agri-Resources and Royal Golden Eagle – and who's exports find their way into the products of multinational companies – have been found to process illegal palm fresh fruit bunches coming from within the Park's boundaries[204].

FIGURE 35:
PLANT AND ANIMAL SPECIES AT RISK IN SUMATRA[205]



Netherlands link to palm oil from Riau

The only direct publicly available data tracing palm oil from Riau to the Netherlands is for 2015[206]. In that year, 447,000 tonnes of palm oil were imported from Riau province to the Netherlands, just 6% of the Netherlands' total supply from Indonesia. Nearly 60% of this total was exported by one company, Golden Agri International. However, given the rapid expansion of oil palm cultivation in Riau, as well as the turnover in companies' supply bases, this is considered too dated to allow a comprehensive analysis.

As an alternative, the supply bases of five companies with significant operations in the Netherlands were examined to assess their links to palm oil from Riau[207]. Of these companies, only two, Olenex and Bunge Loders Croklaan (BLC), provide lists of mills that supply their facilities in the Netherlands. Olenex are a joint venture between Wilmar (one of Asia's largest agribusiness companies) and Archers Daniels Midland (one of the world's largest food and feed commodity traders). Cargill (who have major facilities in the Netherlands), and AAK (who own a palm oil refinery in Rotterdam) only supply lists of their global palm oil supply base. In the absence of greater transparency, it is therefore assumed that oil palm products originating in Riau could be part of their imports to the Netherlands. A fifth company, Viterra, is headquartered in the Netherlands. They do not provide any public information on their palm oil supply base, but source large quantities of palm kernel meal (763,852 tonnes in 2019[208]) which they trade as animal feed.

All of the companies assessed have strong links to palm oil from Riau. The Universal Mill List (a database that attempts to list all known palm oil mills with their geographic coordinates and ownership) lists a total of 217 mills in Riau[209]. All companies source from Riau mills, and in the case of Cargill and AAK, from most of them (Table 1 and Figure 36). Riau constitutes 4-15% of the global supply base of the companies assessed.

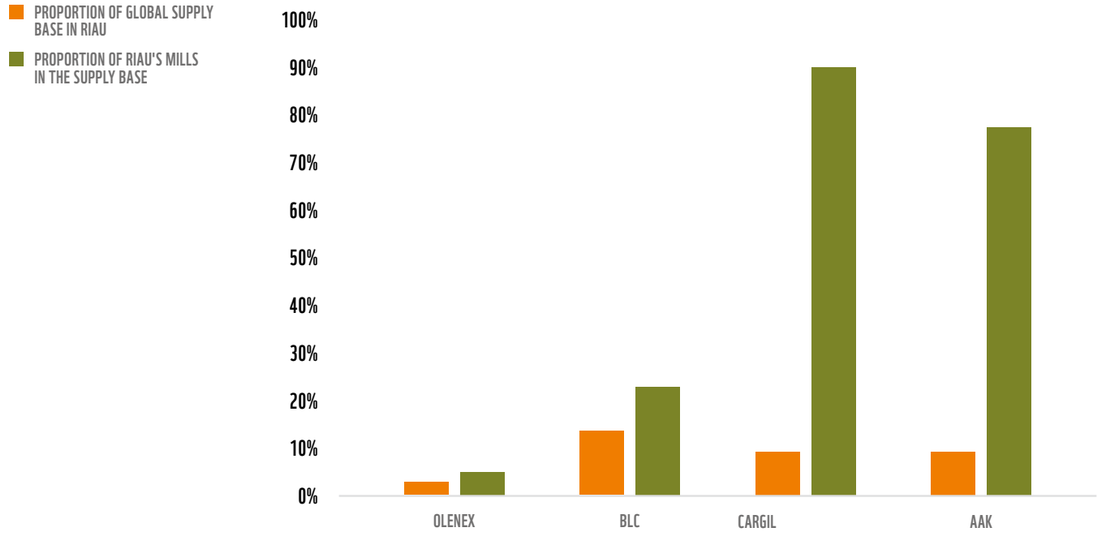
447,000

TONNES OF PALM OIL WERE IMPORTED FROM RIAU PROVINCE TO THE NETHERLANDS

TABLE 1:
PALM OIL TRADING CONNECTIONS BETWEEN RIAU PROVINCE AND COMPANIES WITH MAJOR OPERATIONS IN THE NETHERLANDS

	OLENEX	BLC	CARGILL	AAK
Number of mills in supply base	358	353	1436	1501
Number of Indonesian mills in supply base	63	61	904	889
Number Riau mills in supply base	13	54	213	182

FIGURE 36:
PROPORTION OF EACH COMPANY'S GLOBAL SUPPLY BASE THAT IS FROM RIAU, AND THE PROPORTION OF ALL RIAU'S MILLS THAT THE COMPANY SOURCES FROM



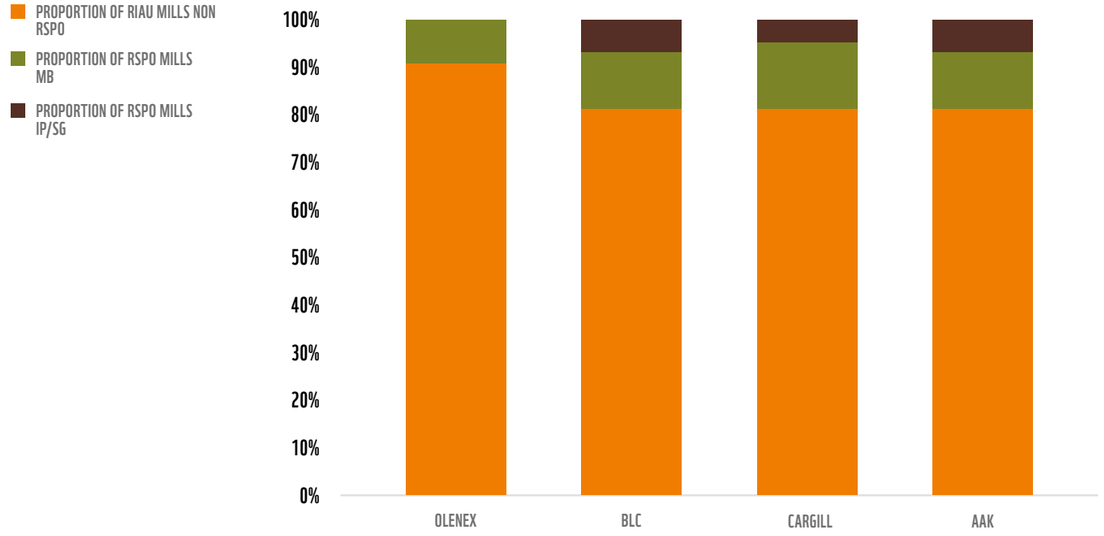
The Roundtable on Sustainable Palm Oil (RSPO) is a voluntary standards system that is by far the most widely used in the palm oil sector. Whilst not without criticism, it provides at least some level of assurance that palm oil has been produced in accordance with the standard, which largely precludes deforestation. However, the scheme runs several different supply chain models: only identity preserved (IP) and segregated (SG) certified palm oil is from physically certified plantations. There are no such guarantees regarding the non-certified portion of 'mass balance' palm oil, and no physical connection whatsoever between palm oil and certification credits. None of the companies have more than 20% of their Riau supply base certified (Table 2, Figure 37). The proportion of identity preserved and segregated mills from Riau in the supply base is minimal; between none (Olenex) and 9% (BCL, Figure 37). Viterra trade mass balance palm kernel expeller, from undeclared provenance[210]. In short, there is little independently verified guarantee that the palm oil, palm kernel oil and palm kernel meal from Riau that may be entering from these companies is from sustainable, deforestation-free sources.

TABLE 2:
CERTIFIED AND NON-CERTIFIED MILLS IN EACH COMPANY'S SUPPLY BASE

	OLENEX	BLC	CARGILL	AAK
Number of non-RSPO Riau mills in supply base	12	44	173	145
Number of RSPO mass balance Riau mills in supply base	1	5	26	22
Number of RSPO IP/SG Riau mills in supply base	0	5	14	15

FIGURE 37:
PROPORTION OF NON-CERTIFIED MILLS AND MILLS CERTIFIED ACCORDING TO THE DIFFERENT SUPPLY CHAIN MODELS IN THE SUPPLY BASE OF EACH COMPANY

Viterra (not shown) sourse no RSPO certified material



With the exception of Viterra, all of the companies assessed have public 'No Deforestation, No Peat and No Exploitation' (NPDE) policies in which they claim to eliminate some of the worst environmental and social ills from their supply base, and particularly the non-RSPO certified part of their supply. However, weak implementation and the fact that products from known sources can be mixed with products from often unknown sources at every stage of many palm oil supply chains lowers the effectiveness of such policies[211], have resulted in many companies failing to meet the goal of NDPE[212].

The low levels of certification coupled with the sheer complexity and lack of transparency of palm oil supply chains makes it almost inevitable that some material from environmentally and socially undesirable sources will enter supply chains. For example, six of the seven mills that have been identified as receiving illegal fresh fruit bunches from within Tesso Nilo National Park are unambiguously present on the Universal Mill list, and five are present within the supply chains of the companies assessed (Table 3). Given that only a fraction of the fresh fruit bunch supply from within the National Park has been traced to mills, this almost certainly underestimates the supply chain linkages between Tesso Nilo and the companies assessed.

TABLE 3:
MILLS IDENTIFIED AS RECEIVING ILLEGAL FRESH FRUIT BUNCHES FROM WITHIN TESSO NILO NATIONAL PARK[213] THAT ARE RECORDED AS SUPPLYING FIVE MAJOR PALM OIL COMPANIES.

MILL NAME	OLENEX	BLC	CARGILL	AAK
Mitra Unggul Pusaka (Segati)	-	-	Yes	yes
Citra Riau Sarana (Teso Satu)	-	-	Yes	-
Citra Riau Sarana 2 (Teso Dua)	-	-	Yes	-
Citra Riau Sarana 3	-	-	-	-
Inti Indosawit Subur (Pks Ukui I)	Yes	-	-	-
Inti Indosawit Subur (Pks Ukui 2)	Yes	-	-	-


Aaron Gekoski / WWF-US

4. CONCLUSIONS

The Netherlands is a major player in international trade of deforestation and conversion risk commodities, for example importing 23% of global cocoa production, and having an import footprint that is an estimated 17.3 million hectares each year, equivalent to four times the Netherlands' land area.

Production from countries such as Argentina (soy), Brazil (soy, beef & leather, coffee, maize), Cameroon (cocoa), China (timber products), Indonesia (palm oil, coconuts), Nigeria (cocoa) and the Russian Federation (timber products) presents a high risk of environmental and social damage. Forty-two percent of the overall external footprint – over 7 million hectares – is from countries that have a high or very high risk of deforestation, poor rule of law and a poor record of labour rights. This includes the majority of imports of palm oil, cocoa and coffee. The estimated GHG emissions associated with the conversion of natural ecosystems and changes in land cover for the production of just six commodities (soy, palm oil, maize, cocoa, coconut and coffee) amounted to an average of around 43.6 million tonnes of CO_2 equivalent each year between 2017 and 2021.

Until now, neither corporate and public policies nor regulation have been able to eradicate deforestation, conversion, and human rights abuses from the Netherlands' commodities supply chains. This is despite an increasing number of deforestation and conversion-free commitments made by companies and political leaders[214]. For example, Dutch supermarkets have signed up to a soy manifesto, pledging to eliminate deforestation and conversion from their supply chains by 2025[215]. Whilst it is too early to judge the effectiveness of this particular pledge, little progress has been observed on the ground from the previous ones[216]: pledges are important and have to be backed up with effective action. Instead, deforestation and conversion rates have accelerated significantly in producer countries[217], human rights abuses continue to occur unabated in some places[218], with environmental activists often bearing the brunt (Box 1).

Box 1: The impact of trade in deforestation and conversion risk commodities on indigenous people and environmental defenders

In 2020, Global Witness recorded 227 murders of people who took a stand and peaceful action against unjust, discriminatory, corrupt, or damaging exploitation of natural resources or the environment[219]. Many environmental defenders and communities also experienced attempts to silence them, with tactics such as death threats, surveillance, sexual violence, or criminalisation. Given the lack of a free press and difficulties in monitoring land disputes and environmental damage in many countries, this is almost certain to be an underestimate.

Seventy-one percent of the people were killed whilst trying to protect forests. Where the economic motives behind the deaths could be established (60% of cases), logging and agribusiness were the largest (23 killings, 21% of all known deaths) and joint third largest cause (17, 15%) respectively. The Netherlands buys significant quantities of commodities associated with deforestation and conversion from many of the countries in which the highest number of environmental defenders were killed: coffee and palm oil from Colombia (65 killings, 23% of the total), coconuts from the Philippines (29, 11%), soy, maize, coffee and beef & leather from Brazil (20, 7%), and palm oil and coffee from Honduras (17, 6%). In addition to killings, agribusiness and logging are amongst the largest sectors responsible for human rights abuses of environmental defenders[220].

The persecution of environmental defenders is not just a theoretical risk of the Netherlands' trade in commodities. For example, companies that import palm oil to the Netherlands, including ADM and Bunge, purchase from mills that have been accused of violating local community land rights, criminalising or attacking defenders, and/or causing serious environmental degradation[221]. Palm oil plantations in West Kalimantan owned by Astra Agro Lestari, First Resources, Golden Agri Resources-Sinar Mas and Salim (Indofood) groups have been linked with various human rights abuses including the denial of indigenous peoples' rights, expropriation of community lands without consent, involuntary displacement, and repression find their way into the products of companies such as Unilever, Nestlé and PepsiCo, via traders such as Wilmar International, Cargill ADM, and AAK, all of which operate in the Netherlands[222]. On the other side of the planet, soy and beef cattle that may be entering the supply chains of companies such as Amaggi, Cargill and Bunge (soy) and JBS (beef) that export from Brazil to the Netherlands is increasingly encroaching in indigenous territories[223] and, in the case of JBS, has been directly linked with deforestation[224].

At least one third of the environmental defenders killed in 2020 were indigenous people[225]. Despite indigenous groups making up less than 5% of the world's population, they live in nearly one quarter of the world's territory[226]. The result is often that their land is taken for commercial logging, agriculture and plantations[227]. Indigenous lands hold 80% of global biodiversity and huge stocks of carbon: resources that indigenous peoples have managed and protected for millennia. Indigenous people are therefore increasingly seen as central to the biodiversity and climate crises[228].

The European Commission's proposal for a regulation on deforestation-free products, will, if adopted, require companies to conduct due diligence to ensure that certain products placed on the EU market are not driving deforestation. This is an important and welcome step in eliminating some of the worst environmental impacts from supply chains.

However, the proposed regulation is likely to be insufficient in their current form. Firstly, by only referring to deforestation, rather than deforestation *and* conversion of all natural ecosystems, they will allow companies to continue their involvement in the ongoing destruction of some of the most threatened, biodiverse and carbon rich habitats on earth[229]. These include peatlands, savannah, grasslands, wetlands and coastal ecosystems. Secondly, they might conceivably shift part of the ongoing habitat conversion from forests to other biomes, as has been observed in the past when the Amazon Soy Moratorium coincided with an increase in the conversion of the Cerrado biome to cropland[230]. Thirdly, the proposals currently relate only to soy, cattle, cocoa, coffee, palm oil and timber, and some products that contain or have been fed with these commodities. This means that commodities such as maize and coconut, and many products that are not specified in the proposal, can continue to be imported even if they are responsible for deforestation and conversion. As the research presented here shows, there is a very real risk that they do. It is difficult to see how the EU's environmental aspirations - to have a neutral or positive environmental impact[231] and to become carbon neutral by 2050[232] - could be achieved if non-forest ecosystems and the full suite of commodities and products are excluded from the regulations.

The Netherlands exports a high proportion of imported commodities to other countries. Except for timber and maize, over half of imports (or imports plus domestic production where applicable) are exported, often after additional processing. The pre-eminent role that companies in the Netherlands play in supplying the EU with deforestation and conversion risk commodities means that they will have a large responsibility for ensuring robust due diligence and for comprehensive and effective remediation and mitigation activities where deforestation risk occurs in their supply chains.

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5. METHODS

5.1 Commodity footprinting

Estimating the quantity of imports and consumption

The methods for estimating quantities of imports, land footprint and socio-environmental risk follows the approach used for similar studies in countries that are major trading partners with the Netherlands, including the UK[233], Belgium[234], Denmark[235], France[236] and Switzerland[237], and for one sub-national study in Wales[238].

Import data from the UN Comtrade database[239] was used to estimate the quantity (net weight) of imports for the period from 2011 to 2018. We chose this database because it allows a similar method to be replicated for other countries, giving us a global comparable overview of trade flows.

We examined three routes by which commodities feature within the Netherlands' supply chains:

- As raw materials (e.g. palm oil, soymeal, beef meat)
- As an ingredient of imported manufactured goods (e.g. natural rubber in imported car tyres, beef in corned beef products)
- Embedded within imported products as part of the upstream production process (e.g. soymeal used in pig feed is 'embedded' in imported pork products)

Note that many commodities are used in thousands of different products, and so the data captured was confined to those product categories that are cited in the literature as being major uses of the commodity. The estimates provided are therefore conservative. Where a commodity is imported as an ingredient or is embedded, we only accounted for the weight of the commodity of interest in such a product. For example, chocolate contains cocoa (in various forms and proportions) and also sugar, sometimes dairy products and other ingredients. A conservative estimate from the literature is that the cocoa component is just over 40%.

This rule was applied to assess the weight of the main imported goods containing commodities as 'ingredients' and 'embedded'. This was done using conversion factors derived from published literature where possible, with a mid-range conversion factor used when the proportion of a commodity within a product is highly variable (e.g. the cocoa content of chocolate).

Consumption was estimated by deducting exports[240] from imports plus domestic production[241] where appropriate (for maize, timber, beef & leather).

Estimating the provenance of imports

The UN Comtrade database provides information on both the net weight of the commodity imported and the identity of the exporting country. Three situations are generally found:

- A country is a producer and an exporter of the commodity. For example, Brazil is a major producer of soy. In such a case, the Netherlands' imports can be assigned the provenance of the exporting country without further analysis.
- A country is an importer and exporter of the commodity. For example, Belgium imports and exports palm oil, but does not produce it. In this case, the country's imports were analysed, and the exports to the Netherlands assigned according to the proportion of its imports.
- A country is a producer, importer and exporter of the commodity. For example, Canada produces approximately 7 million tonnes of soy each year, and imports six times that volume from the USA. The provenance of exports from Canada to the Netherlands are therefore assigned on that ratio (1:6).

The combination of imports highlighted above means that some commodities are imported from hundreds of countries to the Netherlands, even if the raw commodity is produced in a much smaller number. Given the inevitable need to focus limited research resources, we examined the sourcing provenance of all countries responsible for at least 2% of the Netherlands' imports of a given commodity. A similar cut-off has been used by other researchers (e.g. de Ruiter et al., 2017 used a cut-off of 1.5%[242]).

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Estimating the footprint of imports

For the majority of commodities, estimating the land area required to produce the quantities of commodities imported by the Netherlands was relatively straightforward, as yield data is readily available[243]. The yield for each country, each year, could be used to convert the imported volumes into an estimated land area required for production, i.e. land footprint.

For crops that produce co-products, the yield was allocated to the co-products. This applied to soy (soymeal and soy oil), cocoa (butter, paste and powder), palm oil (palm oil, palm kernel oil and palm kernel meal), we allocated land use to co-product fractions. In this case, imported goods are first assigned to the fraction of the commodity they contain, and then yield is assigned to that fraction in the same proportion that the fraction is derived from the harvested crop. For example, one tonne of whole soybeans yields 0.82 tonnes of soymeal and 0.18 tonnes of soy oil[244]. The area required to supply the Netherlands' imports of whole soybeans (or products containing whole beans or that have whole beans embedded in the production process, once their weights have been converted to soybean equivalent) is estimated by dividing the quantity (weight) of soybeans imported from a given country by the yield; therefore, the land footprint area for products using soymeal is estimated by dividing the quantity of soymeal by its proportion of yield (i.e. 0.82); and the land footprint area for products using soy oil is estimated by dividing the quantity of oil by its respective yield (i.e. 0.18). The land footprint areas for each product analysed are summed to produce a total figure for a certain commodity.

The two commodities for which no yield data is available are beef & leather and timber. For beef & leather, we filled this gap, by adopting a method used by de Ruiter et al. (2017)[245] that allocates total country pastureland to different grazing animals based on the relative feed conversion efficiencies and overall sector production. The method apportions the national pasture area between the three main livestock types: beef cattle, milk cattle and sheep/goats. The area assigned to beef cattle is then divided by the national production of beef & leather to give a hectare per tonne estimate. Given that beef cattle have two products (i.e. meat and leather), we allocated a share of the land footprint to beef & leather co-products on the basis of their mass[246]. Thus, the hide being 15% of the mass of a carcass, it was allocated 15% of the land footprint. This was done to avoid the potential double counting of land where beef & leather were sourced from the same country. There are limitations to this method (explored in detail by de Ruiter et al., 2017) – for example we assume similar feed conversion rates and pasture use in all countries. However, given the lack of data on this topic, it was felt to be a reasonable approach to estimating sector-level grazing use for beef cattle.

For timber, the Netherlands' import quantities were converted from tonnes of imports to wood raw material equivalent (WRME). This conversion adjusts for the wood content of manufactured products (e.g. plywood contains both wood and resin) and results in a volume metric that is broadly equivalent to the usable volume of a harvested tree. Most conversion factors used were from the UK Forestry Commission[247] and where no conversion factor is available, the closest available estimate was used. The area of forest required to produce the total imported volume of WRME, i.e. the land footprint for timber, was estimated by dividing the total WRME imported by the producer country's Net Annual Increment (NAI)[248], a measure of the annual increase in timber volume of growing trees on a hectare of land.

Estimation of GHG from land use change

The Land Use Change Impact Tool[249] was used to estimate commodity specific per-hectare CO_2e emissions for soy, cocoa, coffee, coconut, palm oil and maize.

The tool allows emissions from land use change to be assessed when the country of production is known, but the exact parcel of land used to produce the crop is unknown. This matches the level of detail of our provenance calculations which is determined by the available data. For this scenario, the tool uses an indirect approach to calculating emissions from land-use change (LUC), based on the relative rates of crop expansion at the expense of different previous land uses in a country. It uses FAO data on direct LUC (i.e. deforestation, conversion and crop-to-crop change) associated with a crop in a certain country and divides by the total expansion of the same crop in the country, assigning a rate of LUC (and therefore GHG emissions) per hectare of crop expansion.

Crop expansion is calculated for each year by comparing the average harvested area of the crop in the three most recent years for which data is available to the average of three years 20 years ago. For each subsequent year, this 'baseline' will therefore shift or move up by a year and data on LUC in a specific year is not counted in subsequent years. The associated emissions per hectare are then calculated based on methods consistent with the Intergovernmental Panel on Climate Change (IPCC)[250] and the PAS 2050-1 framework[251], including 'amortisation' so that the total emissions from the 20-year period of the land-use change are apportioned equally over the 20 years (see tool's methodology for further details).

The commodity-specific per-hectare CO_2e emissions was then multiplied by the Netherlands' land footprint per commodity in each country to estimate the GHG emissions associated with LUC per country, for each crop per year.

The method does not allow for GHG estimates for specific parcels of land, due to the lack of primary data at the necessary level of spatial detail. The figures used are therefore averaged for entire countries, meaning it is not possible to distinguish regional variations in emissions or assign deforestation to a specific piece of land. The values are therefore an indication of the risks of deforestation/land conversion and GHG emissions associated with the Netherlands' imports of such commodities.

The Land Use Change Impact Tool is one of the most comprehensive tools for estimating GHG emissions from direct LUC with global coverage. However, there are still significant data gaps. For example, there is no data available for forest products nor livestock. Therefore, no GHG emissions estimates were made for beef & leather, or for timber products.

5.2 Risk assessment

Overview

A risk-based approach was used to illustrate the potential association of the Netherlands' imports of commodities with negative socio-environmental impacts. To achieve this, we assigned a risk rating to each exporting country according to indicators of deforestation and ecosystem conversion (i.e. the area of tree cover loss and percentage of natural forest loss) and social risks (i.e. rule of law and labour rights). The land footprint of the Netherlands' imports was then apportioned to risk categories based on the country of production.

This risk-based approach was preferred to other ways of assessing deforestation, ecosystem conversion and social exploitation associated with the commodity trade, for the following reasons:

- Remote sensing has been used to estimate the amount of deforestation and conversion associated with the production of commodities[252] (although, with a few limited exceptions[253], not the trade with specific countries). This presents a rigorous approach but has the disadvantages of excluding the social dimensions of the commodities' impacts and being comparatively expensive if repeated for different importing countries. It also often assumes a linear approach to deforestation or conversion (i.e. the plantation or farm in an area that was forested sometime in the past is the cause of deforestation), whereas deforestation is often a multi-stage process with several underlying drivers.
- Coupled economic land-use models have been used to estimate the EU's contribution to deforestation[254]. Again, this is a rigorous method but, similar to remote sensing, it is relatively computationally intensive, does not include social dimensions, and has coarse (national-level) assumptions about land use (e.g. that an increase in the planted area of a crop in a country is responsible for the same area of deforestation in that country). The result of this can lead to a false sense of precision over the area of deforestation attributed to imports – in fact the estimated area of deforestation is more correctly considered as an 'average risk' of deforestation.

The risk-based approach allows a broader set of potential impacts to be considered across multiple commodities without making assumptions about the mechanisms of deforestation or conversion. Note that our analysis does not envisage measuring impact (e.g. number of hectares cleared to produce the commodity volumes exported to the Netherlands). Rather, this analysis indicates a risk that there might be a link between commodity production due to the Netherlands' trade and impacts on the ground. This risk should, therefore, be examined and mitigated.

Developing the risk rating

Four indicators were used to indicate the risk of deforestation, conversion and social risks associated with production.

Extent of tree cover loss. This provides an indication of the total extent of deforestation and conversion of natural ecosystems with ≥10% tree cover in producer countries. It uses remote sensing data from Global Forest Watch (GFW) that does not distinguish between vegetation types, and is only looking at the area of loss, not the balance between loss and gain. The data used is the area of land with a minimum of 10% tree cover that has lost tree cover for the years between 2017 and 2020[255].

Proportion of natural forest loss. This is a measure of the proportion of change in net natural forest area (i.e. loss + gain) in each producer country between 2010 and 2015[256]. The use of this second deforestation indicator helps to balance out the risk weighting, as large countries will tend to score high on the first indicator, whereas countries that are losing a large proportion of their small remaining forest extent score highly on rates of deforestation. Note that FAO's definition of forest refers to an ecosystem with a minimum of 10% tree cover, which allows us to use this indicator to assess the rate of loss of other natural woody ecosystems.

Rule of law. No single global dataset is available that captures the range of social problems that have been associated with production of the commodities analysed here, which include land grabs, forced labour, child labour, and terms and conditions of labour below international norms. The World Bank's Rule of Law governance indicator for 2021[257] is used as a proxy for the likelihood of the range of social issues within a producer country. This provides a score for each country on the perceptions of the extent to which citizens, government officials and enterprises have confidence in and abide by the rules of society. This indicator is commonly used in global analysis of social issues, including other assessments of deforestation (e.g. the Forest 500[258]).

Labour standards. The International Trade Union Confederation (ITUC) documents violations of internationally recognised labour rights by governments and employers and uses these records to score countries, providing a measure of the likelihood of serious workers' rights violations, including forced labour, violence and the denial of the right to free association[259].

The value of each indicator in each country was scored on a three-point scale (high = 3 to low = 1) according to the thresholds described in Table 4. These thresholds were selected according to the data range of producer countries that export to the Netherlands to clearly distinguish between high and low impact. For example, Brazil lost over 14 million hectares of vegetation with >10% tree cover between 2017 and 2020, compared with Belgium's 20,000 hectares – these are scored 'high' and 'low', respectively.

TABLE 4:
RISK INDICATOR THRESHOLDS

RISK FACTOR	DESCRIPTION	RATIONALE	HIGH RISK	MEDIUM RISK	LOW RISK
Deforestation extent	Area of forest cover loss 2017-21 (Global Forest Watch)	Amount of deforestation	>1 Mha	0.5 Mha-1 M ha	< 0.5 Mha
Deforestation rate	% net natural forest loss 2010-20 (FAO)	Rate of deforestation	>1%	0% - 1%	< 0%
Labour rights	Labour standards score (ITUC)	Reported incidence of major labour rights violations	4 - 5	2 - 3	1
Rule of Law	Rule of Law score (World Bank)	Perception of how good laws are and how well they are implemented	<-0.3	0.3 - 1	>1

Finally, an overall country risk rating was calculated by summing the scores for the individual indicators. The numerical risk rating was assigned to one of five risk categories (Table 5). See Annex 7.2 for details of the assignment of country scores.

TABLE 5:
OVERALL COUNTRY RISK CATEGORIES

Risk score

- > 11 Very High Risk
- 9-10 High Risk
- 7-8 Medium Risk
- 5-6 Medium-low Risk
- 4 Low Risk

6. ANNEXES

6.1 Summary of major importing countries

Values indicate the proportion of the Netherland's imports, by quantity, originating from that country.
Blank cells are where <2% of imports come from a country.

	SOY	PALM OIL	MAIZE	COCOA	COCONUT	COFFEE	TIMBER	BEEF	LEATHER
ARGENTINA	6%							3%	
AUSTRIA								6%	
BELGIUM							12%	17%	23%
BRAZIL	47%		6%			35%		4%	
CAMEROON				13%					
CANADA	3%								
CHINA							6%		11%
COLOMBIA		6%				7%			
CÔTE D'IVOIRE				47%	1%				
CZECHIA									2%
ECUADOR					3%				
FINLAND							2%		
FRANCE			15%				5%	11%	2%
GERMANY							23%	12%	31%
GHANA				15%					
GUATEMALA		4%				2%			
HONDURAS		6%				9%			
INDIA									3%
INDONESIA		42%			13%				
IRELAND								9%	
ITALY							3%	7%	7%
LATVIA							4%		
MALAYSIA		21%							
NIGERIA				10%					
PAPUA NEW GUINEA	9%								
PERU						1%			
PHILIPPINES					82%				
POLAND			5%				10%	13%	4%
ROMANIA			5%						
RUSSIAN FEDERATION			5%						
SIERRA LEONE				2%					
SPAIN								3%	
SRI LANKA					1%				
SWEDEN							5%		
UKRAINE	2%		33%						
UNITED KINGDOM								3%	3%
URUGUAY	2%							2%	
USA	31%		16%				3%		
VIET NAM						20%			4%

6.2 RISK INDEX

COUNTRY	GWF TREE COVER LOSS	FAO% NATURAL FOREST LOSS	WORLD BANK RULE OF LAW	LABOUR RIGHTS (ITUC)	TOTAL	RISK CATEGORY
Argentina	2	3	3	2	10	High risk
Austria	1	1	1	1	4	Low Risk
Belgium	1	1	1	2	5	Medium-low risk
Brazil	3	3	2	3	11	Very high risk
Cameroon	2	3	3	3	11	Very high risk
Canada	3	2	1	2	8	Medium risk
China	3	1	2	3	9	High risk
Colombia	3	2	3	3	11	Very high risk
Côte d'Ivoire	3	2	1	3	9	High risk
Czechia	1	1	1	2	5	Medium-low risk
Ecuador	1	3	3	3	10	High risk
Finland	3	1	1	1	6	Medium-low risk
France	1	1	1	2	5	Medium-low risk
Germany	1	1	1	1	4	Low risk
Ghana	2	1	2	2	7	Medium risk
Guatemala	1	3	3	3	10	High risk
Honduras	1	3	3	3	10	High risk
India	2	1	2	3	8	Medium risk
Indonesia	3	3	3	3	12	Very high risk
Ireland	1	1	1	1	4	Low risk
Italy	1	1	2	1	5	Medium-low risk
Latvia	1	1	2	2	6	Medium-low risk
Malaysia	3	3	2	3	11	Very high risk
Nigeria	3	3	3	3	12	Very high risk
Papua New Guinea	1	2	3	3	9	High risk
Peru	3	3	3	3	12	Very high risk
Philippines	1	1	3	3	8	Medium risk
Poland	1	1	2	2	6	Medium-low risk
Romania	1	1	2	3	7	Medium risk
Russian Federation	3	2	1	3	9	High risk
Sierra Leone	2	3	3	3	11	Very high risk
Spain	1	1	2	2	6	Medium-low risk
Sri Lanka	1	3	2	3	9	High risk
Sweden	3	3	1	1	8	Medium risk
Ukraine	1	1	3	3	8	Medium risk
United Kingdom	1	1	1	2	5	Medium-low risk
Uruguay	1	1	2	1	5	Medium-low risk
USA	3	1	1	3	8	Medium risk
Viet Nam	3	1	2	3	9	High risk

6.3 CONVERSION FACTORS USED FOR SOY

See the Riskier Business report for explantion of the derivation of the conversion factors used for all commodities: https://www.wwf.org.uk/riskybusiness.

HS CODE	COMMODITY	CONVERSION FACTOR
3826	Biodiesel and mixtures thereof; not containing or containing less than 70% by weight of petroleum oils or oils obtained from bituminous minerals	0.07
206	Edible offal of bovine animals, swine, sheep, goats, horses, asses, mules or hinnies; fresh, chilled or frozen	0.18
201	1 Meat of bovine animals; fresh or chilled	0.18
202	Meat of bovine animals; frozen	0.18
203	Meat of swine; fresh, chilled or frozen	0.263
209	Pig fat, free of lean meat, and poultry fat, not rendered or otherwise extracted, fresh, chilled, frozen, salted, in brine, dried or smoked	0.263
404	Whey and products consisting of natural milk constituents; whether or not containing added sugar or other sweetening matter, not elsewhere specified or included	0.0165
207	Meat and edible offal of poultry; of the poultry of heading no. 0105, (i.e. fowls of the species Gallus domesticus), fresh, chilled or frozen	0.575
21012	Meat; salted, in brine, dried or smoked, of swine, bellies (streaky) and cuts thereof	0.263
21019	Meat; salted in brine, dried or smoked, of swine, n.e.c. in item no. 0210.1	0.263
21020	Meat; salted, in brine, dried or smoked, of bovine animals	0.263
21011	Meat; salted, in brine, dried or smoked, of swine, hams, shoulders and cuts thereof, with bone in	0.263
102	Bovine animals; live	0.18
103	Swine; live	0.263
105	Poultry; live, fowls of the species Gallus domesticus, ducks, geese, turkeys and guinea fowls	0.575
401	Milk and cream; not concentrated, not containing added sugar or other sweetening matter	0.0165
406	Cheese and curd	0.1442
408	Birds' eggs, not in shell; egg yolks, fresh, dried, cooked by steaming or boiling in water, moulded, frozen or otherwise preserved, whether or not containing added sugar or other sweetening matter	0.307
403	Buttermilk, curdled milk and cream, yoghurt, kephir, fermented or acidified milk or cream, whether or not concentrated, containing added sugar, sweetening matter, flavoured or added fruit or cocoa	0.0165
40221	other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)	0.1403
120190	Soya beans; other than seed, whether or not broken	1
120810	Flours and meals; of soya beans	1
4021	Dairy produce; milk and cream, concentrated or containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content not exceeding 1.5% (by weight)	0.1403
40229	Dairy produce; milk and cream, containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)	0.1403
40299	Dairy produce; milk and cream, containing added sugar or other sweetening matter, other than in powder, granules or other solid forms	0.033
40291	Dairy produce; milk and cream, concentrated, not containing added sugar or other sweetening matter, other than in powder, granules or other solid forms	0.033
120110	Soya beans; seed, whether or not broken	1
407	Birds' eggs, in shell; fresh, preserved or cooked	0.307
2034	Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of soya-bean oil	0.87
150710	Vegetable oils; soya-bean oil and its fractions, crude, whether or not degummed, not chemically modified	1.72
150790	Vegetable oils; soya-bean oil and its fractions, other than crude, whether or not refined, but not chemically modified	1.66

6.4 CONVERSION FACTORS USED FOR PALM OIL

See the Riskier Business report for explantion of the derivation of the conversion factors used for all commodities: https://www.wwf.org.uk/riskybusiness.

HS CODE	COMMODITY	CONVERSION FACTOR
3401	Soap; organic surface-active preparations used as soap, skin washing, in bars, cakes, moulded pieces, shapes, liquid or cream, containing soap or not; for retail, paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent	0.75
3826	Biodiesel and mixtures thereof; not containing or containing less than 70% by weight of petroleum oils or oils obtained from bituminous minerals	0.37
1517	Margarine; edible mixtures or preparations of animal or vegetable fats or oils or of fractions of different fats or oils of this chapter, other than edible fats or oils of heading no. 1516	0.24
1806	Chocolate and other food preparations containing cocoa	0.0515
1511	Palm oil and its fractions; whether or not refined, but not chemically modified	1
2105	Ice cream and other edible ice; wether or not containing cocoa	0.1
151321	Vegetable oils; palm kernel or babassu oil and their fractions, crude, not chemically modified	1
151329	Vegetable oils; palm kernel or babassu oil and their fractions, other than crude, whether or not refined, but not chemically modified	1
190510	Food preparations; crispbread, whether or not containing cocoa	0.0237
190531	Food preparations; sweet biscuits, whether or not containing cocoa	0.0935
190532	Food preparations; waffles and wafers, whether or not containing cocoa	0.1049
190540	Food preparations; rusks, toasted bread and similar toasted products, whether or not containing cocoa	0.0237
190590	Food preparations; bakers' wares n.e.c. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.01
230660	Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of palm nuts or kernels oils	1
291570	Acids; saturated acyclic monocarboxylic acids; palmitic acid, stearic acid, their salts and esters	1
120710	Oil seeds; palm nuts and kernels, whether or not broken	1
190520	Food preparations; gingerbread and the like, whether or not containing cocoa	0.01
330410	Cosmetic and toilet preparations; lip make-up	0.0156
330499	Cosmetic and toilet preparations; n.e.c. in heading no. 3304, for the care of the skin (excluding medicaments, including sunscreen or sun tan preparations)	0.0152
330510	Hair preparations; shampoos	0.0268
330420	Cosmetic and toilet preparations; eye make-up	0.0239

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6.5 CONVERSION FACTORS FOR MAIZE

See the Riskier Business report for explantion of the derivation of the conversion factors used for all commodities: https://www.wwf.org.uk/riskybusiness.

HS CODE	COMMODITY	CONVERSION FACTOR	NOTES
1005	Maize (corn)	1.00	
1904	Prepared foods obtained by swelling or roasting cereals or cereal products (e.g. corn flakes); cereals (other than maize (corn)) in grain form or in the form of flakes or other worked grains (not flour and meal), pre-cooked or otherwise prepared, n.e.c.	0.1	Not all maize products in this category, assume 10%
110220	Cereal flour; of maize (corn)	20	Yield of flour from maize is c. 5%
110313	Cereal groats and meal; of maize (corn)	4.347	Yield of medium grits is 23%
110423	Cereal grains; worked (e.g. hulled, pearled, sliced or kibbled) of maize (corn)	4.347	Yield of medium grits is 23%
110812	Starch; maize (corn) starch	1.429	Maize is 70-72% starch
151521	Vegetable oils; maize (corn) oil and its fractions, crude, not chemically modified containing added sugar or other sweetening matter, not elsewhere specified or included	28.57	Maize grains contain 2-4% oil
151529	Vegetable oils; maize (corn) oil and its fractions, other than crude, whether or not refined, but not chemically modified	28.57	Maize grains contain 2-4% oil
170230	Sugars; glucose and glucose syrup, not containing fructose or containing in the dry state less than 20% by weight of fructose, the syrup not containing added flavouring or colouring matter	0.99	One tonne maize yields 0.604 tonnes glucose
230210	Bran, sharps and other residues; of maize (corn), whether or not in the form of pellets, derived from the sifting, milling or other workings thereof	1.00	
170240	Sugars; glucose and glucose syrup, containing in the dry state at least 20% but less than 50% by weight of fructose, excluding invert sugar, the syrup not containing added flavouring or colouring matter	0.99	High Fructose Corn Syrup is made mostly from maize. In the absence of better data, the conversion for glucose syrup is used.
2207	Ethyl alcohol, undenatured; of an alcoholic strength by volume of 80% vol. or higher; ethyl alcohol and other spirits, denatured, of any strength	2.00	One tonne maize yields 0.332 tonnes ethanol. Assumes that 60% of imported ethanol is made from maize (world's largest producer, USA, uses predominantly maize and produced 53% of global ethanol, Brazil (second largest producer uses mostly sugar cane and produced 30% of global ethanol).

6.6 CONVERSION FACTORS USED FOR COCOA

See the Riskier Business report for explantion of the derivation of the conversion factors used for all commodities: https://www.wwf.org.uk/riskybusiness.

HS CODE	COMMODITY	CONVERSION FACTOR
1803	Cocoa; paste; whether or not defatted	1
180631	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, filled, weighing 2kg or less	0.41
180632	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, (not filled), weighing 2kg or less	0.41
1801	Cocoa beans; whole or broken, raw or roasted	1
1805	Cocoa; powder, not containing added sugar or other sweetening matter	1
1802	Cocoa; shells, husks, skins and other cocoa waste	1
1804	Cocoa; butter, fat and oil	1
180610	Cocoa; powder, containing added sugar or other sweetening matter	0.25
180620	Chocolate & other food preparations containing cocoa; in blocks, slabs or bars weighing more than 2kg or in liquid, paste, powder, granular or other bulk form in containers or immediate packings, content exceeding 2kg	0.18
180690	Chocolate and other food preparations containing cocoa; n.e.c. in chapter 18	0.18
1905	Bread, pastry, cakes, biscuits, other bakers' wares, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice paper and similar products	0.02

6.7 CONVERSION FACTORS USED FOR COFFEE

HS CODE	COMMODITY	CONVERSION FACTOR	NOTES
90111	Coffee; not roasted or decaffeinated	1	Fairtrade International (2013). Questions & Answers: Cocoa conversion rates for mass balance. 19 December 2013.
90112	Coffee; decaffeinated, not roasted	1.05	Fairtrade International (2013)
90121	Coffee; roasted, not decaffeinated	1.19	Fairtrade International (2013)
90122	Coffee; roasted, decaffeinated	1.25	Yield of medium grits is 23%
90190	Coffee; husks and skins, coffee substitutes containing coffee in any proportion	0.8	Fairtrade International (2013)
210112	Preparations with a basis of extracts, essences or concentrates or with a basis of coffee	0.4	No conversion factor available. Estimated from recipes for coffee extract, with assumption that common products containing some coffee essence contain c. 4% (see Risky Business Switzerland)
21011	Extracts, essences and concentrates; of coffee, and preparations with a basis of these extracts, essences or concentrates or with a basis of coffee	0.5	No conversion factor available. Estimated from recipes for coffee extract. Assume largely preparations with c. 5% coffee extract (see Risky Business Switzerland)

6.8 CONVERSION FACTORS USED FOR COCONUT

HS CODE	COMMODITY	CONVERSION FACTOR	NOTES
3307	Perfumery, cosmetic or toilet preparations; pre-shave, shaving, after-shave, bath preparations; personal deodorants and depilatories; room deodorisers, perfumed or not with disinfectant properties or not	0.044	Based on survey of top-selling products, with estimated coconut content converted from oil to coconut equivalent
3401	Soap; organic surface-active preparations used as soap, skin washing, in bars, cakes, moulded pieces, shapes, liquid or cream, containing soap or not; for retail, paper, wadding, felt and nonwov-ens, impregnated, coated or covered with soap or detergent	0.102	Based on survey of top-selling products, with estimated coconut content converted from oil to coconut equivalent
80111	Nuts, edible; coconuts, desiccated	4.4	0.68 tonnes coconut yield 0.1545 tonnes desiccated coconut
80112	Nuts, edible; coconuts, in the inner shell (endocarp)	1.538	The inner part of coconut represents 65% of the weight
80119	Nuts, edible; coconuts, fresh or dried, other than desiccated or in the inner shell (endocarp)	2.326	The meat and water represent 43% of the weight
291520	Acids; saturated acyclic monocarboxylic acids; palmitic acid, stearic acid, their salts and esters	0.1632	Coconut oil is c. 3% of oils used to produce fatty acids (see HS 151311 for oil yield)
330499	Cosmetic and toilet preparations; n.e.c. in heading no. 3304, for the care of the skin (excluding medicaments, including sunscreen or sun tan preparations)	0.059	top-selling products, with estimated coconut content converted from oil to coconut equivalent
330510	Hair preparations; shampoos	01.77	Based on survey of top-selling products, with estimated coconut content converted from oil to coconut equivalent
151311	Vegetable oils; coconut (copra) oil and its fractions, crude, not chemically modified	5.44	Yield of oil from coconut
151319	Vegetable oils; coconut (copra) oil and its fractions, other than crude, whether or not refined, but not chemically modified	5.44	Yield of oil from coconut
330420	Cosmetic and toilet preparations; eye make-up	0.070	Based on survey of top-selling products, with estimated coconut content converted from oil to coconut equivalent
1203	Copra	3.4	Yield of copra from coconut
440220	Wood charcoal (including shell or nut charcoal), whether or not agglomerated	N/A	No imports recorded in COMTRADE
570220	Carpets and other textile floor coverings; woven, (not tufted or flocked), whether or not made up, of coconut fibres (coir)	0.144	0.68 tonnes coconuts yields produces 0.13 tonnes coir. Assumes that c. 60% of the composition is coconut (ie excluding yarn, rubber backing, etc)
230650	Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of coconut or copra seed oils	1.26	1 tonne copra yields 370 kg copra cake
530810	Yarn; of coir	0.19	0.68 tonnes coconuts yields produces 0.13 tonnes coir
530511	Coconut (coir); raw, but not spun	2.326	The meat and water represent 43% of the weight
530519	Coconut (coir); processed (but not spun), tow, noils and waste	N/A	No imports recorded in COMTRADE

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6.9 CONVERSION FACTORS USED FOR TIMBER

See the Riskier Business report for explantion of the derivation of the conversion factors used for all commodities: https://www.wwf.org.uk/riskybusiness.

HS CODE	COMMODITY	CONVERSION FACTOR
4401	Fuel wood, in logs, billets, twigs, faggots or similar forms; wood in chip or particles; sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms	1.2
4402	Wood charcoal (including shell or nut charcoal), whether or not agglomerated	6
4403	Wood in the rough, whether or not stripped of bark or sapwood, or roughly square	1.1
4404	Hoopwood; split poles; piles, pickets, stakes of wood, pointed, not sawn lengthwise; wooden sticks, roughly trimmed, not turned, bent, etc., suitable for walking sticks, umbrellas, tool handles, etc.	1.8
4405	Wood wool; wood flour	1.7
4406	Railway or tramway sleepers (cross-ties) of wood	2.26
4407	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness exceeding 6mm	1.8
4408	Sheets for veneering (including those obtained by slicing laminated wood), for plywood or for similar laminated wood and other wood, sawn lengthwise, sliced or peeled, planed or not, sanded, spliced or end-jointed, of a thickness not exceeding 6 mm	3.45
4409	Wood (including strips, friezes for parquet flooring, not assembled), continuously shaped (tongued, grooved, v-jointed, beaded or the like) along any edges, ends or faces, whether or not planed, sanded or end-jointed	2.5
4410	Particle board, oriented strand board (OSB) and similar board (e.g. waferboard) of wood or other ligneous materials, whether or not agglomerated with resins or other organic binding substances	2.5
4411	Fibreboard of wood or other ligneous materials, whether or not bonded with resins or other organic substances	2.5
4412	Plywood, veneered panels and similar laminated wood	2.5
4413	Densified wood, in blocks, plates, strips or profile shapes	8
4414	Wooden frames; for paintings, photographs, mirrors or similar objects	9
4415	Packing cases, boxes, crates, drums and similar packings, of wood; cable-drums of wood; pallets, box pallets and other load boards, of wood; pallet collars of wood	2
4416	Acids; saturated acyclic monocarboxylic acids; palmitic acid, stearic acid, their salts and esters	2.5
4417	Tools, tool bodies, tool handles, broom or brush bodies and handles, of wood; boot or shoe lasts and trees, of wood	2.5
4418	Builders' joinery and carpentry of wood, including cellular wood panels, assembled flooring panels, shingles and shake	2.5
4419	Tableware and kitchenware, of wood	2.5
4420	Wood marquetry and inlaid wood; caskets and cases for jewellery or cutlery, and similar articles of wood; statuettes and other ornaments of wood; wooden articles of furniture not falling in chapter 94	2.5
4421	Wooden articles n.e.c. in heading no. 4414 to 4420	2.5
940161	Seats; with wooden frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)	2.5
940169	Seats; with wooden frames, not upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)	2.5
940330	Furniture; wooden, for office use	2.5
940340	Furniture; wooden, for kitchen use	2.5
940350	Furniture; wooden, for bedroom use	2.5
940360	Furniture; wooden, other than for office, kitchen or bedroom use	2.5
940391	Furniture; parts, of wood	2.5

6.10 CONVERSION FACTORS USED FOR BEEF & LEATHER

See the Riskier Business report for explantion of the derivation of the conversion factors used for all commodities: https://www.wwf.org.uk/riskybusiness.

HS CODE	COMMODITY	CONVERSION FACTOR
2104	Soups and broths and preparations therefor; homogenised composite food preparations	0.05
201	Meat of bovine animals; fresh or chilled	0.66
202	Meat of bovine animals; frozen	0.66
160250	Meat preparations; of bovine animals, meat or meat offal, prepared or preserved (excluding livers and homogenised preparations)	0.66
20610	Offal, edible; of bovine animals, fresh or chilled	0.47
160210	Meat preparations; homogenised preparations of meat, meat offal or blood	0.66
21020	Meat; salted, in brine, dried or smoked, of bovine animals	0.66
102	Bovine animals; live	0.62
4115	Composition leather with a basis of leather or leather fibre, in slabs, sheets or strip, in rolls or not; parings and other waste of leather or of composition leather, not suitable for the manufacture of leather articles; leather dust, powder and flour	0.128
4201	Saddlery and harness for any animal (including traces, leads, knee pads, muzzles, saddle cloths, saddle bags, dog coats and the like) of any material	0.23
4202	Trunks; suit, camera, jewellery, cutlery cases; travel, tool, similar bags; wholly or mainly covered by leather, composition leather, plastic sheeting, textile materials, vulcanised fibre, paperboard	0.23
4203	Articles of apparel and clothing accessories, of leather or of composition leather	0.23
4101	Raw hides and skins of bovine (including buffalo) or equine animals (fresh, salted, dried, limed, pickled, otherwise preserved but not tanned, parchment dressed or further prepared), whether or not dehaired or split	1
4104	Tanned or crust hides and skins of bovine (including buffalo) or equine animals, without hair on, whether or not split, but not further prepared	0.255

HS CODE	COMMODITY	CONVERSION FACTOR
6403	Footwear; with outer soles of rubber, plastics, leather or composition leather and uppers of leather	0.084
410711	Leather; further prepared after tanning or crusting, including parchment-dressed leather, of bovine (including buffalo) or equine animals, without hair on, other than leather of heading 41.14, whole hides and skins, full grain, unsplit	0.255
410712	Leather; further prepared after tanning or crusting, including parchment-dressed leather, of bovine (including buffalo) or equine animals, without hair on, other than leather of heading 41.14, whole hides and skins, grain splits	0.255
410719	Leather; further prepared after tanning or crusting, including parchment-dressed, of bovine (including buffalo) or equine animals, without hair on, split or not, other than leather of heading 41.14, (other than grain splits and full grains, unsplit)	0.255
410799	Leather; further prepared after tanning or crusting, incl. parchment-dressed, of bovine (including buffalo) or equine animals, no hair, excluding leather of heading 41.14, and whole hides and skins, and sides, (full grains, unsplit and grain splits)	0.255
410792	Leather; further prepared after tanning or crusting, including parchment-dressed, of bovine (including buffalo) or equine animals, without hair on, other than leather of heading 41.14, not whole hides and skins, but including sides, grain splits	0.255
410791	Leather; further prepared after tanning or crusting, including parchment-dressed, of bovine (including buffalo) or equine animals, without hair on, other than leather of heading 41.14, not whole hides and skins, but including sides, full grain, unsplit	0.255
8703	persons (other than those of heading no. 8702), including station wagons and racing cars	0.006
640510	Footwear; with uppers of leather or composition leather, n.e.c. in chapter 64	0.084
940120	Seats; of a kind used for motor vehicles	0.001
940161	Seats; with wooden frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)	0.022
940171	Seats; with metal frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)	0.022

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Our Mission
Together, we protect the environment and create a future worth living for generations to come.

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