Illicit Harvest, Complicit Goods:

The State of Illegal Deforestation for Agriculture

Summary of Methodological Approach

"Illicit Harvest, Complicit Goods" estimates the scale of illegal conversion of tropical forests for commercial agriculture and associated exports of key commodities between 2013 and 2019. A detailed description of methodological approach and data will be available in the Appendices of the full report.

Methodology Part 1: Estimating illegal deforestation for commercial agriculture and associated trade

To estimate tropical deforestation driven by the illegal clearing of forest lands for commercial agriculture and then calculate associated trade of agricultural commodities, Forest Trends followed the following steps:

Step 1: Estimating tropical forest loss, 2013-2019 (Variable A)

The amount of forest loss for each tropical country was obtained from the Global Forest Watch (GFW 2020, using Hansen et al. 2013) database of annual change in tree cover between 2013 and 2019, inclusive for all forests with greater than 50 percent canopy cover – primary as well as secondary forests and plantations. Plantations were 8 percent of all forest loss over this period.

Step 2: Estimating percentage of tropical forest loss linked to commercial agriculture (Variable B)

The study used the GFW (2020) database, which uses the methodology of Curtis et al. (2018) for drivers of forest loss in each country. However, for the countries most affected by deforestation, Forest Trends conducted 23 country studies (Annexes 1-3 of full report). The remaining 101 countries comprise the "rest of the world" and account for only 14 percent of all tropical forest loss. Key sources of information include national REDD+ reporting and Pendrill et al. (2019, updated with data to 2017). In particular, Forest Trends focused on the role of commercial agriculture driving tropical forest loss between 2013 and 2019, which includes all major crops, cattle, and forestry products from tree plantations.

Box 1. Typology of Illegalities in the Conversion of Forests for Commercial Agriculture

This report defines illegal deforestation as forest clearing in violation of the producer country's own laws and regulations at the time the deforestation took place. The methodology focuses only on material violations (those that are substantial and most serious), specially on violations occurring during the licensing and forest clearing processes. Breaches of international law or customary law are not included unless integrated into national legislation. Typical examples include:

Non-compliance with licensing or permit processes:

- Failure to consult communities affected by commercial operations
- Lacking the consent of landowners
- Forced relocation of local communities without compensation
- Allocated in areas zoned for permanent forest cover (e.g., protected areas, forest estates where only sustainable forest management is permitted)
- Failure to obtain regulatory approval (e.g., lacking socio-/environmental-impact assessments, failing to produce pre-qualification requirements)
- Failure to post performance bonds
- Concessions allocated in excess of the limits on total area for an individual/company

Non-compliance with harvesting or land clearance requirements:

- Clearance prior to obtaining appropriate permits
- Clearance without consent and/or compensation of affected communities
- Illegal use of fire
- Failure to pay taxes and fees, including on timber extracted during conversion
- Clearance of forest outside boundaries of license area
- Pollution of waterways with, for example, logging debris
- Failure to comply with regulations (e.g., related to road construction and culvert/bridge design to minimize erosion)
- Felling of protected tree species
- Clearance of forest in prohibited zones within concession area, including steep slopes, river buffer areas, and deep peat soils
- Clearing in excess of maximum proportion of the concession area permitted

Corruption at any stage of these processes

- Licenses issued improperly and/or at below market value in exchange for bribes
- Rights obtained through fraud, coercion, or other illegal means
- Monitoring and enforcement reductions in exchange for bribes
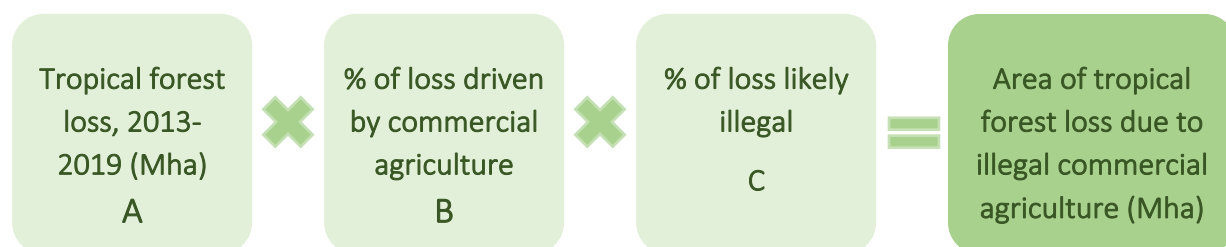- Failure to pay royalties on timber harvested, fees, and taxes

Step 3: Estimating percentage of forest conversion driven by commercial agriculture that was likely illegal (Variable C)

In this report, legality is framed in the context of recognizing each country's sovereign rights. "Illegality" is therefore defined as the conversion of forests that takes place in contravention of a country's legislative framework, including its laws, regulations, instructions, and any other legal instrument that penalizes non-compliance (Box 1). International treaties are not included in this definition unless they have been incorporated into national law. For each of the country studies, the literature was reviewed to evaluate compliance of forest clearing (agro-conversion) against the relevant legislative framework *at the time the deforestation took place*.

Step 4: Calculating forest loss driven by agro-commodities linked to illegal conversion

For the 23 countries that comprised 85 percent of all tropical forest loss, Forest Trends used the case studies (Annexes 1-3 of full report) to derive best estimates of Variables A, B, and C. For the "rest of the world," Forest Trends used GFW (2020) data for each country (Variables A and B), and the regional average for Variable C (Africa, Asia, or Latin America). The product of these variables provides a best estimate of the area of tropical forest lost to agro-commodities linked to illegal conversion for each country (Equation 1). To test the implication of using regional averages for Variable C for the "rest of the world," Forest Trends conducted a sensitivity analysis by substituting a "best case scenario," where all agro-clearing was assumed to be legal and a "worst case scenario," where all the agro-conversion was assumed to be illegal (Appendix 3, full report). Given that the 101 countries in the "rest of the world" comprised only 14 percent of tropical deforestation, it was assumed that global results would not vary too widely among the three scenarios. This sensitivity analysis also allowed Forest Trends to examine the impact of having to use regional averages for seven of the case study countries that lacked sufficient data on compliance (Variable C).

Equation 1: Formula used to calculate area of tropical forest loss due to illegal conversion for commercial agriculture, 2013-2019

Tropical forest loss, 2013-2019 (Mha) A	✖	% of loss driven by commercial agriculture B	✖	% of loss likely illegal C	=	Area of tropical forest loss due to illegal commercial agriculture (Mha)

Step 5: Percentage of agro-commodities linked to deforestation and exported (Variable D)
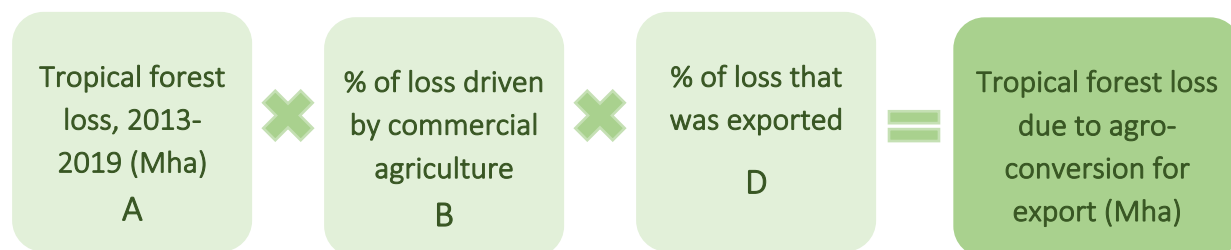
The primary source of data for Variable D was the Pendrill et al. (2020) analysis of embodied deforestation and country of consumption. For commodity-specific analysis in each country study, the proportion of production exported was calculated with production data from the United Nations Food & Agriculture Organisation (UN FAO) and trade data from the UN's

International Trade Statistics Database (Comtrade). Where a country produced more than one export commodity, the amount of deforestation embedded in the trade was weighted by the size of each commodities' trade and its link to deforestation.

Step 6: Calculating tropical forest loss driven by agro-commodities for export

The product of Variables A, B, and D provides Forest Trends' best estimate of the area of tropical forest lost due to agro-commodity production for export markets (Equation 2).

Equation 2: Formula used to calculate tropical forest loss driven by exported agro-commodities, 2013-2019

Tropical forest loss, 2013-2019 (Mha) **A**	✖	% of loss driven by commercial agriculture **B**	✖	% of loss that was exported **D**	=	Tropical forest loss due to agro-conversion for export (Mha)

Step 7: Estimating emissions from agro-commodity conversion (Variable E)

This report estimated the amount of carbon dioxide-equivalent (CO_2e) emissions from forest loss disturbance using analyses by Harris et al. (2021).

Methodology Part 2: Estimating the quantity and value of exports from converted forestland

Forest Trends estimated the quantity and value of exports in 2019 for specific agricultural commodities that originated from converted forestland: beef, palm oil, soy, pulp and paper, rubber, cocoa, coffee, and maize. Deforestation linked to this trade was tracked in the focus 23 countries over the last 30 years (since ~1990), not just on land cleared of forests since 2013. To calculate the amount of tropical forest loss embodied in exports, and the risk of contamination by illegal deforestation, the following steps were taken:

Step 1: Estimating quantity and value of exports (Variable F)

For each relevant commodity and country, 2019 trade data was obtained from UN Comtrade and relevant literature, where available.

Step 2: Estimating percentage of production coming from agro-conversion (Variable G)

The proportion of production for each commodity that originated from land cleared of forest was obtained from a literature review. Estimates of deforestation between 1990 and 2013 were obtained from Forest Trends (2014).

Step 3: Estimating the risk of agro-commodity contamination by illegal agro-conversion

Illegality was evaluated for the deforestation associated with the commercial agricultural commodities (Variable C). When production of a commodity is widespread across the country, Variable C (the estimate of illegality used above). When a product is grown in a specific region (such as Paraguayan soy grown in the eastern Atlantic Forest region that has a Zero Deforestation Law) then the illegality estimate is commodity specific. Forest Trends (2014) and other literature provided estimates of illegality for land cleared prior to 2013.

Step 4: Calculating total volume of exports linked to deforestation

The product of Variables F and G provides Forest Trends' best estimate of the total volume of exported commodities that was likely contaminated by its link to deforestation.

Equation 3: Formula used to calculate tropical forest loss embodied in agro-commodity exports, 2013-2019

For each commodity, for each major producing country

$$\begin{array}{c}\text{Total volume or value of exports (tonnes or US\$)} \\ F\end{array} \quad \times \quad \begin{array}{c}\text{\% of production from land converted from forests since 2000} \\ G\end{array} \quad = \quad \begin{array}{c}\text{Total volume or value of exports linked to deforestation (tonnes or US\$)}\end{array}$$

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