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An EU legal framework to halt and reverse EU-driven global deforestation

European added value assessment

STUDY

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An EU legal framework to halt and reverse EU-driven global deforestation

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Deforestation caused by agricultural activity is continuing at an alarming rate, threatening irreplaceable tropical forests that, among other things, are crucial for fighting climate change. The EU bears its share of responsibility for this environmental loss, as it is one of the major importers of several forest-risk commodities.

To date, action has been taken at different levels to stop commodity-driven deforestation. Nevertheless, the impact on forest loss has been low as deforestation continues and new hot spots occur.

There has been a recent commitment at EU level to propose new measures to minimise the risk of deforestation and forest degradation associated with products placed on the EU market.

This European added value assessment (EAVA) accompanies the European Parliament's own-initiative legislative report calling on the European Commission to take legislative action on the matter. The EAVA looks at why EU action is needed and analyses four potential demand-side regulatory policy options at EU level. A quantitative analysis reveals that to varying extents, all options have the potential to reduce EU-driven deforestation and associated carbon emissions, while having a relatively small impact on the EU economy.

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The annexed analysis of the quantitative assessment of the European added value has been written by Cornelia Suta, Ornella Dellaccio, An Vu and Hector Pollitt of Cambridge Econometrics, at the request of the European Added Value Unit (EPRS).

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Executive summary

Background

Deforestation is taking place at alarming rates. It inflicts biodiversity loss, negatively impacts climate change through higher carbon emissions and causes other environmental, societal and even economic losses. Production of agricultural commodities, such as palm oil, soy and beef (forest-risk commodities – FRCs), is the main driver of deforestation in tropical and subtropical regions, because of the search for new areas for cropland, pastures and forest plantations. Although the majority of FRCs are produced and consumed locally, the share of deforestation from these regions embodied in exports continues to grow.

In the past three decades, different initiatives to stop deforestation have been undertaken worldwide by private and public players at all levels of government; overall, however, their effectiveness has been limited and there is scientific consensus on the need for urgent action.

Why should the EU act?

The EU is a substantial importer of forest-risk commodities, due to its consumption patterns, policy incentives and industrial needs. The EU therefore has a significant share of responsibility for global forest loss caused by international trade in FRCs.

The EU has been active in the field of international forest protection through different policy instruments (trade, environment, development). However, there is no EU law addressing the problem of deforestation and associated emissions that occur outside the EU in relation to trade in agricultural commodities. Recently, political momentum has gathered speed and EU-level intervention has been planned to minimise the risk of deforestation and forest degradation associated with products placed on the EU market. The European Commission has started to prepare the ground for such an intervention, for which there is support from stakeholders as well as the Member States. EU-level action could provide a level playing field for EU companies, as some of them have already eliminated deforestation from their supply chains, whereas others have not.

In the meantime, the European Parliament (EP) Committee on Environment, Public Health and Food Safety (ENVI) is preparing an own-initiative legislative resolution (under Article 225 of the Treaty on the Functioning of the European Union), calling on the European Commission to take legislative action on an EU legal framework to halt and reverse EU-driven global deforestation. European added value assessments (EAVAs) accompany the EP's legislative own-initiative reports in order to provide evidence-based information on possible EU intervention, and aim to estimate the potential European added value (EAV) stemming from such action.

The present EAVA looks into four possible demand-side EU-level regulatory measures that could be undertaken to eliminate deforestation and associated carbon emissions embodied in EU imports of FRCs. The policy options analysed are: i) policy option 1: mandatory due diligence, ii) policy option 2: mandatory certification standards, iii) policy option 3: mandatory certification standards with due diligence; and iv) policy option 4: mandatory labelling. The scope of the assessment is narrowed to six FRCs: palm oil, soy, beef, maize, rapeseed and sugar crops, as well as to food products and biofuels containing them.[1] It is optimistically assumed that the European Commission will present a proposal for an EU regulation in 2021, and that in 2023 the legislative process will have finished and policy measures will enter into force. The time horizon of the analysis is 2030, for the purpose of checking the extent to which the EU would have been able to eliminate products and activities leading to deforestation from its imports and supply chains by that year. Policy options are

[1] Biofuels are not considered in policy option 4, where the scope is limited to the six FRCs and food products containing them.

described in qualitative and quantitative terms. For the quantitative aspects, an assessment has been commissioned and can be found annexed to this study.

Description of key findings

All of the policy options analysed decrease deforestation and associated carbon emissions, and have a small negative effect on the EU economy in terms of a decrease in EU GDP and employment. All the results related to the impact on deforestation and associated carbon emissions should be viewed as upper bounds, because of the assumptions made.

Measures containing mandatory certification standards (policy options 2 and 3) that would be imposed on all FRC imports to the EU are the most effective in eliminating deforestation and associated carbon emissions. By bringing EU imports of FRCs to zero, deforestation and emissions would be reduced by 76 % on average compared to the baseline in the cumulative 2020-2030 period (assuming the policy is fully effective and does not have loopholes). Avoided deforestation would yield 197 500 hectares of non-deforested land and avoided carbon emissions would amount to 56 615 183 tCO_2. While it is true that these two policies involve the highest economic costs, they are relatively small, as EU GDP growth is expected to decrease by about 0.001 percentage points in the 2020-2030 period compared to the baseline (and a similar effect in percentage points is expected for employment growth). Despite their effectiveness and efficiency, these policy options might be difficult to implement, due to several potential risks. One is that the mandatory certification standards are a de facto ban on imports of commodities and products that are not certified. If deforestation is not effectively tackled at the level of the producing countries as well, it is quite likely that commodities exported to the EU will be deforestation-free certified, but deforestation will nevertheless continue because other markets with less strict environmental requirements will continue buying them.

Policy option 1 on mandatory due diligence envisages that all economic operators who place FRCs on the EU market would have to undertake a risk assessment of their merchandise throughout the supply chain. Due diligence is a process aimed at covering the whole supply chain, so it could have a potential positive effect on entities at different stages of production, processing and sales, provided they are willing and have incentives to make their activity deforestation-free. This intervention would decrease deforestation and associated carbon emissions by 62 % compared to the baseline (saving up to 160 197 ha of forest and avoiding up to 45 775 855 of CO_2t of emissions). It would also have a small negative effect on the economy (a 0.001 percentage-point reduction of GDP and an even smaller employment reduction with respect to the projected baseline in 2030). This policy option also involves some risks that could impede effective implementation and enforcement. A major one involves the difficulty in tracing products along the supply chains, including where bottlenecks occur. Establishing a mechanism that could avoid this risk would improve the feasibility of this policy option.

Mandatory labelling – policy option 4 – could help EU consumers in understanding which products might be associated with deforestation, through the use of two labels: 'no deforestation' and 'this product might be associated with deforestation'. This measure reduces deforestation and associated carbon emissions the least among all analysed options, by only 4 % compared to the baseline. It also involves the most negligible economic costs in terms of GDP decline and employment loss. This policy intervention could be considered a supportive one to the other policy options, which are more effective in reducing deforestation and emissions.

European added value is present in all four policy options and is estimated after a check against criteria of feasibility (both political and technical), effectiveness (in reducing deforestation and emissions) and efficacy (relation of achieved reduction in deforestation and emissions to economic costs of introducing intervention). Policy option 1 seems to have the highest EAV, as it is the most feasible, relatively effective and efficient one. Policy option 4 seems to have the lowest EAV.

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1. Introduction

The purpose of this European added value assessment (EAVA) is to support the European Parliament's (EP) report on a legislative own-initiative proposal on an EU legal framework to halt and reverse EU-driven global deforestation (2020/2006(INL)).[2] The report was initiated by the Committee on Environment, Public Health and Food Safety (ENVI) in accordance with Article 225 of the Treaty on the Functioning of the European Union (TFEU), which gives the EP a right to request the European Commission (EC) to take legislative action in a particular area. Under the associated committee procedure,[3] the Committee on International Trade (INTA) is in charge of some trade policy aspects. The report is planned to be voted upon at the end of September 2020 in the ENVI committee and later in the autumn in plenary session.

In accordance with Article 10 of the Interinstitutional Agreement on Better Law-Making of 13 April 2016, the EC should respond to an EP request for proposals for EU acts within three months, by indicating if it plans on adopting a specific communication.[4] If the EC decides not to submit such a proposal in response to an EP request, it explains the grounds for its decision in a detailed reply to the EP. This reply should include a response to the analysis of the potential European added value of the measure(s) requested.

1.1. Structure, scope and method

This EAVA aims to provide a scientifically based assessment of the potential impacts of selected EU-level regulatory actions targeting global deforestation and forest degradation[5] driven by EU demand for agricultural commodities. These commodities are the main driver of deforestation in tropical and subtropical zones.[6] The EAVA seeks to assess the extent to which the analysed policy options could reduce the deforestation embodied[7] in EU imports of agricultural commodities. The EAVA also tries to comparatively estimate (both qualitatively and quantitatively) a European added value (EAV) of those policy actions.

EAV is understood as a positive net benefit if an action can be better achieved at EU level compared to Member-State level. EAV is therefore inseparable from the principles of subsidiarity and proportionality.

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2 https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?lang=&reference=2020/2006(INL)

3 According to Rule 57 of the European Parliament Rules of Procedure.

4 Interinstitutional Agreement between the European Parliament, the Council of the European Union and the European Commission on Better Law-Making

5 This EAVA defines 'deforestation' as changes in natural and planted forest due to human activities as well as due to natural causes. Furthermore, it defines 'forest' as an area with a minimum threshold of 30 % canopy cover. These definitions correspond to the ones used in the quantitative assessment that underpins this EAVA (see the study in the Annex), and their choice is related to the selected Global Forest Watch dataset, on which calculations have been based. It does not mean that it is a recommended definition for a future EU intervention.

6 COWI, Ecofys, Milieu, 2018. Feasibility study on options to step up EU action against deforestation Part I and Part II. Final report. Publications Office of the European Union, Luxembourg.

7 'Embodied deforestation' is understood to have the same meaning as given to this notion by the European Commission in its 2013 study on The impact of EU consumption on deforestation: Comprehensive analysis of the impact of EU consumption on deforestation. The study was funded by DG ENV of the European Commission, and was carried out by VITO, IIASA, HIVA and IUCN NL.

This assessment is organised along the following logic:

- firstly, it presents the problem of global deforestation, its link to climate change and its key drivers;
- secondly, it presents the reasons for taking action at EU level and outlines the current action taken by different actors and its limitations;
- thirdly, it presents a selection of possible EU legislative actions related to the demand side of global value chains, which could help to halt and reverse deforestation;
- fourth, it outlines the European added value of a possible EU intervention.

The scope of this EAVA is limited to demand-side policy options addressing EU-driven deforestation. Given the variety of demand-side measures that could be potentially adopted at EU level[8], this EAVA has focused primarily on those linked to commercial agriculture production, seen as the main cause of EU-driven deforestation according to the relevant literature.[9] Quantifications of impacts of the policy options are based on an analysis of EU imports of six forest-risk commodities (FRC)[10] and their supply chains: beef, maize, palm oil, rapeseed, soy and sugar crops. This commodity selection was based on the available literature and the following main criteria:

- deforestation risk associated with the production of these commodities;
- EU being an important global importer of these commodities;
- data availability as well as practical considerations linked to fitting data into the modelling framework.[11]

In the quantitative assessment of policy options, biofuel imports are also analysed alongside the above agricultural commodities.

Timber and timber-based products are not included in the scope of this assessment, as EU legislation for the prevention of deforestation from illegally sourced timber is in place.[12]

It needs to be acknowledged that the above-mentioned narrowing-down of the scope creates a limitation with regard to making the total assessment of impacts and estimating the EAV of the analysed policy options. First, because it leaves behind other drivers of deforestation, such as infrastructure development, mining and urban expansion. Second, because some other important forest-risk commodities imported into the EU, such as cocoa, coffee and rubber, cause deforestation as well, but could not be studied here.[13]

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8 See a selection of EU demand-side measures presented in: i) COWI, Ecofys, Milieu, 2018. Feasibility study on options to step up EU action against deforestation Part I and Part II. Final report. Publications Office of the European Union, Luxembourg, ii) European Commission, 2012. The impact of EU consumption on deforestation: Proposal of specific Community policy, legislative measures and other initiatives for further consideration by the Commission - Final report, Study funded by the European Commission, DG ENV, and undertaken by VITO, HIVA and IUCN NL. European Commission, DG ENV, Brussels.

9 COWI, Ecofys, Milieu, 2018. (op. cit.); Pendrill F., *et al.* (2019b), Agricultural and forestry trade drives large share of tropical deforestation emissions, Global Environmental Change, Volume 56, May 2019, pp. 1-10.

10 Forest risk commodities are defined as in the quantitative assessment that underpins this EAVA: Cambridge Econometrics (2020), C. Suta, O. Dellaccio, A. Vu and H. Pollitt, Quantitative assessment of European added value of an EU legal framework to halt and reverse EU-driven global deforestation, European Parliament (see Annex). The definition is based on the one used in the COWI, Ecofys, Milieu, 2018, (op. cit.) and means commodities associated with deforestation or forest degradation; higher production of these commodities means increase in deforested land.

11 For details on data selection, see Chapter 3.2. Data in the Cambridge Econometrics (2020) study in Annex.

12 Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market Text with EEA relevance

13 On the identification of the main FRCs that provoke deforestation, see: i) COWI, Ecofys, Milieu, 2018. (op. cit.), Pendrill, F. *et al.* (2019a), Deforestation displaced: trade in forest-risk commodities and the prospects for a global forest

The four policy options analysed in section 3 of this EAVA and in the quantitative assessment study in the Annex[14] are the following:

- Policy option 1: mandatory due diligence for operators placing on the EU market forest risk commodities;
- Policy option 2: sustainability criteria for imported forest risk commodities with mandatory certification;
- Policy option 3: mandatory due diligence with sustainability criteria for imported forest-risk commodities with mandatory certification – a combination of policy options 1 and 2;
- Policy option 4: mandatory labelling of food products containing forest-risk commodities.

1.2. Background – What is the problem?

Global deforestation[15] and forest degradation[16] continue at an alarming rate.[17] It is estimated that over half of the tropical forests worldwide have been destroyed since the 1960s.[18] A clear causal link between international demand for agricultural commodities and deforestation has been confirmed. The next sections explain why deforestation is a global problem and what its magnitude is. They also describe the main drivers of deforestation and provide an estimate of proportions of EU demand-driven deforestation.

transition, Environ. Res. Lett.; and ii) the dataset: Pendrill, F., Persson, U.M., Kastner, T., 2020. EU imports of embodied deforestation 2005-2017. Chalmers University of Technology, Senckenberg Society for Nature Research, SEI, and Ceres Inc. (available from the authors upon request).

14 Cambridge Econometrics (2020), op. cit. (see the Annex).

15 There are different definitions of *deforestation* (often due to differences in national definitions of *forest*). It generally means a permanent change from *forest* to other land use, whether it is human-induced or not. The FAO defines *deforestation* as the conversion of forest to other land use independently, whether human-induced or not. This might mean a conversion to agriculture but also other impacts, due to which the forest cannot sustain a canopy cover above the 10 percent threshold that defines a forest. For more FAO definitions, see: FAO. 2020. Global Forest Resources Assessment 2020 – Terms and Definitions FRA 2020. Forest Resources Assessment Working Paper 188. Rome, 2018.

16 Forest degradation can be generally defined as 'the reduction of the capacity of a forest to provide goods and services', FAO, 2011, Assessing forest degradation. Towards the development of globally applicable guidelines. Forest Resources Assessment Working Paper 177. Rome, December 2011.

17 FAO and UNEP, 2020, The State of the World's Forests 2020. Forests, biodiversity and people. Rome.

18 ICUN, Deforestation and forest degradation, Issues Brief. November 2017.

1.2.1. Global deforestation

Figure 1: Tropical primary forest loss, 2002-2019

Source: Global Forest Watch, 2019.

The latest estimates show that during the past decade, 11 million hectares of forest globally were deforested on average per year, which corresponds roughly to the territory of Bulgaria. However, there is no scientific consensus on the current deforestation trend, as one major global assessment shows a trend of slowing down, whereas another shows a reverse one.[19] Nevertheless, there is a scientific consensus that since 1990 global net forest area has been decreasing.[20] Deforestation is especially disturbing in zones where it occurs in primary tropical forests, which are of highest irreplaceable value because of their undisturbed, natural state.

Although tropical forest loss[21] decreased in 2019, it registered the third-highest annual loss rate (3.8 million hectares) since the beginning of the 21st century (Figure 1). It is the same as if throughout that single year, a football field of tropical primary forest was lost every six seconds.[22] In the past two decades, the biggest tropical forest loss has taken place in Africa and South America.[23] In Africa, the annual net forest area loss has been constantly increasing since 1990, while in South America it has slowed down in the past decade.[24] It is argued that tropical primary forest loss (even though it does not account for restoration or regeneration) is most important because of its long-term impact and the critical role of tropical primary forests on our planet. Therefore, even a gross rate of loss of these forests should be treated the same as a net loss because they cannot be restored within a human timeframe.[25]

Forest loss, even if not permanent, means a severe disruption of ecosystem services that could take from decades to centuries to fully recover. Forests provide habitat for 80 % of the world's

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19 See more on this discrepancy in: Olsson, L. (et al.) 2019: Land Degradation. Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla et al. (eds.)]. In press. p. 368.

On challenges to measure, monitor and report on primary forests see: FAO. 2020. Global Forest Resources Assessment 2020 – Key findings. Rome.

20 FAO defines *net forest area change* as the sum of all forest losses (deforestation) and all forest gains (forest expansion) in a given period. The net forest area is decreasing in the tropics and increasing outside the tropics (e.g. in Europe). Olsson, L. (et al.) 2019: Land Degradation. (op. cit.).

21 *Forest loss* (or *tree cover loss* – a broader term that includes all tree canopy loss including from plantation forest), is often used in the literature on deforestation and implies a more temporary character of loss due to both human activity and natural processes, after which forest can regenerate. It means that *forest loss* (or *tree cover loss*) can but does not have to lead to deforestation. See more in: NYDF Assessment Partners. (2019). Protecting and Restoring Forests: A Story of Large Commitments yet Limited Progress. New York Declaration on Forests Five-Year Assessment Report. Climate Focus (coordinator and editor). Accessible at forestdeclaration.org and in Global Forest Watch, How does GFW define key terms?

22 Global Forest Watch, We Lost a Football Pitch of Primary Rainforest Every 6 Seconds in 2019.

23 FAO and UNEP, 2020. (op. cit.) and NYDF Assessment Partners. (2019). (op. cit.)

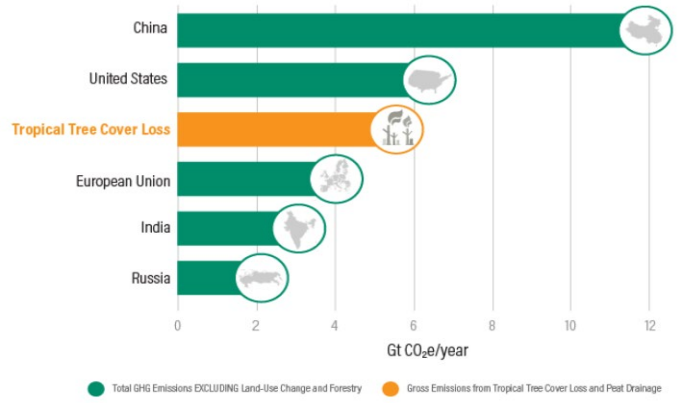
24 FAO. 2020. Global Forest Resources Assessment 2020 – Key findings. Rome.

25 NYDF Assessment Partners. (2019). (op. cit.).

documented species as well as regulate climate and water flows.[26] They also provide social, cultural and economic benefits and indispensable services. The livelihood of over a quarter of the world's population (1.6 billion people) depends on different forest resources.[27] In countries with a weak rule of law, where land tenure rights are often not respected, indigenous populations are at risk of losing access to forest resources, which are key for their culture, heritage and subsistence.[28]

The causal link between deforestation and climate change is particularly important. On one hand, deforestation drives climate change by provoking an increase in greenhouse gas (GHG) emissions and through the reduced rates of carbon uptake.[29] On the other hand, climate change is expected to impact forests' vulnerability to different disturbances (e.g. fire, drought, landslides, species invasions, insect and disease outbreaks, and storms such as hurricanes, windstorms and ice storms) as well as affect their frequency, intensity, duration, and timing.[30] The rate of the contribution of forest degradation and deforestation to global carbon dioxide (CO_2) emissions is yet uncertain and is estimated between 25 % and nearly 70 % depending on assessment.[31] Estimates based on annual gross CO_2 emissions from tropical tree cover loss and peat drainage tropical zones outgrow the total CO_2 emissions of some of the main emitters including the EU (Figure 2).

Figure 2: If tropical deforestation were a country, it would rank third in CO_2e emissions



Source: Global Forest Watch – World Resources Institute after Seymour & Busch, 2016, *By the Numbers: The Value of Tropical Forests in the Climate Change Equation*, October 5, 2018.

1.2.2. Commodity-driven deforestation and forest degradation

Global demand for agricultural products puts pressure on forests and leads to their conversion into pastures and agriculture land.[32] The underlying factors are global population growth, agricultural development, land-tenure security, and the governance of land-use change.[33]

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26 WWF, Tropical Rainforests, website.

27 Food and Agriculture Organisation of the United Nations (FAO), Forests and poverty reduction, website.

28 See e.g. Human Rights Watch (2019), Rainforest Mafias: How Violence and Impunity Fuel Deforestation in Brazil's Amazon. September 2019.

29 Olsson, L. (et al.) 2019: Land Degradation. (op. cit.)

30 FAO. 2008. Climate change impacts on forest health. Forest Health & Biosecurity Working Papers FBS/34E. Rome.

31 European Commission, EU Science Hub, Forestry, website. Last update: 07/08/2019.

32 Moreover, global agricultural land expansion is expected to continue increasing by 2050, but estimates vary. See literature overview in COWI, Ecofys, Milieu, 2018. (op. cit.), Part I, p. 46.

33 FAO. (2016). State of the world's forests. Forests and agriculture: land-use challenges and opportunities. Rome.

Agricultural and pasture-land expansion into previously forested land is acknowledged as a dominant driver of deforestation especially in the tropical and subtropical regions. [34] A part of this expansion is driven by national demand for agricultural commodities (local and subsistence agriculture) and another by international demand (commercial agricultural production for export). It is estimated that between 2000 and 2010, large-scale commercial agriculture (primarily cattle-ranching and the cultivation of soya bean and oil palm) provoked 40 % of tropical deforestation, and local subsistence agriculture 33 %.[35]

The main drivers of forest degradation are unsustainable forest management practices that allow the extraction of forest products (e.g. timber, fuel wood, charcoal), further exacerbated by natural degradation causes like climate change, wildfires, pests and diseases.[36]

According to a recent study[37] that sought to distinguish gross tree cover loss from permanent deforestation, 27 % (equal to approximately 5 million ha per year) of gross global tree cover loss was caused by commodity driven deforestation (i.e. led to a long-term, permanent conversion of forest and shrubland to a non-forest land-use, such as agriculture (including oil palm cultivation), mining, or energy infrastructure) between 2001 and 2015. However, these findings vary strongly depending on the region of the world, with rates of commodity-driven deforestation being the highest in Latin America and south-east Asia. Moreover, shifting agriculture that is practiced by local communities (involving the clearing and burning of land for short-term cultivation of subsistence crops), was associated with 24 % of global tree cover loss.[38] This practice, which is predominant in Africa (93 %), may result in forest regeneration, but it may also result in forest degradation and varies from place to place.[39]

The data underlying this study have been updated for the 2016-2018 period;[40] they have furthermore confirmed the previous trends, where commodity-driven deforestation was the main cause of tree loss in Latin America (59 %) and south-east Asia (80 %). (Figure 3).

These findings seem coherent with the findings of another scientific analysis (looking at a time span between 2005 and 2013) on deforestation in tropical and subtropical countries due to trade in FRCs.[41] It showed that 62 % (or 4.5 million ha per year) of forest loss across tropics and subtropics was attributed to the expansion of agricultural and tree plantations for production of commodities. The remaining 38 % (3.4 million ha per year) of forest loss was likely due to forestry (logging) and natural forest loss (e.g. wildfires). It indicated that two countries (Brazil and Indonesia) together accounted for 44 % of the deforestation attributed to expanding cropland, pastures and tree plantations over the studied period.

That same scientific analysis revealed that between 2005 and 2013, cattle meat production, soybeans, palm oil and forestry products were associated with 70 % of total deforestation due to the expansion of agricultural land and forestry in tropical and subtropical countries. Cattle meat production (beef) accounted for more than 40 % of embodied deforestation, and forestry products,

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34 FAO. (2016). State of the world's forests. Forests and agriculture: land-use challenges and opportunities. Rome.

35 FAO and UNEP. 2020. The State of the World's Forests 2020. Forests, biodiversity and people. Rome.

36 COWI, Ecofys, Milieu, 2018, op. cit.

37 Curtis *et al.*, Science 361, 1108–1111 (2018).

38 Curtis *et al.* (op. cit.)

39 Other global tree cover loss that was not accounted for in terms of permanent deforestation was due to forestry (26 % predominant in Europe and North America) and wildfires (23 % concentrated in the northern hemisphere). Urbanisation accounted for 0.6 % of the global tree cover loss.

40 Global Forest Watch, Agriculture Drove Recent Record-Breaking Tree Cover Loss.

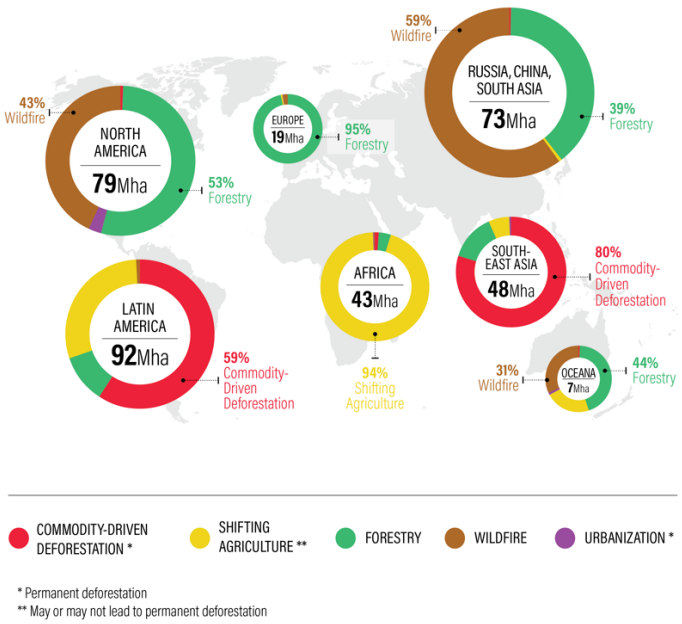
41 Florence Pendrill *et al.* (2019a), op. cit.

palm oil and a group of 'other cereals' (including maize and soybeans) accounted for another 40 % of total embodied deforestation.[42] However, commodities embodying deforestation were varying between countries and continents. Crops, such as rubber, sugar, coffee and cacao, although accounting in total for less than 5 % of total deforestation, were the dominant driver of deforestation in certain African and Asian countries.

Although the scientific analysis estimated that over the studied period deforestation was predominantly driven by national consumption of the producer countries, 26 % of the embodied deforestation from tropical and subtropical countries was exported.[43] Among the most exported commodities were palm oil, soybeans, tree nuts and 'other crops, which accounted for 63-77 % of all FRCs exported from tropics and subtropics).[44] Cattle meat (although mainly consumed nationally in producer countries) accounted for 18 % of the total deforestation embodied in exports.

The EU, US, China and Japan are among the main importers of embodied deforestation. In recent decades, there has been a substantial increase in the volume of China's imports of some FRCs (e.g. soy).

Figure 3: Regional tree cover loss by driver, 2001-2018



Source: Global Forest Watch, 2020.

1.2.3. Illegal deforestation for commercial agricultural exports

An additional externality of production and trade in FRCs is that they originate from illegally deforested land. A study published in 2014 estimated that almost half of all tropical deforestation between 2000 and 2012 was due to the illegal conversion of forests for commercial agriculture, and 24 % was the direct result of illegal agro-conversion for export markets. Around half of all commodities produced on that illegally deforested land were exported (the other half was consumed on local markets).[45] The study linked 65 % of Brazilian beef exports, 9 % of Argentinian beef exports, 41 % of Brazilian soy exports, 5 % of Argentinian soy exports and 30 % Paraguayan soy exports with illegal deforestation.

42 Florence Pendrill *et al.* (2019a), op. cit.

43 Florence Pendrill *et al.* (2019a), op. cit.

44 Florence Pendrill *et al.* (2019a), op. cit.

45 Lawson S. (2014), Consumer Goods and Deforestation: An Analysis of the Extent and Nature of Illegality in Forest Conversion for Agriculture and Timber Plantations, Forest Trends, September 2014.

Although the latest analyses show a decline in illegal logging in Indonesia since the previous decade[46], the situation in Brazil seems less optimistic. In the first three months of 2020, a rise in deforestation and illegal logging in Brazil has been reported with a 51 % upwards trend compared to the same period in the previous year.[47] Brazil's problems with land-tenure protection and law enforcement have been known for years, and have been compounded by land-grabbing.[48] What is more, the situation is expected to get worse as a result of the coronavirus crisis. With reduced environmental enforcement, there is a risk that even more land will be illegally deforested. The EU Expert Group dealing with the EU Timber Regulation concluded at the end of 2018 – and has upheld its conclusion since – that there is a serious risk of illegally harvested timber entering the supply chain in Brazil.

1.3. Why is the EU a part of the problem?

The EU has its share of responsibility for commodity-driven and illegal deforestation that stems from its consumption of FRCs. A substantial volume of the commodities imported into the EU from tropical and sub-tropical zones is associated with deforestation and forest degradation.

1.3.1. EU demand-driven deforestation

Studies for the European Commission published in 2013 estimated that between 1990 and 2008 the EU was responsible for 10 % of the global embodied deforestation consumption driven by imports, and that 'deforestation within the EU is negligible'.[49] Compared to the US and China, the EU has the highest embodied deforestation imports share per capita.[50] Moreover, other assessments concluded that between 2000 and 2012 the EU was one of the biggest importers of commodities grown on illegally cleared land in the tropics.[51]

The EU is among the major global importers of a number of FRCs, such as palm oil (27 %), maize (30 %), sugar (14 %), beef (12 %) and soy (10 %).[52] For some other commodities, such as cocoa and coffee, the EU is the world's biggest importer, representing a share of over 60 % and 50 % respectively.[53]

EU consumption of FRCs depends on different economic (size of economy and relevant industries), social (consumption patterns) and political conditions (national legislation that incentivises FRCs consumption).[54] Some EU countries process coffee, cocoa and palm oil and re-export[55] them. The

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46 FAO and UNEP. 2020, op. cit. p. 94.

47 UNEP-WCMC, Briefing Note for the Competent Authorities (CA) implementing the EU Timber Regulation, February-May 2020.

48 See e.g. Human Rights Watch (2019), op. cit.

49 European Commission, 2013, op. cit.

50 Lawson S. (2015), Stolen Goods: The EU's complicity in illegal tropical deforestation, FERN, March 2015.

51 Lawson S. (2015), op. cit.

52 Cambridge Econometrics (2020), op. cit. (see Table 2 in the Annex).

53 IDH (2020), The urgency of action to tackle tropical deforestation. February 2020. Prepared for IDH by FACTS Consulting, COWI A/S and AlphaBeta Singapore. IDH: Utrecht, the Netherlands.

Data for 2016 imports, EU-28 plus the four EFTA countries.

54 IDH (2020), op. cit.

55 EU countries re-export a minor share of the main FRCs imports (less than 15 %). IDH (2020), op. cit.

Renewable Energy Directive (2009/28/EC),[56] which encourages the use of biofuels as renewable energy sources especially in transport, has substantially increased EU demand for commodities used for producing bioliquids (especially palm oil for biodiesel).

Deforestation (tropical and subtropical) embodied in EU imports comes predominantly from beef, soy and palm oil.[57] In the studied period (2000-2012), nine EU countries (plus three other European ones) were identified as the main EU FRCs net importers, which, if they eliminated importing products linked with deforestation, would have the biggest impact on removing EU import embodied deforestation.[58]

Corresponding results relate to commodity-driven illegal deforestation.[59] In the same studied period as above, it is possible that EU imports accounted for the illegal clearing of up to 2.4 million ha. Around half of the illegally cleared land was used for producing palm oil, 28 % for producing beef and 23 % for soy, all of them for EU imports. Some 85 % of illegal deforestation embodied in EU imports throughout these 12 years originated in just two producing countries – Brazil (60 %) and Indonesia (25 %).

Research focused on FRCs supply chains has shown that it is not necessarily the quantity of FRCs imported that increases deforestation risk but the 'sourcing pattern'. TRASE data for the soy supply chain from Brazil (2011–2016) revealed that although EU countries imported much less Brazilian soy than the two main global consumers (Brazil and China), the deforestation risk of EU imports was often associated with a higher deforestation risk per tonne.[60] This was due to the fact that the companies importing the soy on the EU market were sourcing it from high deforestation-risk regions.

Only a part of FRCs imported to the EU are sourced sustainably and are covered by standards that have actually been adopted by the companies along the supply chain. However, there is no EU-wide data source on 'sustainable imports'. Data available for EU Member States come from standard-setting associations but are scattered, cover only countries in which corporate actors are members of a deforestation-free standard and are available only for palm oil, soy and tropical timber among the major FRCs.[61] In 2017, 74 % of palm oil imported to Europe was certified.[62] Deforestation-free soy represented 13 % of all EU imports of this commodity in 2017.[63]

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56 A revised Directive (EU) 2018/2001 was adopted in 2018 and together with the Commission Delegated Regulation (EU) 2019/807, it tries to address the negative environmental impact of biofuels production and aims to halt and eventually eliminate (with some exceptions) palm oil-based biofuels from the transport energy mix by 2030.

57 This finding is common for different studies looking at different time spans. See, e.g. COWI, Ecofys, Milieu, 2018. (op. cit.), Part II, p.31 and Florence Pendrill *et al.*, op. cit.

58 IDH (2020) (op. cit.). The net imports (to satisfy local demand) are total imports minus re-exports. The nine EU countries analysed in the IDH (2020) study are: Belgium, Denmark, France, Germany, Italy, the Netherlands, Poland, Portugal and Spain. The study also analysed Norway, Switzerland and the UK. The study distinguished eight main FRCs according to their importance as EU imports: beef, cocoa, coffee, palm oil, rubber, soy, tropical timber and wood pulp.

59 Lawson S. (2015), op. cit.

60 Trase (2018), Trase Yearbook 2018, Sustainability in forest-risk supply chains: Spotlight on Brazilian soy, https://yearbook2018.trase.earth/, Transparency for Sustainable Economies, Stockholm Environment Institute and Global Canopy.

61 IDH (2020) (op. cit.). This means that there is no country-level data for sustainably sourced commodities such as beef, cocoa, coffee, rubber and wood pulp.

62 European Sustainable Palm Oil (2019). Choosing sustainable palm oil – progress report on the import and use of sustainable palm oil in Europe. The certified imports were predominantly used for food including relatively small volumes for feed and the oleochemical industry.

63 IDH and IUCN NL (2019). European Soy Monitor. Researched by B. Kuepper and M. Riemersma of Profundo. Utrecht and Amsterdam: The Sustainable Trade Initiative and IUCN National Committee of the Netherlands.

Deforestation embodied in imports also means embodied emissions (Figure 4). The EU is a substantial contributor to GHG emissions from global deforestation and peat drainage in countries where FRCs are produced. For some EU countries (and other FRCs importers), GHG emissions associated with trade in FRCs amount to more than half of the national agricultural emissions. In some countries, they even exceed national agricultural emissions (e.g. Luxemburg and Belgium) but are not taken into account in national GHG inventories. When looking at the EU food consumption carbon footprint, 15 % comes from deforestation emissions.[64]

Figure 4: European countries' imported deforestation-related carbon emissions

Source: IDH (2020). February 2020. Prepared for IDH by FACTS Consulting, COWI A/S and AlphaBeta Singapore. IDH: Utrecht, the Netherlands.

[64] Pendrill F., *et al.* (2019b), Agricultural and forestry trade drives large share of tropical deforestation emissions, Global Environmental Change, Volume 56, May 2019, pp. 1-10.

2. Current framework addressing deforestation and its limitations

2.1. EU commitments towards stopping global deforestation

The EU's engagements to halt and reverse global deforestation stem from different commitments. At global level, the EU joined the New York Declaration on Forests in 2014.[65] The declaration sets a global timeline to cut natural forest loss in half by 2020, and strives to end it by 2030. It laid out 10 goals that went beyond elimination of deforestation from agricultural commodities supply chains. The EU also committed to protecting global forests under the UN sustainable development goals (Goal 15) and the Paris Agreement (Article 5).

2.2. EU-level framework addressing global deforestation

2.2.1. Existing EU-level framework

The EU has already introduced some direct regulatory measures to tackle the problem of imported deforestation. They are primarily addressed at eliminating forest products coming from illegal deforestation. In 2003, the European Commission adopted the Forest Law Enforcement, Governance and Trade (FLEGT) Action plan covering both supply and demand-side measures to fight illegal logging and associated trade. In 2005, the EU adopted the FLEGT Regulation; by signing with third countries the voluntary partnership agreements (VPAs) envisaged under the regulation, the EU is able to control the entry of timber to its territory from such countries.[66] So far, only Indonesia has received access to the EU market through licensing that verifies the legality of its timber and timber products' exports. The EU Timber Regulation adopted in 2010, which prohibits putting on the EU market wood and certain wooden products that come from illegal logging, has complemented this framework. Under this regulation, economic operators that put these products on the EU market undergo and implement due diligence to verify the legality of their sourced timber. Companies either conduct the risk assessment on their own or rely on voluntary schemes that guarantee sourcing legal timber.

The EU also acts through its other policies on protecting world forests.[67] EU trade agreements include chapters on trade and sustainable development with binding provisions on environmental protection, climate change, biodiversity and forests. The EU is also the biggest development assistance donor, and the promotion of sustainable agricultural value chains to halt, prevent and reverse deforestation is among the guiding principles of its development cooperation. The EU also supports sustainable forest management, afforestation and reforestation projects. For example, it supports initiatives, such as the Reduced Emissions from Deforestation and forest Degradation (REDD+) that aim to reduce GHG emissions by combatting tropical deforestation on the ground.

In 2008, a European Commission communication on deforestation and forest degradation advocated for EU action to help reduce gross tropical deforestation by 50 % by 2020 (compared to

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65 https://unfccc.int/sites/default/files/new-york-declaration-on-forests_26-nov-2015.pdf

66 Council Regulation (EC) No 2173/2005 of 20 December 2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community.

67 European Commission, EU Communication on Stepping up EU Action to Protect and Restore the World's Forests, COM/2019/352 final.

2008) and halt global forest loss by 2030.[68] The same goals were repeated in 2013 in the EU 7th Environmental action programme for the period up to 2020.

The EU 2009 Renewable Energy Directive (RED) set sustainability criteria ensuring that the biofuels it promotes do not directly originate from agricultural expansion into forests and other valuable ecosystems. Later, the RED was revised as Directive (EU) 2018/2001 (RED II), and the mandatory EU sustainability criteria on biofuels were extended for the period 2021-2030 to all bioenergy end-users (including heating, cooling and electricity. The supporting Commission Delegated Regulation (EU) 2019/807 was adopted with the aim to address the negative environmental impact of biofuels production from indirect land-use change and to halt and eventually eliminate (with some exceptions) palm-oil based biofuels from the transport energy mix by 2030.

The European Parliament has repeatedly called on the European Commission to step up EU action against global deforestation. In the previous legislature, it reaffirmed its stance in a resolution of 4 April 2017 on palm oil and deforestation of rainforests[69] and in a resolution of 11 September 2018 on transparent and accountable management of natural resources in developing countries: the case of forests.[70]

On 23 July 2019, the European Commission adopted an EU communication on stepping up EU action to protect and restore the world's forests.[71] This document sets five priorities and an action plan to be implemented by the European Commission, the Member States, regional and local authorities, industry and civil society in order to accomplish these priorities. The new European Commission has clearly confirmed that it is planning to take legislative action at EU level against global deforestation. This stance was confirmed in the communication on the European Green Deal, which said that measures to support deforestation-free value chains would be presented in the course of 2021 and in the inception impact assessment on 'Minimizing the risk of deforestation and forest degradation associated with products placed on the EU market', which was published in early 2020.[72]

At the end of 2019, EU environment ministers, supported the Commission communication on stepping up action to protect the world's forests and its five priorities. It provided political guidance on the issue.[73]

In its resolution of 15 January 2020 on the European Green Deal, the Parliament called on 'the Commission to present, without delay, a proposal for a European legal framework based on due diligence to ensure sustainable and deforestation-free supply chains for products placed on the EU market, with a particular focus on tackling the main drivers of imported deforestation and instead encouraging imports that do not create deforestation abroad'.[74]

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68 European Commission, Addressing the challenges of deforestation and forest degradation to tackle climate change and biodiversity loss, COM(2008)0645 final.

69 European Parliament resolution of 4 April 2017 on palm oil and deforestation of rainforests (2016/2222(INI)).

70 European Parliament resolution of 11 September 2018 on transparent and accountable management of natural resources in developing countries: the case of forests (2018/2003(INI)).

71 European Commission, EU communication on stepping up EU action to protect and restore the world's forests, COM/2019/352 final.

72 European Commission, Inception Impact Assessment, Minimising the risk of deforestation and forest degradation associated with products placed on the EU market, 5 February 2020.

73 Council of the EU, Council conclusions on the communication on stepping up EU action to protect and restore the world's forests, 16 December 2019.

74 European Parliament resolution of 15 January 2020 on the European Green Deal (2019/2956(RSP)).

The European Commission has addressed some aspects of the problem of deforestation in other regions of the world provoked by EU action in the Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system and in the EU Biodiversity Strategy for 2030 both published in May 2020.[75]

The Commission is currently preparing a legislative initiative on 'Minimising the risk of deforestation and forest degradation associated with products placed on the EU market'. The initiative is aimed at minimising 'the EU's contribution to deforestation and forest degradation worldwide and promote the consumption of products from deforestation-free supply chains in the EU'. During the impact assessment, different regulatory and non-regulatory policy interventions will be analysed, including mandatory labelling, voluntary commitments and labelling, due diligence, verification schemes and bilateral agreements with producing countries.

2.2.2. Limitations of the existing EU-level framework

The existing EU regulatory and policy framework aimed at stopping global deforestation is incomplete and has not achieved its set goals thus far. The EU has not reached the zero-deforestation commitment pledged in several initiatives. Moreover, it is estimated that the global climate goals of keeping the temperature rise below 2 degrees Celsius cannot be achieved without preserving and restoring global forests.[76]

Current EU regulatory acts address only illegal logging (EUTR) as well as biofuels and bioenergy sources (RED II). The EUTR, although being a potential example of how to extend anti-deforestation measures to other commodities, is facing challenges related to implementation and enforcement.[77] The RED II, although having extended the application of sustainability criteria to all energy end-uses (than only biofuels) beyond 2020, stays limited to raw materials used for bioenergy production.

Therefore, the current EU frame framework is highly fragmented, covers only a specific, limited set of commodities and, as evidence suggests, contributes to stopping global deforestation only to a very limited extent, unfortunately.

2.3. Action at EU Member-State level addressing global deforestation

2.3.1. Current action at Member-State level

Several European countries (including EU Member States) signed in 2015 the two non-legally binding Amsterdam declarations (on deforestation and on palm oil) aimed at eliminating deforestation from their supply chains by 2020.[78] The signatories – Denmark, France, Germany, Italy, the Netherlands, Norway and the United Kingdom – promote eliminating deforestation from global

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75 European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system. COM/2020/381 final and European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. EU biodiversity strategy for 2030 bringing nature back into our lives. COM/2020/380 final.

76 New York Declaration on Forests, Progress on the New York Declaration on Forests – Protecting and Restoring Forests – A Story of Large Commitments yet Limited Progress, five-year assessment report, 2019.

77 European Commission, Report from the Commission to the European Parliament and the Council, Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market (the EU Timber Regulation), Biennial report for the period March 2015 - February 2017, COM/2018/668 final.

78 https://ad-partnership.org/about/

supply chains and supporting the private sector goal of zero-net deforestation. The declarations build on the vision of the New York Declaration on Forests for joint action by all stakeholders.

Nine EU Member States (Belgium, Denmark, France, Germany, Italy, the Netherlands, Poland, Portugal and Spain) and three other European countries (Norway, Switzerland and the UK) have been identified in the literature as having the biggest impact on deforestation embodied in European imports. [79] They have the potential to stop this process, because they are major importers and consumers of FRCs (some even at global scale). These 12 countries represent more than 95 % of regional net imports of cocoa and soy, more than 90 % of palm oil and timber and over 80 % of beef, coffee, wood pulp and over 70 % of rubber.[80]

Some EU governments, mainly the nine mentioned above, have developed national-level approaches to diminish and eliminate the risk of deforestation embodied in imports. Some governments have engaged in multi-stakeholder dialogues aimed at achieving a sustainable sourcing of FRCs.[81] For example, the Belgian government has played an active role in the creation of the Beyong Chocolate partnership platform. In France, the National Group on Tropical Forests (GNFT) promotes sustainably produced timber and prevents illegal logging. Similar initiatives exist in the countries party to the Amsterdam declarations.

Some EU Member States also counteract deforestation directly in FRCs-producing countries through their development policy. Many development agencies support and cooperate on the ground on sustainable FRCs production techniques, on sustainable forest management, and on afforestation and reforestation projects.

EU Member States have also engaged in capacity-building in their national markets. For example, Denmark is helping its companies in choosing sustainable sourcing.[82]

However, only a few EU Member States have adopted legislative measures addressing consumption patterns that could contribute to reducing deforestation. Since 2016, the Netherlands has stopped using biofuels based on palm oil for its domestic consumption (although it still imports palm oil to be reprocessed for exports).[83]Additionally, the French government decided to end tax benefits for palm oil-based diesel from 1 January 2020, and the Constitutional Court upheld the decision.[84] So far, France has been the only Member State to introduce mandatory reporting requirements regarding deforestation risk, set in the Duty of Vigilance Law. It obliges large multinationals active in France to establish mechanisms preventing human rights violations and negative environmental impact throughout their chain of production, including for their subsidiaries and companies that they control.[85]

Member States have adopted several national strategies and guidelines mentioning that EU-level action is desired to address the problem of EU consumption-driven deforestation. The French National strategy against imported deforestation set itself the goal to put an end to deforestation caused by the import of unsustainable forest and agricultural products by 2030. The strategy identified several pathways and approaches to help achieve its goal (such as changes in

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79 IDH (2020), op. cit. The study identifies a total of 12 European countries that are key to eliminating embodied deforestation: the 99 EU countries as well as Norway, Switzerland and the United Kingdom.

80 IDH (2020), op. cit.

81 IDH (2020), op. cit.

82 IDH (2020), op. cit.

83 https://ad-partnership.org/signatory-countries/netherlands/

84 Assemblée Nationale, Rapport d'information sur les agrocarburants, N°2609, 22 janvier 2020.

85 IDH (2020), op. cit.

consumption patterns and development of vegetable protein autonomy).[86] The German federal government has adopted guidelines on the promotion of deforestation-free supply chains of agricultural commodities.[87] Its aim is to address persisting shortcomings in the efforts to eliminate deforestation from agricultural supply chains by 2020, and to improve implementation of deforestation-free agricultural supply chains.

2.3.2. Limitations of action at EU Member-State level

Current national measures addressing deforestation have a limited effect on reducing and eliminating deforestation embodied in EU imports. Existing regulatory demand-side measures are predominantly aimed at eliminating illegal timber from EU supply chains (these measures stem from the EU Timber Regulation), but not other FRCs.[88] Non-regulatory measures in use (e.g. awareness-raising) shift the responsibility to individual consumers to choose from differently labelled products, without provoking shifts in consumption. Most EU imports of FRCs show an increasing trend and only a fraction of all commodities is deforestation-free.

Moreover, current public-level actions in the EU have a limited effect on stimulating demand for deforestation-free products and commodities. Big disparities in sustainable sourcing[89] of FRCs exist both among the main EU consumers and importers, and among the commodities. Moreover, there is lack of coherent data on sustainably sourced commodities (except for palm oil, soy and timber), and data are not available for all main EU FRC-consumer countries.[90] Although the reasons for the limitations above are many, importing and consuming countries' interventions could reinforce market demand for deforestation-free commodities. For example, the countries that signed the Amsterdam declarations and made zero-deforestation commitments are still exposed to high levels of deforestation risk due to the sourcing patterns of their main importing companies. The TRASE initiative analysis of the soy supply chain revealed that the declarations signatories' exposure to risk of deforestation did not decline and was even similar to or higher per tonne of exports than that of major consumer markets like China.[91]

Another limitation of the current demand-side country-level measures is their limited effectiveness in achieving the set goals. It often stems from the complexity of the task that includes different supply-chain players and the risk that their actions can be sustainable or not. The literature on initiatives to combat deforestation along the supply chain shows that if effectiveness of public measures would be increased, they would substantially help voluntary private sector initiatives to become more effective.[92]

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86 Ending deforestation caused by importing unsustainable products, French government website, 14 November 2018.

87 Federal Ministry of Food and Agriculture, German Federal Government's Guidelines on the Promotion of Deforestation-Free Supply Chains of Agricultural Commodities.

88 Brack D., Tackling deforestation and the trade in forest risk commodities: Consumer-country measures and The 'legality approach'. Forest Policy Trade and Finance Initiative. Brief. May 2019.

89 Sustainable sourcing would mean a commodity comes from a source that guarantees that its production did not provoke deforestation. Voluntary sustainability standards (issuing certification) are the most often used to ensure that a commodity was sustainably produced.

90 IDH (2020), op. cit. p.49, Exhibit 10.

91 Trase (2018), op. cit.

92 See: Lambin, E. *et al.* (2018). The role of supply chain initiatives in reducing deforestation, Nature Climate Change, 8, 109-116 and Chagas, T. *et al.*, Impacts of Supply Chain Commitments on the Forest Frontier (Tropical Forest Alliance 2020), June 2018.

2.4. Private-sector initiatives addressing global deforestation

2.4.1. Action at private-sector level

Over the past decades, the private sector in Europe (as well as in North America and Australia) has been particularly active and has developed numerous voluntary schemes aimed at eliminating deforestation from agricultural supply chains.[93] In many cases, these schemes were created with support from civil society in the wake of growing consumer awareness about the negative environmental impact that the production of some commodities can produce. Their creation has also helped to address the lack of international conventions or agreements on preventing deforestation due to agricultural activity. They can also prove crucial in countries with weak rule of law where forests are not protected.

A landmark initiative was creation of the Consumer Goods Forum (CGF) in 2010, which gathered together over 400 companies including the biggest world retailer companies and set a zero-net deforestation commitment to eliminate from its supply chains palm oil, soy, beef, and pulp and paper coming from deforested land by 2020. This initiative popularised the 'zero-net deforestation commitments' that allow for offsetting de facto deforestation by forest restoration and afforestation on degraded land elsewhere.

The latest data on corporate commitments to eliminate deforestation from supply chains show that large manufacturers and retailers dominate the list of companies that set zero (and zero-net) deforestation commitments. This is surely due to the higher reputational risk that their activity bears.[94]

Private sector initiatives have been classified depending on their type and can be distinguished as[95]:

i) *collective aspirations* (e.g., the CGF): their approach is broad and can be described as a collective objective by a group of stakeholders;
ii) *company pledges*: listed by initiatives such as Supply Change, Forest 500 and assessed by the Carbon Disclosure Project, pledges establish and communicate a company's commitment to reduce deforestation;
iii) *company policies* (codes of conduct): these entail approved supplier lists, quality standards and sourcing criteria (including certification), and translate aspirations and pledges into concrete internal policies for production and sourcing practices;
iv) *sectorial standards and agreements* that can be either:

- incentives-driven ones (examples include the Forest Stewardship Council (FSC), the Roundtable for Sustainable Palm Oil (RSPO), the Round Table for Responsible Soy (RTRS), which incentivise positive behaviour; standardise sustainable production practices across participants; and enable the assignment of market access or price premiums;

  or

- sanctions-driven ones (examples include the Soy Moratorium and Zero Deforestation Cattle Agreements in the Brazilian Amazon and the Peatland Moratorium in Indonesia), which

[93] Currently, nearly 90 % of commitments to stop deforestation originate in companies based in North America, Europe and Australia. Rothrock, P., Weatherer, L. and Zwick, S. Donofrio, S. and Hamrick, K., Eds. (2019) Corporate Commitments to Zero deforestation: Company Progress on Commitments that Count, 2019. Washington, DC: Forest Trends.

[94] Rothrock, P., Weatherer, L. and Zwick, S. Donofrio, S. and Hamrick, K., Eds. (2019), op. cit.

[95] See: Lambin, E. *et al.* (2018). op. cit. and Chagas, T. *et al.*, op. cit.

serve as supply-chain sanctions and identify practices to be discouraged through market penalties imposed by other players within the supply chain.

2.4.2. Limitations of action at private-sector level

Despite the proliferation of corporate commitments against deforestation and the launch of several international initiatives, many problems related to their scope, implementation and effectiveness persist, showing there is room for improvement.[96] Goals such as the CGF's on zero deforestation in the supply chains of certain commodities by 2020 were not achieved by their deadline.[97] The annual assessment of Forest 500, an initiative tracking the most influential companies and financial institutions taking part in forest-risk supply chains, reports a mixed result involving progress made by some leading players and a lack of action by nearly half of them. The assessment also shows that no company is on track to eliminate commodity-driven deforestation.[98] In Europe, 21 % of companies have not yet made any forest-protecting commitment as regards commodity production or sourcing. Moreover, companies headquartered in Europe source mainly sustainable palm oil and timber, whereas for other commodities – pulp and paper, soy, beef, leather – the sustainable imports rates remain lower.[99]

The deforestation-free standards of voluntary sustainability initiatives differ in their scope and not all interpret deforestation in the same way (e.g. their adopted definition of 'deforestation', being less inclusive, does not cover aspects such as 'high conservation value' of land and 'high-carbon-stock lands'). The above-mentioned CGF approach of zero-net deforestation has been controversial due to the fact that it allows deforestation to occur in the first place, which leads to potential irreplaceable losses of forest ecosystems and biodiversity that cannot be compensated either by forest restoration or by afforestation. In response, some initiatives call on companies to move beyond zero-net and only set zero (gross) deforestation commitments (no-deforestation commitments).[100] Research has shown that the more stringent a standard is, the less frequently it is adopted because companies prefer to have some leeway when it comes to zero deforestation commitments.

The effectiveness of many voluntary commitments and standards is questioned as regards their actual impact on reducing deforestation. Studies conducted on impacts of environmental certifications are confusing and show a high degree of uncertainty regarding on-the-ground effects.[101] Some show positive impacts (e.g. lower rates of deforestation), while others conclude that there is no change in the level of forest protection. Research on initiatives in the forestry sector shows that the problem lies in weak investigative and monitoring capacity during commodity production at the local level.[102] Investigations of environmental activist groups on how voluntary

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96 R.D. Garrett, et al. (2019), Criteria for effective zero-deforestation commitments, Global Environmental Change, Volume 54, January 2019, pp. 135-147, as well as Lambin, E. *et al.* (2018). op. cit. and Chagas, T. *et al.*, op. cit.

97 Rothrock, P., Weatherer, L. and Zwick, S. Donofrio, S. and Hamrick, K., Eds. (2019), op. cit.

98 IDH (2020), op. cit.

99 Thomson, E. and Rogerson, S., 2020, Forest 500 annual report 2019 - the companies getting it wrong on deforestation, Global Canopy: Oxford, UK.

100 Rothrock, P., Weatherer, L. and Zwick, S. Donofrio, S. and Hamrick, K., Eds. (2019), op. cit.

101 Harris, M., Hawker, J., Croft, S., Smith, M., Way, L., Williams, J., Wilkinson, S., Hobbs, E., Green, J., West, C., Mortimer, D., 2019. Is the Proportion of Imports Certified as Being from Sustainable Sources an Effective Indicator of UK Environmental Impact Overseas? (JNCC No. JNCC Report No. 631). Peterborough.

102 Moog, S., The Politics of Multi-Stakeholder Initiatives: The Crisis of the Forest Stewardship Council, Journal of Business Ethics, 2014.

Meidinger, E., The Administrative Law of Global Private-Public Regulation: the Case of Forestry, The European Journal of International Law Vol. 17 No 1, 2006.

standard schemes prevent deforestation have shown that even companies that did adhere to schemes pledging no deforestation, in practice are not always in line with their commitments.[103]

Another weakness related to certification schemes to which companies adhere is that their main uptake is focused on the downstream of (often long) supply chains. Companies that participate in certification schemes are mainly manufacturers and retailers in developed countries that consume commodities posing risks to forests.[104] To ensure broader participation there is a need for an uptake of commitments by players from across the FRCs supply chain, including the financial sector.[105]

Sectorial standards based on sanctions (like moratoria on sourcing commodities coming from deforested lands) are assessed as one of the most effective tools to halt deforestation. Nevertheless, a successful soy moratorium in the Brazilian Amazon has provoked leakage (displacement) of deforestation to neighbouring regions where producers did not implement such a strict approach. This shows that without a coherent national approach and policies in producing countries, the effectiveness of such initiatives might be undermined.

2.5. Conclusions on the gaps in the existing framework on actions to eliminate deforestation

Based on the above, it may be concluded, that although various stakeholders have taken a number of actions, their effectiveness to date, as measured by the trends in global deforestation discussed in Chapter 1, is limited.

EU-level measures are fragmented, only cover certain FRCs and have yielded little effect on EU-embodied deforestation trends.

Member States' measures, although more and more numerous, stay limited and are rarely mandatory or set in a regulatory framework, leaving soft-policy measures to dominate.

Private sector measures are numerous but still unable to make a difference and stop deforestation. Their effectiveness is limited if they are not supported by public policies. Moreover, tracking and verifying companies' commitments on zero-deforestation remains challenging and on-the ground effects are difficult to assess.

2.6. Why act at EU level?

The data on the global deforestation trends suggest that overall, the above-mentioned regulatory and non-regulatory tools are not enough to halt and reverse EU-driven global deforestation and forest degradation, both of which pose an on-going problem. Currently, there is no coherent EU legal framework directly addressing FRCs. The problem of deforestation and forest degradation provoked by EU imports and FRCs consumption is of primary concern for the EU's environmental policy, but it is also directly linked to two other core EU policies: on the internal market and on the trade policy.

Action at EU level could address the problem more effectively and efficiently than at Member State level alone, because the EU has experience in taking effective common action for the environment

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[103] Greenpeace, The moment of truth. Time for brands to come clean about their links to forest destruction for palm oil, March 2018.

Environmental Investigation Agency website at https://eia-international.org/forests/deforestation/.

[104] Rothrock, P., Weatherer, L. and Zwick, S. Donofrio, S. and Hamrick, K., Eds. (2019), op. cit.

[105] Lambin, E. *et al.* (2018), op. cit.

to ensure a level-playing field for all players on the internal market, and its know-how has even been replicated at global level (as in the case of the framework to eliminate illegal timber). The problem of commodity-driven deforestation also adds trade aspects to the nexus, trade policy being an EU competence. Efficiency could also be higher than when acting at national level as economies of scale could arise.

Without strengthening its action against deforestation, the EU risks letting a gap appear between its pledges (see Section 2.1) and what it delivers. Moreover, the on-going global deforestation is incompatible with many different EU policy objectives, such as environmental protection (especially biodiversity); fighting climate change (protection of high-carbon stock reservoirs); protecting and respecting human rights; peace and security; good governance; and the rule of law.[106]

The EU cannot tackle the issue alone, by using its soft power and widely acclaimed standard-setting powers. Instead, it should lead by example and engage with other key players through international cooperation in order to achieve tangible results on limiting and stopping deforestation.

The below-proposed demand-side measures addressing several FRCs imported into the EU could help decrease deforestation, forest degradation and the associated CO_2 emissions (see sections 3 and 4 below and the Cambridge Econometrics (2020) study in the Annex). Other analyses have shown that 'just sourcing 100 % verified sustainable tropical timber EU28 could positively impact (reduce degradation) approximately 11.7 to 13.4 million hectares of tropical forest'.[107]

The legal basis that could be used in an EU intervention is Article 191 (2) of the Treaty on the Functioning of the European Union, which requires the Union environmental policy to aim at a high level of protection.[108] Article 21(2.f) requires the Union to help to develop international measures to preserve and improve the quality of the environment and the sustainable management of global natural resources, in order to ensure sustainable development.

2.6.1. Support for EU intervention on deforestation

A YouGov poll commissioned by several leading NGOs engaged in campaigning for stopping deforestation, revealed that 87 % of EU consumers that were polled in 2019 demand deforestation-free products.[109]

Over 70 % of the respondents in the public consultation organised in 2019 by the European Commission stated that the current EU policy and legislative framework to prevent deforestation was inadequate.[110] There was also an over 60 % support for the EU to 'develop a coherent framework, including measures that support and enhance the coherence of existing commitments and initiatives by Member States, civil society and the private sector'.

Some Member States' front-running initiatives against deforestation (especially those launched by some of the signatories of the Amsterdam declarations) have since long advocated for regulatory action at EU level. This stance has recently found confirmation through the French and German strategies to eliminate deforestation from supply chains.

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106 European Commission, Deforestation and forest degradation, website.

107 IDH (2020), op. cit. p.38.

108 European Commission, Inception Impact Assessment, Minimising the risk of deforestation and forest degradation associated with products placed on the EU market, 5 February 2020.

109 https://www.fern.org/news-resources/press-release-87-per-cent-of-europeans-support-new-laws-to-combat-global-deforestation-new-poll-shows-1963/

110 European Commission, Summary report of the results of the public consultation in the context of the Communication on stepping up EU action against deforestation and forest degradation, May 2019.

3. EU-level policy options

An EU intervention seems to be needed and wanted by various stakeholders. Moreover, given the complexity of the problem, this intervention should be multi-faceted, coherent and comprehensive, addressing at the same time supply, demand and financing.[111] In general, it should strengthen and further develop existing and new commitments of the Member States and the private sector to stop deforestation.

There are many potential regulatory and non-regulatory policy options to address this problem, which have been discussed in the literature and in policy debates. The upcoming European Commission's legislative proposal will consider some of these options, among them mandatory labelling, voluntary commitments and labelling, due diligence, verification schemes and methods such as the Product Environmental Footprint and Organisational Environmental Footprint. The proposal will also consider measures based on the EU regulatory framework on unreported and unregulated fishing; financing instruments; and bilateral agreements.[112]

In view of the above and considering the complexity of the topic, the policy options analysed below should not be treated as stand-alone measures but as a part of the measures of a comprehensive EU framework that would likely include various instruments.

3.1. Demand-side EU regulatory measures

The present EAVA focuses only on potential regulatory measures that could halt and reverse EU-driven deforestation and forest degradation. These measures could be undertaken by the demand-side players, i.e. the EU, its citizens, consumers, Member States and economic entities operating in the EU.[113]

Based on the analysis in the available literature, demand-side EU interventions could potentially be used to achieve the following main objectives:[114]

- reduce overall EU demand for forest-risk commodities, reducing the EU's consumption footprint on land;
- considering an overall reduction, increase the share of EU demand for sustainable and deforestation-free products;
- make the global supply chains of forest-risk commodities more sustainable, inclusive and transparent in reducing their impact on deforestation and forest degradation; and
- promote trade in legal and sustainable and deforestation-free agricultural commodities.

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111 As already identified in comprehensive studies and public consultations on the subject carried out by the European Commission. For details, see: European Commission, Communication on Stepping up EU Action to Protect and Restore the World's Forests, COM (2019) 352 final; COWI, Ecofys, Milieu, 2018. Feasibility study on options to step up EU action against deforestation Part I and Part II. Final report. Publications Office of the European Union, Luxembourg; European Commission, Summary of the Public Consultation Stepping up EU Action against Deforestation and Forest Degradation, 2019.

112 European Commission, Inception Impact Assessment, Minimising the risk of deforestation (...), op. cit.

113 Further down in the study are presented the results obtained by Cambridge Econometrics (2020) in the course of their quantitative analysis undertaken for the European Parliament on estimating the impacts of selected policy options and their potential European added value (see in the Annex).

114 These objectives were identified on the basis of the Commission communication on stepping up EU action to protect and restore the world's forests, the study underpinning it (COWI et al., 2018), as well as the 2012 report prepared for the Commission (European Commission, 2012).

The policy options (regulatory tools), through which those main objectives can be achieved and which are analysed in this assessment, are:

- Policy option 1: mandatory due diligence for forest-risk supply chains;
- Policy option 2: mandatory certification standards for forest risk commodities;
- Policy option 3: mandatory due diligence with sustainability criteria for imported forest risk commodities with mandatory certification – a combination of policy option 1 and 2;
- Policy option 4: mandatory labelling of food products containing forest risk commodities.

Those four policy options are comparatively analysed to qualitatively assess their relevance in respect of fulfilling the above-mentioned objectives (Table 1) and to quantitatively assess (Sections 3.4 to 3.7) their potential to reduce deforestation. The quantitative assessment is run against 'a baseline' – a yardstick to measure the relative impact of proposed policy options as compared to the current status quo.

The selection of policy options has been based on the available literature that has analysed (but not quantified the impacts of) similar EU-level interventions aiming at the elimination of commodity-driven deforestation.[115] Furthermore, the selection has been adapted to the capacity for modelling the policy options as a prerequisite for making a quantitative assessment. The options selected were also assessed against their relevance in respect of fulfilling the above-mentioned main objectives. In general, all policy options fulfil all the objectives but to a different extent; this extent was rated as high (+++), medium (++), low (+) and indirect (+-).

Table 1: Assessment of the four EU-level policy options in terms of the extent to which they fulfil the demand-side EU intervention objectives

Policy option / Objective	Policy option 1	Policy option 2	Policy option 3	Policy option 4
reduce overall EU demand for forest-risk commodities, thereby reducing the EU's consumption footprint on land	+++	+++	+++	+
considering an overall reduction, increase the share of EU demand for sustainable and deforestation-free products	+++	+++	+++	+
make the global supply chains of forest-risk commodities more sustainable, inclusive and transparent in reducing their impact on deforestation and forest degradation	+++	++	+++	+
promote trade in legal and sustainable and deforestation-free agricultural commodities	++	++	++	+-

Source: Author's own elaboration.

[115] European Commission, communication on Stepping up EU Action to Protect and Restore the World's Forests, COM (2019) 352 final; COWI, Ecofys, Milieu, 2018. Feasibility study on options to step up EU action against deforestation Part I and Part II. Final report. Publications Office of the European Union, Luxembourg; European Commission, 2012. The impact of EU consumption on deforestation: Proposal of specific Community policy, legislative measures and other initiatives for further consideration by the Commission - Final report, Study funded by the European Commission, DG ENV, and undertaken by VITO, HIVA and IUCN NL. European Commission, DG ENV, Brussels.

3.2. Methodology to assess policy options

The sections below present a qualitative and a quantitative assessment of the four policy options compared to the baseline. Each policy option is analysed in the same way. First, a policy option is introduced and its general benefits outlined. Second, impact on reducing EU-driven deforestation and associated CO_2 emissions are presented based on the quantitative assessment study (see Annex). Third, the economic impacts are presented in terms of changes in EU GDP and employment, based on the quantitative assessment study (see Annex). The assumptions for private and public sector impacts (costs and benefits) are based on the available literature review. Finally, some main risks linked to feasibility and implementation of a policy option are presented.

3.2.1. Main assumptions for the quantitative assessment of the policy options

Different assumptions had to be made in the assessment of impacts of the proposed policy options. They made possible the modelling, filled existing data gaps, but also created limitations.[116]

EU demand for selected FRCs and its impact on embodied deforestation

Implementation of any of the proposed policy options provokes a change in the total quantity of the analysed FRCs imported to the EU. However, the share of EU imports from each exporting country is assumed to remain constant by 2030. It is also assumed that the changes in the EU demand for the analysed agricultural commodities are driven by the prices of FRCs. Their prices will be impacted by the introduction of any of the assessed policy options. It is assumed that all policy options will lead to an increase in the prices of the analysed commodities, as producers will pass their costs of ensuring no-deforestation to the products' prices (price premiums). This will lead to a reduction of EU demand for the analysed agricultural commodities. These cost increases should be interpreted as an upper limit because they are based on past trends for similar policies and it is possible that some of the cost increases assumed in this analysis may not in fact occur. The assumption on the decrease of EU demand for FRCs due to their higher costs is linked with another one: that there will be substitution of some of the FRCs with others or demand will be met only by EU domestic production. However, in some cases this might not be possible. Subsequently, it is also assumed and modelled that due to changes in the EU demand for the relevant agricultural commodities, there will be changes in the amount of land needed to produce the quantity demanded by the EU. These changes in land needed for production can impact the size of the area that could have been potentially deforested. Due to a decrease of EU demand for FRCs, it is assumed that less land will be deforested for commodity production.

Deforestation-free certification and 'no-deforestation' label

Imported commodities that are deforestation-free certified or products that have a 'no-deforestation' label are assumed not to cause any deforestation. Even if in reality certification systems and labels might not be 100 % effective, this is the optimistic underlying assumption in this study. Therefore, in the calculations on deforestation and carbon emissions levels linked to EU imports, it is assumed in all policy options that these imports have no impact on deforestation levels. These are estimated only for the quantity of non-certified commodities and products consumed under the label 'this product might be associated with deforestation'.

Information on EU imports of agricultural commodities covered by deforestation-free certification is scattered and incomplete and could only be identified for palm oil (78 %), soy (13 %) and sugar crops (7.6 %). For the other commodities, i.e. beef, maize and rapeseed, it was assumed at zero. For

[116] For a detailed explanation, see Chapter 3: Methodology in Cambridge Econometrics (2020), study in the Annex.

maize and rapeseed, the authors did not come across any certification schemes demonstrating that the commodity is deforestation-free.

Timeline

Entry into force of a policy option

All analysed policy options assume that the Commission will propose measures in 2021 and that they will enter into force in 2023. This assumption is optimistic and foresees a relatively quick (two years from presentation of proposal by the Commission) entry of the regulation into force.

The analysed time horizon

All policy options are analysed in a time horizon of 10 years from now, i.e. by 2030. This corresponds with some EU commitments to eliminate deforestation as well as with the EU climate goals. In view of the above-mentioned assumption that all policy options enter into force in 2023 and assuming that they become effective from that moment on, the quantitative results of the assessment regarding the impact on reducing deforestation and carbon emissions for each policy option should be considered as an upper bound.

3.3. The baseline

The baseline reflects maintenance of the status quo without EU-level intervention (that is, without implementing a policy option). It comprises all currently existing legislation and initiatives and actions at public/private level aimed at reducing deforestation and forest degradation driven by EU imports and consumption of FRCs. Until the year 2030, it foresees a business-as-usual scenario by capturing the trend in demand for the selected agricultural commodities.[117] It is also based on publicly available long-term economic projections.

Impact on reducing EU-driven deforestation and associated carbon emissions

There are two versions of the baseline, differentiated on the basis of the constant rate of imports of deforestation-free certified FRCs or by a rate that increases over time. Policy option 1 is compared to this baseline in two versions.[118] Policy option 2, policy option 3 and policy option 4 are compared with the baseline with an assumption that there will be a constant growth of certification in FRCs imports.

In the baseline, under the assumption that the share of certified imports of palm oil, soy and sugar remains constant, the deforestation embodied in EU imports and the related carbon emissions are expected to slightly increase over time (Table 2).

In the baseline, assuming that the share of certified imports of palm oil, soy and sugar increases over time (palm oil by 4 %, soy by 3 %, and sugar by 3 % per year), the cumulative deforestation and carbon emission (2020-2030) will fall slightly.

[117] See Table 17 in Cambridge Econometrics (2020), study in the Annex.

[118] For details on how policy option 1 is compared to two versions of the baseline and why, see Chapter: 3.4.3. Policy option 2: Mandatory certification in Cambridge Econometrics (2020), study in the Annex.

Table 2: Deforestation embodied in EU imports* (hectares) and related emissions (tCO_2) in the baseline

	2020	2021	2023	2030	Cumulative (2020-2030)
Deforestation embodied in EU imports (hectares)					
Agricultural commodities with a constant share of certified imports	23 274	23 285	23 378	23 693	258 219
Agricultural commodities with an increasing share of certified imports	23 274	23 213	23 149	22 816	253 662
Emissions linked to deforestation (tCO_2)					
Agricultural commodities with a constant share of certified imports	6 654 060	6 656 710	6 682 371	6 768 648	73 795 232
Agricultural commodities with an increasing share of certified imports	6 654 060	6 634 458	6 612 275	6 498 973	72 396 033

Note: *This table only accounts for deforestation embodied in EU imports of agricultural commodities for food and does not include biofuels.

Source: Cambridge Econometrics (2020).

Economic impacts

In the business as usual scenario, EU population growth is expected to slow down nearly to zero with a working-age population decline after 2020 (Table 3). This will impact the EU GDP by reducing its growth potential. Similarly, employment rates are projected to start falling by 2030 because of the ageing population.

Table 3: Baseline GDP and employment in the EU

	2020	2021	2023	2030	Average annual growth (%pa)
Population ('000 people)	446 555	446 878	447 423	448 751	0.05
GDP (Million EUR)	12 747 254	12 942 000	13 336 513	14 578 208	1.35
Total employment ('000 people)	203 699	204 223	205 033	204 711	0.05

Source: Cambridge Econometrics (2020).

Risks

As outlined in the sections above, if the EU does not act on limiting and eliminating deforestation embodied in its imports, it will continue to contribute to the disappearance of the tropical and subtropical forests and their biodiversity, which runs counter to many EU political objectives and goals. Importantly, EU trade policy will not be aligned with EU environmental and climate goals.

Furthermore, a fragmentation at the EU internal market will persist, as some economic entities will continue to apply measures seeking to eliminate the deforestation risk from their supply chains, while others will not. Lastly, EU consumers are facing an asymmetry of information on the EU internal market, as they do not have access to coherent information as regards what products are deforestation-free, and what could be associated with deforestation.

3.4. Policy option 1: Mandatory due diligence for forest-risk supply chains

The introduction of mandatory due diligence measures for EU companies trading FRCs is currently one of the most considered options in the public debate. It would regulate the EU market in order to minimise the risk of deforestation-linked commodities entering the EU supply chain.

This policy option is generally based on the EU Timber Regulation (EUTR) example. It would require companies placing FRCs and food and biofuel products containing them on the EU market[119] to undergo and implement due diligence in order to ensure that the products are deforestation-free and fulfil other sustainability criteria that are both a part of EU policies or are associated with the problem of deforestation.[120] This intervention would be applicable across the whole EU supply chain of the relevant commodities and products – whether imported or produced in the EU – to effectively prevent and mitigate deforestation risk.

It should build on the state-of-the-art standards and practices adopted globally. For example, a five-step approach to risk-based due diligence along agricultural supply chains developed by the OECD and FAO could be considered mandatory for companies.

It is assumed that the effectiveness of the policy increases over time, starting at an estimated 70 % at its entry into force in 2023. By 2030 it is assumed that 100 % of EU imports and supply chains will be free from the risk of deforestation.[121]

General benefits

Due diligence could help improve companies' transparency and accountability regarding the deforestation risk. If effectively implemented and enforced, this policy option could address an important implementation gap observed currently in voluntary commitments. An EU due diligence scheme would help avoid deforestation risk throughout the whole supply chain. Thus, it would also impact producing countries and producers that would like to comply with EU criteria, thereby spreading the benefits of this measure way outside EU frontiers.

Impact on reducing EU-driven deforestation and associated CO_2 emissions

As due diligence would incur costs for both private and public players, it is assumed to impact FRCs import prices as well. This in turn would translate into a lower volume of imports to the EU, which,

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[119] The scope of this intervention has been narrowed-down to the six FRCs analysed and to food and biofuels products containing them for the ease of making a quantitative assessment. The scope of products covered by the forthcoming legislation could be broader. The same goes for those economic players who would be required to undergo mandatory due diligence. It could also become obligatory for financial operators.

[120] These criteria could, apart from relating directly to deforestation, equally relate to the sustainable use of other ecosystems, but also to respect for human rights, social rights, land tenure rights, and to ensuring the legality of traded commodities.

[121] This assumption as all subsequent ones is based on the literature. For details see the modelling of this policy option in section: 3.4.2. Policy option 1: Due diligence in the Cambridge Econometrics (2020) study in the Annex.

in its own turn, will ease the pressure on the land and result in lower deforestation embedded in EU imports and lower associated carbon emissions.

As in the baseline, two different versions were checked for this policy option:

- an assumption that the share of certified imports of palm oil, soy and sugar remains constant, at the level set in the baseline;
- an assumption that the share of certified imports of palm oil, soy and sugar will increase over time because the due diligence system in place would encourage the uptake of voluntary certification serving as proof that the products are deforestation-free: once the policy option enters in force, it is assumed that the yearly rate of certification will increase compared to the baseline as follows: for palm oil to 6 % (from 4 %), for soy to 5 % (from 3 %), and for sugar to 5 % (from 3 %).

For both assumptions, the deforestation embodied in EU imports and its associated deforestation decreases substantially compared to the baseline (Table 4). Cumulative deforestation between 2020 and 2030 could be up to 62 % lower than in the baseline, and the same applies to the associated CO_2 emissions. Considering all the assumptions made in the modelling of this policy option, this reduction should be treated as an upper bound of decrease of deforestation and associated emissions compared to the baseline.

Table 4: Deforestation embodied in EU imports* (hectares) and associated emissions (tCO_2) under policy option 1: mandatory due diligence

Due diligence	Absolute difference from baseline in cumulative deforestation (2020-2030)	Difference in cumulative deforestation from the baseline %	Absolute difference from baseline in cumulative CO_2 emissions (2020-2030)	Difference in cumulative CO_2 emissions from the baseline %
Agricultural commodities for food (with constant certification over time)	-160 197	-62 %	-45 775 855	-62 %
Agricultural commodities for food (with increasing certification share over time)	-156 556	-62 %	-44 657 505	-62 %

Note: *This table only accounts for deforestation embodied in EU imports of agricultural commodities for food and does not include biofuels.

Source: Cambridge Econometrics (2020).

Economic impacts

It is assumed that the costs for economic operators for introducing and exercising due diligence would be passed to the FRCs import prices. They would thus increase between 0.2 % and 1 %. The higher the complexity of a supply chain, the higher a price increase of an FRC is assumed. These costs would lead to a decrease in the demand for FRCs and related products in the EU, although it will be very small and amount to less than 0.1 % for all six FRCs analysed. This would result in reduced imports of FRCs and therefore the impact that FRCs have on deforestation would also decrease (as presented above).

The increases in FRC prices would lead to a lower aggregated demand and have negative impacts on EU GDP and employment compared to the baseline. However, the overall impacts will be relatively small (Table 5).

Table 5: Economic impact of policy option 1 – Due diligence (difference compared to the baseline), EU

	2021	2023	2030	2020-30
GDP (% difference)	-0.0005	-0.0007	-0.0009	-0.0011**
GDP (Million EUR)	-65.5	-93.8	-138.3	-829*
Total employment ('000 people)	-0.7	-1.1	-1.5	-11.2*
Total employment (% difference)	-0.0004	-0.0005	-0.0007	-0.0007**

Note: * Aggregated difference between the scenario and the baseline across the period; GDP values are discounted at 5% pa to make the EUR values comparable over time.

** Difference in growth in the 2020-2030 period between the scenario and the baseline, expressed in percentage points.

Source: Cambridge Econometrics (2020).

Private sector

Based on the existing literature, it is assumed that this intervention would generate costs both for economic operators placing FRCs on EU market (importers) and for producers in the exporting country. Although there are different views on whether the costs will be higher initially or over time, based on the prevalent part of the relevant evidence it is assumed that due diligence to eliminate deforestation risk will incur a higher initial cost than ongoing due diligence. This would especially be the case for economic players that do not have due diligence in place. Based on the impact assessment of the EUTR, it is estimated for the analysed six FRCs that the costs incurred for due diligence will amount to a total of €16 million for private companies. This includes costs of €2 million for companies within the EU.[122]

It might be important to mention in this context that a recent study on due diligence requirements through the supply chain to identify, prevent, mitigate and account for abuses of human rights and environmental damage estimated that 'the cost of mandatory due diligence compared to the revenue of companies appears to be relatively low'.[123] The additional recurrent company-level costs on average amount to less than 0.14% for SMEs and 0.009 % for large companies. The study underlines that it is not much compared to the currently applied EU trade tariffs on goods (in 2017 the weighted mean average tariff of the EU was 1.8 %).

Costs on the producers' side might increase if they will want to align with the new EU legislation and maintain exports. However, this assessment has not estimated the costs related to shifting to more sustainable means of production.

Important benefits (also not quantified in this assessment) could be envisaged for the companies offsetting the costs they would bear. These benefits have to do with a more reliable regulatory

[122] European Commission, Commission staff working document accompanying the proposal for a regulation of the European Parliament and of the Council determining the obligations of operators who make timber and timber products available on the market - Impact Assessment - Report on additional options to combat illegal logging {COM(2008) 644 final} {SEC(2008) 2616}, /* SEC/2008/2615 */.

[123] European Commission, Study on due diligence requirements through the supply chain (…), op. cit., p. 66.

environment, given especially that stakeholders perceive it as dynamically changing (with Member States putting out new policies on due diligence and a growing focus among investors and financial players on due diligence requirements).[124]

Public sector

It is assumed that as in the EUTR impact assessment, the costs that Member States would incur would amount to €1 million.[125] This is due to the increased activity of the competent authorities in charge of annually checking the compliance of economic operators with deforestation-free criteria.

Risks

The main risks relate to effective implementation.

To ensure the effective implementation of this policy option, a definition for 'deforestation-free' product would need to be agreed upon and adopted. In this respect, a clear cut-off date would need to be set to account for commodities produced on already deforested land. Moreover, any other criteria (e.g. sustainability ones) to be fulfilled by companies placing FRCs on the EU market would need to be specified. Establishing these criteria might be politically challenging, but there are many sustainability criteria in EU policies and at Member State level to build on.[126]

Another risk for effective implementation would be if the liability of economic operators is not clearly indicated. If economic operators prefer to use voluntary certification schemes to mitigate the risk of trading FRCs produced on deforested land, they might not want to take responsibility for potential loopholes and flaws in the certification schemes.

Traceability across the supply chains is key for a working and effective due diligence. However, in reality it might prove to be challenging for the competent authorities to track some FRCs especially when they are imported as ingredients (e.g. of processed foods).

As this intervention is broadly based on the EUTR, the latter implementation challenges should be considered, analysed and to the extent possible prevented.[127] The complexity of this policy option compared to the EUTR – the fact that it would cover a broader scope of commodities (than just timber), that it would have a wider range than just the legality of the products, that it would be necessary to be continuously aware of the deforestation situation in each producing country, and that there would be a larger number of producers – increases the risk of potential 'resistance from both producer countries exporting to the EU and domestic producers'.[128]

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124 European Commission, Study on due diligence requirements through the supply chain, Part I: Synthesis Report, Directorate General for Justice and Consumers, p. 66.

125 European Commission, Commission staff working document accompanying the proposal for a regulation of the European Parliament and of the Council determining the obligations of operators who make timber and timber products available on the market (...), op. cit.

126 COWI, Ecofys, Milieu, 2018. Feasibility study on options to step up EU action against deforestation Part I and Part II. Final report. Publications Office of the European Union, Luxembourg, as well as in the European Commission, 2012. Part II, p. 89.

127 See e.g.: Constance L. McDermott, Metodi Sotirov, A political economy of the European Union's timber regulation: Which member states would, should or could support and implement EU rules on the import of illegal wood? Forest Policy and Economics, Volume 90, May 2018, pp. 180-190; as well as European Commission, Report from the Commission to the European Parliament and the Council, Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market (the EU Timber Regulation), Biennial report for the period March 2015 - February 2017, COM/2018/668 final.

128 COWI, Ecofys, Milieu, 2018. Feasibility study (…), op. cit., Part II, p. 90.

3.5. Policy option 2: Mandatory certification standards for forest-risk commodities

This policy option would regulate access to the EU market so as to prevent imports of commodities that are associated with deforestation and continue to allow imports of deforestation-free commodities into the EU market. It is assumed that all current producers in the exporting country will get the deforestation-free certificates required by the EU and continue their exports. This means that some forms of derogations or support schemes would be deployed for small producers, for which obtaining certification would constitute a barrier to trade. As a result, in the modelling exercise, no external shock is envisaged for the quantity of EU imports.

This intervention is based on policy proposal 24 (to attach sustainability criteria to the import of commodities that are associated with deforestation) developed in a study for the European Commission.[129] It foresees that economic operators importing to the EU have an obligation to demonstrate that the imported FRCs and food and biofuels products containing them are deforestation-free. For this purpose, it will be mandatory to certify imported FRCs and related products by a certification body. Non-certified FRCs and products would not be allowed to enter the EU market. A certification body would ensure that throughout the production process there was no associated deforestation and that other relevant legality, sustainability, and human rights criteria (if established) were fulfilled. The European Commission would authorise certification bodies that comply with a selected set of criteria to operate within the EU scheme.

General benefits

If effectively implemented, this policy option could render EU imports of the analysed FRCs and food products deforestation-free. For companies that already have a practice of sourcing deforestation-free and sustainable FRCs, it will be simple and less costly to align with the mandatory certification requirements.

In the producing countries, the policy option would ideally translate into benefits linked to the elimination of deforestation and the increase in sustainable agriculture practices. For example, in Indonesia, certification standards used by palm oil producers within a broader integrated and comprehensive effort to eliminate commodity-driven deforestation, have proved effective.[130] This intervention should benefit the producers through the higher prices obtained for the deforestation-free products (price premium).[131]

Impact on reducing EU-driven deforestation and associated CO_2 emissions

It is assumed that even before the entry of the policy option in force in 2023, there will be a substantial increase in certification uptake with regard to imported FRCs. As from 2023, 100 % of the FRCs imported to the EU will be free from deforestation because the intervention is assumed as fully effective. By 2030, the mandatory certification could result in an up to 76 % on average drop in deforestation embodied in EU imports of agricultural commodities for food and a 77 % drop in

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[129] European Commission, 2012. The impact of EU consumption on deforestation: Proposal of specific Community policy, legislative measures and other initiatives for further consideration by the Commission - Final report, Study funded by the European Commission, DG ENV, and undertaken by VITO, HIVA and IUCN NL, p. 58.

[130] NYDF Assessment Partners. (2019), op. cit.

[131] Currently, price premia for deforestation-free products are so low that they disincentivise producers to seek certificates guaranteeing products are deforestation-free. This situation results in an overproduction of sustainable and deforestation-free FRCs that are sold as non-certified.

associated carbon emissions compared to the baseline (Table 6). Considering all the assumptions made in the modelling of this policy option, this reduction should be treated as an upper bound of decrease of deforestation and associated emissions compared to the baseline.

Table 6: Deforestation embodied in EU imports* (hectares) and associated emissions (tCO_2) in policy option 2: mandatory certification standards

Mandatory certification	Absolute difference from baseline in cumulative deforestation (2020-2030)	Difference in cumulative deforestation from the baseline %	Absolute difference from baseline in cumulative CO_2 emissions (2020-2030)	Difference in cumulative CO_2 emissions from the baseline %
Agricultural commodities for food	-197 500	-76 %	-56 615 183	-77 %

Note: *This table only accounts for deforestation embodied in EU imports of agricultural commodities for food and does not include biofuels.

Source: Cambridge Econometrics (2020).

Economic impacts

The costs of certification increase both the FRCs' and the import products' prices. As the policy is applicable only to imports, the certification costs are borne by non-EU producers and the domestic production prices are not impacted. The higher the price increase, the bigger the impact on the demand for the FRCs. However, the change in consumption is less than 0.1 % compared to the baseline for all FRCs, and thus the overall economic impact of this policy option is relatively small. Nevertheless, it should be noted that when product prices increase and are passed onto EU consumers and industry, their disposable income and real level of consumption shrink. This can translate into a lower level of GDP and employment. By 2030, the economic impact of this intervention will be negligible (Table 7).

Table 7: Economic impact of policy option 2: mandatory certification (difference compared to the baseline), EU

	2021	2023	2030	2020-30
GDP (% difference)	-0.0020	-0.0009	-0.0002	-0.0002**
GDP (Million EUR)	-261	-121	-27	-961*
Total employment ('000 people)	-3.6	-1.5	-0.7	-14.3*
Total employment (% difference)	-0.0018	-0.0007	-0.0003	-0.0003**

Note: * Aggregated difference between the scenario and the baseline across the period; GDP values are discounted at 5% pa to make the EUR values comparable over time.

**Difference in growth in the 2020-2030 period between the scenario and the baseline, expressed in percentage points.

Source: Cambridge Econometrics (2020).

Private sector costs

Different certification costs were assumed for each commodity based on evidence from the literature (Table 8).[132] No specific certification schemes were identified for maize and rapeseed and the costs were assumed to be the same as for soy. For sugar, no relevant data were identified, and the soy certification cost was used as a proxy. The costs are estimated to be higher in the initial phase of adhering than the current ones after acquiring certification. These costs are also related to the audit preceding certification and to the periodical audits required for maintaining the certification status. Producers could recover some of the costs they will incur through price premiums for their deforestation-free commodities.

Table 8: Import price increase per commodity[133] due to mandatory certification standards for imported FRCs

	Beef	Maize	Palm Oil	Rapeseed	Soy	Sugar
Initial (2021-2022)	335 EUR/ha	1.5 EUR/tonne price premium	422 EUR/ha	1.5 EUR/tonne price premium	1.5 EUR/tonne price premium on certified beans to produce soymeal 3.6 $/tonne premium on certified soybeans to produce biofuel	1.5 EUR/tonne price premium
Ongoing (2023-2030)	1%	1.5 EUR/tonne price premium	11 EUR/ha	1.5 EUR/tonne price premium	1.5 EUR/tonne price premium on certified soybeans that produce soymeal 3.6 $/tonne premium on certified soybeans to produce biofuel	1.5 EUR/tonne price premium

Source: Cambridge Econometrics (2020).

Public sector costs

No extra cost is considered for the public authorities that will be checking imports' certification at the border control. It is assumed that the currently undertaken phytosanitary checks of agricultural commodities will be broadened to also cover the no-deforestation certification standards. The European Commission-led TRACES online platform could be used for this purpose.[134] However, some other EU-level costs could arise (but were not quantified for this assessment) related to the

[132] See Chapter: 3.4.3. Policy option 2: Mandatory certification in the Cambridge Econometrics (2020) study in the Annex.

[133] In 2019, the world price for maize was 145 EUR/t, for soybean 335 EUR/t, for sugar 317 EUR/t and for beef 3,581 EUR/t (European Commission, 2019).

[134] https://ec.europa.eu/food/animals/traces_en.

European Commission's approval of eligible certification bodies, or if necessary, the development of new ones and in relation to the regular auditing of certification schemes in addition to these mandated by the standards.

Risks

The main risks relate to how the certification standards criteria will be set, priced, monitored, reported and verified. Existing voluntary certification standards have many loopholes and their effectiveness in eliminating deforestation is often contested. Moreover, it will be crucial how they will impact demand for FRCs. It is assumed for this policy option that demand will drop, but that there will be a risk that certification schemes ensuring the sustainability of FRCs could justify an increase in consumption instead of decreasing it overall.

A serious issue with regard to the possible introduction of this measure is the low political feasibility of installing sustainability criteria for FRCs, as also stated in a study prepared for the European Commission in 2012.[135] In the current political setting, it remains to be seen if this argument is still valid and how practically difficult an introduction of such a measure could be. If there are substantial difficulties at EU level to find a common agreement, there might be a risk of a much slower adoption of this policy option (contrary to the optimistic assumption in this assessment that it could happen between 2021 and 2023).

Another risk is related to the accessibility of the certification standards. For some farmers, especially independent smallholders, several barriers could exist in the process of getting certified: costs, skills, knowledge and the administrative burden involved.

If this option is to be pursued at EU level, there is a risk that the criteria within the certification standard would not be stringent enough and that enforcement control would be too loose. Companies might prefer to choose schemes that are less ambitious and strict in ensuring deforestation-free commodities. Again, common EU definitions of certification standard criteria as well as a choice of effective monitoring, verification and reporting instruments would help mitigate this risk.

Many other existing weaknesses of voluntary certification standards would need to be assessed and avoided in the implementation and enforcement of this policy option.

Potential non-compliance with the World Trade Organisation's rules is also a serious risk associated with this option.[136] One of the possible counter-arguments for imposing the certification standards solely on non-EU producers would be the existing sustainability criteria imposed through the CAP on EU producers.

A risk of diverting non-certified production away from the EU market to others that do not require deforestation-free certification, could undermine the idea of a positive impact that this measure could have on FRC-producing and consuming countries around the world. That is why this option should be considered in a broader context of other measures, which the EU will undertake to advocate at international level so that other big consumers of FRCs in the world also source only deforestation-free and sustainable FRCs.

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[135] European Commission, 2012. The impact of EU consumption on deforestation: Proposal of specific Community policy, legislative measures and other initiatives for further consideration by the Commission (…), op. cit.

[136] Idem.

3.6. Policy option 3: Mandatory due diligence with sustainability criteria for imported forest-risk commodities with mandatory certification – Combination of policy options 1 and 2

This intervention foresees, like policy option 2, that only deforestation-free certified FRCs and products could enter the EU. Like in the previous option, a recognised certification body authorised by the European Commission would certify the producer. Operators putting FRCs on the EU market for the first time have to ensure due diligence throughout the whole supply chain.

General benefits

This policy option combines option 1 (mandatory due diligence) with option 2 (mandatory certification standards). It was considered, because in this combination the two policy options could mutually strengthen each other and lower their associated risks. For example, the costs and risks associated with policy option 2 could provoke a situation in which deforestation is eliminated only from EU imports but continues at alarming rates so as to supply markets with less environmentally strict entry criteria. Combining policy option 2 with policy option 1 could mitigate this problem, as due diligence is supposed to avoid the deforestation risk throughout the whole supply chain of FRCs including the upstream companies (operating in producing countries).

Impact on reducing EU-driven deforestation and associated CO_2 emissions

As from 2023, when the measure enters into force, only deforestation-free certified FRCs and products containing them can enter the EU market. This would lead to the same decrease (- 76 %) in deforestation embodied in EU imports and a decrease in associated carbon emissions compared to the baseline as in policy option 2 (Table 9). As in policy options 1 and 2, this reduction should be treated as an upper bound of decrease of deforestation and associated emissions compared to the baseline (as a result of all the assumptions made in the modelling).

Table 9: Deforestation embodied in EU imports* (hectares) and associated emissions (tCO_2) under policy option 3: mandatory certification with due diligence

Mandatory certification with due diligence	Absolute difference from baseline in cumulative deforestation (2020-2030)	Difference in cumulative deforestation from the baseline %	Absolute difference from baseline in cumulative CO_2 emissions (2020-2030)	Difference in cumulative CO_2 emissions from the baseline %
Agricultural commodities for food	-197 500	-76 %	-56 615 183	-77 %

Note: *This table only accounts for deforestation embodied in EU imports of agricultural commodities for food and does not include biofuels.

Source: Cambridge Econometrics (2020).

Economic impacts

Before the policy option enters into force in 2023, the economic impacts are the same as in policy option 2 (because the assumptions are also the same). High initial certification costs drive the results by provoking a price increase in FRCs and products containing them. This results in a decrease in consumption, which is reflected in lower GDP and employment (Table 10). By 2030, the impacts on the EU economy will be smaller because the economy will react to the increase in prices.

Table 10: Economic impact of policy option 3: mandatory certification with due diligence (absolute difference compared to the baseline), EU

	2021	2023	2030	2020-30
GDP (% difference)	-0.0020	-0.0014	-0.0011	-0.0013**
GDP (Million EUR)	-261	-189	-163	-1,573*
Total employment ('000 people)	-3.6	-23	-2.0	-22.8*
Total employment (% difference)	-0.0018	-0.0011	-0.0010	-0.0010**

Note: * Aggregated difference between the scenario and the baseline across the period; GDP values are discounted at 5% pa to make the EUR values comparable over time.

**Difference in growth in the 2020-2030 period between the scenario and the baseline, expressed in percentage points.

Source: Cambridge Econometrics (2020).

Private sector costs

The option assumes the same import price increase for FRCs as in policy option 1 (mandatory due diligence) in the ongoing phase and as in option 2 (mandatory certification standards).[137] The overall price increase is therefore higher and the related decrease in demand for each analysed FRC is bigger than in policy option 2 (although they follow a similar pattern). Due diligence costs for economic operators first placing FRCs on the EU market will be however lower because some of the costs of due diligence will already be covered in the mandatory certificates.

Public sector costs

As in the due diligence option, there will be a cost of €1 million for establishing competent authorities at Member State level as well as for them annually controlling compliance with criteria on deforestation-free production and other established criteria.

Risks

Some of the risks identified for policy options 1 and 2 would apply but, most importantly, as mentioned above, the combination of the two measures will lead to a general mitigation of associated risks.

3.7. Policy option 4: Mandatory labelling of food products containing forest-risk commodities

Firstly, this policy option is linked to the need for a general shift in consumption patterns towards consuming less and consuming more sustainably in order to protect the world's environment and biodiversity. Moreover, it has been estimated that the EU is responsible for 10 % of global deforestation embodied in agricultural production for exports. Food consumption patterns are especially relevant in the context of deforestation and – as shown in the analysis of the above policy options – a decrease in EU consumption of FRCs could substantially decrease the associated deforestation and carbon emissions.

Secondly, modern supply chains are very complex and in a globalised world it is 'increasingly difficult for consumers to fully understand the resource and environmental impacts of their

[137] See Table 11 in the Cambridge Econometrics (2020) study in the Annex.

consumption decisions'.[138] Therefore, this policy option aims to provide EU consumers with accessible information on the deforestation risk of products so that they can make informed decisions when buying food products. Currently, some voluntary labels used on food products show their environmental or other footprint. Others also include in their assessment criteria the concern regarding deforestation (a 'no deforestation' label), but the information provided to consumers is rarely explicit and clear. There is no EU-level regulation on the matter.

Thirdly, this intervention is modelled on the policy proposal 18 developed in the European Commission (2012) study.[139] It foresees that all food products that could cause deforestation (e.g. containing FRCs – scope to be precisely defined) must carry a label indicating whether or not they have caused deforestation. There are two labels: either the 'no deforestation' or 'this product might be associated with deforestation'. In order to be eligible for the 'no deforestation' label, products must be certified as deforestation-free by a recognised certification body, using a scheme that has been approved by the European Commission.

Lastly, this policy option could be an important component among different EU measures addressing the problem of commodity-driven deforestation. As its capacity to effectively reduce deforestation embodied in EU imports is relatively low compared to other policy options assessed here, it should be considered a complementary tool that could be highly effective in improving EU consumers' awareness of the deforestation problem and in shifting their choices to deforestation-free products.

General benefits

If the measure proves to be effective, EU consumers would become more aware of the environmental impact (and others, such as e.g. human rights) of the products they buy. This would create a consumer shift towards sustainable and environmentally friendly (including deforestation-free) products. The labels will also bring clarity to the current disinformation situation and enable EU consumers to make informed choices.

This policy should also have positive effects upstream of the FRCs supply chain. Producers of these commodities should see an advantage in ensuring that their exports are deforestation-free, as doing so would facilitate access to the EU market. That is why it is assumed that this measure would increase the uptake of voluntary certification standards (similarly to policy option 1 on mandatory due diligence). Since the entry of the policy into force in 2023, an increase in the rate of imports certified as deforestation-free is assumed at 5 % per year.[140]

Impact on reducing EU-driven deforestation and associated CO_2 emissions

It is assumed that products labelled 'no deforestation' have no impact on the deforestation embodied in EU imports of FRCs. Deforestation levels are therefore quantified only for the products labelled 'this product might be associated with deforestation'.

As EU consumption of 'deforestation-free' products is assumed to increase by 5 % per year once the measure enters into force in 2023, it drives the levels of EU deforestation embodied in imports

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138 Tramberend Sylvia, *et.al.*, Our Common Cropland: Quantifying Global Agricultural Land Use from a Consumption Perspective, Ecological Economics 157 (2019), pp. 332–341.

139 European Commission, 2012. The impact of EU consumption on deforestation: Proposal of specific Community policy, legislative measures and other initiatives for further consideration by the Commission (…), op. cit.

140 As rates of deforestation-free certification of beef, maize and rapeseed are unknown and assumed at 0 % in the baseline, it is assumed for this policy option that they will reach 5 % for each of these FRCs by 2023.

down.[141] A decrease in demand for the FRCs also drives deforestation levels down, but to a lesser extent. This policy option does not eliminate agricultural commodities associated with deforestation from EU imports by 2030 (as it is assumed for other policy options), but reduces their levels by 4 % (Table 11). The associated CO_2 emissions would also be reduced by 4 %. These estimates should be considered an upper bound of deforestation and emissions reductions.

Table 11: Deforestation embodied in EU imports* (hectares) and related emissions (tCO_2) under mandatory labelling

Policy Option	Absolute difference from baseline in cumulative deforestation (2020-2030)	Difference in cumulative deforestation from the baseline %	Absolute difference from baseline in cumulative CO_2 Emissions (2020-2030)	Difference in cumulative CO_2 emissions from the baseline %
Mandatory labelling	-11 024	-4 %	-3 151 639	-4 %

Note: *This table only accounts for deforestation embodied in EU imports of agricultural commodities for food and does not include biofuels.

Source: Cambridge Econometrics (2020).

Economic impacts

As mentioned above, an increase in the share of the demanded quantity of food products labelled 'no deforestation' is expected at 5 % per year from the entry of the policy option into force in 2023, because it is assumed that EU consumers will prefer these products over the ones labelled 'this product might be associated with deforestation'. The share of the quantity of the latter products is assumed to decrease by 5 %. Nevertheless, the overall change in consumption in comparison to the baseline is not important and amounts to less than 0.1 % for each FRC. Thus, the economic impact of this policy option is small.

However, the increase in products' prices provoked by the costs of introducing this measure will negatively impact the EU GDP and employment level (Table 12).

Table 12: Economic impact of mandatory labelling (absolute difference compared to the baseline), EU

	2021	2023	2030	2020-30*
GDP (Million EUR)	0	-44	-125	-481
Total employment ('000 people)	0.0	-0.6	-1.3	-7.3

Note: * Aggregated difference between the scenario and the baseline across the period, GDP values are discounted at 5% pa

Source: Cambridge Econometrics (2020).

[141] See explanations on the assumptions made in Chapter 3.4.5. Policy option 4: Mandatory labelling in the study in the Annex.

Private sector impacts

EU or non-EU companies placing food products containing FRCs on the EU market will bear the cost for the introduction and operation of the mandatory labelling system. For the 'no deforestation' label, food manufacturers but also retailers (for products of their own brand) would need to apply to a competent body in a Member State (in which the product is manufactured or imported) for a certificate proving that their production (or importation) is not associated with deforestation. Once obtained, the certificate will allow the use of the 'no deforestation' label. The competent body would charge a fee for auditing/inspecting a producer and delivering the certificate, as well as for the annual use of the label (scheme based on the existing EU Ecolabel).[142] Producers that do not comply with the 'no deforestation' label criteria will also have to pay to the competent authorities for the application process and a fee to use the 'this product might be associated with deforestation' label; however this cost will be negligible compared to the one borne by the producers of the 'no deforestation' products.

However, producers of deforestation-free products will be able to offset some of their costs through price premiums assumed at 4 % per year for the products labelled 'no deforestation'. This will be possible if (as it is assumed) EU demand for these products increases.

Public sector impacts

This policy option foresees the establishment of competent authorities at Member State level (or designation of existing ones and increasing their competences). They will check companies' compliance with the criteria set for the labelling scheme. The cost of creating relevant bodies and the running cost of controls is assumed at €1 million per year, similarly to policy options 1 and 3. The example of the EU Ecolabel scheme shows that direct income from annual fees paid by companies to the competent bodies amounts to €1 million per year.[143] This could offset the above-mentioned regulatory cost for public authorities estimated at the same amount.

Risks

There are several risks potentially impeding the effectiveness of this policy option.

The main objective of this policy option – to improve transparency and information about the deforestation impact of products – could be endangered if the labels used are unclear and confusing to consumers. Paradoxically, labels and any other materials used for getting consumers more informed, could add more confusion if not well designed. Moreover, the measure will be effective only if EU consumers understand the importance of the dangers of deforestation and are willing, motivated and able to change their consumption patterns. This would be especially challenging in Member States with lower disposable income where price criteria might dominate over sustainability of a product.

There are risks associated with the regulatory impacts of this policy option. If the voluntary deforestation-free certification associated with the measure constitutes a barrier to FRCs producers

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[142] The costs of labelling were assumed to stand at between €1 500 and €3 000 for an audit/inspection by the competent body per operator per year and between €1 500 to €4 000 in transaction costs per operator, based on the literature on the EU Ecolabel scheme. For details, see the Chapter 3.4.5 on Policy option 4: Mandatory labelling in the Cambridge Econometrics (2020) study in the Annex.

[143] European Commission, 2008. Commission staff working document accompanying the proposal for a Regulation of the European Parliament and of the Council on a Community Ecolabel scheme - Impact assessment {COM(2008) 401 final} {SEC(2008) 2119} (No. SEC(2008) 2118). Brussels.

in non-EU countries (e.g. smallholders), they will not be willing to adhere to it and change their way of production.

3.8. Comparison of the policy options

The policy options that reduce the most deforestation embodied in EU imports and the associated carbon emissions are policy option 2 (mandatory certification standards) and policy option 3 (mandatory certification standards with due diligence), as outlined in Table 13 below. The second most effective in reducing deforestation and emissions is policy option 1 (mandatory due diligence). Policy option 4 (mandatory labelling) is the least effective and would reduce deforestation and emissions by only 4 % compared to the baseline. However, it has to be remembered that the effectiveness of all policy options presented here is judged optimistically, based on the assumptions made. In reality, policy design, including specific implementation measures (among many other parameters), will play a crucial role in the actual effectiveness of EU-level intervention.

Table 13: Deforestation embodied in EU imports* (hectares), related emissions (tCO_2) under mandatory labelling and overall effectiveness (+++ high, ++ medium, + low) of all four policy options

Policy Option	Absolute difference from baseline in cumulative deforestation (2020-2030)	Difference in cumulative deforestation from the baseline %	Absolute difference from baseline in cumulative CO_2 emissions (2020-2030)	Difference in cumulative CO_2 emissions from the baseline %	Overall effectiveness in reducing deforestation and CO_2 emissions
Policy option 1: due diligence with constant certification	-160 197	-62 %	-45 775 855	-62 %	++
Policy option 1: due diligence with increasing certification	-156 556	-62 %	-44 657 505	-62 %	++
Policy option 2: mandatory certification	-197 500	-76 %	-56 615 183	-77 %	+++
Policy option 3: mandatory certification with due diligence	-197 500	-76 %	-56 615 183	-77 %	+++
Policy option 4: mandatory labelling	-11 024	-4 %	-3 151 639	-4 %	+

Note: *This table only accounts for deforestation embodied in EU imports of agricultural commodities for food and does not include biofuels.

Source: Cambridge Econometrics (2020) and author's own elaboration of the overall effectiveness in the last column.

All of the four policy options produce negative impacts on the EU economy, but these are relatively small (Table 14). The highest GDP decrease and biggest employment loss is observed for the policy options containing mandatory certification standards – policy option 2 and policy option 3 (an even higher negative impact). This is mainly driven by the assumption of higher costs in the phase of preparation for the measure to enter into force (between 2021 and 2023) than when the policy

option is in place (2023-2030). When policies 1 and 2 are combined into policy 3, the overall economic effect is a bit smaller than their combined individual effect. This proves that synergies between the two interventions exist.

The economic impact of policy option 1 is smaller mainly because of the higher costs expected during the preparatory phase in options 2 and 3. In this option, the running costs are nevertheless higher (compared to mandatory certification). Overall, the cumulative economic effects (2020-2030) of policy option 1 and policy option 2 are of similar magnitude.

Policy option 4 leads to the highest price increase out of all policy options, which only applies to products carrying the 'no deforestation' label. As the market share of these products is assumed to grow, but not to the extent that it would dominate the market in 2030, the cumulative economic effect of this option is the smallest of the four.

Table 14: Impact on GDP and employment – cumulative difference from the baseline throughout the 2020-2030 period and indication of high (€€€), medium (€€) and low (€) economic impact of policy options

	GDP (EUR millions)	GDP (% difference)	Employment (000s)	Employment (% difference)	Overall impact on GDP & employment
Policy option 1	-829	-0.001	-11	-0.0007	€€
Policy option 2	-961	-0.0002	-14	-0.0003	€€
Policy option 3	-1573	-0.0013	-23	-0.0010	€€€
Policy option 4	-481	-0.0010	-7	-0.0006	€

Source: Cambridge Econometrics (2020) and author's own elaboration of the overall economic impact.

4. European added value of the policy options analysed

European added value (EAV) is often defined as a net benefit stemming from EU-level action compared to action taken separately at Member State level. The net benefits of EU-level action to halt and reverse EU-driven deforestation can be identified in this assessment as the effectiveness in decreasing EU-driven deforestation (quantified in this EAVA as a decrease in the EU imports' embodied deforestation levels and associated carbon emissions, see Table 13). The alternative action – to address deforestation at Member State level – can be assumed to be the baseline of this assessment (as no alternative national-level policy options were modelled).

All analysed policy options also bring about economic costs because they increase prices of commodities and products (Table 14).

However, we believe that basing the EAV only on the above quantitative comparison could be misleading, especially considering some important risks that each policy option bears, which can impede the actual effectiveness of EU-level intervention. That is why to establish the overall EAV we also compare (Table 15) the policy options qualitatively against the following criteria: **feasibility** (whether the measure is technically and politically feasible), **effectiveness** (in reducing deforestation and emissions embodied in EU imports, as well as political acceptability), **efficiency** (measured in the ratio between the economic costs caused by the regulation and the benefits to be reaped as a result of reducing the deforestation and carbon emissions embodied in EU imports).

Table 15: Qualitative assessment of all four policy options to establish their European added value (+++ high, ++ medium, + low)

Policy Option / Qualitative criteria	Feasibility	Effectiveness	Efficiency
Policy option 1: due diligence	++	++	++
Policy option 2: mandatory certification	+	+++	+++
Policy option 3: mandatory certification with due diligence	+	+++	++
Policy option 4: mandatory labelling	+	+	+

Source: Author's elaboration based on the available literature,[144] including the study by Cambridge Econometrics (2020) in the Annex.

Although such comparison is only indicative, as other criteria could also be added, policy option 1 on mandatory due diligence has the highest potential European added value, as it is the most

[144] Main sources for this assessment include: i) COWI, Ecofys, Milieu, 2018. Feasibility study on options to step up EU action against deforestation (…), op. cit.; ii) European Commission, 2012. The impact of EU consumption on deforestation: Proposal of specific Community policy, legislative measures and other initiatives for further consideration by the Commission (…), op. cit.; iii) Bager, Simon and Persson, Martin and Reis, Tiago, Reducing Commodity-Driven Tropical Deforestation: Political Feasibility and 'Theories of Change' for EU Policy Options (June 15, 2020). Reducing Commodity-Driven Deforestation – Bager et al. (2020), Available at SSRN: https://ssrn.com/abstract=3624073.

feasible, relatively effective and efficient among the four policy options considered. Stakeholders seem to be willing to accept it; however, its implementation will still be a very challenging task, especially if the scope of commodities and criteria is broader. As mentioned in the study for the European Commission, this measure could be mutually strengthened with partnership agreements on deforestation-free FRCs with producing countries (taking example from such partnerships on elimination of illegal timber).[145]

The policy options comprising mandatory certification (policy option 2 and 3) standards could be less feasible because they would constitute a de facto ban on imports not certified as 'deforestation-free'; but, if effectively implemented, these two policies would have the biggest potential to quickly eliminate deforestation and carbon emissions embodied in EU imports, as it is assumed that they would bring these to zero from the moment they enter into force.

Policy option 4 on mandatory labelling seems to have the lowest European added value and should probably not be the sole option considered to halt and reverse EU-driven deforestation due to its low effectiveness in eliminating it, but rather as a complementary tool addressing consumers' disinformation regarding the deforestation impacts of the products they buy.

[145] COWI, Ecofys, Milieu, 2018. Feasibility study on options to step up EU action against deforestation (…), op. cit.

5. Conclusions

An EU intervention to halt and reverse EU-driven deforestation is needed. The analysis in this EAVA clearly shows that if the *status quo* is maintained, EU-driven deforestation will not be stopped or eliminated.

Generally, all four policy options focusing on the demand-side regulatory measures analysed in this EAVA have a potential to reduce EU-driven deforestation caused by trade in agricultural commodities, and the associated carbon emissions. This is however conditional on their full and effective implementation. The degree of deforestation and emissions reduction varies, with policy options 2 and 3 showing the biggest reduction potential (76 %), followed by policy option 1 (62 %), and with policy option 4 having the smallest potential (4 %). All policy options have a small negative economic impact that in 2030 is estimated to drop to less than 0.01 % for both GDP and employment rates compared to the baseline.

Developing EU-level interventions addressing the problem of deforestation provoked by agricultural commodities imports to the EU is an unprecedented challenge. Any policy option that will be proposed and legislated at the EU level will need the support of other EU policies and instruments due to the complexity and broadness of the problem. Demand-side measures, including these analysed in this study, could only be a part of the solution. Political coherence will need to be ensured among the environment, trade, development, finance, agriculture and other policy areas, so as not to undermine the effectiveness of EU action.

The EU has an important role to play and potentially become a front-runner in addressing commodity-driven deforestation. The potential for EU action is big as are expectations. Addressing the existing limitations, such as the absence of standards for deforestation-free supply chains or common terms and definitions in this field, could make the EU a global standard-setter, as has already been the case with regard to other environmental legislation.

The success of halting and reversing EU-driven deforestation will also depend on evidence-based decisions. The numerous gaps stemming from a lack of transparency in long and complex supply chains of agricultural commodities, from difficulties in monitoring, reporting and verifying progress of anti-deforestation standards, etc. constitute an opportunity to use and/or develop innovative tools and solutions.

Moreover, there are limits to what the EU can achieve in reducing global deforestation by itself. Although it lags on its own commitments, it is still one of the most advanced regions that have developed some tools to fight deforestation. The EU could lead by example, especially in terms of promoting changes in consumption towards more sustainable patterns. It is important to remember that although trade in agricultural commodities is one of the main drivers of deforestation, local and regional consumption in forest-risk commodities-exporting countries is still the principal one.

Annex

An EU legal framework to halt and reverse EU-driven global deforestation

Quantitative assessment of European added value

This report quantifies the impacts of different policy options that the EU could apply in order to halt or reverse EU-driven global deforestation. The policy options considered in this study are based on previous studies and regulations.

Four policy options are analysed in detail: mandatory due diligence for forest-risk commodities' supply chains; mandatory certification standards for forest-risk commodities; mandatory certification standards combined with due diligence of supply chains; and mandatory labelling of products from forest-risk commodities' supply chains. Cambridge Econometrics' E3ME macroeconomic model is used to measure the economic impacts in the EU of each policy option. Additional quantitative analysis provides estimates of the impacts of the policy options on deforestation and CO_2 emissions linked to deforestation.

The forest-risk commodities considered in this report are soy, beef, palm oil, maize, rapeseed and sugar. All four policy options lead to a small negative economic impact in terms of GDP and employment. The due diligence and mandatory certification policy options, provided they are implemented effectively, both reduce deforestation embodied in EU imports substantially, effectively bringing it to zero by 2030. The European Added Value is therefore reaching 100 % deforestation-free imports in the selected commodities by 2030 (if the EU policies are effectively implemented), and this is equivalent to a reduction between 4 % and 77 % of cumulated deforestation linked to EU imports in the 2020-2030 period.

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Executive summary

Deforestation contributes to global greenhouse gas emissions and leads to loss of biodiversity. In recent decades agricultural activity has driven faster rates of deforestation worldwide. Commercial agriculture, which usually dominates international trade in agricultural commodities, is estimated to account for over 50% of tropical and subtropical deforestation (FAO, 2016). The EU is among the major global importers of 'forest risk commodities' (FRCs), defined as commodities that are often associated with deforestation or forest degradation. Against this background, the EU is considering multi-faceted, coherent and comprehensive regulatory intervention to address the issue of EU-driven deforestation.

This report quantifies the impacts of different demand-driven policy options that the EU could apply to reduce, or even end, global deforestation caused by EU imports. The policy options considered in the report are based on previous studies on deforestation and regulations meant to improve the environmental impact of EU economic activity. They are assessed against the current regulatory framework (referred to as the baseline in this report) which includes Member State level actions.

Cambridge Econometrics' E3ME macroeconomic model is used to measure the economic impacts in the EU of each policy option, compared to the baseline. The E3ME model quantifies the changes in EU demand for each of the six commodities driven by changes in production costs and prices. It captures the demand for these commodities destined for food but also includes their use in biofuels. Additional quantitative analysis provides estimates of the impacts of the policy options on deforestation embodied in imports and CO_2 emissions linked to deforestation.

The FRCs considered in this report are soy, beef, palm oil, maize, rapeseed and sugar. In previous studies and academic publications these commodities are often associated with deforestation. The choice of commodities also reflects the availability of data and of classifications within the modelling framework.

At EU level, four policy options are analysed in detail: mandatory due diligence for FRCs' supply chains; mandatory certification standards for FRCs; mandatory certification standards combined with due diligence of supply chains; and mandatory labelling of products from FRCs' supply chains. If each policy is effectively implemented, then each policy option leads to an increase in the cost of production and therefore price of FRCs.

A mandatory due diligence requirement at EU level would require companies to carry out due diligence to identify, prevent, mitigate and account for actual or potential deforestation risk in their own operations or supply chains. Companies could use existing voluntary certification schemes to meet the requirement. In the period 2021-22, economic operators will enter an initial phase of setting up due diligence systems before the policy is fully enforced from 2023 onwards. It is assumed that the cost of setting up and running the system will be passed on to consumers through higher food and biofuel prices. The increase in price depends on the complexity of the supply chain and the size of the companies involved. The share of already-certified imports will either remain constant or increase because companies are more likely to prefer certified products that do not require further due diligence. Past experience suggests that not all operators will have satisfactory due diligence systems in place by 2023. Therefore, the scenario in this report assumes that initially 70% of imported FRCs have no deforestation risk, with the share increasing to 100% by 2030. Therefore, by 2030, all imports of FRCs to the EU are covered by due diligence and no deforestation is embodied in EU imports.

Mandatory certification requires that all EU imports of FRCs must be officially certified as deforestation-free by a recognised certification body, using schemes that are approved by the European Commission. Commodities that are not certified as deforestation free cannot enter the

EU. This policy would therefore in 2023 immediately bring to an end deforestation embodied in EU imports. The cost of certification is borne by producers in the third countries and is passed on to EU consumers through higher prices. It is expected that there will be higher initial costs to obtain the certificates, with lower running costs once the required systems are in place. The initial high cost could prevent smallholder producers from getting certified. The certification is requested only to foreign producers, therefore this policy option could be considered by the WTO as arbitrary or hidden protectionism.

There are interactions and potential synergies between the due diligence and mandatory certification policy options. It is therefore possible that the two policy options could be combined, forming the third policy option discussed in this report. Two sets of costs are considered in this combined policy option: the cost of certification for producers and the cost of due diligence for operators.

The mandatory labelling policy option requires the application of a label on all products that contain FRCs. Consumers are provided with accessible information on the forest footprint of products and can therefore account for potential deforestation impacts when making purchasing decisions. It is assumed that there would be some preference amongst consumers for 'no deforestation' products. As other studies on labelling for environmental sustainability have shown, consumers may pay a price premium for the deforestation-free product. Biofuels are not considered in the evaluation of this policy option.

In the period up to 2030 all four policy options show a negative economic impact in terms of GDP and employment. However, at EU level the size of the GDP and employment impacts is less than 0.01%, compared to the baseline. In all cases, the final prices of FRCs in the EU increase by less than 2%.

The limited number of FRCs assessed in this report could influence the economic impact of the policy options, but it does not influence conclusions on the relative costs of each policy option. The economic impact is driven by cost increases that are comparable to those observed for similar policies in the past, as reported in the published literature. The cost increases should be interpreted as upper bounds rather than best guesses. Moreover, a gradual movement towards certification schemes means that some of the costs may be incurred even in the absence of new policy.

The European Added Value is quantified as the additional net benefit that can be generated, compared to the net benefit achieved by action by any Member State. The baseline case includes the current actions of Member States. The impacts of the selected EU policy options are compared to the baseline and therefore show the European added value.

The due diligence and mandatory certification policy options both reduce deforestation embodied in EU imports substantially, and to zero by 2030. The cumulative reduction in embodied deforestation in EU imports between 2020 and 2030 (compared to the baseline) is 62-77%. Mandatory certification could achieve an immediate reduction to zero by 2023 if the policy option is fully effective. The labelling policy option would lead to smaller reductions in embodied deforestation in EU imports, but would also have the smallest economic impact. Both results are driven by assumptions about the cost and therefore price increases for the FRCs, assumptions about the share of consumers buying deforestation-free products and assumptions about the resulting share of certified imports.

Overall, based on the cost assumptions that drive the price increase and other assumptions made in the analysis, the mandatory due diligence and certification policy options bring the largest benefits in terms of reductions in embodied deforestation and emissions linked to deforestation by 2030. These two policy options entail a similar economic cost. The combined mandatory due

diligence and certification policy option brings the same benefits as mandatory certification but with almost twice the economic cost.

One potential factor that remains unexplored is whether reducing deforestation embodied in EU imports would lead to lower *global* deforestation levels overall. Without coordination with other major importers, it is possible that new EU policy could incentivise exporters to direct sustainably-produced goods to the EU, and non-sustainably-produced goods to other countries. This issue goes beyond the scope of this report, but it suggests that there could be an important role for the EU working in collaboration with other major consumers of the FRCs.

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1. Introduction

Driven mainly by agricultural activity (80%) and infrastructure construction (20%), rates of global deforestation have risen in recent decades (FAO, 2016). The volume of international trade in agricultural commodities has also been rising and is estimated to account for 45-50% of global deforestation, with the remaining part being caused by local and regional subsistence agriculture (COWI et al., 2018a, p. 44). Three commodities: soy, beef and palm oil are responsible for nearly 80% of global deforestation (COWI et al., 2018a).

There are many international initiatives that are trying to stop global deforestation. Various governments have committed to ending deforestation, and a range of voluntary schemes operate in the private sector. However, despite all these initiatives, rates of deforestation are not falling, which suggests that these actions are not effective.

The EU is therefore considering multi-faceted, coherent and comprehensive regulatory intervention to address the issue from various angles, including supply, demand and financing. The previous European Commission adopted an EU Communication on Stepping up EU Action to Protect and Restore the World's Forests (European Commission, 2019a) and the new European Commission has confirmed that legislative action at EU level against global deforestation will be taken as part of the European Green Deal (European Commission, 2019b).

The EU is a substantial contributor to greenhouse gas (GHG) emissions from global deforestation. Overall, 15% of the EU's food consumption carbon footprint comes from deforestation (Pendrill et al., 2019b). The EU is responsible for 7-10% of global consumption of crops and livestock products that are associated with deforestation in their countries of origin (European Commission, 2019c). The EU is also a major global importers of several 'forest risk commodities' (FRCs), including palm oil (17%), soy (15%), rubber (25%), beef (41%), maize (30%), cocoa (80%), and coffee (60%) (European Commission, 2019c).

Against this background, the European Parliament is preparing an own-initiative legislative report[1], calling on the European Commission to present a legislative proposal for an EU legal framework to halt and reverse EU-driven global deforestation. This report aims to support the legislative report of the European Parliament and contribute to the European Added Value Assessment prepared by the European Parliamentary Research Service.

This report assesses demand-side EU policy options to tackle deforestation that is driven by the EU's demand for certain food products. EU demand-side policy options refer to actions that can be taken in the EU as an importing market. These actions are meant to induce corresponding actions on the supply side in the exporting/producing countries.

The main objectives of demand-side EU interventions could be defined as[2]:

- to reduce overall EU demand for FRCs, reducing the EU's consumption footprint on land;
- considering an overall reduction, to increase the share of EU demand for sustainable and deforestation-free products;

[1] https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2020/2006(INL)&l=en

[2] These objectives were identified on the basis of the European Commission Communication on Stepping up EU Action to Protect and Restore the World's Forests, the study underpinning it (COWI et al., 2018b), and the 2012 report prepared for the European Commission (European Commission, 2012).

- to make the global supply chains of FRCs more sustainable, inclusive and transparent in reducing their impact on deforestation and forest degradation; and
- to promote trade in legal, sustainable and deforestation-free agricultural commodities.

FRCs are defined in this report as commodities that often have been found to be associated with deforestation or forest degradation (COWI et al., 2018b), i.e. higher production of these commodities is linked to an increase in land taken from forests. Moreover, in this report deforestation refers to changes in both natural and planted forest, as a result of human activities, including forestry practices such as timber harvesting or deforestation, as well as natural causes such as disease, fire or storm damage (Global Forest Watch, 2020). In this report, forests are defined as areas with a minimum threshold of 30% canopy cover (Global Forest Watch, 2020). It is important to acknowledge that tree cover loss and deforestation do not always coincide. While deforestation is generally intended as the conversion of natural forest[3] to other land uses due to human activities, tree cover loss also accounts for the reduction in the presence of trees because of natural events or disasters. Deforestation-free FRCs and products containing deforestation-free FRCs are understood in this report as those not coming from deforested or degraded forest (in accordance with the criteria outlined above).

FRC producers include smallholders, large plantation holders, establishments or enterprises whose production of FRCs is mostly or all sold commercially. They are the first link in the supply chain of the FRCs. Economic operators are defined as establishments or enterprises in the supply chain that perform the function of importing FRCs to the EU. Economic operators and importers will be used interchangeably throughout the report.

The quantitative assessment that is carried out in this report considers three groups of measures: due diligence, certification, and labelling. These are compared to a baseline case that includes Member State policy implemented before the end of May 2020. The food products that are considered in the analysis are soy, beef, palm oil, maize, rapeseed and sugar.

Throughout this report, 'EU' refers to the current EU with 27 Member States. Where the UK is included in the analysis, the abbreviation EU-28 is used.

The next chapter describes the policy measures in more detail. Chapter 3 describes the quantitative modelling approach that was used to carry out the assessment. Chapter 4 presents the results and the final two chapters discuss European added value and the overall conclusions from the analysis.

[3] A natural forest is defined as a forest that is a natural ecosystem (Burkhardt, 2020).

2. Policy options and scenario narrative

2.1. Introduction to the policy options

There are several different policy options that could be introduced to reduce the level of deforestation from EU food and biofuel consumption. In this report, we assess three of them in detail:

- mandatory due diligence for forest-risk commodities' supply chains;
- mandatory certification standards for forest-risk commodities; and
- mandatory labelling of products from forest-risk commodities' supply chains.

In this report we consider the application of these policies to six types of commodities that are deemed to be forest-risk commodities (FRCs):

- soy
- beef
- palm oil
- maize
- rapeseed
- sugar

The choice of commodities is based on the commodities commonly associated with deforestation, as discussed in COWI et al. (2018b, p. 41) and Pendrill et al. (2020). The selection of commodities also depends on the practicalities of fitting within the available data and modelling framework (see details in Section 3.2)[4].

Table 1 outlies the logic of intervention in each of three policy options, plus one case where two of the policy options are combined. These policy options are translated into scenario narratives in the next section and form the basis of the quantitative assessment in subsequent chapters of this report.

Table 1: Selected demand-side policy options to be quantitatively assessed

Name	Policy option 1 – Mandatory due diligence for forest-risk supply chains
Specific objective	Regulate the EU market to minimise the risk of deforestation-linked commodities entering the EU supply chain
Description	Due diligence through the supply chain refers to due diligence processes to prevent, mitigate and account for deforestation both in a firm's own operations and in its supply chain (European Commission, 2020). The intervention follows the example of due diligence introduced in the Regulation (EU) No 995/2010 laying down the obligation on operators who place timber products on the market (EU Timber Regulation - EUTR). EU-level regulation addressing FRCs could lay down comparable obligations for food and biofuel importers and EU domestic producers as those of operators who place timber and timber products on the market. However, the regulatory framework would be adapted to the risks posed by the FRCs to forest ecosystems and therefore not only restricted to the legality of FRCs and products containing them (as it is in the EUTR) put on the EU market.

[4] Commodities such as cocoa and coffee, although important FRCs, were therefore not modelled (see discussion in Section 3.3.7).

	The intervention is based on a broader range of sustainability and deforestation-free criteria that are applied to FRCs and their supply chains[5]. The operators who first place FRCs on the EU market (both importers and EU domestic producers) must have in place a system of due diligence to minimise the chance of them handling FRCs not complying with the criteria.
Name	Policy option 2 – Mandatory certification standards for forest risk commodities
Specific objective	Regulate EU market access so as to prevent imports of commodities that are associated with deforestation, while deforestation-free commodities can still access the EU market.
Description	This option includes the introduction of sustainability criteria to the imports of commodities that could cause deforestation. As laid out in the policy proposal 24 developed in the study for the European Commission (European Commission, 2012, p. 58), « (…) importers must demonstrate that the commodities they are importing are deforestation-free. To this end, commodities need to be certified by a recognised certification body, using schemes that were approved by the European Commission. Commodities that are not certified cannot enter the EU." This policy option also builds on the example of the sustainability criteria and certification of low Indirect Land Use Change (ILUC) risk of biofuels laid out in the European Union Renewable Energy Directive 2018/2001 – recast (EU RED II) and in the related Delegated Regulation (EU) 2019/807.
Name	Policy option 3: Mandatory due diligence and certification standards
Specific objective	Regulate EU market access to promote sustainable and deforestation-free products.
Description	A combination of policy options 1 and 2.
Name	Policy option 4 – Mandatory labelling of products from forest-risk supply chains
Specific objective	Provide consumers with accessible information on the deforestation risk of products so that they can make informed decisions when buying food products.
Description	All food products that could cause deforestation must carry a label indicating whether they have caused deforestation. As laid out in policy proposal 18 developed in the study for the European Commission (European Commission, 2012, p. 49), « For reasons of clarity and effectiveness, food products must carry either the label 'No deforestation' or 'This product might be associated with deforestation'. In order to be eligible for the 'No deforestation' label, products must be certified as deforestation-free by a recognised certification body, using a scheme that has been approved by the European Commission."

Source: European Parliamentary Research Service.

2.2. Further details of the policies

2.2.1. The current regulatory framework

The current regulatory framework for imports of agricultural commodities linked to deforestation is captured though a business-as-usual scenario, in this report called the baseline, to which the different policy options are compared to. The baseline captures the trend in the demand for imported agricultural commodities based on the current regulatory framework. The baseline

[5] These criteria could, apart from relating to deforestation, relate to sustainable use of other ecosystems, respect of human rights, social rights and land tenure rights - as mentioned in the (COWI et al., 2018b) study.

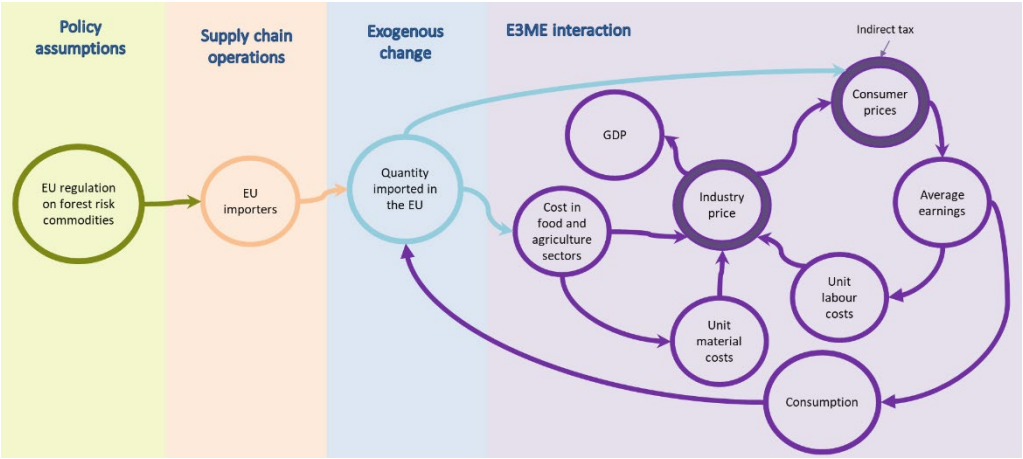
includes the impact of all current Member State and private initiatives to reduce deforestation from imported food products.

2.2.2. Mandatory due diligence

A mandatory due diligence requirement at EU level would require companies to carry out due diligence to identify, prevent, mitigate and account for actual or potential deforestation impacts in their own operations or supply chains (COWI et al., 2018b). Operators who first place their products on the EU market would need to trace back the origin of those products and ensure that they comply with deforestation-free criteria in production. These criteria will be set out in the regulation and applied to operators importing to the EU, as well as to EU domestic producers.

At Member State level, regulatory bodies (competent authorities) will be designated to check that the criteria set in the regulation are complied with. This implies an increase in government spending, both for the creation of the regulatory body (or extension of functions of an existing one) and the cost of annual compliance controls.

Figure 1: How the due diligence policy option is modelled



Source: Cambridge Econometrics.

Figure 1 illustrates how the due diligence policy option is modelled. The EU regulation on due diligence requires that EU importers, i.e. companies first placing FRCs on the EU market, ensure that FRCs are produced in compliance with the criteria. This implies a cost for EU importers to set up a system of due diligence, so as to minimise the chance of them handling FRCs not complying with the criteria.

The five steps of the OECD and FAO (2016) approach to risk-based due diligence along agricultural supply chains could be applied. They are:

1. Establish strong enterprise management systems for responsible agricultural supply chains;
2. Identify, assess and prioritise risks in the supply chain;
3. Design and implement a strategy to respond to identified risks;
4. Verify supply chain due diligence; and
5. Report on supply chain due diligence.

It is assumed that an initial phase of two years between the proposal of the due diligence policy and the launch of the policy will allow all relevant EU importers to set up the due diligence system,

following the five steps above. They will also need to switch away from producers or other agents in their supply chains that do not meet the criteria, thus affecting the quantity of FRCs that can be imported to the EU (as indicated in Figure 1). For operators that do not have due diligence in place, there would be some costs associated with initially setting up this system, maintaining it and controlling it. In turn, it is assumed that these costs lead to an increase in import prices and domestic prices of commodities and products associated with FRCs in the EU. The increases in prices are expected to lead to a decrease in the demand for FRCs and related products within the EU, hence reducing EU imports of these products and their related impacts on global deforestation (compared to the baseline). Due to the price increase, some of the commodities will be substituted with other commodities or demand will be met exclusively by domestic production. In some cases, substitution might not be possible because of intrinsic characteristics of the commodity or a lack of domestic production. For example, soy is used because it is a very efficient protein source for animals and is available at relatively low cost.

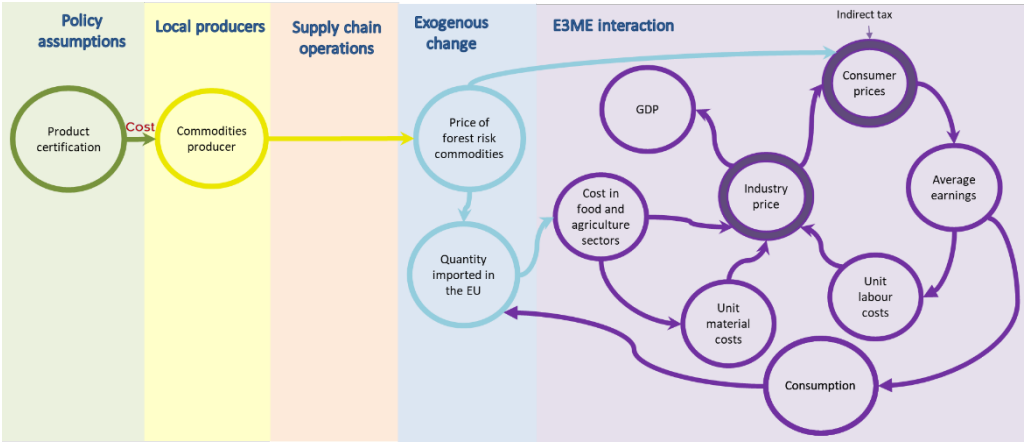
The price increase is passed on to EU consumers, reducing their disposable income and real levels of consumption. Falling demand leads to lower levels of Gross Domestic Product (GDP) and employment.

Currently, certification for deforestation-free commodities is voluntary: 78% of palm oil and 13% of soy imported for food in the EU are certified. In the exporting countries, due diligence is assumed to incentivise the increase in the uptake of voluntary certification of these commodities 'as being from sustainable sources' because EU importers will more likely decrease the length/complexity of their supply chains to reduce the risk of sourcing unsustainable products. The uptake of voluntary certification might depend on the structure of supply chains in terms of type of producers involved and might also lead to changes in their structure. Given the high costs of adherence to certification schemes, smallholders might be excluded from supply chains, unless special financial incentives are provided for them (e.g. government aid). Conversely, the uptake of certification schemes is easiest for large producers (who already are certifying at least part of their production).

2.2.3. Mandatory certification

In the case of mandatory certification, all EU imports of FRCs must be officially certified as deforestation-free. In practical terms, this means that all commodities must be certified by a

Figure 2: How the mandatory certification policy option is modelled



Source: Cambridge Econometrics.

recognised certification body, using schemes that have been approved by the European Commission (European Commission, 2012). Commodities that are not certified cannot enter the EU.

Companies that want to export FRCs from countries where the production of these commodities is at risk of being associated with deforestation will have to demonstrate that their commodities are not associated with deforestation. Obtaining the necessary certificates will likely require some cost on the producer side (see Figure 2).

To be certified, producers will pay the certification body an annual membership fee and may also incur several costs relating to the auditing process before obtaining the certification (and period auditing to maintain the certification). It is expected that producers will transfer the cost of acquiring and maintaining the certificates to the prices of the products. Therefore, the prices of commodities associated with deforestation are likely to increase[6]; EU industry and consumers will find themselves less well-off in real terms, which will affect the quantity demanded of both food and non-food products. In general, aggregate demand will be affected, leading to a decrease in GDP and employment.

At EU level, the certification of FRCs will be checked by border control. No extra cost for these controls is considered because these agricultural commodities are already checked for compliance with EU sanitary and phytosanitary standards. Moreover, the European Commission already has a multilingual online platform, called TRACES[7], for the sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union. TRACES also covers intra-EU trade and EU exports of animals and certain animal products. TRACES' main objective is to streamline the certification process and all linked entry procedures. A similar system could be put in place for the other FRCs, and therefore checking the validity of the certification document is not expected to increase the cost of border controls. Nevertheless, some additional EU-level implementation costs could arise, for example in relation to approval by the European Commission of existing standards or developing new ones (if deemed necessary) or in relation to auditing in addition to the one mandated by the standards.

The effectiveness of this policy will largely depend on the transparency and traceability of large volumes of imports from the point of production to the point of consumption. Data available from certification schemes often indicate the total land area at the point of production, rather than the quantity of product certified (Harris et al., 2019).

While this policy option aims to target global environmental protection, it still needs to pass the WTO rules on environmental measures to confirm that the measures are not applied arbitrarily or as hidden protectionism (European Commission, 2012). In the absence of coordinated international action related to deforestation, the biggest risk of this policy option is the continuation of deforestation linked to FRCs exports to markets that do not require deforestation-free certification (Harris et al., 2019).

2.2.4. Mandatory due diligence and certification standards

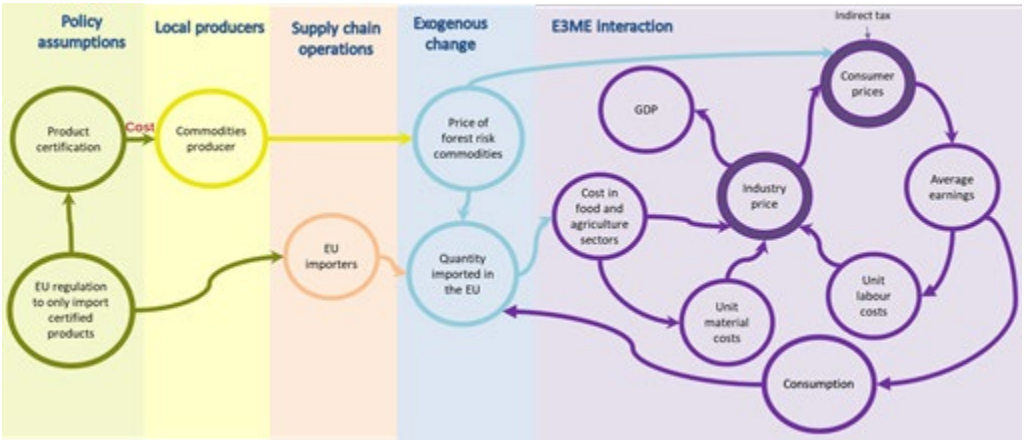
In view of current criticism and limitations regarding the effectiveness of voluntary certification schemes in reducing deforestation (see e.g. Lambin, E. et al. (2018)), mandatory due diligence could be combined with mandatory certification schemes for the FRCs. In this case, for commodities

[6] According to Chagas et al. (2020), due to a weak demand for certified palm oil, roughly half of all palm oil grown under voluntary certification ends up in the standard market, and thus is sold at too low a premium to encourage expansion in certified supply. Under mandatory certification, the situation is expected to be the opposite, with higher demand that will lead to an increase in the price premium, at least in the medium term.

[7] https://ec.europa.eu/food/animals/traces_en

directly imported into the EU, the producer must be certified by a recognised certification body, using a scheme that has been recognised by the European Commission. For products containing FRCs, the EU's manufacturers and retailers must ensure due diligence in their supply chains.

Figure 3: How mandatory due diligence with certification is modelled



Source: Cambridge Econometrics.

As in the previous policy option, a price premium is expected to develop for FRCs. Additionally, the EU's manufacturers and retailers will face a cost of implementing the due diligence system, albeit at lower cost than in policy option 1 (because some of the costs of due diligence are already covered in the certificates). At the Member State level, regulatory bodies will be established to check that the due diligence criteria set in the regulation are complied with.

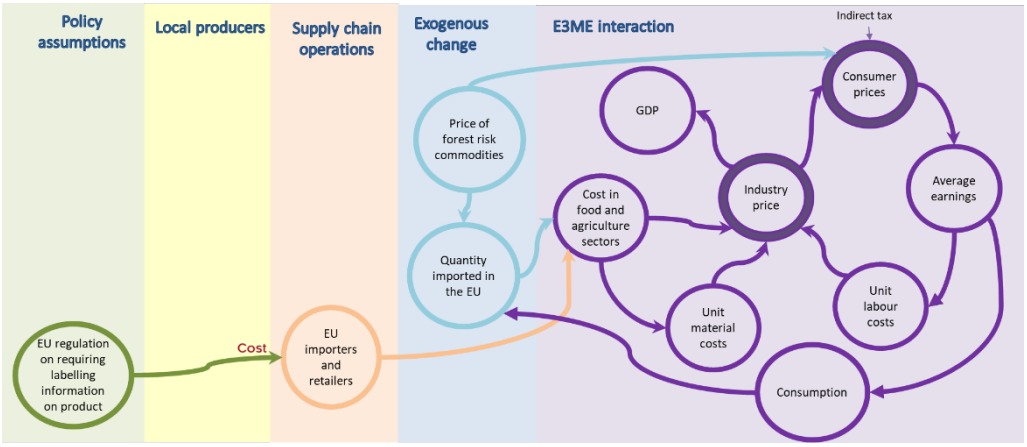
2.2.5. Mandatory labelling

The mandatory labelling policy option implies that consumers are provided with accessible information on the forest footprint of products, so that they can account for potential deforestation impacts when making purchasing decisions.

All food products that contain commodities associated with deforestation will need to carry a label indicating whether they may have caused deforestation. To make it easier for consumers to choose between products, food products will carry either the label 'No deforestation' or 'This product might be associated with deforestation' (European Commission, 2012). To use the 'No deforestation' label, operators in the EU market must go through a deforestation-free certification process by a recognised certification body, using a scheme that has been approved by the European Commission.

Food products who include ingredients that may cause deforestation can carry the 'No deforestation' label only if the producer holds a certificate stating that their production activities are not associated with deforestation. In this policy option, it is assumed that EU producers and retailers will also incur costs for changing their labels to include the information and checking the source of the products (see Figure 4). The increase in the cost of production will be passed on to consumers, leading to reductions in product demand.

Figure 4: How the mandatory labelling policy option is modelled



Source: Cambridge Econometrics.

Following the example of the EU Ecolabel (European Commission, 2008), food industry companies and retail companies that want to use the "No deforestation" label must apply to the Competent Body (CB) in the Member State in which the product is manufactured. For imported products, the application must be filed with one of the CBs where the product is imported. After a positive verification of the application, the CB concludes a contract with the company that entitles the applicant to use the "No deforestation" label for marketing purposes for the remaining period of validity of the deforestation-free criteria. The CB charges a fee for the application and the annual use of the label. Products that do not meet the criteria must still go through the application process and pay the fee to use the label, but the cost of the application and fee is considered negligible when compared to the one faced by those meeting the deforestation-free criteria.

The final consumer will be able to choose between the products carrying 'No deforestation' or 'This product might be associated with deforestation' label. An increase in the demand for products carrying the 'No deforestation' label[8] is expected, based on the consumer preference for these products; this higher demand might offset the negative demand effects of the increase in prices for 'No deforestation' products. For the products associated with deforestation, a loss of demand is expected. This policy option will be effective only if consumers are aware of the (importance) of the deforestation problem and are willing, motivated and able to change their behaviour (European Commission, 2012, p. 50).

The increase in prices leads to lower disposable incomes, which affect aggregate demand and lead to lower levels of GDP and employment at the EU level.

At Member State level the CB will be established to check that the criteria set in the regulation are complied with. This will lead to an increase in public expenditure, both for the creation of the body and to cover the cost of controls over time.

[8] In the method to calculate deforestation and emissions linked to EU imports, the assumption is that "No deforestation" products have no impact on levels of deforestation. Deforestation levels are estimated only for the quantity consumed under the label "This product might be associated with deforestation".

2.2.6. Summary of assumptions

Table 2 summarises the main assumptions around where costs are borne in the different policy options.

Table 2: Summary of assumptions by policy option

Policy option	Cost increase for	Regulatory cost
Mandatory due diligence	Operators who first place FRCs on the EU market	Yes
Mandatory certification	Producers in third countries	No
Mandatory due diligence and certification	Producers in third countries Operators who first place FRCs on the EU market	Yes
Mandatory labelling	Operators in the EU market that apply for the 'No deforestation' label	Yes

Source: Cambridge Econometrics.

3. Methodology

3.1. Introduction

This chapter introduces the quantitative modelling approach that was used to carry out the analysis. The next section describes the data that were collected. The following two sections describe the calculations carried out using these data and how they relate to the specific policy options that have been assessed.

3.2. Data

In this report, we consider deforestation related to the production of soy, beef, palm oil, maize, rapeseed and sugar. The geographical scope of the analysis is the EU-27 (where the new policy options are introduced) and the main exporting countries of soy, beef, palm oil, maize, rapeseed and sugar crops to the EU (where changes in production will take place). Table 3 summarises the main exporters of the six agricultural commodities (based on quantity produced) and the importance of the EU as a global importer.

Table 3: Global producers and importers (based on quantity), 2017

Commodities	Main producers (% of global production)	Main Importers (% of global imports)
Beef	United States (19%) Brazil (15%) China (12%) Argentina (5%) India (4%)	EU (24%) China (13%) United States (12%) Vietnam (7%) Japan (6%)
Soy	Unites States (34%) Brazil (33%) Argentina (16%) China (4%) India (3%)	China (65%) EU (10%) Mexico (3%) Japan (2%) Thailand (2%)
Palm Oil	Indonesia (51%) Malaysia (32%) Thailand (4%) Nigeria (2%) Colombia (2%)	EU (20%) India (19%) China (12%) Pakistan (6%) Unites States (4%)
Maize	United States (36%) China (24%) Brazil (9%) Argentina (5%) India (3%)	EU (20%) Mexico (9%) Japan (9%) South Korea (6%) Egypt (5%)
Rapeseed	Canada (35%) China (23%) India (13%) Australia (6%) United Kingdom (4%)	EU (48%) China (17%) United States (8%) Japan (8%) Mexico (5%)

Sugar crops	Brazil (35%) India (15%) China (6%) Thailand (5%) Pakistan (4%)	EU (14%) Indonesia (6%) China (5%) United States (5%) United Arab Emirates (4%)

Source: FAOSTAT (2020).

The commodities included in this study were chosen based on their deforestation risk[9], the practicalities of fitting them within the modelling framework (i.e. being present in the food equations in the E3ME model[10]), their availability in the Pendrill et al (2020) dataset and their low volume of re-exported imports by the 27 EU Member States[11]. Table 4 shows the size of imports and re-exports[12] in terms of quantity (in tonnes) and economic value (in euros) for the selected commodities and the share of certified imports identified from the literature. The data for EU imports were collected from Eurostat (Eurostat, 2020) and the information on re-exports was collected from the UN Comtrade database (UN Comtrade, 2020). For each selected product, the re-exported amount is consistently a small share of total imports. Therefore, at least for the commodities considered in this report, not considering re-exports in the modelling framework does not have a significant impact on the results.

The two most important FRCs that are not considered in the analysis are cocoa and coffee. In both cases they do not fit well into the equations in the E3ME model as they are part of a broader category of food product called "Other"[13]. In addition, the EU is a major re-exporter of both commodities: in 2019 the ratio between gross exports of EU and imports in EU was 60% for cocoa and 11% for coffee.

Table 4: Imports and re-exports by the EU of selected products, 2019

	Imports		Certified Imports	Re-exports	
	Quantity (000' tonnes)	Value (million EUR)	Share of total EU imports	Quantity (000' tonnes)	Value (million EUR)
Beef	610	4,072	*	0.04	0.06
Soy	63,501	21,316	13%	-	-
Palm Oil	14,140	7,744	78%	4.59	0.31
Maize	44,348	7,629	*	11.42	4.03
Sugar	5,003	2,009	*	0.09	3
Rapeseed	11,956	4,867	*	0.04	0.05

Note: Nomenclature 1988/92; * unavailable to the authors' knowledge.

Source: Eurostat (2020); UN Comtrade (2020); International Trade Centre (2019); IDH (2020).

[9] The deforestation risk is assessed qualitatively by reviewing the literature on commodity-driven deforestation. The results presented in Pendrill et al (2020) are used to choose the product list.

[10] See Section 3.3.1 and Appendix A.

[11] The modelling framework does not capture the re-export of food products; see Section 3.5 for further details.

[12] Re-exports are defined by UN Comtrade as exports of foreign goods in the same state as previously imported.

[13] See Section 3.3.1 and Appendix A.

Data used in the E3ME baseline and scenarios

As described in Appendix A, the structure of the E3ME macroeconomic model is based on the system of national accounts, with further linkages to energy demand and environmental emissions. The labour market is also covered in detail.

E3ME's historical database covers the period 1970-2016 and for the scenarios in this report the model projects forward annually to 2030. The main data sources for European countries are Eurostat and the IEA, supplemented by the OECD's STructural ANalysis Database (STAN) database and other sources where appropriate. Gaps in the data are estimated using customised software algorithms.

The E3ME model variables for aggregate and disaggregate food demand are measured in terms of final demand and therefore include food waste during the production process. Data for food demand and food prices are taken from FAO Food Balances and cover the period 1991-2017.

Deforestation and emissions

The data sources used in the estimation of deforestation caused by EU food consumption and its related carbon emissions are shown in Table 5. The main deforestation data source used in the analysis is a spatially explicit dataset of global annual tree cover loss that is provided by Global Forest Watch (2020). Similarly, the main source of data on emissions is provided by Global Forest Watch (2020).

Table 5: Data sources used to determine rates of deforestation and emissions

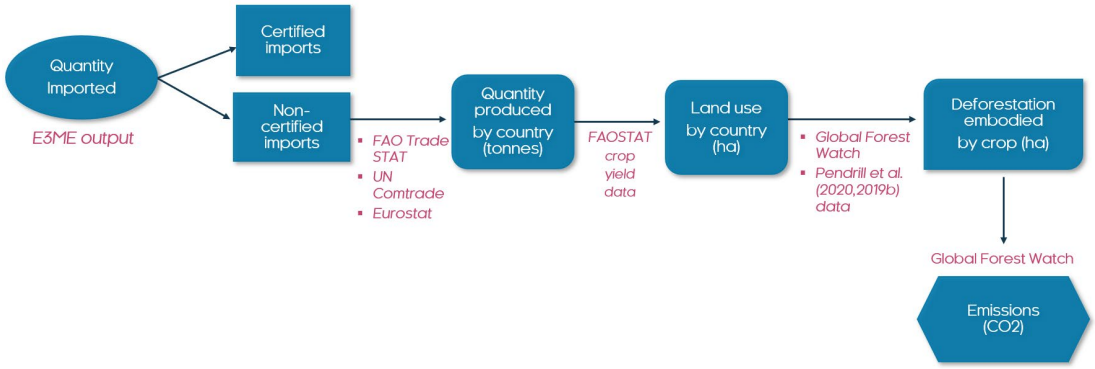
Variable	Data Source
Imported Quantity	Eurostat (2020) UN Comtrade (2020)
Land Use	FAOSTAT (2020)
Deforestation and Emissions	Global Forest Watch (2020) Global Forest Research Assessment (FAO, 2020) Pendrill et al. (2020, 2019a, 2019b)

Source: Cambridge Econometrics.

3.3. Method to calculate deforestation rates and emissions linked to EU imports

In this section, the methodological approach and the main underlying assumptions used to calculate rates of deforestation and emissions related to EU demand for FRCs is explained. The approach to estimating the deforestation and emissions linked to EU food imports is summarised in Figure 5.

Figure 5: Approach to modelling EU demand-induced deforestation and emissions



Source: Cambridge Econometrics.

The approach consists of five main steps to estimate the levels of land use, deforestation and carbon emissions embodied in EU imports of beef, soy, palm oil, maize, rapeseed and sugar. The following sub-sections describe these steps in turn.

3.3.1. E3ME model

Cambridge Econometrics' E3ME model is a computer-based model of the world's economic and energy systems and the environment. It was originally developed through the European Commission's research framework programmes and is now widely used in Europe and beyond for policy assessment. The model manual (Cambridge Econometrics, 2019) is available online at the model website www.e3me.com[14]. A short description of the model is provided in this section and the model is also described in Appendix A.

The E3ME model provides an economic accounting framework that can be used to evaluate the effects of economic shocks (in this report higher food import prices) on the wider economy. Behavioural relationships in the model are estimated using econometric time-series analysis based on a database that covers the period since 1970 annually. As noted in the previous section, the main source of European data is Eurostat.

A key feature of the E3ME is model is its level of disaggregation. The model is global but breaks the world economy into 61 regions, including all EU Member States individually identified. Within each European country the economy is broken down into 69 sectors. The key sectors in this report are the agriculture and food production sectors, but there may be secondary impacts on any other sector of the economy. For example, if households must spend a larger share of income on basic food products, providers of other consumer goods may see a loss of revenue.

E3ME extends its treatment of the economy to cover physical measures of energy, food and material consumption. The equations that estimate food demand are particularly relevant to this report because they determine reductions in the consumption of food in response to the higher costs that result from the policy measures. Separate equations are estimated for 20 different food types; these

[14] A direct link to the manual is here: https://www.e3me.com/wp-content/uploads/2019/09/E3ME-Technical-Manual-v6.1-onlineSML.pdf

categories map directly to the commodities covered by the policy measures, with the exception of palm oil (which is part of the 'other oils' category). Further details of the equations and modelling classifications are provided in Appendix A.

The difficulties with identifying palm oil in the available data are problematic in the analysis because it becomes impossible to isolate the effects of higher costs for palm oil; instead it is necessary to use the broader category as a proxy. For example, higher prices for palm oil could incentivise switches to using other oil products that fall within the same food product category, but the modelling would fail to register this impact. The results may therefore underestimate potential impacts on palm oil consumption and resulting deforestation and emissions.

The main input to the E3ME modelling is changes in import prices for each commodity. Changes in import and domestic prices are converted to a final consumption price using the weights in Table 6. Depending on the responses from individual food products, a weighted average change in price is then calculated for food consumption.

The food price is fed into the calculation of real household incomes (real incomes account for inflation, which is affected by food prices; higher food prices therefore mean lower real incomes). This in turn feeds into the model's consumption equations, with knock-on effects for production levels (GDP) and employment. The model captures potential secondary effects from losses of employment leading to further reductions in household incomes and consumption.

Table 6: Import quantity and production by commodity, EU-27, 2017

	Beef	Maize	Palm Oil	Rapeseed	Soy	Sugar
Import quantity ('000 tonnes)	2,824	34,551	9,742	15,502	15,513	9,646
Production ('000 tonnes)	6,983	65,569	106	29,347	5,278	157,027
Import share (%)	29	34	99	35	85	6
Domestic share (%)	71	66	1	65	15	94

Source: Cambridge Econometrics based on FAO Food Balances (FAOSTAT, 2020).

3.3.2. Allocation of EU Imports

As described above, for each policy option the E3ME model is used to quantify the changes in EU consumption demand for each of the six commodities. From this we can also infer the volume of imports to the EU of each commodity.

E3ME captures the demand for these commodities when destined for food but also includes their use in biofuels implicitly (see Section 3.3.6). To also include the imports of the processed products (e.g. soymeal) in the deforestation and emission calculations, Eurostat data on imports of these commodities (as listed in Table 7) are used[15].

[15] In this analysis, imports of maize flour are not considered. They only represent a very small share of maize imports; in 2019 EU imports of flour accounted for 0.13% of total maize imports.

Table 7: Eurostat H4 product categories included in the analysis

Commodity	Eurostat Category	Eurostat H4 Code
Beef	Live Bovine Meat of Bovine Animals, fresh or chilled Meat of Bovine animals, frozen	0201 0201 0201
Soy	Soya beans whether or not broken Soya beans oil whether or not refined Oilcake and other solid residues, whether or not ground or in the form of pellets, resulting from the extraction of soya-bean oil	1201 1507 2304
Palm oil	Palm oil and its fractions whether or not refined Palm kernel oil (from E3ME result)	1511 NA
Maize	Maize or Corn	1005
Rapeseed	Rape or colza seed, whether or not broken Rape colza or mustard oil	1205 1514
Sugar	Cane or beet sugar and chemically pure sucrose	1701

Note: Nomenclature 1988/92.
Source: Cambridge Econometrics selection from Eurostat (2020).

An annual growth rate is derived from E3ME for EU food demand under each policy option. The growth rate is applied to the total imported quantity reported by Eurostat (2020) for each commodity, starting from 2019, to obtain the total imported quantity to the EU in the projection period (2020-30).

For each commodity, the composition of EU imports by origin is thereby calculated. While the total quantity imported to the EU changes in response to the implemented policies, the share of imports from each country is assumed to remain constant up to 2030. As noted in Table 5, UN Comtrade (2020) and Eurostat (2020) trade data are used to carry out this decomposition.

In the calculations, the share of imports already covered by deforestation-free certification is deducted from the totals, since this production does not affect deforestation rates. This information was only identified for soy, palm oil and sugar (see Table 3) and so the share of certified imports of beef, maize and rapeseed is assumed to be zero. The adopted share of certified sourcing is based on information retrieved from recent reports: European Sustainable Palm Oil (ESPO, 2019), the European Soy Monitor (IDH et al., 2019), the Sustainable Trade Initiative (IDH, 2020) and the State of Sustainable Markets (International Trade Centre, 2019).

European imports of certified palm oil are covered by the Roundtable on Sustainable Palm Oil (RSPO). RSPO is the main certification standard for sustainable palm oil used for food production in Europe. In 2017, 78% of the palm oil imported for food into the EU-28 was covered by RSPO (ESPO, 2019);

According to 2017 data, at least 22% of soy consumed in the EU-28, Norway and Switzerland was compliant with the European Feed Manufacturers' Federation soy sourcing guidelines (FEFAC-SSG) standards. At least 13% of total soy used in the EU, UK, Norway and Switzerland was certified under deforestation-free standards, namely RTRS, ISCC+, Proterra, Danube / Europe Soy, CRS / BFA and SFAP-Non-Conversion. Furthermore, 7% of European soy was certified by the Roundtable on

Responsible Soy (RTRS) and International Sustainability & Carbon Certification (ISCC+). Usually, FEFAC-SSG is used as a proxy for responsible soy sourcing, while RTRS, ISCC+ and Proterra are characterised by stricter standards and can be used to determine the share of certified deforestation-free soy. Accordingly, in this analysis a 13% share of certified soy imported into the EU was used, as suggested by IDH et al. (2019).

According to the latest statistics published in the State of Sustainable Markets (International Trade Centre, 2019), the certified share of global production of sugarcane is on average 8.2%, with a minimum of 7.6% and a maximum of 8.8%. Certified sugarcane production is licenced by Bonsucro, Fairtrade International, Organic and the ProTerra Foundation, which combined account for 2.1 million hectares harvested, on average. Due to data availability, the minimum share of global certified sugarcane from the State of Sustainable Markets report (International Trade Centre, 2019) is assumed to represent a sensible proportion of the EU's imports of certified sugar. Therefore, 7.6% of EU imports of sugar are deducted in our calculations of deforestation impacts, as this quantity is already covered by certification.

3.3.3. Estimating land use requirements to produce EU imports

The objective of this step is to determine the amount of land use associated with EU imports of each commodity. The land required to meet a given level of demand is estimated based on current yields in each of the producing countries. FAOSTAT (2020) crop yield data[16] and land use data[17] are used to link the change in EU demand with the land used to meet this demand. Crop yields are assumed to remain constant[18] over the projection period for each commodity. To estimate land use requirements for EU imports of beef, the imported quantity expressed in tonnes is converted into number of animals slaughtered, assuming a fixed carcass weight[19] per animal of 15kg. This value is taken as a reasonable approximation of cattle productivity in Brazil; for further information see Nepstad et al (2014) on beef deforestation in the Amazon.

For each commodity, processed agricultural commodities are also considered. For example, in the case of soy, we include both unprocessed soy and processed soy meal and soy oil. The estimation of land use requirements builds on the IDH (2020) approach for processed commodities. It is assumed that each tonne of raw material (i.e. soybeans) requires the same amount of land as one tonne of processed material (i.e. soymeal and soy oil) to avoid double counting.

3.3.4. Estimating embodied deforestation in imports

The purpose of this step is to estimate the rate of deforestation associated with the given land use in each of the sourcing countries. The estimates use historical data on tree cover loss from the Global Forest Watch (2020) dataset, which provides information on the transformation of natural and planted forest caused by human activity or natural events.

The methodological approach developed to determine the EU's deforestation footprint builds on the land-balance model illustrated in Pendrill et al (2019a). The land-balance model attributes deforestation first to major land uses and then to single commodities. This approach adopts four main steps to determine the levels of EU import-embodied deforestation:

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16 http://www.fao.org/faostat/en/#data/QC

17 http://www.fao.org/faostat/en/#data/RL

18 This is a simplifying assumption to calculate the land used to produce EU imports, as explained Section 3.3.2.

19 For cattle, carcass weight is the weight of the slaughtered animal's cold body after being skinned, bled and eviscerated, and after removal of the external genitalia, the limbs, the head, the tail, the kidneys and kidney fats, and the udder (Eurostat, 2019).

1 Calculation of the change in cropland and pastureland.
2 Calculation of the deforestation attributed to cropland and pastureland.
3 Calculation of the deforestation attributed to each FRC.
4 Calculation of the deforestation embodied in EU imports of each FRC.

These steps are described further below.

Change in cropland and pastureland

For each country that exports the selected commodities to the EU, the change in cropland and pastureland area in a given year is estimated. The change in cropland area is averaged over a three-year period. Land use data (cropland area and pastureland area) are taken from FAOSTAT (2020) for all countries and gross annual cropland loss data from Pendrill et al (2019a) for the countries available. Over the projection period in the baseline and in the scenario, cropland area, pasture area and annual cropland loss in each country are assumed to remain constant at the latest year of observed data.

Deforestation attributed to cropland and pastureland

The observed tree cover loss in each year and in each country is attributed to the expansion in cropland and pastureland. The attribution to each cropland and pastureland is capped at the total amount of tree cover loss in the given country. This is motivated by the assumption that the expansion in agricultural practice systematically displaces forests. For example, if cropland uses 10% of the additional required land in a country, then it is assumed to cause 10% of the total deforestation recorded in that country.

In particular, if tree cover loss exceeds the expansion in cropland, pastureland and planted forest, then deforestation attributed to cropland equals the expansion in cropland ($\Delta cropland_t$). Alternatively, if tree cover loss is lower than the expansion in cropland, pastureland and planted forest, then deforestation attributed to cropland is derived by applying the share of cropland expansion on total land use expansion to the amount of tree cover loss ($tree\ cover\ loss_t * \frac{\Delta cropland_t}{\Delta cropland_t + \Delta pasture\ land_t + \Delta planted\ forest_t}$).

Therefore, to attribute total deforested area to cropland, the following equation is used:

$$DEFORESTATION, cropland_t = MIN\left[\Delta cropland_t; tree\ cover\ loss_t * \frac{\Delta cropland_t}{\Delta cropland_t + \Delta pasture\ land_t + \Delta planted\ forest_t}\right]$$

Where:

$\Delta cropland$ and $\Delta pastureland$ represent the gross change in cropland and pastureland respectively, determined in the previous step;

$tree\ cover\ loss$ represents the amount of lost tree cover in a given year;

$\Delta planted\ forest$ represents the change in planted forest between a given year and the following three years.

A similar equation is used to determine the attribution of deforestation to pastureland.

The tree cover loss data, which measure deforestation, are assumed to remain constant at the 2018 rate throughout the projection period and are taken from Global Forest Watch (2020) for all the countries that export FRCs to the EU. Data on planted forests are provided by the most updated version of the Global Forest Research Assessment (FAO, 2020, 2016).

Deforestation attributed to products

Deforestation attributed to cropland expansion is further allocated to individual crops and products, in relative proportion to their expansion in area. The relative expansion in area is determined using the share of crop expansion on the gross changes in total agricultural area. The latter is defined using FAOSTAT land use data on the harvested area of eight crop groups: paddy rice, cereals, soybeans, palm oil, other oil crops, pulses, roots, vegetable, fruits, tree nuts, fibre crops and crop not elsewhere specified[20]. It follows that if the harvested area of a single FRC accounts for X% of the total cropland expansion in a given country, then X% of the country's cropland deforestation is attributed to the country's production of the given FRC (Pendrill et al., 2019a).

For example, the following equation is used to calculate the deforestation attributed to soy, based on the production of soy:

$$DEFORESTATION_{c,t} = MIN\left[MAX[\Delta soy\ area_t; 0]\ ; \Delta DEFORESTATION\ cropland_t * \frac{\Delta soy\ area_t}{\sum_i \Delta crop\ area_{i,t}}\right]$$

where $\Delta soy\ area$ represents the average change over three years in soy harvested area in a given country;

$\Delta cropland\ deforestation$ represents the deforestation attributed to cropland, as derived in the previous step.

$\sum_i \Delta crops\ area$ represents the sum of the average change over three years of the main crop categories (paddy rice, cereals, soybeans, oil palm, other oil crops, pulses, roots, vegetable, fruits, tree nuts, fibre crops and crop not elsewhere specified).

In the above equation, if the expansion in soy harvested area exceeds cropland deforestation, then the soy is not entirely associated with deforestation practice. In this case, the deforestation attributed to soy is derived by applying the share of soy area expansion on the expansion in area of the eight crop groups to the amount of cropland deforestation ($\Delta DEFORESTATION\ cropland_t * \frac{\Delta soy\ area_t}{\sum_i \Delta crop\ area_{i,t}}$). Alternatively, if the expansion in soy harvested area is lower than the level of cropland deforestation, then deforestation attributed to soy equals the expansion in soy harvested area.

In the case of beef, the calculation uses deforestation attributed to pastureland instead of cropland.

Deforestation embodied in EU imports

Deforestation attributed to each product is then allocated to physical units based on the trade flows for each commodity. The allocation assumes proportionality of the EU as a share of total demand in each of the sourcing countries; the share of EU imports in total production is applied to the deforestation that total production causes. Data on the production of each commodity by country are provided by FAOSTAT (2020). The quantity produced by third countries is assumed to remain constant in the projection period. Given this assumption, the effects of the regulations driving the changes in EU imports can be captured, other things remaining equal.

3.3.5. Determining CO_2 emissions from forest loss

The last step in the methodological approach consists of estimating the carbon dioxide (CO_2) emissions associated with deforestation in each of the sourcing countries. The estimation of CO_2 emissions uses the same methodology as IDH (2020). The historical data from Global Forest Watch

[20] This crop group includes typical tropical cash crops (e.g. tea, coffee, cocoa or spices).

(2020) are used to determine the per-hectare aboveground CO_2 emissions associated with tree cover loss (the proxy for deforestation). In addition, average CO_2 emissions per hectare of tree cover loss are derived for each of the sourcing countries. CO_2 emissions related to the deforestation embodied in EU imports are then estimated by applying the average emissions per hectare of tree cover loss to the deforestation attributed to EU imports. Higher levels of deforestation in a given country are associated with higher levels of CO_2 emissions. Hence, the CO_2 emissions estimated in this analysis reflect the carbon dioxide emitted as a result of the aboveground biomass loss.

3.3.6. Biofuels

First-generation biofuels (i.e. biofuels produced from crops) are produced from five of the FRCs considered in this study. The price changes in these commodities under the different policy options lead to higher prices in imported biofuels that are used in transport fuel[21]. These price increases are estimated in two steps. First, a weighted average of price increases in biofuels produced using FRCs is estimated using the shares of the biofuels production from each commodity (maize, palm oil, rapeseed, soy and sugar). Second, the price increase in biofuels is added to final fuel prices using the share of first-generation biofuels in total fuel used for road transport. Under EU RED II, the share of first-generation biofuels is expected to decrease and, by 2030, only fuel certified as low ILUC risk can be accounted for as a renewable source of energy in transport and count towards the EU target (European Commission, 2019d). Based on the 2019 DG AGRI agricultural outlook (European Commission, 2019d), the share of first-generation biofuel in total fuel for transport is assumed fixed over the projection period at 4.7%[22].

The quantity of biofuels imported is derived from E3ME total biofuel demand using a share of imports in total supply from the 2019 DG Agri EU agricultural outlook data (European Commission, 2019d). The trade flow composition for EU biofuel imports by sourcing country is determined using UN Comtrade data[23].

The imported quantity by sourcing country is then disaggregated by crop used in production (i.e. maize, sugarcane, palm oil, soybeans and rapeseed), using the share of biofuel produced by each source in the 2019 OECD-FAO Agricultural Outlook (OECD/FAO, 2019). This information is available only for a reduced number of producing countries[24]. The figures are then converted from tonnes of oil equivalent to the quantity of crops required for the given production in tonnes. This calculation uses conversion factors derived from crops' yields from FAOSTAT (2020) and biofuel yields taken from WBA (2013).

Finally, the deforestation and emissions embodied in EU imports are estimated using the same method described in previous sections (from Section 3.3.2 to Section 3.3.5), using the disaggregated biofuel imported quantity by country and by crop. The results in the next chapter include impacts through both food and biofuel production. However, due to limited data availability on biofuel production, deforestation and emissions footprints are captured only for 18% of total EU biofuel imports.

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21 According to Directive (EU) 2018/2001, by 2020 in every EU country, at least 10% of transport fuel should come from renewable sources such as biofuels.

22 This is the value in 2019 based on the recast Renewable Energy Directive (EU) 2018/2001 (RED II) ; by 2030 this share is expected to rise to 5.4% according to the 2019 DG AGRI agricultural outlook (European Commission, 2019d).

23 The biofuel category in the UN Comtrade database is reported with the code 382600 (Biodiesel and mixtures thereof, not containing or containing less than 70% by weight of petroleum oils or oils obtained from bituminous minerals).

24 Biofuel imports from the following sourcing countries are considered: Argentina, India, Indonesia, Malaysia, Norway, Pakistan, Philippines, United States.

The analysis was performed for the following policy options: mandatory due diligence, mandatory certification and mandatory certification with due diligence. For the mandatory labelling policy option, the biofuel analysis was not performed because it is difficult to label blended motor fuel as either deforestation-free or not.

3.3.7. Limitations of the current method

Models represent simplifications of a complex reality and are therefore subject to assumptions and limitations. The aim of the modelling exercise is to capture as accurately as possible the most important mechanisms, while simplifying less important factors to keep the analysis tractable. Where there is uncertainty, we have adopted a cautious approach with assumptions that favour the status quo.

Like any macroeconomic model, the E3ME model is subject to its own limitations, some of which are described in the model manual (see Cambridge Econometrics, 2019). For example, as an econometric model, it depends on historical data with which to estimate behavioural parameters. It is assumed that these behavioural responses do not change over time or in response to policy changes. The model therefore assumes that the demand responses to changes in the price of each food product (e.g. due to labelling or certification) are similar to the responses that we have seen in the past due to commodity price fluctuations.

The other important limitation within the E3ME model is the level of granularity in its main classifications. The 19 food categories are helpful for the analysis but do not always go into the level of detail we would like (e.g. assessing coffee or cocoa is beyond the potential scope of analysis and palm oil cannot properly be separated). The economic data are more limiting still, with a single agricultural sector and a single food processing sector. There could therefore be impacts within sectors that are missed in the model results.

Outside the modelling framework, there are further assumptions that relate to the ways that different data sources have been combined. Here, the approach based on fixed coefficients from published literature is relatively basic, representing the data that are available. For example, the allocation of EU imports to each exporting country is based on shares that remain fixed to 2030. The land requirements per unit of food produced are fixed and the relationship between land requirements and deforestation rates is also fixed. As a final step, the estimates of CO_2 emissions are assumed to be proportional to the area of deforestation.

This approach rules out any economies of scale or technological options relating to the intensity of production, which could affect both deforestation rates and economic costs. For example, if the implementation of EU policy leads to the expansion of services to certify agricultural production as deforestation-free, the costs of such services may fall, leading to smaller price increases and economic impacts. Methods to increase the intensity of production (thereby reducing land requirements) may become more widespread, improving overall efficiency in production and again reducing overall costs.

Due to the uncertainty and non-linear nature of these potential effects, they are not incorporated in the analysis in this report. The assumptions remain conservative, with the costs more likely to be upper bounds than best estimates.

Our overall approach measures the impact of a change in demand on direct deforestation. Some indirect deforestation is possible if land use changes at country level to ensure that EU demand is met by the production on 'deforestation-free' land. For all other demand (including of other agricultural products), deforestation may continue. This means that the production intended for export to the EU might shift to land that meets the criteria set in the regulation, while deforestation might continue to meet domestic demand and demand coming from other countries that do not

impose deforestation-free standards (Harris et al., 2019). The methodology used in the quantitative analysis does not consider deforestation associated with other major importing countries (e.g. China, the US or India) which might continue to take place.

Due to the limited availability of the data, our model estimation includes the change of tree cover as a result of both human activities and natural events. The same source of data has been adopted for other relevant analysis on the extent of deforestation, namely Pendrill et al (2020, 2019a, 2019b) and the IDH report on deforestation (IDH, 2020). In tropical and sub-tropical forests, deforestation is mainly commodity driven or caused by shifting agriculture (IDH, 2020). In the light of this, the tree cover loss data used in this analysis represent the best data source available, to the best of our knowledge, to measure deforestation. The method described above also accounts for the deforestation and emissions embodied in EU imports of biofuels. However, due to limited data availability on biofuels production the analysis does not account for the whole quantity of biofuels imported. Nevertheless, the biofuel estimation provides a clear indication of the main energy crops that are associated with a higher deforestation footprint in the countries used in the analysis.

The approach is not well-suited to covering the 're-export' of agricultural commodities because it is driven by consumption in EU countries (and re-exported goods are generally consumed elsewhere). While it would be possible to include estimates of impacts from re-exporting goods, this would require further assumptions about the behaviour of the firms involved, making results more uncertain. Other re-exports not covered are the re-exports of commodities from foreign countries. For example, if the US imports beef from Brazil and re-exports part of this quantity to the EU, we will miss some potential impacts on deforestation. This limitation in the methodology again relates to limitations in the available data. The current method assumes that FRC deforestation is attributed and located directly in the EU's import partner, even though it may have occurred in a different country.

Finally, the method presented in this chapter only provides national level analysis of deforestation and emissions, and does not account for regional heterogeneity in deforestation patterns within producing countries. Although sub-national level data on tree cover loss and aboveground carbon emissions are reported by the TRASE (2020) database, regional data are available only for Brazil, Paraguay and Argentina. Furthermore, deforestation risk data reported by TRASE are not directly comparable to the estimates presented in this analysis, and therefore cannot be included as inputs for this method. Only the share of regional deforestation on national level deforestation is compatible with the method described here. Using the shares derived from TRASE to determine regional heterogeneity in EU-driven deforestation would result in a simplistic and inaccurate estimation.

Table 8 shows as an example the regional distribution of deforestation risk linked to EU imports of soy and beef from Brazil. A mandatory certification policy option could lead to switching of production to meet EU imports from high risk regions to low risk areas; and a corresponding switch from low to high-risk areas for production intended for other markets than the EU. If this were to happen, while EU consumers pay the costs of certification through slightly higher food prices, the overall deforestation levels in the producing countries might not be reduced. Therefore, coordination with other important importers or additional criteria added to the regulation might prevent the switching of land and lead to better global outcomes.

The modelling of the four policy options entails several specific assumptions, which bring additional limitations to the analysis. These are described in the next section.

Table 8: Deforestation and emissions embodied in EU imports of soy and beef from Brazil by region, 2017

	Deforestation Risk (ha)		CO_2 emissions (tCO_2)	
	Beef	Soy	Beef	Soy
Amazonia	499	104,691	204,992	47,132,099
Catinga	12	97	2,488	14,618
Cerrado	1,621	67,397	287,530	8,407,262
Mata Atlantica	3	300	784	114,822
Pampa	0	5	4	1,219
Pantanal	18	1,510	4,443	284,509
Unknown Biome	489	-	120,608	-

Source: TRASE (2020).

3.4. Modelling the policy options

For each policy option, a scenario is developed that is consistent with the specifications outlined above, and compatible with the E3ME macro-econometric modelling framework. In this section, the scenarios are defined in terms of the model inputs needed to quantify the policy options' impacts on the EU's economy and the imported quantities of FRCs. First, however, we provide a summary of the baseline.

3.4.1. Overview of the baseline

It would be possible to use the E3ME model equations to develop a baseline set of projections. However, by matching to an external set of projections, we can use a set of data that has already been verified at national level. The E3ME model baseline is therefore calibrated to match published figures.

For long-term GDP growth rates in Europe, the European Commission's Ageing report (European Commission, 2018) is used as the basis for the projections. This report in turn draws upon Eurostat's projections of population[25].

The aggregate economic projections are extended to cover sectors and the components of GDP using the figures in the European Commission's 2016 'Reference Scenario' of the projections of future energy demand (European Commission, 2016a). The figures are converted to annual time-series by interpolating across the five-year gaps in the published values.

Projections of energy prices are also taken from European Commission (2016a). Baseline employment projections draw on the CEDEFOP Skills Forecast 2018 (Cedefop and Eurofound, 2018), which are also produced using the E3ME model. The baseline projections of food demand were estimated using the E3ME model equations, given the anticipated changes in population and income growth (see Section 4.1). We recognise that food prices are uncertain, and, for this reason, we use using sensitivity analysis to test the validity of scenario results using different food prices than in the baseline (see Appendix D).

[25] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20190710-1

Projections of activity rates outside the EU are derived from OECD projections of GDP and IEA projections of energy demand, using similar methods to those described above.

In the baseline, the share of voluntary certified products imported[26] into the EU is expected to:

- Either remain the same, i.e. a constant share of certified imports of soy (13%), palm oil (78%) and sugar (7.6%); or
- Or increase the share of certified imports from 2021 onwards with a fixed annual growth per year in the certified imports of soy (3% pa), palm oil (4% pa) and sugar (3% pa).

A quantitative summary of the baseline is presented in Section 4.1.

3.4.2. Policy option 1: Due diligence

For the due diligence policy option, as described in Section 2.2.2, there are costs associated with both the preparation phase of launching the policy and the ongoing costs once the policy has been implemented. This leads to the price increases in the FRCs under analysis. Based on the findings from the literature (European Commission, 2014, 2007), we assume that the cost of due diligence is formed from the cost of controls by the Member State's regulatory bodies and cost of maintaining a system of due diligence by the private sector.

Timeline

Mandatory due diligence is assumed to be applicable within two years from the moment that the European Commission presents the proposal for legislation. It is assumed that the European Commission presents a proposal in the first quarter of 2021 and that the law will be in place by the first quarter of 2023. During 2021 and 2022, economic operators will assess and prepare their system to check their supply chains for the risk of deforestation, so deforestation will be still embodied in EU imports.

By 2023, all operators in the EU market will have identified and assessed risks in their supply chains and taken action to mitigate the risks. Therefore, no external shock on the quantity of imported goods is envisaged.

Past experience suggests that not all operators will have satisfactory due diligence systems in place by the time that the regulation is implemented. For the Timber Regulation, which entered into force in 2012, a report on the 2018 timber trade (International Tropical Timber Organisation and FLEGT IMM, 2019) shows that the checks performed on operators in 2017 and 2018 found that only two thirds of them had satisfactory due diligence systems in place. The pilot project on the implementation of the OECD-FAO Guidance for Responsible Agricultural Supply Chains identifies that around 70% of participating companies sourcing or producing (selected) core commodities, have established policy commitments to address specific risks by the end of the pilot project. Therefore, in our analysis we set a rate of success for the implementation of due diligence systems. In 2023, 70% of imports of each commodity are successfully checked for deforestation risk, and the proportion increases over time until it reaches 100% by 2030. This means that, by 2030, all imports are covered by due diligence and no deforestation is embodied in EU imports.

Cost of due diligence

In the assessment of due diligence in relation to the responsible sourcing of selected conflict minerals (European Commission, 2014), the costs of due diligence for private companies are

[26] No information on certification was identified for beef, maize and rapeseed, therefore the share of certified imports of beef, maize and rapeseed is assumed to be zero.

separated into two types: the initial cost of setting up (a one-time cost) and the ongoing cost of maintaining the system of compliance. Overall, most literature (European Commission, 2016b, 2014; OECD et al., 2016) indicates that initial costs are higher than ongoing costs, with a high range of values depending on the size of the company and its supply chain. The initial costs, while higher than the ongoing costs, are expected to be spread over several years in the same way that companies would normally seek to recoup investment costs.

The Regulation (EU) No 995/2010 (EU Timber Regulation) Impact Assessment (European Commission, 2007) provides a total cost of rolling out due diligence policy. It is estimated that the total cost would be around EUR 17 million annually (EUR 1 million of regulatory costs for EU Member States and EUR 16 million for private companies with costs of EUR 2 million for companies within the EU). However, when considering unit costs, the total costs range between EUR 0.22 and 0.34/m^3 which represents only a fraction of the log prices that range from EUR 40/m^3 to more than EUR 100/m^3. This range of costs per unit indicates a price increase of between 0.2% and 1%. In the absence of a consensus in the literature on how much the cost per unit in the initial phase differs from the cost per unit in the ongoing phase, this range of price increases is used to set the assumptions of both initial and ongoing costs[27]. The difference between unit costs in the initial phase and in the ongoing phase is still expected to be lower than for mandatory certification policy option, since due diligence is a process that takes longer to successfully be implemented and does not act as an outright import ban.

The costs of due diligence are expected to fall on both producers in the exporting country and EU operators (importers and producers). This in turn would lead to an increase in both import prices and EU domestic prices of the relevant products.

The complexity of the supply chain for each food product influences the assumption on the cost increases because longer supply chains will be more difficult and expensive to assess in terms of due diligence. For example, a small number of large trading and plantation groups control more than 60% of exports of palm oil from Indonesia and Malaysia, who in turn source 60 to 80% of their palm oil from hundreds of smaller traders and plantations, who in turn source from millions of independent farmers, often with several intermediaries involved (Chagas et al., 2020). This makes it harder for EU operators to identify the origin of their products. Therefore, it is assumed that the cost of due diligence for palm oil is the highest out of the six products considered. There is an increase in the price of palm oil of 1% compared to the baseline for 2021-30.

In contrast, soy is often processed within large farms (Brack et al., 2016) so EU operators can trace back more easily the source of the product. In some cases, these farms might operate with contracts (Prowse, 2012) directly with EU operators. Hence a lower cost of preparing and running the due diligence checks is assumed, and there is an increase in prices of just 0.2% compared to the baseline for 2021-30.

No sources in the literature were found for the supply chains of maize, rapeseed and sugar. For maize and rapeseed, the complexity of the supply chain is assumed to be similar to that for soy. Some increases in import prices for maize and rapeseed are assumed (0.2%). In the case of sugar, firms traditionally invest directly in sugarcane production through large-scale estates or plantations; or a firm (often a large processor) contracts a large number of farmers (Prowse, 2012). This would suggest a supply chain that is similar in complexity to that for soy but, given that sugar is a processed product

[27] The same costs per unit are used in both the initial and ongoing phases. In Appendix C, two alternative scenarios are modelled: 1) low initial costs per unit and high ongoing costs per unit; and 2) high initial costs per unit and low ongoing costs. The ongoing price increases are between 0.2% and 1%, while the low/ high initial price increases are ten times lower/ higher than the ongoing price increases.

of sugarcane, a slightly higher increase is assumed. Prices increase by 0.4% compared to the baseline for 2021-30.

Beef has a complicated supply chain because there are two separate beef products (meat and leather) (Brack et al., 2016). Furthermore, many dispersed formal and informal farms in Brazil operate autonomously in the early breeding stages of juvenile animals, creating challenges in sourcing at this stage of the supply chain (Chagas et al., 2020). The supply chain of beef products is assumed to be shorter than that for palm oil, and so we assume that prices increase by less. However, given the issue of a lack of information on the origin of live animals, the supply chain for beef is assumed to be more complicated than that for sugar. Therefore, it is assumed that the price increase for beef is between the one for sugar and the one for palm oil (a 0.6% increase in prices compared to the baseline for 2021-30).

A summary of the price increase assumptions for the cost of due diligence is presented in Table 9.

Table 9: Price increase per tonne of commodity in Policy option 1 (mandatory due diligence), in %

		Beef	Maize	Palm Oil	Rapeseed	Soy	Sugar
2021-30	Import	0.60	0.20	1.00	0.20	0.20	0.40
	Domestic	0.60	0.20	1.00	0.20	0.20	0.40

Source: Cambridge Econometrics.

The impact assessment of the Timber Regulation estimates the regulatory cost in each EU Member State at EUR 1 Million per year. This is the cost for the competent authority to verify whether effective systems have been put in place by operators to ensure that the products complied with the criteria. This assumption is adopted in the model as an increase in government spending.

Due diligence and deforestation-free voluntary certification

The introduction of the mandatory due diligence policy option is assumed to incentivise the demand for deforestation-free certified products by companies that need to report on their supply chains. Therefore, for this policy option, the following assumptions are considered:

- The shares of certified imports to the EU of soy, palm oil and sugar used in 2020 can be found in Table 15;
- Two growth rates of certified imports over the projection period are considered:

1. The shares of certified imports to the EU of soy, palm oil and sugar are assumed to increase at a constant rate between 2021 and 2022; an annual growth rate of 4% is used for palm oil and 3% for soy and sugar;
2. The shares of certified EU imports of soy, palm oil and sugar increase at a constant rate from 2023 onwards. In the baseline, an annual growth rate of 4% is used for palm oil and 3% for soy and sugar[28]. For the due diligence policy option, the producers have more incentive to certify their production, so the annual growth rate increases to 6% for palm oil and 5% for soy and sugar.

For beef, maize and rapeseed, no information was found on the deforestation-free share of certified EU imports. Therefore, no assumptions are made in the baseline and this scenario.

[28] The choice of these annual growth rates for soy and sugar is made on the basis of the information reported by the IDH report on tropical deforestation (IDH, 2020).

Limitations

The costs of due diligence embodied in the prices presented in Table 9 do not consider the costs of producers changing their production methods from unsustainable to sustainable production. The due diligence policy option requires EU operators to check the origin of their products but cannot force the producers themselves to change the production method to comply with the policy guidelines. If the producers refuse to shift the production system, then EU importers would need to switch to other producers that meet the criteria set in the regulation. Under these conditions there could be further costs associated with the switching.

3.4.3. Policy option 2: Mandatory certification

The main objective of the mandatory certification policy option is to allow only the import of deforestation-free FRCs into the EU market. It is assumed that all current producers/suppliers in the exporting country will obtain the appropriate certificates for their products in order to continue exporting to the EU market.

In reality, without public support there might be potential supply issues because many smallholder farmers do not have the capacity to fulfil certification criteria (e.g. due to high cost or lack of skills/knowledge to conduct the assessment for certification). For example, approximately 40-50% of palm oil is produced by smallholder farmers in Indonesia and Malaysia. The upfront cost of certification for palm oil created "up to 8% loss in net income per hectare on average, per smallholder in the first year after certification" (Rietberg and Slingerland, 2016). This cost might discourage smallholders from complying with the certification requirements and this policy might be fall under 'green protectionism' under WTO rules (WTO, n.d.).

Timeline

Mandatory certification is assumed to be applicable two years from the first day that the European Commission presents the proposal for legislation. It is assumed that deforestation-free certification standards are fully effective from the moment they are applied (2023) and there is no longer embodied deforestation in the imported FRCs. This assumption may be optimistic when considering the existing body of evidence on problems with the effectiveness of many currently existing certification standards (Lambin et al., 2018). As noted above, no external shock on the quantity of imports is envisaged, suggesting that there could be some support for smallholders in obtaining the certification.

Certification cost

The Roundtable on Sustainable Palm Oil (RSPO) is an example of a certification body that assesses the production of FRCs. To be certified, producers must become an RSPO member and pay a membership fee of EUR 2,000 per year. Smallholders are supported by the RSPO by being offered a reduced membership fee of EUR 500 annually (RSPO, 2020). On top of these basic costs, producers may also incur costs relating to the auditing process before obtaining the certification. This cost varies between producers and countries.

Hutabarat et al (2018) found that the upfront cost of certification for independent palm oil smallholders in Indonesia is 86 EUR/ha. On top of the cost of certification, additional costs for annual fees and to improve plantations to meet standards are, on average, 336 EUR/ha. The result is a total initial cost of 422 EUR/ha. Furthermore, the producers incur additional costs annually for auditing, of around 11 EUR/ha. This cost is used to calculate the price increase assumption for palm oil in our policy option scenario, over the period 2023-30.

For soy, KPMG (2020, 2013) assumes a price premium of 1.5 EUR/tonne if it is certified by the Round Table for Responsible Soy (RTRS)[29]. A similar price increase is assumed for maize, rapeseed and sugar, because information regarding the cost of certification for these three commodities was not identified.

For beef, the assumptions for switching to sustainable production are based on the study of Whelan et al. (2017). For Brazilian beef, the study assumed a cost of infrastructure investment of R$ 2000 per ha (335.44 EUR/ha)[30] and a long-term increase in beef cost due to sustainability of between 0.5 and 1% (Whelan et al., 2017, p. 36). Based on the information from previous literature, a 1% increase in import prices is used in our analysis to capture the maximum possible cost.

Table 10 summarises the initial and ongoing import price increases gathered from the literature that are used in the certification policy option scenario. Table 33 in Appendix B provides the same figures but converted to a proportion of total costs, so that the cost increases are easier to compare between commodities.

Deforestation-free certification

The introduction of the mandatory certification policy option will ban all imports of products that are not covered by deforestation-free certification. The following assumptions are made on the growth of certified imports over the projected period:

- The initial shares of certified EU imports of soy, palm oil and sugar used to estimate the certified imported quantity in 2020 can be found in Table 15.
- The shares of certified EU imports of soy, palm oil and sugar will grow between 2021 and 2022 to reach 100% in 2023 when the policy option enters into force. In particular, the share is assumed to be 50% in 2021 and 70% in 2022. For beef, maize and rapeseed, the certification share is assumed to be 0% in 2021 and to reach 100% in 2023.

Table 10: Import price increase per commodity[31] in Policy option 2 (mandatory certification)

	Beef	Maize	Palm Oil	Rapeseed	Soy	Sugar
Initial (2021-2022)	335 EUR/ha	1.5 EUR/tonne price premium	422 EUR/ha	1.5 EUR/tonne price premium	1.5 EUR/tonne price premium on certified beans to produce soymeal 3.6 $/tonne premium on certified soybeans to produce biofuel	1.5 EUR/tonne price premium
Ongoing (2023-2030)	1%	1.5 EUR/tonne	11 EUR/ha	1.5 EUR/tonne	1.5 EUR/tonne price premium on certified	1.5 EUR/tonne

[29] KPMG (2013) acknowledges that the price premium is realistic and conservative; for certified soy meal, the actual premium paid is currently around US$3 to US$4 per tonne.

[30] An exchange rate of 1 EUR = 5.96 R$ is used.

[31] In 2019, the world price for maize was 145 EUR/t, for soybean 335 EUR/t, for sugar 317 EUR/t and for beef 3,581 EUR/t (European Commission, 2019d).

		price premium		price premium	soybeans that produce soymeal 3.6 $/tonne premium on certified soybeans to produce biofuel	price premium

Source: Cambridge Econometrics, based on wider literature (see main text).

For the certification policy option, the regulatory costs of checking the certification of the products imported is not included, because these would be part of existing border checks. However some additional costs at EU level related to the implementation framework could also arise. These costs may originate, depending on the selected approach, from additional auditing on top of the one mandated by the standards. These costs were not included in this scenario.

3.4.4. Policy option 3: Mandatory certification with due diligence

The due diligence and certification policy options are combined in a single scenario.

The same import price increases in both periods 2021-2022 and 2023-2030 as in the mandatory certification policy scenario (see Table 10) are assumed. The same annual regulatory cost for the Member States as in the due diligence scenario is applied because the relevant regulatory bodies are expected to check the implementation of the due diligence criteria. For private costs, the same cost increase from due diligence as in the ongoing the phase cost is expected (see Table 9) because the companies are expected to report on due diligence checks. The ongoing cost increase assumed for the period 2023-2030 is shown in Table 11.

Table 11: Price increase in period 2023-2030 per tonne of commodity in Policy option 3 (mandatory certification with due diligence)

	Beef	Maize	Palm Oil	Rapeseed	Soy	Sugar
Increase due to Due Diligence	0.6%	0.2%	1%	0.2%	0.2%	0.4%
Increase due to Mandatory Certification	1%	1.5EUR/ton	11EUR/ton	1.5EUR/ton	1.5EUR/ton	1.5EUR/ton

Source: Cambridge Econometrics based on the literature (see main text).

Timeline

Mandatory certification with due diligence is assumed to be applicable two years from the first day that the European Commission presents the proposal for legislation. It is assumed that the European Commission presents a proposal in the first quarter of 2021 and that the law will be in place by the first quarter of 2023. During 2021-22, producers in the exporting countries will prepare to obtain the certification for their products. EU operators are expected to put in place the due diligence systems prior to the launch of the legislation, but with negligible costs compared to policy option 1. By 2023, it is assumed that all producers will have obtained the appropriate certification and that operators in the EU market will have checked that the commodities in their supply chains are bought from certified producers; hence only deforestation-free products are imported into the EU. No external shock on the quantity of imports is envisaged.

Deforestation-free certification

The assumptions made on the growth of certified imports are the same as those in the previous policy option.

3.4.5. Policy option 4: Mandatory labelling

The mandatory labelling policy option aims to encourage the consumption of sustainable and deforestation-free products through improved transparency and information for EU consumers.

All food industry and retail companies that use or sell FRCs in the EU market will need to add a label to their products indicating whether the FRCs were obtained from areas certified as deforestation-free. All of them will need to go through a verification process by a Competent Body recognised by the European Commission, which charges a fee for the application and the annual use of the label. Those that want to meet the criteria for "No deforestation" will bear the additional cost of ensuring that the FRCs come from certified areas. At Member State level, a regulatory body will check that the criteria set in the regulation are complied with, which will lead to an increase in government spending, both for the creation of the body and to cover the cost of controls over time.

Timeline

Mandatory labelling is assumed to be applicable in two years from the moment the European Commission presents the proposal for legislation. The European Commission is expected to present a proposal in the first quarter of 2021 and the law will be in place by the first quarter of 2023. During 2021 and 2022, all economic operators will assess their food products and submit applications to get the label. Operators requesting the "No deforestation" label are assumed to bear higher costs because their products will face higher scrutiny.

It is assumed that, by 2023, all food products in the EU market will have been split into the two categories: labelled 'No deforestation' or labelled 'This product might be associated with deforestation'. No external shock on the quantity of imports is envisaged.

Label cost

The policy requires that EU operators put a label on products and has no initial set-up costs; hence there are no costs assumed in 2021-2022 period. As the policy is assumed to be in place from 2023 onward, there is expected some cost associating with producing labels for FRCs. Following the example of the EU Ecolabel, this policy option is assumed to involve substantial costs for the companies that request the "No deforestation" label (Oakdene Hollins, 2011). For the EU Ecolabel, the costs for audit/inspection range from EUR 1,500 to EUR 3,000 per operator per year, depending on the requirements set. Transaction costs for operators for adaptation measures range from EUR 1,500 to EUR 4,000 per operator per year, depending on what additional requirements are set. The European Commission impact assessment of the EU Ecolabel scheme (European Commission, 2008) puts the costs that companies have to bear for testing and verification associated with applying for the EU Ecolabel in the range of around €1,000 to €10,000[32].

Some examples of price premia that consumers face for food product attributes emphasising sustainability can be found in the literature related to fish. Past research has revealed price premia of 10–25% for eco-labels on products of Alaska pollock, Atlantic cod, haddock and salmon in the UK grocery retail market (Zhang et al., 2018). The same study shows that the average price premium for the Marine Stewardship Council (MSC) eco-label is GBP 0.957 for large retailers and GBP 0.732 for

[32] See here the entire list by Member State: https://ec.europa.eu/environment/ecolabel/documents/eu-ecolabel_fees.pdf

high-end retailers for each product sold with the label. A similar study indicates that MSC premia in Germany vary substantially between species, from 30.6% for the high-end species cod, to a 4% price premium for Alaska pollock, and no premia for saithe (Asche and Bronnmann, 2017).

Higher costs are assumed to be reflected in higher prices. Taking into consideration the price increases above, a premium of 4% in each commodity due to labelling policy is applied to the price of FRCs. This premium, however, only applies to the deforestation-free products, i.e. products with the "No deforestation" label.

Table 12 summarises the price increases due to the premium applied from 2023 onwards on all FRCs (both imported and domestic) with the label "No deforestation".

Table 12: Price increase per tonne of commodity in Policy option 4 (mandatory labelling), in %

	Beef	Maize	Palm Oil	Rape-seed	Soy	Sugar
Ongoing	4.0	4.0	4.0	4.0	4.0	4.0

Source: Cambridge Econometrics based on the wider literature (see main text).

Consumer switching

EU consumers are becoming increasingly conscious of the nature of the products that they buy, whether related to the type of production (organic, carbon footprint, geo-localisation) or the social and environmental conditions of the production process (child labour or deforestation). Increasing importance is being given in product choice to the sustainability of production. In some cases, consumer preferences have led to adoption of labels by producers that show the orientation of the production towards sustainable sources. For example, 74% of the palm oil imported in 2017 for food in Europe was RSPO certified (ESPO, 2019).

The introduction of the label on deforestation will have an impact on consumer choices at the time of purchase. From the literature, two examples were identified:

- Label on carbon emissions: increase in purchases with the green label of 5% of total purchase (up to 20% if the price is cheaper) (Vanclay et al., 2011).
- Eco-friendliness label: increases the overall eco-friendliness of subjects' food consumption in the experimental market by about 5.3% (Vlaeminck et al., 2014).

Therefore, the share of quantity demanded of food products with the label "No deforestation" is expected to increase by 5% per annum, starting from 2023. Conversely, the share of quantity demanded of food products with the other label is expected to decrease by 5% per annum.

Table 13: Share of consumption that switches to 'No deforestation' products and share of initial certified quantity imported in policy option 4 (mandatory labelling), in %

	Beef	Maize	Palm Oil	Rapeseed	Soy	Sugar
Ongoing	5.0	5.0	5.0	5.0	5.0	5.0
Initial share of certified imported quantity	5.0	5.0	78.0	5.0	13.0	7.6

Source: Cambridge Econometrics, based on wider literature (see main text).

Some of the FRCs imported to the EU are already certified, so the 5% annual increase in consumer demand for certified products is expected to increase the imported quantity certified by the same amount. Table 13 shows the current level of the share of imported certified quantity by product. For beef, maize and rapeseed, this information is not available, so the initial share is assumed to be 5%.

Deforestation-free certification

Similarly to the mandatory due diligence policy option, the introduction of mandatory labelling leads to an increase in the certificated quantity imported, this time through a stimulus coming from consumers' demand. The following assumptions are made on the growth of certified imports over the projection period:

- For 2020, the shares of certified EU imports of soy, palm oil and sugar can be found in Section 3.4.3;
- The shares of certified EU imports of soy, palm oil and sugar are assumed to increase at a constant rate between 2021 and 2022. An annual growth rate of 4% is used for palm oil and 3% for soy and sugar;
- The share of certified production for beef, maize and rapeseed is assumed to be 5% in 2023, since no information on the share of these products was found in the literature;
- From 2023 onwards, the shares of certified EU imports of all FRCs are assumed to increase at an annual growth rate of 5%.

3.4.6. Summary of modelling assumptions

Table 14 summarises the assumptions that are entered into the E3ME macroeconomic model for each policy option scenario. The figures in the table reflect the information that has been obtained from the literature (see Table 9, Table 10, Table 11 and Table 12) in mixed units. The price increases from the literature are applied to the baseline food price and are used to calculate the increase in the biofuel price used in transport.

It should be noted that the price increases for each commodity in this table are the average price increases weighted by the products quantity imported and domestic production, hence some numbers differ from those in the previous tables based on the literature. Table 33 in Appendix B translates these inputs into percentage increases, which is more useful for making comparisons between the commodities and scenarios.

Table 14: Summary of assumptions on the increase in food price in each scenario

Time	Commodity	Mandatory due diligence	Mandatory certification	Mandatory certification with due diligence	Mandatory labelling*
2021-2022	Beef	0.6%	83.42 EUR/tonne	Certification increase: 83.42 EUR/tonne	0%
	Maize	0.2%	0.52 EUR/tonne	Certification increase: 0.52 EUR/tonne	0%
	Palm oil	0.1%	18.59 EUR/tonne	Certification increase: 18.59 EUR/tonne	0%
	Rapeseed	0.2%	0.52 EUR/tonne	Certification increase: 0.52 EUR/tonne	0%
	Soy	0.2%	1.27 EUR/tonne	Certification increase: 1.27 EUR/tonne	0%

	Sugar	0.4%	0.09 EUR/tonne	Certification increase: 0.09 EUR/tonne	0%
2023-2030	Beef	0.6%	1%	Certification increase: 1% Due Diligence increase: 0.6%	4%
	Maize	0.2%	0.52 EUR/tonne	Certification increase: 0.52 EUR/tonne Due Diligence increase: 0.2%	4%
	Palm oil	1%	0.5 EUR/tonne	Certification increase: 0.5 EUR/tonne Due Diligence increase: 1%	4%
	Rapeseed	0.2%	0.52 EUR/tonne	Certification increase: 0.52 EUR/tonne Due Diligence increase: 0.2%	4%
	Soy	0.2%	1.27 EUR/tonne	Certification increase: 1.27 EUR/tonne Due Diligence increase: 0.2%	4%
	Sugar	0.4%	0.09 EUR/tonne	Certification increase: 0.09 EUR/tonne Due Diligence increase: 0.4%	4%
	Regulatory cost	1 million Euros pa	N/A	1 million Euros pa	1 million Euros pa

Note: * Price increases for the labelling policy option are only applied to the share of certified imports of each product. This proportion is provided in Table 13. All the proportions are subject to a 5% growth annually.
Source: Cambridge Econometrics.

Table 15 summarises the assumptions relating to the share of deforestation-free certified imports for each policy option scenario.

Table 15: Summary of assumptions on the share of imports certified as deforestation-free

Policy Option	2020	2021	2023 to 2030
Mandatory Due Diligence	Share of certified products set at: Soy: 13% Palm Oil: 78% Sugar: 7.6% Beef: 0% Maize: 0% Rapeseed: 0%	Increase in share of certified imports: Soy: 3% pa Palm Oil: 4% pa Sugar: 3% pa Beef: 0% Maize: 0% Rapeseed: 0%	Increase in share of certified imports: Soy: 5% pa Palm Oil: 6% pa Sugar: 5% pa Rate of success of due diligence implementation increases gradually from

			70% in 2023 to 100% in 2030.
Mandatory Certification	Share of certified products set at: Soy: 13% Palm Oil: 78% Sugar: 7.6% Beef: 0% Maize: 0% Rapeseed: 0%	Increase in share of certified imports: Soy: 50% Palm Oil: 50% Sugar: 50% Beef: 0% Maize: 0% Rapeseed: 0%	Share of certified imports: Soy: 100% Palm Oil: 100% Sugar: 100% Beef, Maize, Rapeseed: 100%
Mandatory Certification with Due Diligence	Share of certified products set at: Soy: 13% Palm Oil: 78% Sugar: 7.6% Beef: 0% Maize: 0% Rapeseed: 0%	Increase in share of certified imports: Soy: 50% Palm Oil: 50% Sugar: 50% Beef: 0% Maize: 0% Rapeseed: 0%	Share of certified imports: Soy: 100% Palm Oil: 100% Sugar: 100% Beef: 100% Maize: 100% Rapeseed: 100%
Mandatory Labelling	Share of certified products set at: Soy: 13% Palm Oil: 78% Sugar: 7.6% Beef: 0% Maize: 0% Rapeseed: 0%	Increase in share of certified imports: Soy: 3% pa Palm Oil: 4% pa Sugar: 3% pa Beef: 0% Maize: 0% Rapeseed: 0%	Share of certified imports: Beef, Maize, Rapeseed: 5% Increase in share of certified imports: Soy: 5% pa Palm Oil: 5% pa Sugar: 5% pa Beef: 5% pa Maize: 5% pa Rapeseed: 5% pa

Source: Cambridge Econometrics.

4. Quantitative Impact Assessment

In this section, the results for the four scenarios are presented and discussed. The baseline and scenarios run until 2030, with 2020 the first year of the projection.

4.1. The baseline

4.1.1. Economic results

Table 16 summarises population, GDP and employment levels in the EU over the projection period. Population growth is expected to slow to near-zero and working age population will start to decline after 2020. This means that the potential for GDP growth is also reduced. Total employment in the EU is also expected to start falling by 2030 because of the older population; over the full ten-year period the changes in population growth and employment are similar.

Table 16: Baseline GDP and employment in the EU

	2020	2021	2023	2030	Average annual growth (%pa)
Population ('000 people)	446,555	446,878	447,423	448,751	0.05
GDP (Million EUR)	12,747,254	12,942,000	13,336,513	14,578,208	1.35
Total employment ('000 people)	203,699	204,223	205,033	204,711	0.05

Source: Cambridge Econometrics, based on European Commission publications (see Section 3.4.1).

Demand for the six commodities is largely static over the projection period (see Table 17). The trends in growth reflect historical rates of growth, with a gradual increase in total consumption as incomes rise and some shifts from basic grains to imported products. Despite changing diets, a small growth in beef consumption is expected in the baseline.

Table 17: Food demand by commodity in the baseline (thousand tonnes)

	2020	2021	2023	2030	Average annual growth (%pa)
Maize	3,433	3,418	3,395	3,324	-0.3
Soy	1,588	1,587	1,595	1,615	0.2
Rapeseed	1,409	1,411	1,420	1,456	0.3
Other oil crops*	4,919	4,962	5,015	5,121	0.4
Sugar crops	15,399	15,497	15,568	15,877	0.3
Beef	63,82	6,395	6,436	6,507	0.2

Note: * Palm oil is part of 'Other oil crops'.
Source: Cambridge Econometrics.

Table 18: Deforestation embodied in EU imports (hectares) and related emissions (tCO_2) in the baseline

	2020	2021	2023	2030	Cumulative (2020-30)
Deforestation embodied in EU imports (hectares)					
Agricultural commodities (with constant share of certified imports)	23,274	23,285	23,378	23,693	258,219
Agricultural commodities (with increasing share of certified imports)	23,274	23,213	23,149	22,816	253,662
Biofuels	60	57	55	45	564
Emissions linked to deforestation (tCO_2)					
Agricultural commodities (with constant share of certified imports)	6,654,060	6,656,710	6,682,371	6,768,648	73,795,232
Agricultural commodities (with increasing share of certified imports)	6,654,060	6,634,458	6,612,275	6,498,973	72,396,033
Biofuels	15,402	14,618	14,100	11,319	143,687

Source: Cambridge Econometrics.

4.1.2. Deforestation and emissions

Growth in consumption of the six FRCs is translated into deforestation and emissions levels, linked to imports.

As explained in Section 3.3, the share of imported quantities already covered by deforestation-free certificates is deducted from the total quantity of demand resulting from the E3ME model simulation. Given the different assumptions that are made on the share of certified products imported[33] into the EU (see Table 15), two different variations of the baseline are presented:

- First version, with a constant share of certified imports of soy (13%), palm oil (78%) and sugar (7.6%) assumed;
- Second version, with a fixed annual increase in the share of certified imports of soy (3% pa), palm oil (4% pa) and sugar (3% pa) by 2030.

Table 18 shows the baseline trajectories for deforestation embodied in EU imports and for the related carbon emissions when no policy is introduced. In the baseline, both deforestation embodied in EU imports and associated emissions are expected to increase slightly over time.

[33] No information on certified imports of beef, maize and rapeseed was identified, therefore the share of certified imports of beef, maize and rapeseed is assumed to be zero.

However, if it is assumed that the share of certified imports increases over time, the cumulative deforestation (2020-30) falls slightly.

4.2. Scenario 1 – Mandatory due diligence policy option

4.2.1. Economic results

The key assumptions and inputs for this scenario are described in Section 3.4.2.

As the price of the six commodities increases compared to the baseline, a decrease in the demand for each commodity is expected. The impact of higher prices on food demand is felt from 2021, once EU operators start preparations for the due diligence systems.

Table 8 shows the difference in consumption of each commodity in the due diligence policy scenario, compared to the baseline. The assumptions for the changes in price of each commodity are small (ranged between 0.2 and 1%). Therefore, the impact on the demand for each commodity is also expected to be relatively small. For example, in 2021, demand for beef is expected to decrease by 0.05% compared to the baseline, in response to an increase in the price of beef of 0.6%. In 2023, the first year of full implementation of the policy option, the quantity consumed is expected to decrease by 0.03%, compared to the baseline. The difference in 2030 is similar.

As the change in the quantity demanded is less than 0.1% of the baseline amount for all six commodities considered, the overall economic impact of policy implementation is also relatively small for the EU as a whole. The one million euros of regulatory cost that is added annually to the government and service sectors also has a small impact on overall economic performance.

In addition to the price increase for the six food products, the cost of due diligence is added to the price of biofuels that are derived from five of the commodities (maize, rapeseed, sugar, soy and palm oil). The increase in prices of biofuels negatively affects the transport sector and has a more substantial effect on the overall economy. The economic results presented below include both the effects of higher food and biofuel prices.

Table 19: Quantity demand by commodity (% difference to the baseline) - Due Diligence scenario, EU

	2021	2023	2030
Maize	-0.06	-0.06	-0.05
Soy	-0.04	-0.05	-0.02
Rapeseed	-0.02	-0.02	-0.01
Other oil crops*	-0.004	-0.004	-0.002
Sugar crops	-0.06	-0.04	-0.02
Beef	-0.05	-0.03	-0.03

Note: * Palm oil is part of 'Other oil crops'.

Source: Cambridge Econometrics.

Table 20 shows the impacts of the policy option on GDP and employment. The increases in prices of the six commodities lead to a decrease in aggregate demand and thus to negative impacts on GDP and employment, compared to the baseline.

Table 20: Economic impact of due diligence (difference compared to the baseline), EU

	2021	2023	2030	2020-30
GDP (% difference)	-0.0005	-0.0007	-0.0009	-0.0011**
GDP (Million EUR)	-65.5	-93.8	-138.3	-829*
Total employment ('000 people)	-0.7	-1.1	-1.5	-11.2*
Total employment (% difference)	-0.0004	-0.0005	-0.0007	-0.0007**

Note: * Aggregated difference between the scenario and the baseline across the period; GDP values are discounted at 5% pa to make the EUR values comparable over time.

** Difference in growth in period 2020-30 between the scenario and the baseline, expressed in percentage points.

Source: Cambridge Econometrics.

The impacts of the due diligence policy option on the economy are small in 2021. As the cost of implementation of the policy continues, its negative effect on GDP also grows up to 2030. However, the overall scale of impacts remains small.

4.2.2. Deforestation and emissions

Similarly to the baseline figures presented in Table 18, in this section the results for deforestation embodied in EU imports and related emissions are presented in two different versions. The first version includes the assumption of a constant share of certified imports of soy, palm oil and sugar. In the second version, the shares of certified imports of soy, palm oil and sugar are assumed to increase over time.

Table 21 shows the effects of introducing the due diligence policy option on the level of embodied deforestation in EU imports and on related carbon emissions. EU embodied deforestation decreases substantially from 2023, which is the year in which the due diligence policy option enters into force. For the second version (increased certification), by 2023, the share of certified FRCs imported into the EU starts increasing at 5% annually for soy and sugar and 6% annually for palm oil. By 2030, all EU imports of beef, soy, palm oil, maize, rapeseed and sugar are covered by due diligence. The rapid reduction in embodied deforestation in EU imports is driven by a gradual increase in the rate of satisfactory due diligence systems between 2023 and 2030.

The reduction in deforestation embodied in imports is consistently reflected in a decrease in CO_2 emissions. The implementation of the due diligence policy option is associated with a 62% average reduction in cumulative emissions in the period 2020-30, when compared to baseline. By 2030, EU imports of beef, soy, palm oil, maize, rapeseed and sugar do not embody carbon emissions linked to deforestation, because their supply chains are fully compliant with deforestation-risk free criteria.

Considering the assumptions made in the modelling of this policy option (see Section 3.4.2), the results in Table 21 should be considered as the upper bound reduction in embodied deforestation and emissions linked with deforestation.

Table 21: Deforestation embodied in EU imports (hectares) and related emissions (tCO_2) under mandatory due diligence (absolute difference from the baseline)

	2020	2021	2023	2030	Cumulative (2020-30)
Deforestation embodied in EU imports (hectares)					
Agricultural commodities for food (with constant certification over time)	-	-9	-16,367	-23,693	-160,197
Agricultural commodities for food (with increasing certification share over time)	-	-9	-16,223	-22,816	-156,556
Biofuels	-	-0.001	-0.001	-0.001	-0.014
Emissions linked to deforestation (tCO_2)					
Agricultural commodities for food (with constant certification)	-	-2,485	-4,678,474	-6,768,648	-45,775,855
Agricultural commodities for food (with increasing certification)	-	-24,730	-4,704,242	-6,768,648	-44,657,505
Biofuels	-	-0.250	-0.343	-0.375	-3.578

Source: Cambridge Econometrics.

4.3. Scenario 2 – Mandatory certification

4.3.1. Economic results

The key assumptions and the inputs for this scenario are described in Section 3.4.3. Compared to due diligence, most of the costs of this policy option are incurred outside the EU and passed on to EU consumers through higher prices.

As the price of the six commodities increases, a decrease in demand for them is expected. The price impact of the policy is greater in the period 2021-22 (preparation period) than in the period 2023 onwards (the first year in which the policy is implemented). The reason for this is that there is a high cost incurred by producers in preparing their production processes for obtaining the certification required to export their products to the EU. By 2023, all producers who want to export products to the EU will have obtained the certification and ongoing costs of maintaining the certification will be lower.

The assumed price premia for most products are small compared to the baseline food price[34] (e.g. an increase of 1.5 euros per tonne for soy, rapeseed, and maize compared to the baseline). Moreover, the price increases affect only import prices and not domestic prices because the cost of obtaining the certification is borne by non-EU producers. Hence, the weighted overall price increase in food is smaller than the initial premium added as input to the model.

Table 22 shows the changes in demand at EU level for all six commodities, compared to the baseline. Beef has the highest initial cost for gaining the certification (289 EUR/tonne compared to 1.5

[34] In 2019, the world price for maize was 145 EUR/t, for soybean 335 EUR/t, for sugar 317 EUR/t and for beef 3,581 EUR/t (European Commission, 2019d).

EUR/tonne for most other commodities, see Table 10). Therefore, the impact on the demand for beef is higher than the impact on the other products (see Table 22). In 2021, there is a 0.2% reduction in consumption of beef compared to the baseline, while for other products the decrease compared to baseline is less than 0.1%. From 2023 onwards, the price increase for beef is around 1% compared to the baseline price[35]. Beef is also a food product for which easier substitution with domestic production can be achieved following an increase in the price of imports.

Palm oil faces a high initial certification cost, but this becomes smaller when combined with the other products in the 'other oil products' category used in the modelling. Therefore, the price effect for palm oil is relatively small. In addition, some of the substitution away from palm oil could be expected to increase consumption of other products within the same category. Overall, the effect on the consumption of other oil crops is therefore limited. This result should not be interpreted as meaning that there is no impact on palm oil consumption.

Table 22: Quantity demand by commodity (% difference to the baseline) – Mandatory certification scenario, EU

	2021	2023	2030
Maize	-0.08	-0.07	-0.05
Soy	-0.07	-0.07	-0.02
Rapeseed	-0.03	-0.01	-0.00
Other oil crops*	-0.06	0.02	0.00
Sugar crops	-0.05	-0.01	-0.01
Beef	-0.20	0.03	-0.01

Note: * Palm oil is part of 'Other oil crops'.

Source: Cambridge Econometrics.

As the change in consumption is less than 0.1% compared to the baseline in all commodities considered (with the exception of beef in the preparation phase), the overall economic impact of policy implementation is also relatively small (see Table 23). With the price increase much higher in 2021-22 than in 2023-30, the economic impact is also larger at the start of the projection period. This outcome is reflected in the results for GDP and employment in the table. By 2030, the economic impact is negligible.

Table 23: Economic impact of mandatory certification (difference compared to the baseline), EU

	2021	2023	2030	2020-30
GDP (% difference)	-0.0020	-0.0009	-0.0002	-0.0002**
GDP (Million EUR)	-261	-121	-27	-961*
Total employment ('000 people)	-3.6	-1.5	-0.7	-14.3*
Total employment (% difference)	-0.0018	-0.0007	-0.0003	-0.0003**

Note: * Aggregated difference between the scenario and the baseline across the period; GDP values are discounted at 5% pa to make the EUR values comparable over time.

[35] The dynamics in the econometric modelling suggest that the lower price in 2023 compared to 2022 could lead to a short-term increase in consumption, before the longer-term negative response takes hold. A similar pattern is seen for palm oil.

**Difference in growth in period 2020-30 between the scenario and the baseline, expressed in percentage points.
Source: Cambridge Econometrics.

Like the due diligence policy scenario, the increase in food prices is matched by higher biofuel prices, weighted by the share of input from each commodity. Since most of the price premia for the crops used for biofuel production are small (in both in the initial and ongoing phases), the price effects passed into biofuel prices are also small.

In this scenario, EU-level implementation costs are not included in the model because current EU border checks are assumed to cover the necessary checks on imports.

4.3.2. Deforestation and emissions

Table 24 shows the effects of introducing the mandatory certification policy option on the levels of embodied deforestation in EU imports and on related CO_2 emissions.

In 2021, the deforestation embodied in EU imports of soy, palm oil, maize and sugar decreases along with total imports of these commodities. The overall decrease in EU-driven deforestation is also linked to an increased share of certified imports of palm oil, soy and sugar. By 2023, the mandatory certification policy option officially enters into force, meaning that all FRCs imported to the EU are covered by deforestation-free certification. From 2023 to 2030, deforestation associated with EU imports is therefore zero. This result is based on the assumption that each producer exporting to the EU holds a certificate that its production is not linked to deforestation and that the certification reflects actual practice. This result does not imply that deforestation does not continue to happen in the producer country, for example in the production of goods for export to other markets.

By 2030, the cumulative difference in deforestation embodied in EU imports is, on average, 77% less than in the baseline scenario.

CO_2 emissions from deforestation embodied in EU imports follow the decrease in deforestation in the period 2021-22, as the preparation period starts. Like deforestation, they drop to zero from 2023 onwards. Accordingly, the decrease in cumulative CO_2 emissions is expected to decrease by 77% compared to the baseline scenario. These results are based on the same assumptions as the results for deforestation described above.

Table 24: Deforestation embodied in EU imports (hectares) and related emissions (tCO_2) under mandatory certification (absolute difference from the baseline*)

	2020	2021	2023	2030	Cumulative (2020-30)
Deforestation embodied in EU imports (hectares)					
Agricultural commodities for food	-	-2,457	-23,378	-23,693	-197,500
Biofuels	-	-	-55	-45	-392
Emissions linked to deforestation (tCO_2)					
Agricultural commodities for food	-	-754,057	-6,682,371	-6,768,648	-56,615,183
Biofuel	-	-0.488	-14,100	-11,319	-99,530

Note: * Absolute difference from the baseline with constant certification.
Source: Cambridge Econometrics.

Compared to the due diligence policy option, the mandatory certification policy option results in a faster path to zero in deforestation embodied in imports (and associated CO_2 emissions). The difference over the projection period to the due diligence option with a constant share of certified imports is 23% for deforestation and 24% for CO_2 emissions.

In view of the assumption concerning the efficiency of the implementation of this policy and the full effectiveness of certification schemes in 2023 (see Section 3.4.2), the results in Table 24 should be considered as the upper bound reduction in embodied deforestation and emissions linked to deforestation.

4.4. Scenario 3 – Mandatory certification with due diligence

4.4.1. Economic results

In this combined policy scenario, the price assumption for the period 2021-22 is the same as it is in the mandatory certification policy scenario. By 2023, the price increase in each commodity is a combination of the price premia of certified products and the private cost of implementing due diligence checks. The overall price increase is higher and the reduction in consumption of each commodity is larger than in the mandatory certification policy option. Overall though, Table 25 shows that the reductions in consumption follow a similar pattern to the mandatory certification policy option.

Table 25: Quantity demanded by commodity (% difference to the baseline) – Mandatory certification with due diligence policy scenario, EU

	2021	2023	2030
Maize	-0.08	-0.12	-0.10
Soy	-0.07	-0.11	-0.03
Rapeseed	-0.03	-0.03	-0.02
Other oil crops*	-0.06	0.02	0.000
Sugar crops	-0.05	-0.07	-0.02
Beef	-0.20	-0.01	-0.04

Note: * Palm oil is part of 'Other oil crops'.

Source: Cambridge Econometrics.

Since the assumptions for this policy option between 2021-22 are the same as in the mandatory certification policy option, the economic impact is also largely the same (see Table 26). From 2023 onward, the additional food price increase from the due diligence implementation is entered as part of the modelled scenario. The regulatory cost of one million euros from implementing the due diligence is also applied in this scenario, which also contributes to a slightly greater economic impact from 2023 onwards, compared to the mandatory certification policy option.

Table 26 shows the impacts on EU GDP and employment levels. Most of the impacts are driven by high initial certification costs and so the negative impacts are larger in 2021. By 2030, the impacts are smaller as the economy reacts to the higher prices.

The treatment of biofuel costs in this scenario is similar to the treatment in the previous scenario.

Table 26: Economic impact of Mandatory Certification with Due Diligence policy (absolute difference compared to the baseline), EU

	2021	2023	2030	2020-30
GDP (% difference)	-0.0020	-0.0014	-0.0011	-0.0013**
GDP (Million EUR)	-261	-189	-163	-1,573*
Total employment ('000 people)	-3.6	-23	-2.0	-22.8*
Total employment (% difference)	-0.0018	-0.0011	-0.0010	-0.0010**

Note: * Aggregated difference between the scenario and the baseline across the period; GDP values are discounted at 5% pa to make the EUR values comparable over time.

** Difference in growth in period 2020-30 between the scenario and the baseline, expressed in percentage points.

Source: Cambridge Econometrics.

4.4.2. Deforestation and Emissions

Table 27shows the effect of the introduction of the combined policy option on the level of deforestation linked to EU imports, and on the related CO_2 emissions. In 2021, the level of EU deforestation embodied in imports decreases because of an increase in the amount of certified imported quantities. As in the previous policy option, the combination of mandatory certification and due diligence requires the share of certified imports to double between 2021 and 2022, during the preparation period for the introduction of more stringent requirements. From 2023 onwards, all imports must be certified and therefore deforestation rates linked to EU imports fall to zero. The effect of combining mandatory certification with due diligence equals the effect of introducing solely mandatory certification. It follows that the reduction in deforestation embodied in EU imports and in the related CO_2 emissions is equivalent for the two policy options.

Table 27: Deforestation embodied in EU imports (hectares) and related emissions (tCO_2) under mandatory certification with due diligence (absolute difference from baseline*)

	2020	**2021**	**2023**	**2030**	**Cumulative (2020-30)**
Deforestation embodied in EU imports (hectares)					
Agricultural commodities for food	-	-2,457	-23,378	-23,693	-197,500
Biofuels	-	-	-55	-45	-392
Emissions linked to deforestation (tCO_2)					
Agricultural commodities for food	-	-754,057	-6,682,371	-6,768, 648	-56,615,183
Biofuels	-	-	-14,100	-11,319	-99,529

Note: * Absolute difference from the baseline with constant certification.

Source: Cambridge Econometrics.

Both in the case of mandatory certification and mandatory due diligence, the assumptions of implementation effectiveness and cost increases are the upper bounds of the possible outcomes. Therefore, the reductions in deforestation embodied in imports and related emissions in Table 27 should also be considered as upper bounds for the possible reduction.

4.5. Scenario 4 – Mandatory labelling

4.5.1. Economic results

The implementation of mandatory labelling leads to price increases for the six commodities, and reductions in consumption as a result (see Table 28). The policy option requires that EU operators put a label on products and has no initial set-up costs; hence there are no changes to prices or consumption levels in 2021. From 2023, prices increase in response to the labelling, partly because of the costs of getting the validated labels but also because of a price premium that develops for deforestation-free products. Deforestation-free products increase in price by 4%; but Table 28 shows that this leads to only a small impact (less than 0.1%) on the change in consumption of each product as the demand for these products is relatively small.

The demand for deforestation-free imported products is assumed to increase by 5% annually as consumers respond to the labels; this leads to higher overall prices because of a weighting effect. Consumption therefore continues to fall, relative to the baseline.

Table 28: Quantity demanded by commodity (% difference to the baseline) – Mandatory Labelling scenario, EU

	2021	2023	2030
Maize	0.00	-0.05	-0.07
Soy	0.00	-0.10	-0.08
Rapeseed	0.00	-0.02	-0.02
Other oil crops	0.00	-0.01	-0.01
Sugar crops	0.00	-0.05	-0.03
Beef	0.00	-0.01	-0.02

Note: * Palm oil is part of 'Other oil crops'.

Source: Cambridge Econometrics.

As the change in consumption compared to the baseline is less than 0.1% for each commodity, the overall economic impact of the policy option is small (see Table 29). The additional annual one million euro cost is included to capture the regulatory costs of checking whether the products are labelled accordingly to the regulation. This has a small further impact on the GDP and employment results.

Table 29: Economic impact of Mandatory Labelling (absolute difference compared to the baseline), EU

	2021	2023	2030	2020-30
GDP (% difference)	0	-0.0003	-0.0009	-0.0010**
GDP (Million EUR)	0	-44	-125	-481*
Total employment ('000 people)	0.0	-0.6	-1.3	-7.3*
Total employment (% difference)	0.0	-0.0003	-0.0006	-0.0006**

Note: * Aggregated difference between the scenario and the baseline across the period; GDP values are discounted at 5% pa to make the EUR values comparable over time.

** Difference in growth in period 2020-30 between the scenario and the baseline, expressed in percentage points.

Source: Cambridge Econometrics.

As the labelling process is done within the EU, and biofuels are blended with other transport fuel, it is difficult to see how the labelling scheme could be extended to biofuels products. Therefore, no price increase in biofuels is assumed and there is no economic impact through biofuel price changes in this policy option. This further limits the scale of potential economic impacts.

4.5.2. Deforestation and Emissions

Table 30 shows the effect of the introduction of mandatory labelling on deforestation embodied in EU imports, and on the related CO_2 emissions. The implementation of this policy option leads to a decrease in the level of deforestation embodied in EU imports. This decrease is partly explained by the falling demand for the six commodities, but mostly by the assumed 5% annual increase in switching to products certified as deforestation-free (from 2023). By 2030, EU embodied deforestation in imports is not eradicated (as in the other policy options), but it is substantially reduced.

CO_2 emissions follow the trend of deforestation. In 2021, emissions decline by a modest amount. The decline becomes larger over time but total emissions from deforestation embedded in EU imports do not fall to zero by 2030.

The results in Table 30 are based on the assumption that there is a 5% pa growth in the imports of certified FRCs from 2023 onwards. This growth is based on the increase in consumer preference for deforestation-free products. Therefore, the reduction in deforestation embodied in EU imports and related emissions under mandatory labelling should be treated as an upper bound for the possible reduction.

Table 30: Deforestation embodied in EU imports (hectares) and related emissions (tCO_2) under mandatory labelling (absolute difference from the baseline*)

	2020	2021	2023	2030	Cumulative (2020-30)
Deforestation embodied in EU imports (hectares)					
Agricultural commodities for food	-	-73	-729	-2,035	-11,024
Emissions linked to deforestation (tCO_2)					
Agricultural commodities for food	-	-22,252	-199,976	-590,028	-3,151,639

Note: * Absolute difference from the baseline with constant certification.

Source: Cambridge Econometrics.

5. European Added Value

5.1. Introduction

In this report, the European Added Value is quantified as the additional net benefit that can be generated if compared to the net benefit achieved by action of the Member States. In this report, the baseline case includes the current actions of each Member State. Therefore, the European Added Value in each policy is quantified by how it compares to the current regulatory framework, which is the represented in the baseline.

5.2. The quantification of European Value Added

In this report, a combined approach is used to estimate the overall impact of policy options to halt or reverse deforestation from EU imports. Economic impacts within the EU are assessed using the E3ME macroeconomic model and a separate quantitative approach is used to estimate reductions in deforestation (in hectares) and emissions (in tCO_2). Both effects depend on the policy option implemented to reduce deforestation and the assumptions that underlie the combined quantitative approach (see summary of assumptions in Table 14 and Table 15).

Four policy options are quantified in this report: mandatory due diligence, mandatory certification, mandatory certification with due diligence, and mandatory labelling. Each policy option leads to a price increase of FRCs within the EU, leading to higher food and biofuel prices. Due diligence, mandatory certification with due diligence and mandatory labelling will also require a small increase in government spending. The public cost of the three policies implementation is estimated at EUR 1 million per year at EU level.

For three of the six FRCs investigated in the report, a share of the quantity imported into the EU is already certified as being free from deforestation. While mandatory certification will increase this share to 100% by 2023, the other policy options are assumed to also lead to an increase in the certified share by 2030, albeit to values smaller than 100%. The key assumptions used to assess the effects of the policy options are summarised in Table 14 and Table 15.

Table 31 provides a summary of the cumulative economic impact in the EU over the period up to 2030. There are negative but small effects on both GDP and employment; with larger economic impacts in the policy options involving mandatory certification.

In both policy options with mandatory certification, the price increase is higher during the preparatory phase (2021-23) and therefore economic impacts are also higher for the policy in this phase than during the ongoing phase (2023-30). The shock to the EU's economy due to mandatory certification is mostly felt at the beginning of the period.

Mandatory due diligence has smaller impact by 2030 than mandatory certification, mainly because of a lower price increase during the initial phase (2021-22). The price increase from due diligence running costs (2023-30) is higher than that for certification running costs, and so the economic impact rises by 2030 for the due diligence scenario. The cumulated economic effects in the two policy options are of similar magnitude.

When these two policy options are combined, their overall combined economic effect is slightly smaller than their combined individual effect, reflecting the potential synergies in the policies.

The mandatory labelling policy option leads to the highest price increases among the four policy options. However, the price increase is applied only on products that carry the label of no

deforestation and, although growing, this share does not come to dominate the market. Therefore, the cumulated economic impact of this policy option is the smallest of the four.

Table 31: Scenario impacts on GDP and employment - cumulated difference from the baseline across the period 2020-30

	GDP (EUR millions)	GDP (% difference)	Employment (000s)	Employment (% difference)
Due diligence	-829	-0.001	-11	-0.0007
Mandatory certification	-961	-0.0002	-14	-0.0003
Mandatory certification with due diligence	-1573	-0.0013	-23	-0.0010
Mandatory labelling	-481	-0.0010	-7	-0.0006

Source: Cambridge Econometrics.

The price increase in FRCs affects both the EU economy (as shown above) and the quantity of products that are imported from third countries. A land- and trade-based method is used to translate the change in quantity imported into changes in EU import-driven deforestation. The relative price increases of the FRCs are small and therefore the reductions in consumption and imports are also small, especially for products such as soy that have an inelastic demand.

The estimates of deforestation levels embodied in EU imports assume that there are no changes in the production, harvested area and deforestation level in the producer countries. Therefore, the levels of deforestation linked with each policy option in Table 32 capture only the EU demand changes as driven by the policy option assumptions.

The mandatory labelling policy option has the lowest impact on deforestation levels because it is left to consumers to drive the shift to imports coming from sustainable production. The cumulative impact on deforestation-free imports is much smaller than the gains achieved through the other policy options.

Table 32: Deforestation embodied in EU imports* (hectares)

Policy Option	Absolute difference from baseline in cumulative deforestation (2020-2030)	Difference from the baseline %	Absolute difference from baseline in cumulative CO_2 Emissions (2020-2030)	Difference from the baseline %
Due diligence with constant certification	-160,197	-62%	-45,775,855	-62%
Due diligence with increasing certification	-156,556	-62%	-44,657,505	-62%
Mandatory certification	-197,500	-76%	-56,615,183	-77%
Mandatory certification with due diligence	-197,500	-76%	-56,615,183	-77%
Mandatory labelling	-11,024	-4%	-3,151,639	-4%

Note: * This table only accounts for deforestation embodied in EU imports of agricultural commodities for food and does not include biofuels.

Source: Cambridge Econometrics.

Mandatory certification will bring about the largest reductions in EU-driven deforestation because only products that are certified as being deforestation-free may enter the EU from 2023 onwards. This result is based on the optimistic assumption of full effectiveness in the implementation of the policy, in contrast with the existing body of evidence on problems with the effectiveness of many currently existing certification standards (Lambin et al., 2018). However, for all the policy options it should be noted that, in the absence of international cooperation, while EU-driven deforestation may be reduced/halted, global deforestation might continue, driven by import demand from other countries.

Mandatory due diligence leads also to a substantial reduction in EU-driven deforestation. Compared to mandatory certification, deforestation does not halt in 2023 with the implementation of the policy. The assessment of due diligence in the EU Timber Regulation showed that not all operations were found to have a satisfactory due diligence system in place even years after the implementation of the regulation, Therefore, the rate of success of the policy option is assumed to go from only 70% in 2023 to 100% by 2030.

The CO_2 emissions linked to deforestation (Table 32) follow the same pattern as the deforestation levels shown above. Again, the largest reductions are in the policy options that include mandatory certification of EU imports as being deforestation-free.

Combining the information in Table 31 and Table 32, due diligence and mandatory certification appear to have highest benefit per euro spent.

6. Conclusion

The EU aims to develop a regulatory framework to halt and reverse deforestation linked to EU imports of agricultural commodities for food and biofuels produced from crops. In the absence of a new regulatory framework, both deforestation embodied in EU imports and associated emissions are expected to increase over time. The new regulatory framework implies the introduction of some measures at the EU level. In this report we have analysed and discussed four demand-side policy options, namely mandatory due diligence, mandatory certification, mandatory labelling and a combination of mandatory certification and due diligence. Each of these policy options aims to reduce the deforestation linked with the EU demand for FRCs and to incentivise sustainable trade with demand-side interventions.

The policy options were translated into a model-based narrative and four scenarios were constructed to capture the quantitative effects of each option. The current regulatory framework, i.e. action at Member State level, is represented in the baseline case. Each of the four policy options is assessed against this baseline case and the net benefits, in terms of reduction in deforestation embodied in EU imports, provide a measure of the European added value.

The modelling approach combines an existing macroeconomic model with a method to translate the imported quantities of FRCs into land use and deforestation linked to land use. The modelling approach estimates the impact of changes in the prices of FRCs on the EU economy (GDP and employment) and on the imported quantities of FRCs linked to deforestation. Additional assumptions were made to translate other criteria that need to be met by operators depending on the policy option (see Section 3.4). For example, in the case of mandatory certification, all imports of FRCs must be certified as deforestation-free before entering the EU market.

The quantitative analysis presented in this report considers EU food demand for beef, soy, palm oil, maize, rapeseed, sugar, plus the biofuels produced from these crops. Other crops such as rubber, coffee and cocoa, whose imports are also linked to deforestation were not included in the analysis due to data and modelling constraints. Despite the reduced commodities coverage, the conclusion linked to the quantification of each policy option compared to the current regulatory framework remains valid. While the economic impact might be higher if more FRCs were included in the analysis, the order of the policy options given by the economic cost and the reduction in deforestation embodied in EU imports would remain the same.

An important assumption made in the quantitative analysis is that the cost incurred by third-country producers or EU operators due to the implementation of the new regulatory framework will be passed on to consumers. If access to the EU market is critical for the producers and operators, then it is possible that they may not pass these costs on. The 'price premium' used for mandatory certification and labelling is based on literature on voluntary certification and labelling as the premium is used as part of the 'branding'. In the case of voluntary certification schemes for palm oil, there is often an over-supply of 'sustainable' palm oil, which is sold as non-sustainable on the standard market due to lack of overall demand. It is possible that some of the cost increases assumed in this analysis may not in fact occur. This would result in smaller economic impacts and thus the estimated impacts of each policy option in this report should be considered as upper bounds in relation to the six commodities included in the analysis.

The evaluation of these policy options indicates that the EU has the potential to reduce substantially its deforestation footprint embodied in the trade of agricultural commodities for food and biofuels produced from crops, potentially to zero, with a limited economic impact, provided that the proposed option is implemented effectively. The introduction of mandatory labelling is likely to lead a modest decrease in embodied deforestation in EU imports, by incentivising changes in

consumption patterns towards more sustainable purchases. However, the other policy options (the implementation of mandatory due diligence, mandatory certification and mandatory certification with due diligence) could reduce deforestation linked to EU imports by much more, eventually reaching zero.

Mandatory certification could achieve the reduction in deforestation embodied in imports in less time than mandatory due diligence would because it would require that no deforestation-linked product enters the EU market after 2023. The literature (Dou et al., 2018; Harris et al., 2019; Heilmayr et al., 2020) shows that there may be displacement of environmental pressure from lands with certification to lands and actors who do not directly participate in the certification programme. Mandatory due diligence is also not 100% successful in reducing the risk since not all operators would completely eliminate deforestation from their supply chains. In this report, 100% risk-free supply chains are assumed to be reached only by 2030. By comparing the European added value in terms of economic impact and the reduction in deforestation embodied in EU imports between policy options, both due diligence and mandatory certification show similar benefits per euro spent.

The economic impacts of all four policy options are negative but small in magnitude. Impacts may be larger outside the EU for small producers that are unable to adapt to the EU requirements for importing. In the analysis, it is assumed that enough producers can adapt so that there are no disruptions to supply. If the EU could coordinate with other major importers of FRCs, this assumption may be tested, but the global impacts in terms of deforestation would be more substantial because it would not be possible for producers to divert sustainable production to the EU and non-sustainable production to other markets.

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Appendix A: E3ME model description

Overview

E3ME is a computer-based model of the world's economic and energy systems and the environment. It was originally developed through the European Commission's research framework programmes and is now widely used in Europe and beyond for policy assessment, for forecasting and for research purposes. The main advantages of the E3ME model are:

- global geographical coverage with each EU Member State defined explicitly
- a high level of sectoral detail
- close integration of the economy with the energy system, and also with food demand
- an econometric specification that is highly empirical and less reliant on theoretical assumptions than competing approaches
- the potential to model both short and long-term impacts

This model description provides a short summary of the E3ME model (Cambridge Econometrics, 2019). For further details, the reader is referred to the full model manual available online from www.e3me.com[36].

Applications of E3ME

Scenario-based analysis

Although E3ME can be used for forecasting, the model is more commonly used for evaluating the impacts of an input shock through a scenario-based analysis. The shock may be either a change in policy, a change in economic assumptions or another change to a model variable. The analysis can be either forward-looking (ex-ante) or evaluating previous developments in an ex-post manner. Scenarios may be used either to assess policy, or to assess sensitivities to key inputs (e.g. international energy prices).

For ex-ante analysis a baseline forecast up to 2030 is required; in this report the baseline is set to match projections from the European Commission (see Section 3.4.1). The scenarios represent alternative versions of the future based on a different set of inputs. By comparing the outcomes to the baseline (usually in percentage terms), the effects of the change in inputs can be determined.

Price or tax scenarios

Model-based scenario analyses often focus on changes in price because this is easy to quantify and represent in the model structure. Examples include:

- changes in tax rates including direct, indirect, border, energy and environment taxes
- changes in international energy prices

Regulatory impacts

All of the price changes above can be represented in E3ME's framework reasonably well, given the level of disaggregation available. However, it is also possible to assess the effects of regulation, albeit with an assumption about effectiveness and cost. The regulatory costs in the scenarios in this report are formed using assumptions on these inputs.

Comparison with CGE models and econometric specification

[36] https://www.e3me.com/wp-content/uploads/2019/09/E3ME-Technical-Manual-v6.1-onlineSML.pdf

E3ME is often compared to Computable General Equilibrium (CGE) models. In many ways the modelling approaches are similar; they are used to answer similar questions and use similar inputs and outputs. However, underlying this there are important theoretical differences between the modelling approaches.

In a typical CGE framework, optimal behaviour is assumed, output is determined by supply-side constraints and prices adjust fully so that all the available capacity is used. In E3ME the determination of output comes from a post-Keynesian framework (King, 2015) and it is possible to have spare capacity. The model is more demand-driven and it is not assumed that prices always adjust to market clearing levels.

These differences can have important practical implications, as they mean that in E3ME regulation and other policy may lead to increases in output if they are able to draw upon spare economic capacity (see further detail in the manual). In the scenarios in this report, however, the main economic impacts arise through changes in prices. Higher prices feed through the economic system through the model's accounting framework, which is similar in nature to that from a CGE model. It is therefore likely that a CGE model would yield similar GDP results to those from E3ME, at least qualitatively.

The econometric specification of E3ME gives the model a strong empirical grounding. E3ME uses a system of error correction, allowing short-term dynamic (or transition) outcomes, moving towards a long-term trend. The dynamic specification is important when considering short and medium-term analysis and rebound effects[37], which are included as standard in the model's results.

Limitations of the approach

As with all modelling approaches, E3ME is a simplification of reality and is based on a series of assumptions. Compared to other macroeconomic modelling approaches, the assumptions are relatively non-restrictive as most relationships are determined by the historical data in the model database. This does, however, present its own limitations, for which the model user must be aware:

- The quality of the data used in the modelling is important. In this study we rely heavily on Eurostat data to model relationships within the EU Member States.
- Econometric approaches are also sometimes criticised for using the past to explain future trends. In cases where there is large-scale policy change, the 'Lucas Critique' (Lucas, 1976) that suggests behaviour might change is also applicable. There is no easy solution to this argument using any current modelling approach (even agent-based models apply restrictions) but we must always be aware of the uncertainty in the model results.
- The other main limitation to the E3ME approach relates to the dimensions of the model. In general, it is very difficult to go into a level of detail beyond that offered by the model classifications. We see one notable example in this report with palm oil, which is part of a broader category of food products and for which it is therefore difficult to draw firm conclusions. Similarly, cocoa and coffee are part of a broader category of food products which will make it even more difficult to distinguish between results for the two products. Although usually less relevant, attempting to assess impacts on a monthly or quarterly basis would not be possible.

E3ME basic structure and data

[37] Where an initial increase in efficiency reduces demand, but this is negated in the long run as greater efficiency lowers the relative cost and increases consumption.

The structure of E3ME is based on the system of national accounts, with further linkages to energy demand and environmental emissions. The labour market is also covered in detail, including both voluntary and involuntary unemployment. In total there are 33 sets of econometrically estimated equations, also including the components of GDP (consumption, investment, international trade), prices, energy demand, material demand and food demand. Each equation set is disaggregated by country and (where relevant) by sector.

E3ME's historical database covers the period 1970-2016 and the model projects forward annually to 2100. The main data sources for European countries are Eurostat and the IEA, supplemented by the OECD's STAN database and other sources where appropriate. For regions outside Europe, additional sources for data include the UN, OECD, World Bank, IMF, ILO and national statistics. Gaps in the data are estimated using customised software algorithms.

The main dimensions of the model

The main dimensions of E3ME are:

- 61 countries – all major world economies, the EU28 and candidate countries plus other countries' economies grouped
- 44 or 70 (in Europe) industry sectors, based on standard international classifications
- 19 types of food consumption, linked to primary demand for foodstuffs
- 28 or 43 (in Europe) categories of household expenditure
- 19 categories of food products
- 23 different users of 12 different fuel types
- 14 types of air-borne emission (where data are available) including the 6 GHG's monitored under the Kyoto Protocol

The countries and sectors covered by the model are listed at the end of this appendix.

Standard outputs from the model

As a general model of the economy, based on the full structure of the national accounts, E3ME is capable of producing a broad range of economic indicators. In addition there is range of energy and environment indicators. The following list provides a summary of the most common model outputs:

- GDP and the aggregate components of GDP (household expenditure, investment, government expenditure and international trade)
- sectoral output and GVA, prices, trade and competitiveness effects
- international trade by sector, origin and destination
- consumer prices and expenditures
- sectoral employment, unemployment, sectoral wage rates and labour supply
- energy demand, by sector and by fuel, energy prices
- CO_2 emissions by sector and by fuel
- other air-borne emissions
- food demands
- material demands

This list is by no means exhaustive and the delivered outputs often depend on the requirements of the specific application. In addition to the sectoral dimension mentioned in the list, all indicators are produced at the national and regional level and annually over the period up to 2100.

Food demand

There are two steps to the food demand estimation in E3ME. Total food demand (in tonnes) is firstly estimated at an aggregate level and then a separate estimation is used to determine food demand by food type. The two-step approach improves the stability of the food demand equations, as the disaggregate food demand results, which are based on less robust and sometimes volatile data, are scaled to match results from the aggregate equation. Total food consumption does not change much in the scenarios in this report because the change in aggregate food prices is modest. Instead, there are shifts between the consumption of different food products (though still small), as described below.

In E3ME, aggregate and disaggregate food demand variables are a measure of final demand and therefore the measures include food waste during the production process. Data for food demand and food prices are taken from FAO Food Balances.

Disaggregate food demand

Although the key explanatory variables included in the disaggregate equations are similar to those included in the aggregate equations, there are some subtle differences in the two specifications.

For most countries we expect a positive relationship between food demand and real incomes at an aggregate level (with a de-coupling of this relationship as incomes grow above a certain point when the desired level of food consumption is reached), however, at the disaggregate level, the relationship is not necessarily positive, and this restriction is not imposed. For example, as incomes grow, there may be substitution from some cheaper or more basic food types (such as rice and cereals) towards more expensive food types (such as meat and fish).

In the EU, with median incomes already at a relatively high level, income effects are limited but not completely absent due to distributional effects. However, in this report, the focus is instead on price-related effects. To capture price-induced substitution effects, the price term in the disaggregated food demand equation is the ratio of the price for the particular food commodity in question to that of the average food prices. This allows for switching between the different food products; while total food consumption may not change by much, the composition of consumption is affected by more.

Food type classification

The food type classification used for the disaggregate equations includes 19 different food types, as shown in the table below:

1) cereals
2) rice
3) potatoes
4) other roots
5) maize
6) soy
7) sunflower
8) rapeseed
9) other oil crops
10) sugar crops
11) poultry
12) pork
13) beef

14) other meats / animal products
15) fish
16) dairy
17) fruit
18) vegetables
19) other

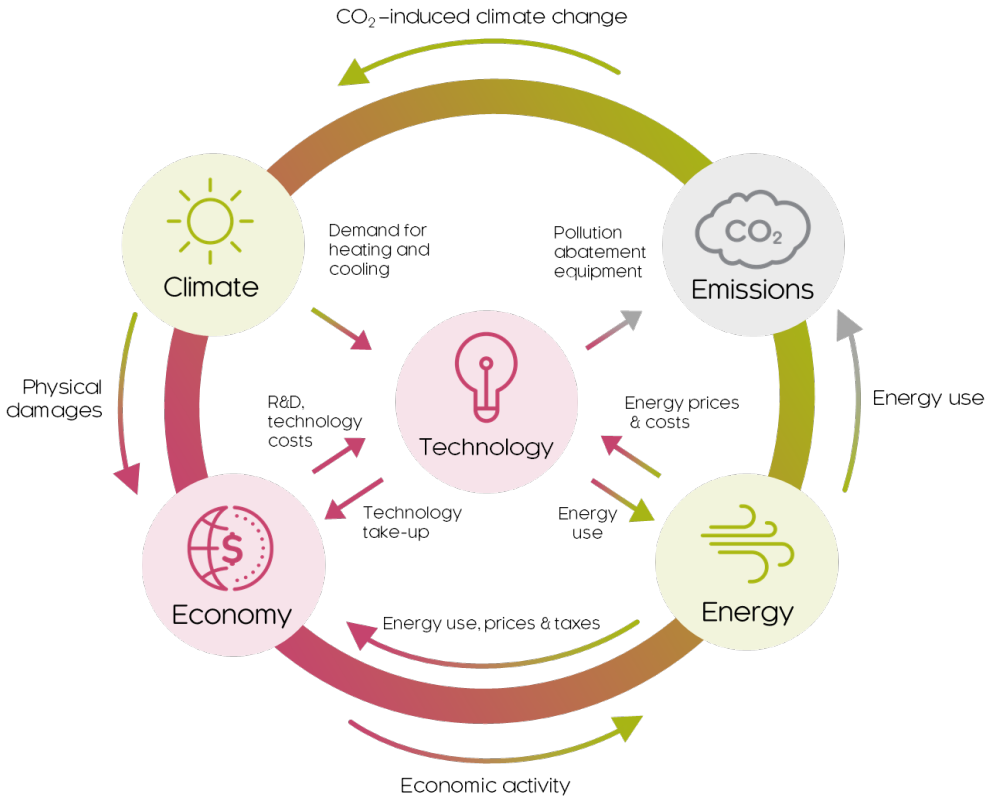
E3ME as an E3 model

The E3 interactions

Figure 6 shows how the three components (modules) of the model - energy, environment (emissions and climate in the diagram) and economy - fit together. Each component is shown separately in the diagram. Each data set has been constructed by statistical offices to conform with accounting conventions. Exogenous factors coming from outside the modelling framework are shown on the outside edge of the chart as inputs into each component. For each region's economy the exogenous factors are economic policies (including tax rates, growth in government expenditures, interest rates and exchange rates). For the energy system, the outside factors are the world oil prices and energy policy (including regulation of the energy industries). For the environment component, exogenous factors include policies such as reduction in SO2 emissions by means of end-of-pipe filters from large combustion plants. The linkages between the components of the model are shown explicitly by the arrows that indicate which values are transmitted between components.

The economy module provides measures of economic activity and general price levels to the energy module; the energy module provides measures of emissions of the main air pollutants to the environment module, which in turn can give measures of damage to health and buildings. The energy module provides detailed price levels for energy carriers distinguished in the economy module and the overall price of energy as well as energy use in the economy.

Figure 6: E3 linkages in the E3ME model



Treatment of international trade

An important part of the modelling concerns international trade. E3ME solves for detailed bilateral trade between regions, similar to a two-tier Armington model (Armington, 1969). Trade is modelled in three stages:

- econometric estimation of regions' sectoral import demand
- econometric estimation of regions' bilateral imports from each partner
- forming exports from other regions' import demands

Trade volumes are determined by a combination of economic activity indicators, relative prices and technology.

The labour market

Treatment of the labour market is an area that distinguishes E3ME from other macroeconomic models. E3ME includes econometric equation sets for employment, average working hours, wage rates and participation rates. The first three of these are disaggregated by economic sector while participation rates are disaggregated by gender and five-year age band.

The labour force is determined by multiplying labour market participation rates by population. Unemployment (including both voluntary and involuntary unemployment) is determined by taking the difference between the labour force and employment. This is typically a key variable of interest for policy makers.

The role of technology

Technological progress plays an important role in the E3ME model, affecting all three E's: economy, energy and environment. The model's endogenous technical progress indicators (TPIs), a function of R&D and gross investment, appear in nine of E3ME's econometric equation sets including trade, the labour market and prices. Investment and R&D in new technologies also appears in E3ME's energy and material demand equations to capture energy/resource savings technologies as well as pollution abatement equipment. In addition, E3ME also captures low carbon technologies in the power sector through the FTT power sector model[38].

Main dimensions of the E3ME model

	Regions	Industries (Europe)	Industries (non-Europe)
1	Belgium	Crops, animals, etc	Agriculture etc
2	Denmark	Forestry & logging	Coal
3	Germany	Fishing	Oil & Gas etc
4	Greece	Coal	Other Mining
5	Spain	Oil and Gas	Food, Drink & Tobacco
6	France	Other mining	Textiles, Clothing & Leather
7	Ireland	Food, drink & tobacco	Wood & Paper
8	Italy	Textiles & leather	Printing & Publishing
9	Luxembourg	Wood & wood prods	Manufactured Fuels
10	Netherlands	Paper & paper prods	Pharmaceuticals
11	Austria	Printing & reproduction	Other chemicals
12	Portugal	Coke & ref petroleum	Rubber & Plastics
13	Finland	Other chemicals	Non-Metallic Minerals
14	Sweden	Pharmaceuticals	Basic Metals
15	UK	Rubber & plastic products	Metal Goods
16	Czech Rep.	Non-metallic mineral prods	Mechanical Engineering
17	Estonia	Basic metals	Electronics
18	Cyprus	Fabricated metal prods	Electrical Engineering
19	Latvia	Computers etc	Motor Vehicles
20	Lithuania	Electrical equipment	Other Transport Equipment
21	Hungary	Other machinery/equipment	Other Manufacturing

[38] See Mercure (2012).

22	Malta	Motor vehicles	Electricity
23	Poland	Other transport equip	Gas Supply
24	Slovenia	Furniture; other manufacture	Water Supply
25	Slovakia	Machinery repair/installation	Construction
26	Bulgaria	Electricity	Distribution
27	Romania	Gas, steam & air cond.	Retailing
28	Norway	Water, treatment & supply	Hotels & Catering
29	Switzerland	Sewerage & waste	Land Transport etc
30	Iceland	Construction	Water Transport
31	Croatia	Wholesale & retail MV	Air Transport
32	Turkey	Wholesale excl MV	Communications
33	Macedonia	Retail excl MV	Banking & Finance
34	USA	Land transport, pipelines	Insurance
35	Japan	Water transport	Computing Services
36	Canada	Air transport	Professional Services
37	Australia	Warehousing	Other Business Services
38	New Zealand	Postal & courier activities	Public Administration
39	Russian Fed.	Accommodation & food serv	Education
40	Rest of Annex I	Publishing activities	Health & Social Work
41	China	Motion pic, video, television	Miscellaneous Services
42	India	Telecommunications	Unallocated
43	Mexico	Computer programming etc.	
44	Brazil	Financial services	
45	Argentina	Insurance	
46	Colombia	Aux to financial services	
47	Rest Latin Am.	Real estate	
48	Korea	Imputed rents	
49	Taiwan	Legal, account, consult	
50	Indonesia	Architectural & engineering	
51	Rest of ASEAN	R&D	

52	Rest of OPEC	Advertising	
53	Rest of world	Other professional	
54	Ukraine	Rental & leasing	
55	Saudi Arabia	Employment activities	
56	Nigeria	Travel agency	
57	South Africa	Security & investigation, etc	
58	Rest of Africa	Public admin & defence	
59	Africa OPEC	Education	
60	Malaysia	Human health activities	
61	Kazakhstan	Residential care	
62		Creative, arts, recreational	
63		Sports activities	
64		Membership orgs	
65		Repair comp. & pers. goods	
66		Other personal serv.	
67		Hholds as employers	
68		Extraterritorial orgs	
69		Unallocated/Dwellings	

Source: Cambridge Econometrics.

Appendix B: E3ME model assumptions

Table 33 shows the price increases in each scenario compared to the baseline, expressed as percentage differences. This table matches Table 14 in the main text, which uses original units.

Table 33 Price increase compared to the baseline by commodity and policy option, %

Time	Commodity	Mandatory due diligence	Mandatory certification	Mandatory cert. & due diligence	Mandatory labelling*
2021-2022	Beef	0.6%	1.9%	Certification increase: 1.9%	0%
	Maize	0.2%	0.2%	Certification increase: 0.2%	0%
	Palm oil	0.1%	6.4%	Certification increase: 6.4%	0%
	Rapeseed	0.2%	0.1%	Certification increase: 0.1%	0%
	Soy	0.2%	0.3%	Certification increase: 0.3%	0%
	Sugar	0.4%	0.1%	Certification increase: 0.1%	0%
2023-2030	Beef	0.6%	1%	Certification increase: 1% Due Diligence increase: 0.6%	4%
	Maize	0.2%	0.2%	Certification increase: 0.2% Due Diligence increase: 0.2%	4%
	Palm oil	1%	0.2%	Certification increase: 0.2% Due Diligence increase: 0.1%	4%
	Rapeseed	0.2%	0.1%	Certification increase: 0.1% Due Diligence increase: 0.2%	4%
	Soy	0.2%	0.3%	Certification increase: 0.3% Due Diligence increase: 0.2%	4%
	Sugar	0.4%	0.1%	Certification increase: 0.1% Due Diligence increase: 0.4%	4%

Note: * Under mandatory labelling the price increase is applied only to a share of overall imports.
Source: Cambridge Econometrics.

8. Appendix C: Due diligence assumption sensitivity checking

For the mandatory due diligence policy option, further sensitivity testing was carried out to test the impacts of different initial set-up costs (for which there is no available information). The testing here considers a higher and a lower price increase in the initial phase of the policy (i.e. 2021-22) compared to the price increase in the on-going phase (2023-30). The higher price is ten times that of the main scenario and the price is reduced by a factor of ten in the lower sensitivity scenario.

As expected, the impact on GDP and employment increase/decrease by roughly same order of magnitude in 2021 than the main scenario. By 2030, however, the effects of the initial price increase on GDP have largely disappeared. There are some remaining differences in employment due to lagged effects, but these remain small overall.

Table 34 EU GDP - Percentage difference from the baseline

	2021	2023	2030
Due Diligence (main scenario)	-0.0005	-0.0007	-0.0009
Due Diligence (Lower price increase in the initial phase)	-0.00002	-0.0005	-0.0009
Due Diligence (Higher price increase in the initial phase)	-0.005	-0.002	-0.0010

Source: Cambridge Econometrics.

Table 35 Employment (000s) - Absolute difference from the baseline

	2021	2023	2030
Due Diligence (main scenario)	-0.7	-1.1	-1.5
Due Diligence (Lower price increase in the initial phase)	-0.0	-0.8	-1.4
Due Diligence (Higher price increase in the initial phase)	-7.3	-3.4	-2.5

Source: Cambridge Econometrics.

Appendix D: Food price sensitivity checking

The results of the E3ME modelling were also checked using two different levels of food prices for the baseline. All the policy option scenarios run were carried out using the same assumptions as defined in Table 14 but with higher and lower food prices than in the baseline case. One sensitivity is performed with food prices that grow 1% pa faster than those in the original baseline and the other has prices that grow 1% slower. The sensitivity starts in 2021 so by 2030 food prices are roughly 10% higher/lower than in the main baseline.

It is expected that lower baseline food prices lead to larger shocks from the policy options, because the relative increase in food prices is higher. The tables below summarise the difference in economic results between the scenarios compared to the baseline and follow the expected pattern. The ranges of results between the different sensitivities are relatively modest, suggesting that overall results are not particularly sensitive to what happens to international food prices.

Table 36 EU GDP (millions Euros) - Absolute difference from the baseline

	Lower price	Main scenario	Higher price
Due Diligence	-150	-138	-131
Certification	-34	-27	-24
Certification with Due diligence	-182	-163	-157
Labelling	-132	-125	-106

Source: Cambridge Econometrics.

Table 37 EU Employment (000s) - Absolute difference from the baseline

	Lower price	Main scenario	Higher price
Due Diligence	-1.56	-1.45	-1.39
Certification	-0.73	-0.67	-0.66
Certification with Due diligence	-2.19	-2.00	-1.90
Labelling	-1.29	-1.28	-1.11

Source: Cambridge Econometrics.

Deforestation caused by agricultural activity is continuing at an alarming rate, threatening irreplaceable tropical forests that, among other things, are crucial for fighting climate change. The EU bears its share of responsibility for this environmental loss, as it is one of the major importers of several forest-risk commodities.

To date, action has been taken at different levels to stop commodity-driven deforestation. Nevertheless, the impact on forest loss has been low as deforestation continues and new hot spots occur.

There has been a recent commitment at EU level to propose new measures to minimise the risk of deforestation and forest degradation associated with products placed on the EU market.

This European added value assessment (EAVA) accompanies the European Parliament's own-initiative legislative report calling on the European Commission to take legislative action on the matter. The EAVA looks at why EU action is needed and analyses four potential demand-side regulatory policy options at EU level. A quantitative analysis reveals that to varying extents, all options have the potential to reduce EU-driven deforestation and associated carbon emissions, while having a relatively small impact on the EU economy.

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