



Consumer Goods and Deforestation:

An Analysis of the Extent and Nature of Illegality in Forest Conversion for Agriculture and Timber Plantations



With support from



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Dedication

This report is dedicated to Edwin Chota Valera, Leoncio Quincima Meléndez, Jorge Rios Perez, and Francisco Pinedo — four indigenous Ashaninka leaders from Peru assassinated in September 2014 in a suspected revenge killing by illegal loggers — and to the many activists who have lost their lives in the fight against illegal deforestation.

PREFACE

As global populations increase and more people around the world rise out of poverty, the demand for agricultural products such as meat, rice, and palm oil will continue to rise. Increases in the efficiencies and productivity of food production around the world have helped to reduce the prevalence of hunger and improve the nutrition status of millions in recent decades. These successes, however, could be undermined by illegal practices that cause negative environmental or social impacts—impacts which could ultimately threaten long-term food security.

In recent years, it has become apparent that the most significant threat to the world's remaining forests is conversion for commercial agriculture and other non-forest use. Agriculture alone accounts for over 70 percent of all deforestation across tropical and sub-tropical countries, along with other smaller drivers, such as mining, infrastructure, urban expansion, and remaining activities (Hosonuma et al. 2012)—all in response to unprecedented demands from a growing population on forestlands for food, fuel, and fiber. In August 2014, for example, the Government of Indonesia announced plans to clear 14 Mha of forests by 2020 to provide more space for infrastructure, energy, and food supply despite ambitious emissions reduction targets (Jakarta Post 2014). While economic development and food security is a clear priority for many of the countries with the world's remaining tropical forests, inclusive and sustainable growth needs to be nested within strong social and environmental safeguards, a strong sense of rule of law, and clarity on the land rights of indigenous and local communities who have lived in, cultivated, and held customary rights to these forests for generations. As the world seeks affordable solutions to enhancing development and prosperity for billions, land for agriculture must be acquired legally, sensibly, and sustainably.

Instead, we are operating with a flawed model. It is increasingly clear that much of the land conversion for large-scale agricultural projects is currently being undertaken in violation of some of the producer countries' most basic laws and regulations and incurring high social and environmental costs: non-compliance with processes related to the issuance of rights to convert forests, within permitting processes, during the clearing of forestland, and/or in the implementation of social safeguards.

This study has sought to estimate for the first time the proportion of recent tropical deforestation that is the result of illegal clearing for commercial agriculture and how much of this was driven by overseas demand. In addition, the study estimates for the first time the scale of primary tropical wood products now being traded globally and originating from forest conversion, as opposed to selective logging.

Forest Trends has been involved in national and international policy initiatives aiming to combat the trade in illegally sourced wood products for close to 15 years, witnessing firsthand the exciting and dramatic changes that have taken place in both producer and consumer nations. Producer countries—particularly those engaging in Forest Law Enforcement, Governance and Trade Voluntary Partnership Agreements (FLEGT VPAs)—are clarifying regulatory frameworks that improve their ability to demonstrate the legality of wood products to their public and discerning buyers. Demand-side measures in consumer nations have been shown to support the enforcement of producer countries' own laws and regulations.

The results of this report suggest that there are tremendous opportunities to draw lessons from the significant initiatives that have been developed to combat the trade in illegally sourced timber while promoting the trade in legally sourced timber. These include the development of standards, importing trade legislation (such as the EU Timber Regulation or the 2008 amendments to the US Lacey Act), public procurement policies, and

voluntary private sector purchasing policies and investment standards. However, there has been limited analysis to date of how similar mechanisms could leverage credible legal compliance for land conversion, support for more rational and sustainable land use policies and laws, and how they could increase transparency in the implementation of laws and regulations benefiting both public and private interests.

It is our hope that this report can initiate an ongoing process that will improve the understanding as well as a more nuanced view of the nature of deforestation, and a differentiation of the tools that can be used when this deforestation is rationally planned and legally implemented versus when it is unplanned and illegal. More research will catalyze a more thorough audit of existing information and result in more and clearer data on this phenomenon in the coming years. We also hope this will catalyze improved legal compliance and enforcement with laws and regulations that govern the conversion of forestland to other uses.

A handwritten signature in black ink, appearing to read "M. B. Jenkins". The signature is fluid and cursive, with a long horizontal stroke at the end.

Michael Jenkins

President and CEO
Forest Trends

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ACRONYMS

AMDAL	Environmental impact assessment (Indonesian acronym)
APP	Asia Pulp and Paper
APRIL	Asia Pacific Resources International Limited
DRC	Democratic Republic of the Congo
EIA	Environmental Investigation Agency
ELC	Economic Land Concession (Cambodia)
EU	European Union
EUTR	European Union Timber Regulation
FAO	Food and Agriculture Organization of the United Nations
FCA	Forest Clearance Authorities (Papua New Guinea)
FLEGT	Forest Law Enforcement, Governance and Trade
FPIC	Free, Prior and Informed Consent
FSC	Forest Stewardship Council
GAM	Grupo André Maggi (Brazil)
ha	Hectares
HAGL	Hoang Anh Gai Lai (Vietnam)
HCS	High Carbon Stock
HCV	High Conservation Value
IBAMA	Brazilian Institute of Environment and Renewable Natural Resources
IFC	International Finance Corporation (World Bank)
IPK	Production permit/timber exploitation license (Indonesian acronym)
IT&S	Independent Timber & Stevedoring Lt. (Papua New Guinea)
ITTO	International Tropical Timber Organization
IUP	Plantation business permit/conversion permit (Indonesian acronym)
KPK	Indonesian Corruption Eradication Commission
m³	Cubic Meters
Mha	Million Hectares
NCR	Native Customary Rights (Malaysia)

OI-FLEG	Independent Observer of Forest Law Enforcement and Governance
PNG	Papua New Guinea
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RSPO	Roundtable on Sustainable Palm Oil
SABL	Special-purpose Agricultural and Business Leases (Papua New Guinea)
(S)EIA	(Social and) Environmental Impact Assessment
SGSOC	Sustainable Oils Cameroon
UN	United Nations
UN-DRIP	United Nations Declaration on the Rights of Indigenous Peoples
US	United States of America
VPA	Voluntary Partnership Agreement
WTO	World Trade Organization
WWF	World Wildlife Fund/World Wide Fund for Nature

GLOSSARY

Agribusiness: Business expansion in the agriculture and rural sector and its supply chains, mainly carried out on a large scale by the private sector. It may involve various exogenous agents and agro-industrial chains, or other partnerships linked together by contracting structures.

Agro-commodities: Commercially produced agricultural commodities, including crops and livestock products.

Agro-conversion: Used in this report to refer to conversion of tropical forests for commercial agriculture and timber plantations.

Commercial agriculture: This study considers deforestation for commercial agriculture to include both cattle-ranching and monoculture timber plantations, as well as commercially grown crop plantations. This study also includes both small- and large-scale commercial agriculture, but excludes subsistence agriculture since this is non-commercial. For most of the countries examined, the majority of the commercial agriculture displacing forests are medium- to large-scale and industrial. In addition, in a number of countries the products of small-scale commercial agriculture is nevertheless processed, traded, or exported by large corporations.

Community forestry: Forest operations where the local community plays a significant role in forest management and land use decision-making. Communities may, depending on national legislation, possess a bundle of rights (usually management, use, or full ownership) to land under community forestry.

Concession: A grant of land or property by a government or some other controlling authority to another legal entity (usually a large company) in return for payment, services, or for a particular use, a right to undertake and profit from a specified activity, or a lease for a particular purpose. Sometimes concessions are allocated based upon a permitting and/or a competitive process such as auctions.

Conversion timber/wood: Timber generated during the conversion of natural forest areas to non-forest or plantation use, such as the clearance of a forest for commercial agriculture.

Corruption: The abuse of entrusted power for private gain.

Degraded land/forest: Land that has experienced long-term loss of ecosystem productivity, caused by disturbances from which it will have difficulty recovering.

Environmental Impact Assessment: Formal process used to predict the environmental consequences of a plan, policy, program, or project, and develop a time-bound plan with specific objectives to mitigate these consequences.

Fraud: The act of intentionally deceiving someone in order to gain an unfair or illegal advantage (financial, political, or otherwise). Countries usually consider such offenses to be criminal or a violation of civil law.

Illegal: This report considers forest conversion to be illegal when it takes place in contravention of the written laws, policies, and regulations in the concerned country. This does not include breaches of international law or customary law unless those are reflected in national statutory or case law. In attempting to quantify illegality, this report considers deforestation and associated commodities as being associated with the illegality regardless of whether illegalities concerned have been identified or prosecuted by the relevant government authorities or have since been formally forgiven. This definition encompasses two general categories: illegalities in licensing and illegalities in forest clearance.

Land grabs: Large-scale land acquisitions that are one or more of the following: in violation of human rights, particularly the equal rights of women; not based on Free, Prior and Informed Consent (FPIC) of the affected land users; not based on a thorough assessment, or in disregard of, social, economic, and environmental impacts; not based on transparent contracts that specify clear and binding commitments about activities, employment, and benefit sharing, and; not based on effective democratic planning, independent oversight, and meaningful participation (as defined by Taylor 2012).

Legal reserve: Brazil's requirement of property owners to keep a certain percentage of their land in forest cover or its native vegetation, historically in the Amazon 80 percent and in the cerrado 35 percent.

Plantation timber/wood: Timber that is established by planting and/or artificially seeding, as opposed to that originating from natural/primary forests. For the purposes of this report, this refers to timber/wood harvested for commercial purposes.

Timber products: All solid wood products, including processed products such as furniture; this definition excludes pulp and paper. Often referred to as "primary tropical timber products," or originating from natural (non-plantation) forests in the tropics.

Tropical deforestation: The conversion of forests to other land uses that results in the loss of tree cover to below 51 percent. This includes the loss of natural forests from countries either entirely within the tropics or in which the majority of its deforestation takes place in the tropics, often to produce agricultural commodities.

Tropical timber: Unless specifically noted, all references to tropical timber in this report refer only to timber of tropical wood species harvested from natural forests. Tropical wood species grown on plantations are not included.

Voluntary partnership agreement (VPA): A legally binding trade agreement between the European Union (EU) and a timber-producing country outside the EU, which is entered into voluntarily. The purpose of a VPA is to ensure that timber and timber products exported to the EU come from legal sources. These agreements also help timber-exporting countries stop illegal logging by improving regulation and governance of the forest sector.

EXECUTIVE SUMMARY

Background

Tropical forests continue to disappear at an alarming rate despite growing international recognition of their crucial role in mitigating climate change. Their loss generates nearly 50 percent more greenhouse gases than the global transportation sector (IPCC 2014). Yet the rate of forest loss is accelerating (Hansen et al. 2013). In this report we examine one central question: what is driving this loss?

Recent studies suggest that at least half of global deforestation in the last decade has been for commercial agriculture to meet the rapidly surging global demand for food, fuel, and fiber. This is likely an underestimate, given the increasing area of forestlands being converted for agricultural commodities—mainly beef, soy, and palm oil—as well as tropical timber, pulp and paper, and plantation wood. The growth of commercial agriculture is cited as an important driver of deforestation by nearly every tropical country in official national strategies to reduce emissions from deforestation and forest degradation (REDD+).

Much of this conversion is taking place in the context of complex, contradictory, and poorly implemented regulations governing forested areas. This confusing regulatory environment makes “legal deforestation” difficult for both large and small forest enterprises to achieve, while enterprises that blatantly break the law often do so with impunity and may even be rewarded after the fact with acts of amnesty or retroactive changes in the law.

This report presents the first-ever assessment of the extent of illegal deforestation and forest conversion for the production of commercial, export-driven agriculture. This study is significant in adding new data to the global dialogue on tropical deforestation and trade in forest-risk commodities because it:

- introduces the concept of “illegal forest conversion” and the subsequent illegality of associated commodities produced on this converted land;
- uses best available data to quantify illegally sourced commodities in global trade, and concludes that a significant portion of global trade in relevant commodities is sourced from illegal forest conversion;
- describes what is illegal and introduces concerns not reflected in current international initiatives designed to reduce deforestation or to make commodity supply chains sustainable;
- argues that unless effective forest governance (including legality as a key indicator of governance) is established, broader efforts by governments, companies, and donors to tackle tropical deforestation and associated trade will continue to face tremendous challenges. Current initiatives need to better understand and capture the legal requirements linked to forest conversion and resulting commodities if they are to be effective in reducing tropical deforestation.

Key Findings

While existing studies estimated that at least half of global deforestation in the past decade was for commercial agriculture, the proportion for tropical deforestation is higher. This report finds that **nearly three-quarters (71 percent)¹ of all tropical deforestation between 2000 and 2012 was caused by commercial agriculture. In addition, almost half (49 percent) of total tropical deforestation between 2000 and 2012 was due to illegal conversion for commercial agriculture. Nearly one-quarter (24 percent) was the direct result of illegal agro-conversion for export markets.** Nearly half (49 percent) of all agricultural commodity products produced on illegally deforested lands were destined for export markets. Nearly three-quarters (70 percent) of all soy in international trade, one-third (32 percent) of the beef, and all of the palm oil, originate in tropical forested countries. Consumer demand in overseas markets resulted in the illegal clearance of more than 200,000 square kilometers of tropical forest during the first 12 years of the new millennium: an average of five football fields every minute. In addition:

- **In terms of climate change, the emissions caused by illegal conversion of tropical forest for large-scale commercial agriculture during 2000-2012 was an average of 1.47 gigatonnes of CO₂ per year—the equivalent of one-quarter of the annual fossil fuel-based emissions of the EU** (Global Carbon Project 2012). Of this, 0.72 gigatonnes was associated with commodity exports. If the international trade in agro-commodities from illegal deforestation were a country, it would be the sixth largest contributor to climate change in the world.
- **In terms of trade, the value of agro-commodities (beef, leather, soy, palm oil, tropical timber, pulp and paper, and plantation wood products) produced on land illegally converted from tropical forests is estimated at \$61 billion per year.** The EU, China, India, Russia, and the US are among the largest buyers of these commodities, and their consumer demand could also be leveraged as a force for positive change given the right mix of policy, trade, and investment incentives.
- **Brazil and Indonesia together account for 75 percent of the global area of tropical forest estimated to have been illegally converted for commercial agriculture during 2000-2012.** In Brazil, where cattle and soy have been the main drivers, at least 90 percent of Amazon deforestation for agriculture is illegal. In Indonesia, at least 80 percent of deforestation for commercial agriculture and timber plantations is illegal. While domestic consumption is growing as both economies expand, a considerable percentage of agricultural commodities is bound for export markets. Brazil exports most of its leather and soy and almost a fifth of its beef. Indonesia exports around 75 percent of both its palm oil and plantation timber (mostly as pulp and paper).
- **Regional differences can be noted, but widespread and high-level corruption with the issuance of licenses for converting forests for commercial agriculture is common across the countries studied.** Illegalities in operations are also widespread. These include the failure to maintain mandated areas of forest reserves, the illegal use of fire to clear forests, the clearance of forest outside legal concession boundaries, lack of consultation based upon the principle of Free, Prior and Informed Consent (FPIC), unfair compensation to Indigenous Peoples and other local communities in concession areas, and disregard of regulations meant to minimize negative impacts of conversion on local people and the environment. In Southeast Asia, many licenses for millions of hectares of forests slated for conversion

¹ The figures cited in this Executive Summary are the mid-point results of sensitivity analyses conducted on data obtained for this report, given the varying levels of uncertainty of the data available for the variables surveyed. See Section 2.2.3 for a detailed description of the sensitivity analyses and Chapter 3 for the full results, including the ranges produced from the sensitivity analyses.

in the Mekong Basin and Papua New Guinea (PNG) were illegally issued. In PNG, a Parliamentary Inquiry found that 90 percent of the agro-conversion licenses issued in recent years were obtained by corrupt or fraudulent means. In Malaysia, recent court judgments suggest that many palm oil licenses may have been issued illegally in contravention of indigenous land rights. Similar concerns have been raised about rubber plantations in Cambodia.

- **Even in tropical forest countries where export-driven commercial agriculture has not been a major driver of deforestation, the situation is rapidly changing, and the same illegalities seen elsewhere are being repeated.** For example, government inspections have found two out of the three largest and newest oil palm plantations under development in the Congo Basin to be operating illegally. Coupled with projections of massive increases in global commodity demand, this analysis suggests that the importance of export-driven commercial agro-conversion is likely to increase even further in the very near future. While countries like Brazil and Indonesia have been battling illegal agro-conversion for many years, the problem is expanding to new countries and regions of the world. Many of these countries lack robust governance capacity or the legal and regulatory frameworks necessary to ensure conversion is carried out legally so that the remaining forests are protected. In almost all of these new cases, the majority of commodity production is bound for export markets.

In summary, the evidence presented in this report indicates that the phenomenon of illegal forest clearing for commercial agriculture and associated exports has continued at an alarming rate since at least the start of the 21st century. Indeed, this problem is worse than previously thought—and is likely occurring to a greater extent than the conservative estimates in this analysis show. While rising global incomes and demand for agricultural products will continue, we are currently responding with a flawed development model. It is increasingly clear that much of the forest land conversion for large-scale agricultural projects is in violation of some of the producer countries' most basic laws and regulations and incurring high social and environmental costs.

These illegalities will become more pronounced as producer countries encourage agricultural investments as a way to catalyze growth. Deforestation will increase in regions such as the Congo Basin where little commercial agriculture previously existed, unless we ensure that forestland converted for production is acquired legally and sustainably. Faced with the scale, breadth, and diversity of these illegalities, and the weak governance underlying them, it would be easy to despair of ever tackling these issues and to focus on other actions to address deforestation. This would be a mistake, as it is unlikely that those other actions will work in isolation and because these illegalities are not insurmountable.

Recommendations

The private sector

Companies producing or trading relevant commodities should:

- comply with all national laws when developing new commercial agricultural and timber plantation projects in forested countries and when purchasing products;
- refrain from engaging in such projects in countries where it is not possible to ensure legality;
- purchase and trade only commodities that are legally produced and traceable back to their source;
- verify that relevant policies such as zero deforestation commitments are properly implemented via independent third-party monitoring and by publishing relevant information;
- improve existing certification schemes to ensure that these more effectively preclude commodities from illegal conversion;
- conduct comprehensive assessments of past illegalities by existing concessions (i.e., that examine the processes by which licenses were issued and that use archived satellite imagery to examine whether clearance began in advance of permitting);
- promote and support actions by producer country governments to tackle the problem (see recommendations for producer countries), including the resolution of legal uncertainties, conflicting regulations, and unclear tenure;
- promote actions by consumer-country governments to tackle the problem, including through demand-side regulation; and
- adopt policies that extend beyond national laws, such as avoiding embedded deforestation entirely and requiring the Free, Prior and Informed Consent (FPIC) of Indigenous Peoples and other local communities (as per established international standards).

Banks, investors, and financial service providers should:

- ensure that financing is only provided to relevant companies, shipments, and projects where legality can be demonstrated.

Certification bodies and associated roundtables should:

- develop or strengthen standards and assessment, monitoring, and compliance mechanisms to ensure that they can meaningfully guarantee that no certified products are associated with any of the types of illegalities described in this report;
- strengthen monitoring and enforcement of standards, including through independent monitoring, transparency of information, and appropriate procedures for handling third-party complaints. These mechanisms should have the capacity to conduct a clear assessment of members' compliance with national laws; and
- lobby for regulatory action by consumer country governments to ensure that only legally produced products can be imported or sold, thereby creating a level playing field on which companies can compete on broader issues of sustainability.

Producer country governments should

- ensure that the legal and regulatory framework governing the licensing and implementation of relevant developments on forestland is clear, consistent, and non-conflicting;
- improve enforcement of relevant laws and regulations by increasing necessary resources, improving inter-agency coordination and information sharing, increasing penalties, making best use of technology (such as satellite images), using anti-corruption and anti-money laundering bodies and laws, and putting in place systems of officially-mandated independent monitoring;
- consider commissioning a full review of the legality of all relevant licenses, to be carried out by an independent body;
- resolve past illegalities in a manner that is practical but which ensures transgressors do not stand to gain and that those affected are properly compensated. Resolve any conflicting land rights claims arising from regulatory conflicts or inconsistencies through clear legal frameworks;
- collate and publish all relevant information (including licenses and permits and associated maps and land use planning and land ownership maps) and make such publication a legal requirement;
- request the assistance of donor and consumer countries, supported by bilateral arrangements such as the EU FLEGT VPAs (see Box 10);
- consider implementing strict and enforceable moratoria on conversion until regulatory arrangements have been clarified, land rights conflicts and past illegalities resolved, and enforcement systems improved;
- draft or revise national REDD+ policies that acknowledge the importance of illegal agro-conversion as a driver of deforestation and outline specific steps to reduce illegalities; and
- ensure that international commitments regarding rights of local communities and Indigenous Peoples are fully reflected in national laws and properly implemented and enforced.

Consumer country governments should

Refocus REDD+ finance and donor assistance:

- provide technical and financial assistance for the necessary actions to be taken by producer countries to eradicate illegal forest clearing and resolve outstanding issues of illegality (see recommendations for producer countries above), including reforms to land tenure regimes to protect the legal rights of forest communities;
- ensure that all donor assistance on forests makes legality and improvements to forest governance a priority and precondition for further assistance;
- advocate for producer country REDD+ policies and programs that directly address legality and forest governance;
- advocate for relevant multilateral institutions such as the World Bank and UNEP to better address this issue in their work with producer countries;
- advocate for REDD+ monitoring, reporting, and verification (MRV) standards in international climate policy fora such as the UNFCCC that will provide oversight to further prevent illegal clearing of natural forests;

- require pension funds, sovereign wealth funds, and other nationally-governed financial instruments to carry out necessary due diligence and refuse to do business with companies found to have a high risk of being associated with illegal forest clearance;
- provide technical and financial support to civil society groups tackling these issues; and
- support further research to better understand the nature and extent of relevant illegalities.

Create new demand-side measures to curb illegal agro-conversion:

- ensure that existing demand-side measures on timber (including procurement policies, regulations governing all imports, and bilateral agreements such as VPAs) are revised to ensure that they encompass conversion timber to the maximum possible extent;
- in countries where no such timber-related demand-side measures exist, enact these as a matter of urgency; and
- ensure that these demand-side measures are fully implemented and enforced, with an appropriate proportion of attention and resources being paid to cases related to conversion and sufficiently dissuasive penalties. Implement policies requiring that all government purchases of relevant commodities are proven to have been legally and sustainably sourced and ensure that new or existing procurement policies include standards that are high enough to ensure that products associated with the kinds of illegalities documented in this report are excluded;
- consider passing legislation making it an offense to import or sell agricultural commodities produced on land illegally cleared of forests and/or requiring that importers carry out due diligence in order to minimize the risk of purchasing such products;
- establish bilateral trade agreements with important supplier countries, following the model of the EU's Voluntary Partnership Agreements; and
- ensure that penalties are sufficiently high and monitoring and enforcement sufficiently robust to guarantee compliance with these regulations.

1. BACKGROUND

1.1 Introduction: Why Are Illegality and Associated Trade Important?

Why focus on illegality? There are three major reasons a greater focus on illegality in commercial agro-conversion is important in the broader fight to tackle tropical deforestation. The first is scale. As this report demonstrates for the first time, at least half of all tropical deforestation is caused by commercial agro-conversion that is illegal.² Because of this scale, illegality is a major driver of deforestation, resulting in some of the worst associated impacts on the environment and people. For example, land conflicts with indigenous and other local communities arise when land rights are not respected, compensation or benefit-sharing requirements ignored, and Free, Prior and Informed Consent (FPIC) of affected individuals is not obtained by land concession developers. In several countries, particularly those experiencing unprecedented growth in commercial agriculture such as Cambodia and Laos, land conflicts have become one of the most high-profile issues confronting policymakers—often catalyzing visible grassroots resistance movements of communities risking their lives to defend their land (Global Witness 2013b).

Secondly, tackling illegality has been shown to be one of the most effective ways to reduce overall deforestation in the tropics, particularly when approached holistically with other proven actions (such as statutory recognition of Indigenous Peoples’ and other local communities’ forest tenure rights). By far the greatest success story to-date in the fight against tropical deforestation has been the dramatic 70 percent decline in deforestation seen in Brazil since 2004. Actions by the Brazilian government to address rampant illegal conversion of forests for commercial agriculture were the most important drivers of this success, albeit not the only factors (see Section 4.1 and Box 4).

Thirdly, illegality and poor governance hold back broader efforts to tackle tropical deforestation, such as private sector initiatives on sustainable commodities, as well as efforts by tropical forest countries to reduce legal deforestation. While the recent spate of “zero deforestation” commitments by large corporations involved in producing, trading, or consuming relevant commodities is to be applauded, such voluntary efforts cannot substitute for good governance (Lambin et al. 2014), and their impact will be restricted unless actions are also taken by governments to address illegality and governance.

The laws and regulations in many countries are often complex, conflicting, out-of-date, or riddled with gaps and vague language, leading to common complaints that “everything is illegal” and thus rendering efforts to increase enforcement impractical. This paper acknowledges the complexities of many legal and regulatory frameworks, particularly when they cross sectoral boundaries of agricultural, forestry, and land use policy. However, accepting such status quo is also unacceptable in countries where weak governance is considered a significant barrier to overall economic development. The public sector, civil society, and private sector actors

² Only laws and regulations related to licensing and forest clearance were considered—infractions with the potential for significant negative impact. Infractions of less significant laws and regulations (such as the oft-cited truck driver with expired driver’s license) were not considered. See Glossary for complete definition.

all have mutual interests in clarifying and streamlining laws and regulations as a fundamental first step in addressing poor land use governance. Increased clarity and consistency in the application of the law is not only fundamental to the creation of a conducive business climate necessary to attract more responsible investment, but also for the efficient and fair identification and prosecution of those who violate the law. Small- and medium-sized enterprises often stand the most to benefit from overall improvements in their business environment due to governance reforms (World Bank 2005). In many developing countries, it is the small enterprises that are disproportionately affected by “irregular” transaction fees at every stage of operating their business, often representing a significant portion of their sales. A process that instigates governance reform has the potential to address regulatory complexities that so often create opportunities for corruption.

This has been the approach used in the EU Forest Law, Enforcement, Governance and Trade (FLEGT) process of developing bilateral Voluntary Partnership Agreements (VPAs) with producer countries to define legality in the timber sector. In Indonesia, for example, the VPA development brought together multiple stakeholders to clarify relevant laws for inclusion in the country’s timber legality verification systems and recommend the elimination of many regulations that no longer served important functions and caused significant regulatory barriers for both industry and enforcement agencies.

Why focus on international trade in commodities? A focus on the international trade in commodities associated with illegal deforestation is important for similar reasons: its scale and potential for impact. Demand-side actions by consumer country governments on timber and wood products taken during the last 10-15 years, for instance, have helped to reduce illegal logging in producer countries (see Chapter 6). And again, illegality hinders broader efforts, undermining voluntary efforts by international companies to source sustainable commodities. Likewise, undiscerning overseas demand that disregards the legality of sourcing holds back efforts by producer countries to make the production of these commodities both legal and sustainable. The responsibility for tropical deforestation does not lie with tropical forest countries alone.

It took the international community more than 20 years to learn the importance of addressing legality and good governance in relation to the impact of the production and trade in tropical timber on forests and the people dependent upon them. The fundamental lesson was that a focus on broader sustainability and an onus on voluntary action by international consumers would not be effective unless legality and governance was addressed first. There are many parallels between the timber and agriculture industries, and it is essential that efforts to tackle deforestation caused by commercial agriculture and associated trade integrate these lessons more quickly.

1.2 Context: Commercial Agriculture and International Demand as Drivers of Deforestation

This report focuses mainly on illegalities in the conversion of tropical forests for export-driven commercial agriculture. However, the importance of these illegalities (in terms of the scale of deforestation and associated trade they represent) depends on three broader trends, which apply to both legal and illegal conversion and associated trade. These are:

- the growing importance of commercial agriculture as a driver of deforestation;
- the increasing role of international demand for agro-commodities in promoting that growth; and
- the rapidly growing proportion of tropical timber production sourced from the conversion of forests rather than selective logging.

Before going on to examine the issue of legality, this chapter examines these three broad trends from a global perspective. Additional country-specific information is included in Chapter 4.

1.2.1 The Importance of Commercial Agriculture as a Driver of Tropical Deforestation

Many studies confirm that agriculture—in fact, commercial agriculture—is by far the largest proximate driver of deforestation in most tropical countries worldwide. Indeed, the growth of commercial agriculture is cited as an important driver of deforestation by nearly all tropical countries in their national REDD+ strategy documents, which serve as the basis for international donor programs to combat climate change (Williams and Davis 2012).

At a global level, two studies have sought to estimate the proportion of recent global tropical deforestation due to agriculture. The first, published in 2012, concluded that 73 percent of tropical and subtropical deforestation during the decade leading up to 2010 was caused by agriculture: 40 percent due to commercial agriculture and the rest to local or subsistence farming (Hosonuma et al. 2012). The second study, produced for the European Commission in 2013, concluded that 65 percent of deforestation in the tropics and subtropics between 2000 and 2008 was due to agricultural expansion (Cuypers et al. 2013).³ Though these figures are high, methodological issues indicate that it is very likely both studies significantly underestimate the recent impact of agriculture on tropical deforestation and that the 2012 study also underestimates the importance of commercial agriculture (see Annex D).

1.2.2 The Role of Overseas Commodity Demand

The growing importance of commercial agriculture as the greatest threat to the world's tropical forests is closely linked to increasing overseas demand for the internationally traded commodities of soy, beef/leather, palm oil, tropical timber, pulp and paper, and plantation-grown timber (Hosonuma et al. 2012; Cuypers et al. 2013). In most of the tropical forest countries where these products are produced, a large majority of production is destined for export (see Chapter 4). The one notable exception is beef from Brazil, where the majority of production is consumed domestically. Seventy percent of the soy in international trade, a third of the beef, and all of the palm oil and tropical timber originate in tropical forest countries. The EU is the largest market for soy and palm oil exports from tropical forest countries, taking 29 percent and 18 percent of total exports respectively; the EU also consumes 7 percent of beef exports from tropical forest countries. China is the second-largest market for soy, palm oil, and beef exports from tropical forest countries, and the largest market for tropical timber. One-third of beef exports from the tropical forest countries of Latin America remain within the region. Other important buyers of these forest-risk commodities include South Asia (taking one-quarter of all palm oil), Southeast Asia (for soy and palm oil), Russia (the largest single buyer of forest-risk beef) and the Middle East (for beef).⁴

The importance of overseas demand for relevant commodities is set to grow even further as global population and wealth increases. The size of the global middle class (which consumes a disproportionate share of agro-commodities) is set to almost triple by 2030, from 1.8 to 4.9 billion people, with most of the growth taking place in China (Kharas and Gertz 2010). Because most of this increased demand is expected to take place outside the tropics, the role of exports in driving tropical deforestation is likely to increase. For example, even if the rapid growth of planting in Indonesia and Malaysia were to continue, it is estimated that the world will need an additional 7 Mha of suitable land in the tropics to be converted to oil palm by 2020 to meet projected increases

³ The report only included the proportion of global deforestation attributed to agriculture over a longer period (1990 to 2008), but a breakdown was obtained from the authors that allowed the figure for tropical/subtropical deforestation in the period 2000 to 2008 to be determined.

⁴ All figures calculated from data for trade in primary products (in weight in kilograms) recorded in UN COMTRADE, collated and analyzed for Forest Trends by James Hewitt.

in demand (Olam 2010)—as much oil palm as has been planted so far in Malaysia.⁵ Exports of beef from Latin America are expected to increase by 30 percent between 2013 and 2022⁶ while Chinese imports of soybeans are expected to double between 2010 and 2020 (Thiesse 2013). The FAO projects that a further 7 Mha of land in Latin America will be turned into soy plantations by 2022.⁷

1.2.3 Forest Clearance as a Source of Tropical Timber

This study estimates for the first time the proportion of tropical timber traded globally that originates from forest conversion as opposed to selective logging. In many tropical timber-producing countries, there has been a dramatic shift over the last ten years in how the majority of this wood is produced. In the past, almost all tropical timber was selectively logged from natural forests, which could in theory be sustainable. More recently, however, a growing proportion of production in key countries originates from the clear-felling of tropical forests, mostly to make way for commercial agricultural plantations. In Indonesia, for instance, forest conversion has grown from 37 percent of total production in 2005 to 72 percent of reported consumption in 2012 (Blundell 2014).

Conversion timber will likely end up in trade or burned during clearing. Either of these scenarios is problematic; the first is a concern for those interested in sustaining forests, while the second is a concern for those combating climate change. This study focuses on production and trade of commodities and therefore did not attempt to measure trees that are burned, which in some countries may represent a significant proportion of the solid wood removed during forest conversion.

Most of this conversion timber is a result of forest clearance for large-scale, export-oriented agricultural developments. In Sarawak (the largest timber-producing state in Malaysia), comparisons of planting data and deforestation data suggest that around 60 percent of conversion is for oil palm and timber plantations; very little that is produced on such plantations remains in the country. In Indonesia, most conversion is also for oil palm and timber plantations, with the majority of palm oil and conversion timber exported. All conversion timber being produced in PNG at present comes from a handful of Special Agricultural Business Leases (SABLS) for oil palm and cocoa, though there are suspicions that some such leases are obtained by developers wishing to harvest timber but with no plans to develop the land for agricultural production (“timber grabs”) and might never be planted (see Section 4.4). None of these plantations are yet mature, but when they are, it is expected that almost 100 percent of production will be exported.

The growing importance of forest conversion as a source of tropical wood has yet to be appreciated and recognized by the main international organizations tasked with monitoring tropical forests and forestry. The International Tropical Timber Organization (ITTO)’s *Status of Tropical Forest Management* report of 2011, for instance, makes almost no mention forest conversion; nor do the UN FAO’s Forestry Outlook Studies for the relevant countries. For PNG and the Congo Basin, where the growth of forest conversion is a recent phenomenon, this is perhaps understandable. For Indonesia and Malaysia, where forest conversion has been a major timber source for some years, it is less excusable. One probable reason for the failure to recognize the importance of conversion timber is the lack of official statistics. Almost no producer country publishes separate figures for volumes of wood originating from conversion as opposed to selective logging, and neither ITTO nor FAO request such a breakdown from member countries as part of their regular data submission procedures. Forestry departments in some countries may not even collect this data, though Indonesia has begun to do so.

⁵ Malaysia had 5.1 Mha of planted oil palm at the end of 2012.

⁶ Calculated from production and export figures in OECD-FAO Agricultural Outlook 2013 to 2022, <http://www.oecd.org/site/oecd-faoagriculturaloutlook/>

⁷ Ibid.

2. METHODOLOGY

2.1 Introduction: Evidence of Illegalities

Chapters 3 and 4 of this report examine the available evidence regarding illegalities during the conversion of tropical forests for commercial agriculture and use that evidence to estimate the scale of the problem and associated trade.

Much of the information on illegality contained in Chapter 3 comes from independent research by academics and non-governmental organizations. Though some information comes from official sources, poor enforcement and weak laws mean that in many countries there are few prosecutions from which to draw information. Even where enforcement does occur, it is rare for information on specific cases to reach the public, and few governments collect relevant statistics, let alone publish them.

Key provisos related to the information and analyses in this report are as follows:

1. In many of the countries studied there are significant gaps, contradictions, and ambiguities in forest, agriculture, environmental, land, and other laws and regulations. This has served to facilitate illegal conversion and made it harder for enforcement agencies to prosecute offenders. These complex legal issues are not discussed in depth in this report but there are general rules of statutory interpretation that can be used to resolve such contradictions.
2. This summary only considers breaches of national legislation and not countries' international commitments unless these are reflected in national legislation. This is especially important in relation to the contravention of customary rights of indigenous and other local forest dwellers. Even where this does not contravene national legislation, it may contradict commitments made by signatories to relevant international conventions and declarations, such as ILO Convention No 169 and the UN Declaration on the Rights of Indigenous Peoples (UN-DRIP). However, ILO 169 has yet to be ratified by any tropical forest country in Asia or Africa (with the exception of the Central African Republic), and UN-DRIP does not take the form of hard international law; in most countries, UN-DRIP has yet to be reflected in local laws. Thus it is important to note that much of the forest conversion in Africa and Asia (where such customary rights are rarely enshrined in law) is "legal" according to national law but nevertheless in breach of customary law.
3. Thirdly, the analysis focuses on whether forest conversion was illegal at the time it took place. In some cases this conversion was "legalized" after the fact, through amnesties, prosecutions, fines, or retroactive amendments to legislation. This is especially important for Brazil, where a legal change in 2012 provided an amnesty for around half of the illegal forest conversion that had occurred prior to 2008 (see Section 4.1). This report includes all these illegal acts as their legacy remains (in terms of the impact on forest loss, for example), regardless of whether the state chose to legalize the activities *post hoc*.

4. Finally, the analysis only considers illegalities in forest conversion that took place in the last 20-30 years and where commercial agriculture or timber plantations were the direct or indirect cause of that conversion.

BOX 1

Typology of Illegalities in Conversion of Forests for Agriculture and Timber Plantations

License Issuance

- Issuance of license/permit contrary to relevant regulations
 - Issuance of license without consent of landowners
 - In area of forest officially zoned for protection/sustainable timber production
 - Without other pre-requisite permits having been obtained
 - In contravention of other regulations (e.g., limits on total area for one company)
 - Waiving of requirement for specific license where this is not justified and/or permitted under law
 - Obtaining property rights to forested land through fraud or other illegal means
- Corruption
 - Proper procedures for issuance/auction of license ignored in exchange for bribes and/or other favors
 - Licenses issued for below true value to family or in exchange for bribes and/or other favors

Clearance

- Clearance in advance of receipt of all necessary permits (including Environmental Impact Assessments)
- Clearance in advance of compliance with regulations related to negotiations with/compensation for affected communities
- Illegal use of fire to clear land
- Failure to pay agreed compensation to local communities or individual landowners
- Failure to pay taxes on timber extracted during conversion
- Felling of protected species of tree
- Pollution of rivers and streams with logging debris
- Breaches of regulations governing road construction (designed to minimize erosion)
- Other breaches of environmental controls placed on development
- Clearance of forest in prohibited zones within license area
 - Steep slopes
 - River buffers
 - Deep peat soils
 - In excess of maximum proportion permitted to be deforested
- Clearance of forest outside boundaries of license area

2.2 Measuring the Problem

2.2.1 Introduction

This study estimates, for the first time, the scale of illegal conversion of tropical forests for commercial agriculture and associated exports of key commodities. Specifically, the study estimates:

- **Illegal Agro-Conversion:** The area and proportion of recent (2000 to 2012) tropical deforestation from the illegal conversion of tropical forests for commercial agriculture and timber plantations.
- **Illegal Agro-Conversion Embodied in Exports:** The area and proportion of recent (2000 to 2012) tropical deforestation from the illegal conversion of tropical forests for commercial agriculture and timber plantations and also embodied in the exports of relevant commodities.
- **Trade in Commodities from Illegal Agro-Conversion:** The proportion and value of exports of key commodities (soy, beef, palm oil, tropical timber, and pulp) in 2012 that originated from land that was illegally converted from tropical forest within the last 30 years.

As an intermediary step, the study also estimated the area and proportion of recent tropical deforestation due to the conversion of tropical forests for both legal and illegal commercial agriculture as a whole.

2.2.2 Methodology

Illegal Agro-Conversion

To estimate the area of tropical forest lost due to *illegal* commercial agriculture (including timber plantations) in a given country, this study first multiplied the total area of measured forest loss by an estimate of the proportion of that deforestation during the reference period (2000 to 2012) that was due to commercial agriculture. The resulting figure was then multiplied by an estimate of the proportion of deforestation for commercial agriculture that was illegal in some way (see Figure 1); an explanation and justification for how the rate of illegality was calculated for each country is provided in Chapter 4. Such estimates have been produced for the 17 countries that comprised 77 percent of tropical forest loss from 2000 to 2012. A global estimate was generated based on the sum of these 17 countries, plus an estimate for the remaining “rest of the world,” which was composed of a conservative average for the countries in Asia, Africa, and Latin America. Estimates of illegality are based on the evidence presented in Chapters 3 and 4; the individual country and global data are presented in Annex B.

The principal deforestation dataset used was the data for gross loss of forest of greater than 51 percent canopy cover as measured by the University of Maryland through high-resolution satellite mapping (Hansen et al. 2013). (All the analyses in this report were also run using FAO data for net loss from 2000 to 2010, but the results did not differ substantially (see Chapter 3). Further discussion of the different deforestation datasets is included in Annex A.)

FIGURE 1

Formula Used to Calculate Area of Tropical Forest Lost due to Illegal Conversion for Commercial Agriculture 2000-2012

**Illegal Agro-Conversion Embodied in Exports**

To calculate the area of illegal agro-conversion embodied in exports, the results of the above analysis were further multiplied by an estimate of the proportion of relevant commodity production that was exported (see Figure 2). For countries where more than one major commodity is exported, the proportion of illegal deforestation was calculated for each commodity.

FIGURE 2

Formula Used to Calculate Area of Tropical Forest Lost due to Illegal Conversion for Commercial Agriculture 2000-2012 which Was Embodied in Exports

**Exports of Associated Commodities**

Using a similar methodology, it is possible to estimate the quantity, value, and proportion of exports of specific commodities that originate from forestland that was illegally converted over the past 20 to 30 years (see Figure 3). By this method, all commodities produced on land that was illegally cleared of forest for the purpose of producing that type of commodity are considered as illegal deforestation, regardless of how long ago that deforestation occurred (i.e., the method does not only consider the first “crop” produced after deforestation, so soy planted on illegally cleared former ranchland would also be considered to be the result of illegal activities).

This analysis was carried out for soy, beef, leather, palm oil, tropical timber, pulp and paper, and plantation-grown solid wood products. For all commodities except pulp and paper and plantation-grown solid wood products, the analysis extended to all global exports. For pulp and paper, separate estimates were produced for those products made from wood originating through conversion, as well as those made from plantation-grown timber that displaced tropical forest; to produce these, estimates of the proportion of pulp and paper production coming from each source were produced for the two relevant countries (Indonesia and Malaysia).

These figures for the value of relevant trade are based on primary commodities at the point of export. No attempt has been made to calculate the value of these commodities after processing at their point of sale, but it can be expected that such a figure would be many multiples higher.

2.2.3 Trade in Tropical Timber

For the three largest tropical timber exporting countries (Malaysia, Indonesia, and Papua New Guinea), proportions were calculated or estimated by the author based on published data. Full details are provided in the relevant country sections in Chapter 4. In 2012, these three countries represented two-thirds of total exports of primary tropical timber products (logs, sawn timber, veneer, mouldings, and plywood) from producer countries. Though the quantitative evidence available is much more limited than it is for the three largest countries, estimates have also been produced for nine other producer countries. These are conservative estimates based on available literature and general understanding of the situation in each country and region. Explanations for the estimates applied for these countries are provided in the tables at the end of the relevant country/regional subsections of Chapter 4. For the rest of the world, the analysis conservatively assumed that the proportion was half the average of the 12 specified countries. Since the estimates for the nine additional countries and for the rest of the world are less well founded than those for the three largest countries, a sensitivity analysis was conducted which examines what difference it would make to the overall global figure if it was assumed that none of the tropical timber from these countries originated from conversion.

FIGURE 3

Formula Used to Calculate Quantities of Specific Forest-Risk Commodity Exports Likely Linked to Illegal Deforestation



2.2.4 Dealing with Uncertainty: Sensitivity Analysis/Ranges

There is considerable variation among countries in the availability and quality of evidence with which to estimate the percentages used in the above formulae. This is especially true with regard to measures of illegality, as well as for measures addressing the “rest of the world” rather than individual countries. In order to capture the variation in certainty, the countries were divided into three categories:

For those countries for which there was sufficiently good evidence for a given variable, a single estimate was produced (i.e., these were GOOD-data countries with respect to the variable in question). For other countries, where the evidence was less strong, a range was produced for the relevant variables (MEDIUM-data countries). For those countries for which there was judged to be insufficient quantitative evidence with which to produce a single figure or range, regional averages were used (WEAK-data countries).

In order to assess the implications of these assumptions for each of the formulas (Figures 1-3), a sensitivity analysis was conducted that incorporated the range in estimates for each of the formulae (Figures 1-3). Annex A describes how low-, mid-, and high-end estimates were developed for the WEAK-data countries (for example, to be conservative a value of 0 was used in the low-level sensitivity analysis run). For MEDIUM-data countries, the low end of the range was used for the low-run, the middle of the range was used for the mid-run, and the high-end of the range was used for the high-run. In all three runs, the individual point-estimate was used for the GOOD-data countries.

The estimates for all of the runs are provided in the tables in Annex A.

3. SUMMARY RESULTS

The results of this analysis suggest that between 29 and 42 percent of overall total tropical deforestation from 2000 to 2012 was due to commercial agriculture and timber products for export⁸ (see Annex A for full data). These figures are not directly comparable with those of Cuypers et al. (2013) (since the latter was measuring all agriculture-related deforestation, rather than only commercial agriculture), but nevertheless appear to show that exports are more important than suggested. The difference stems from variations in the methodology used, especially in relation to how deforestation was attributed to agriculture (see Section 1.2).

3.1 Illegal Agro-Conversion and Associated Exports as a Proportion of Tropical Deforestation

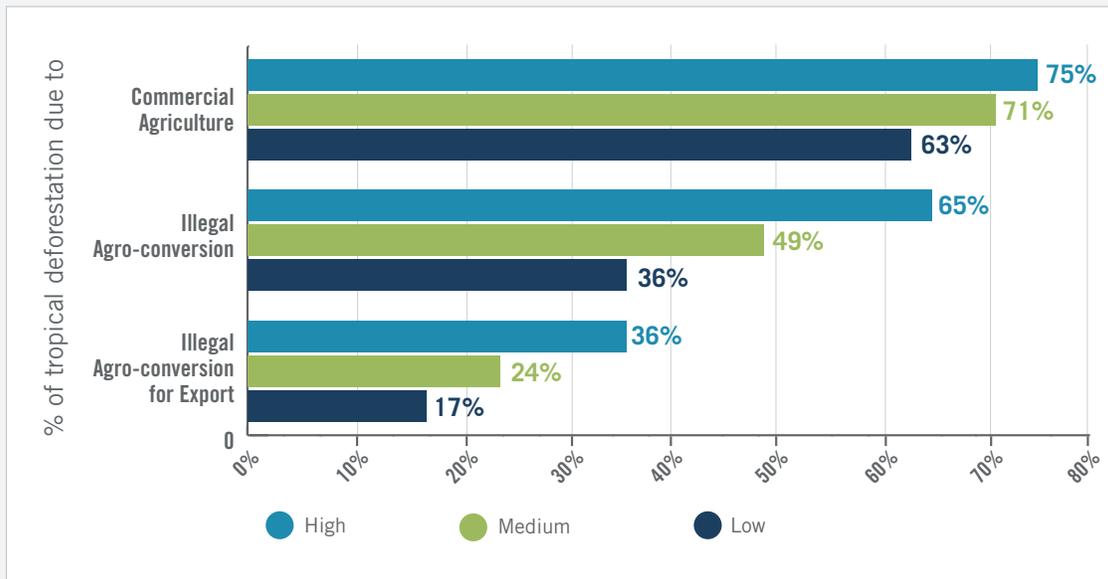
The results of the principal analysis suggest that just under half (49 percent) of tropical deforestation from 2000 to 2012 was due to illegal deforestation for commercial agriculture and timber plantations. They also suggest that around a quarter (24 percent) of tropical deforestation was a direct result of the illegal conversion of forests for production of agro-commodities for export. The full results of the analysis using the principal deforestation dataset are provided in Annex B.

The sensitivity analysis demonstrates that even under the most optimistic assumptions for those situations where the data are poor, illegal agro-conversion still represents more than one-third of all tropical deforestation, and one-fifth of associated exports (see Figure 4). Under the more pessimistic assumptions, illegal agro-conversion represents two-thirds of global tropical deforestation.

⁸ Figures obtained by dividing the total in Column labelled “area of agro-deforestation exported” with the total in Column labelled A (total deforestation) in the low-end and high-end tables (using Hansen 2013 > 51% canopy cover forest loss data) in Annex B.

FIGURE 4

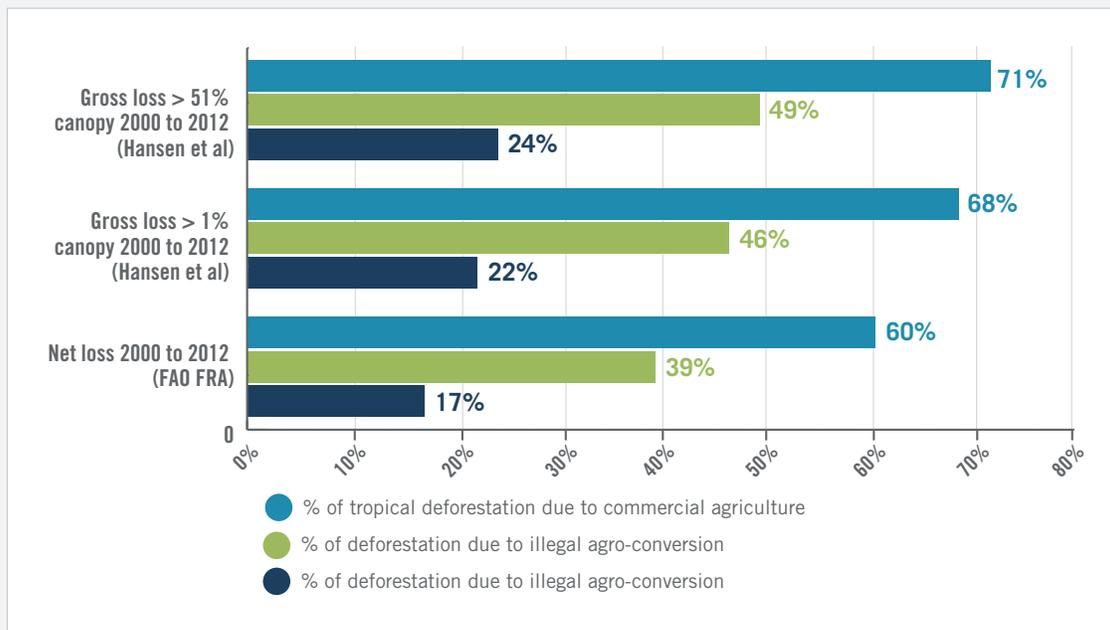
Estimates of Proportion of Tropical Deforestation due to Agro-Conversion, Illegal Agro-Conversion and Exported Illegal Agro-conversion (including Sensitivity Analysis)



The additional sensitivity analysis using alternative global deforestation datasets shows that the choice of dataset makes relatively little difference to the overall results (see Figure 5). The lowest figures are produced when the FAO dataset is used, but these still suggest illegal agro-conversion makes up 39 percent of tropical deforestation, while associated exports are 17 percent. (Full data-tables for calculations with these alternative deforestation datasets are available from the author separately as supporting information.)

FIGURE 5

Estimates of Proportion of Tropical Deforestation due to Agro-Conversion, Illegal Agro-Conversion and Exported Illegal Agro-Conversion, Using Different Deforestation Datasets (All Figures are Mid-Points)



The analysis suggests that almost 21 Mha of tropical forest were illegally cleared in the first 12 years of the millennium in order to supply agro-commodities for export—or an average of over 17,000 square kilometers per year: around five football fields every minute.

Based on consensus figures for the carbon dioxide emissions from tropical deforestation (Harris et al. 2012),⁹ the emissions caused by illegal conversion of tropical forest for large-scale commercial agriculture during 2000 to 2012 was an average of 1.47 gigatonnes of CO₂ per year¹⁰—the equivalent of one-quarter of the annual fossil fuel-based emissions of the EU (Global Carbon Project 2012). Of this, 0.72 gigatonnes was associated with commodities that are exported.¹¹ If the international trade in agro-commodities from illegal deforestation were a country, it would be the sixth largest contributor to climate change in the world.¹²

⁹ There is consensus that average annual CO₂ emissions from tropical deforestation from 2000 to 2005 were 3.0 ±1.1 Gt CO₂ per year (Harris et al. 2012.).

¹⁰ The consensus figure cited above (3.0 Gt) multiplied by 49 percent (the estimate of the proportion of tropical deforestation due to illegal commercial agro-conversion using gross forest loss canopy > 51%).

¹¹ The consensus figure cited above (3.0 Gt) multiplied by 24 percent (mid-point estimate of the proportion of tropical deforestation due to exports of commodities resulting from illegal commercial agro-conversion using gross forest loss canopy > 51%).

¹² Comparison with estimates of fossil fuel and cement emissions by all countries in 2012 (Global Carbon Project 2012). The five countries with emissions greater than 0.72 Gt are China, the US, India, Russia, and Japan.

Two-thirds of the illegal agro-conversion estimated to have occurred during the first 12 years of this century took place in Latin America, and most of the rest in Asia (based on mid-point estimates; see Figure 6). Between them, just two countries—Brazil and Indonesia—are responsible for between 61 and 92 percent of the estimated illegal agro-conversion and between 48 and 91 percent of associated exports. Very little forest is estimated to have been lost in recent years to illegal conversion for commercial agriculture in Africa, but as Section 4.10 makes clear this is set to change in the near future for the Congo Basin.

TABLE 1

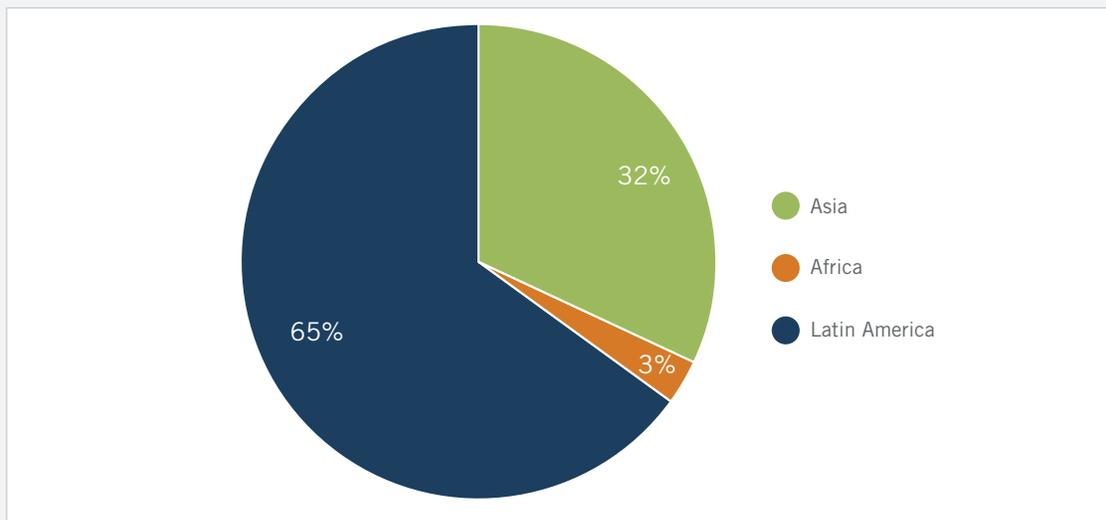
Amount of Tropical Forest Estimated to Have Been Lost due to Illegal Agro-Conversion and Associated Exports (Total and Selected Countries)

Country	Proportion of total gross forest loss (> 51% canopy cover) in the tropics 2000 to 2012	% of deforestation due to illegal agro-conversion			% of deforestation due to illegal agro-conversion for export			Estimated area of forest converted illegally for exported agro-production, 2000 to 2012 (Mha) (mid-point only)
		LOW points	MED points	HIGH points	LOW points	MED points	HIGH points	
Brazil	35%	61%	71%	81%	18%	21%	24%	6.5
Indonesia	18%	64%	64%	64%	48%	48%	48%	7.4
Malaysia	5%	0%	38%	75%	0%	32%	65%	1.5
Paraguay	3%	0%	33%	67%	0%	27%	53%	0.7
Bolivia	3%	68%	68%	68%	38%	44%	51%	1.2
Colombia	3%	0%	32%	63%	0%	6%	13%	0.2
Cambodia	1%	36%	54%	69%	0%	39%	72%	0.4
RoW	32%	SEE APPENDIX						2.7
TOTAL		36%	49%	65%	17%	24%	36%	20.6%
% of total tropical forest loss								24%

Total gross forest loss figures for 2000-2012 sourced from Hansen et al. 2013.

FIGURE 6

Proportions of Estimated Area of Illegal Agro-Conversion 2000 to 2012 by Continent (Mid-Point, > 51% Canopy Gross Loss)



3.2 Trade in Commodities Associated with Illegal Agro-Conversion

The report shows that in many countries, the majority of commodities produced and exported into the global market are products of illegal deforestation. Based on the mid-point estimates of the analysis, 65 percent of Brazilian beef exports are likely linked to illegal deforestation, as are 9 percent of Argentina's. Forty-one percent of Brazil's soy exports are also estimated to originate from illegally deforested land, as are 5 percent of soy exports from Argentina and 30 percent of those from Paraguay. Over half (53 percent) of Indonesia's and around a quarter (24 percent) of Malaysia's palm oil exports are similarly tainted. The analysis indicates that 60 percent of Indonesia's and 28 percent of Malaysia's exports of tropical timber and wood products are also from illegal conversion. Full results of the mid-point analysis are provided in Annex C, while data tables for the low-end and high-end analysis are available from the author as supporting information.

In total, global exports of products from illegal tropical deforestation are estimated to be worth \$61 billion per year, of which \$10 billion is tropical conversion wood and wood products, and the remainder is plantation wood, beef/leather, and crops grown on the land after conversion (see Table 2). The largest product of illegal deforestation is soy, representing more than one-third of the total. Though they receive much less international attention, exports of timber and wood products (mostly pulp and paper) from tree plantations grown on illegally deforested land are worth nearly half as much as the value of exports of palm oil from illegal deforestation. Almost three-quarters (72 percent) of the total measured value of illegal-deforestation exports originate in either Brazil or Indonesia.

TABLE 2

Estimated Value of International Trade in Commodities Linked to Illegal Tropical Deforestation, 2012

Country	Proportion of total gross forest loss (> 51% canopy cover) in the tropics 2000 to 2012
Soy	\$21 billion (\$13–\$30 billion)
Beef & leather*	\$7 billion (\$6–\$10 billion)
Palm oil	\$16 billion (\$10–\$21 billion)
Tropical wood (primary timber products + pulp & paper)**	\$10 billion (\$4–\$26 billion)
Plantation wood (inc pulp & paper)***	\$7 billion (\$4–\$6 billion)
TOTAL	\$61 billion (\$37–\$94 billion)

Note: See text, data in Annex C and supporting information.

* Beef = \$5.8 bn, Leather = \$1.5bn;

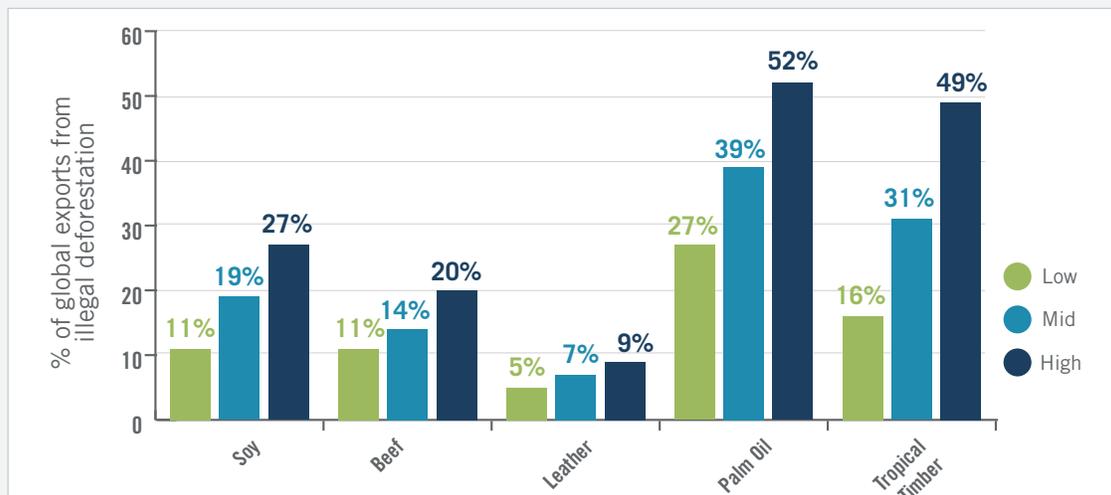
** Pulp & paper = \$6 bn, Primary solid wood products = \$4 bn;

*** Pulp & paper = \$6.4 bn; Solid wood products = \$0.6 bn

The analysis also provides estimates of the proportion of total trade in soy, beef, leather, palm oil, and tropical timber exports that originate from illegal forest conversion. Based on the mid-point analysis, one-fifth of the soy, two-fifths of the palm oil, and nearly one-third of the tropical timber traded internationally are likely linked to illegal tropical deforestation, as is around 14 percent of the beef and 7 percent of the leather. Even under the most optimistic assumptions used in the sensitivity analysis, the results are still dramatic (see Figure 7).

FIGURE 7

Proportion of Global Exports of Different Agro-Commodities Estimated to Originate from Illegal Conversion of Forests



Note: See text, data in Annex C, and supporting information.

3.3 Trade in Tropical Conversion Timber

The results of the analysis suggest that half (50 percent) of all tropical timber in trade now originates from conversion (see Table 3). Even under the most conservative assumption for those countries for which little or no information exists the global figure is still more than two-fifths (43 percent).

TABLE 3

Estimates of Tropical Conversion Timber Exports for Largest Exporters and Global Estimate

Country	Total RWE* primary tropical product exports 2012, million m ³	% of exports from forest conversion (main estimate)	Implied conversion exports RWE 2012, million m ³	% of exports from forest conversion (low-end sensitivity analysis)	Implied conversion exports RWE 2012, million m ³
Malaysia	15.6	65%	10.1	65%	10.1
Indonesia	10.4	75%	7.8	75%	7.8
Papua New Guinea	3.2	30%	1.0	30%	1.0
Burma	2.6	50%	1.3	0%	0.0
Solomon Islands	2.1	15%	0.3	0%	0.0
Cameroon	1.8	5%	0.1	0%	0.0
Laos	1.6	55%	0.9	0%	0.0
Brazil	0.5	20%	0.1	0%	0.0
Gabon	1.1	10%	0.1	0%	0.0
Congo	0.9	2%	0.0	0%	0.0
Ivory Coast	0.7	4%	0.0	0%	0.0
Ghana	0.5	1%	0.0	0%	0.0
Others	3.4	14%	0.5	0%	0.0
TOTAL	44.4		22.2		18.9
% Conversion			50%		43%

*RWE = Roundwood equivalent volume

Source: Total RWE primary product (logs, sawn timber, veneer, mouldings, and plywood) exports produced for Forest Trends by James Hewitt based on UN COMTRADE statistics and other trade data sources. Conversion proportions estimated by the author based on available information (see text).

Note: A very small proportion of primary tropical product exports documented above originate from plantations rather than natural forest. This fact has been taken into account when considering the proportion of total exports which are likely to originate from conversion of natural forest.

4. EVIDENCE OF ILLEGAL CONVERSION OF TROPICAL FORESTS FOR EXPORT-DRIVEN AGRICULTURE

This chapter summarizes evidence relating to the illegal conversion of tropical forests for commercial agriculture and timber plantations, and associated exports. The evidence contained in this chapter was used in the construction of the national and global estimates outlined in the previous chapter, and in the summary discussion regarding the nature of illegalities in Section 2.1.

The evidence is divided into sub-chapters for each of the most important individual countries and regions. For each country or region, the first or second sub-chapter provides detail on the importance of commercial agriculture as a driver of deforestation and the importance of export markets for the production of relevant commodities. Where such information is available, this sub-chapter also includes information on the production and export of tropical conversion timber. The final sub-chapter summarizes available evidence and information on the nature and scale of illegalities in conversion of forests for commercial agriculture and timber plantations. Percentages applied in the analysis in Chapter 3, along with justifications, are provided for those countries profiled.

This chapter contains information relating to illegalities in the conversion of tropical forests for commercial agriculture in 10 of the top 15, and 20 of the top 40 countries in the world for tropical deforestation during 2000 to 2012. These 20 countries (chosen based on the availability of relevant evidence) were responsible for 77 percent of total tropical deforestation during that period.¹³ The most extensive evidence of illegalities relates to Brazil and Indonesia, which between them are responsible for half of all tropical deforestation. The chapter also includes evidence of relevant illegalities relating to suppliers of 68 percent of total global soy exports, 90 percent of palm oil exports, 23 percent of beef exports, and 85 percent of tropical timber exports.

When considering the evidence of illegalities presented in this chapter, it is important to bear in mind the provisos outlined in Section 2.1 above.

4.1 Brazil

4.1.1 Background

Forest loss in Brazil was responsible for a quarter of all the forests lost worldwide between 1990 and 2010 (FAO 2010),¹⁴ and a third of all tropical forests lost between 2000 and 2012 (Hansen et al. 2013). Historically, this deforestation occurred along the “Arc of Deforestation” in Brazil’s Amazon frontier across the three states of Pará, Mato Grosso, and Rondônia (INPE 2002). Here, infrastructure development spurred the construction of new roads, opening up frontier forests to unplanned land conversion and increased human migration and settlement.

¹³ Calculated from data in Hansen et al. 2013, using data for gross forest loss in canopy cover > 51%.

¹⁴ Calculated from forest area data for 1990 and 2010 in FAO 2010.

Since 2004, Brazil has achieved a dramatic reduction in the deforestation rate, which had declined by 70 percent by 2013 compared with the 1996 to 2005 average (Nepstad et al. 2014). Most of this decline has been attributed to government actions, including the creation of large new areas of protected areas and indigenous reserves, and a range of innovative policy measures designed to address illegal deforestation (Arima et al. 2014; Nepstad et al. 2014). Voluntary moratoria on deforestation by soy and beef producers—prompted by NGO campaigns, international markets, national slaughterhouses, supermarkets, and public prosecutors—have also played a part (see Sections 4.1.2 and 4.1.3 regarding soy and beef). However, despite this decrease, the areas lost each year still represent a large proportion of the global figure, and in recent years the rate of progress has slowed and possibly reversed. In the cerrado (now the principal location of Brazil’s forest loss), deforestation has been climbing steadily since 2009, while deforestation in the Amazon also rose again in 2013 (Soares-Filho et al. 2014)—although well below the historic highs experienced between 1996 and 2008.¹⁵

4.1.2 Forest Conversion for Commercial Agriculture and Associated Exports

While many studies have stated the overwhelming importance of commercial agriculture as a driver of deforestation in Brazil, especially for cattle and soybean production, only a few provide hard data on the precise area (see Box 2) (Barona et al. 2010; Fearnside 1996; Margulis 2004). This is complicated by the fact that land is often cleared first for cattle production, and then planted with agricultural crops, soy in particular, and that some land deforested for agriculture is later abandoned and reverts to secondary forest or scrub. Though most research has examined these drivers in relation to the Brazilian Amazon, there is also strong evidence that agriculture is equally important in driving the deforestation of the Brazilian cerrado. The Government of Brazil’s own plan for management of the cerrado, for instance, recognizes that there has been a strong correlation between an increased area of soy planting and increased deforestation (Ministério do Meio Ambiente 2010). Based on a review of available evidence, one study concluded that in total, 98 percent of Brazilian deforestation during 1995 to 2005 could be attributed to cattle and soy (see Box 2 for details). Since 2006, when domestic soy producers declared a voluntary moratorium on deforestation in the Amazon region, the deforestation rate for soy in the Amazon has dropped to near zero (see Section 4.1.3). However, the soy moratorium did not apply to deforestation in other Brazilian forest biomes, and cattle-related deforestation has continued nationwide, albeit at a slower rate since the adoption of a similar voluntary moratorium for beef in 2009 (Walker et al. 2013).



Fields of soy in the Brazilian Amazon © Karla Gachet / Panos / Greenpeace

¹⁵ Deforestation rates in the Brazilian Amazon, online at obt.inpe.br/prodes/index.php.

BOX 2

Summaries of Studies Estimating Forest Loss due to Cattle and Agricultural Production

1. Based on a review of available evidence, Grieg-Gran et al. (2007) estimate that 17.1 of the 22.4 Mha of forest lost (76 percent) in the Brazilian Amazon were lost for cattle pasture between 1995 and 2005. A further 3.9 Mha (17 percent) were initially converted for soy production. In the Brazilian cerrado, at least 3.9 Mha had been lost for cattle farming and a further 3.3 Mha to soy production. In total, the authors estimate that 98 percent of deforestation in Brazil has been driven by ranching and soy plantations (Grieg-Gran et al. 2007; Figure 10, p99).
2. Morton et al. (2006) used field surveys and satellite imagery to assess the fate of large (> 25ha) plots of deforested land in Mato Grosso state (the most important in Brazil for deforestation) during 2001-2004, and found that in 2002, 78 percent of the deforested area was converted to cattle pasture and 13 percent to cropland (a combined total of 91 percent), while in 2003 the figures were 66 percent and 23 percent (a combined total of 89 percent).
3. The National Institute for Space Research (INPE) (2011), using satellite imagery, found that of the cumulative area deforested in the Brazilian “Legal Amazon” to 2007, 63 percent was being used as cattle pasture in 2008 and 5 percent for crops. A further 10 percent was classified as “mosaic of occupation” or “no data” and could also have been pasture or crops, while most of the remainder (21 percent) was classed as “secondary vegetation” and may have originally been cleared for pasture or crops (INPE 2011a).¹⁶
4. Karstensen et al. (2013) state that the share of land use in the year of deforestation in most Brazilian states is 34.7 percent for cropland and 65.3 percent for pastures (i.e., that 100 percent of initial deforestation is for agriculture), but that in subsequent years much of the cropland reverts to secondary forest.

While soy and beef are by far the most important commercial agricultural products driving deforestation in Brazil, Brazil is also the world’s largest producer of sugarcane and has the third largest area of monoculture timber plantations in the world, with 6.5 Mha planted by 2012 (Indufor 2012). While most of these plantations were established on non-forested land, some directly replaced forest, while others may follow cattle production that initially led to the forest clearance (de Sà et al. 2013; Lang 2008). Most timber plantations for pulp occur in the southwest region of Brazil and there are very few in the Amazon region.

Unlike many other tropical countries, the majority of the commodities associated with deforestation in Brazil are consumed locally. Exports are still important, however. Karstensen et al. (2013) found that 15 percent of carbon emissions associated with beef deforestation and 50 percent associated with soy deforestation resulted from products that were exported. In total, the study found that around 30 percent of total carbon emissions from deforestation in the Brazilian Amazon in the decade to 2010 were related to exports. The authors concluded that “in recent years, there is a positive correlation between high deforestation emissions and high proportions of production exported; giving additional support to the hypothesis that deforestation is increasingly connected to international trade.” The authors note that because global drivers contribute to Brazil’s deforestation, “they should also be seen as part of the solution,” and suggest that unless global agro-commodity demand is tackled

¹⁶ Percentages calculated to exclude the area of deforestation in 2008 which was not classified. The pasture figure is calculated from the total area recorded as “clean pasture,” “regenerating pasture,” “pasture with bare shrubs,” and “pasture with bare soil.”

through regulation at various points in the supply chain, it is likely that deforestation rates in Brazil will begin to climb, as was indeed the case in 2013.

As recently as the 1990s, Brazil was a net importer of beef (MercoPress 2013). By 2004, it had become the world's largest exporter.¹⁷ A few years ago, Brazil was exporting more than a quarter of its beef production, but exports have declined steadily since 2007 as a proportion of production (Bonsall 2012), and in 2012, only 17 percent was exported.¹⁸ In contrast to beef, however, most of Brazil's bovine leather is exported.¹⁹ Major markets include the EU and China.²⁰ In the past, the EU was the largest importer of Brazilian beef, but this changed in the mid-2000s and by 2013, Russia, China, and the Middle East were the biggest export markets.²¹

Though Brazil only exports a minority of the beef it produces, it exports 75 percent of its soy production.²² In 2012, the largest market for Brazilian soy exports was China, taking 48 percent of total exports; the second largest market was the EU, with 31 percent. One-third of Brazil's timber plantation area is used for pulp production, and around two-thirds of this pulp is exported. In 2012, 46 percent of this pulp was exported to Europe, 26 percent to China, and 19 percent to North America (BRACELPA 2014).

There is no official data on the proportion of Brazil's tropical timber production and exports being sourced from conversion of forests. Grieg-Gran et al. (2007) estimate volumes of tropical forest conversion timber in Brazil at between 4.7 million m³ and 14.7 million m³ in 2004, compared with total production that year of 24.5 million m³, suggesting that it represents between 19 and 60 percent of production. However, their analysis also concludes that much forest clearance for agriculture involves little commercial harvesting. For this study, the lowest end of the implied range (19 percent) is therefore assumed for tropical wood exports.

4.1.3 Illegalities in Conversion

Introduction

In Brazil the most common illegalities relating to conversion of forests are fraudulent land titles and the failure to retain the legally required minimum percentage of natural forest on each property (known as "legal reserves" under Brazilian law) (see Box 3). Other regulatory breaches, such as converting forests outside legal boundaries (including incursions into protected areas), and the clearing of other forest conservation zones within properties (such as streamside buffers) are also common. While the Brazilian government has been successful in recent years in reducing illegal deforestation (see Box 4), the problem continues, and much of the legacy of past illegal deforestation has yet to be effectively addressed.

The estimate of illegality used in this study for Brazil (68 to 90 percent) is based solely on breaches of legal reserves, and is therefore likely an underestimate of overall levels of non-compliance, because it assumes that conversion that is in compliance with legal reserve requirements is legal in all other respects. Encroachments beyond property boundaries or breaches of other environmental protection measures within properties, such as failures to protect streamside buffers and steep slopes, are known to be common but could not be

¹⁷ UN COMTRADE statistics, analyzed for Forest Trends by James Hewitt.

¹⁸ Calculated from figures from USDA Foreign Agricultural Service, Livestock & Products Annual 2013 for Brazil.

¹⁹ Calculated from production and export figures in FAO—World Statistical Compendium for raw hides and skins, leather and leather footwear 1993 to 2012 (2012).

²⁰ UN COMTRADE statistics, analyzed for Forest Trends by James Hewitt.

²¹ UN COMTRADE statistics, analyzed for Forest Trends by James Hewitt.

²² Calculated from figures for soy production and soybean, soy oil, and soy meal exports in USDA Foreign Agricultural Service, Oilseeds and Products Annual 2013 for Brazil.

considered because of a lack of quantitative data. The estimate used in the analysis also does not capture the extent to which deforestation that was in compliance with legal reserve limits may nevertheless have occurred on properties where ownership rights were obtained illegally.

On the other hand, the general proviso that the measure of illegality used in the analysis does not consider any post-hoc process of “legalization” (see Section 2.1) is of particular importance to Brazil, given the recent “amnesty” covering large areas of illegal deforestation that occurred prior to 2008 (see Box 4). In addition, the illegality percentage for the Brazilian Amazon applied in the analysis in this report is based on evidence that only extends to 2009, and it is likely that a lower proportion of deforestation since that date has been illegal. However, given that the years to 2009 account for 90 percent of Amazon deforestation during the reference period (2000 to 2012), any variation in the illegality rate since will make little difference to the overall total. Similarly, with regard to the commodity analysis (Section 3.2), it is especially important to bear in mind that this analysis considers all production and trade of relevant commodities to be associated with illegality regardless of when the deforestation took place, or whether it has since been “legalized.” Though most relevant Brazilian commodities may still be coming from land which was illegally deforested, the proportion of “new” production (from land cleared only recently) that is illegal will almost certainly be lower.

BOX 3

Two Common Types of Illegalities Associated with Forest Clearing for Agriculture and Livestock

1. **Ownership rights:** Organized land grabbers and squatters have cleared forest areas with impunity, and then taken advantage of various government programs granting land titles after the fact to validate illegal seizures of public lands. This land-grabbing has been a key part of the process of forest conversion to cattle pasture. The World Bank reports that “the high profits to be obtained from cattle ranching are often due to the originally illegal appropriation of land which is camouflaged in subsequent financial returns” (Margulis 2004). Fraudulent title deeds and corruption are common tools in the illegal appropriation of land. The Brazilian government stated in 2009 that clear ownership records existed for less than 4 percent of the land in private hands in the Brazilian Amazon (Barrioneuvo 2009). The Brazilian authorities continue to encourage illegal land-grabbing by allowing such land to be “regularized” through payments that are below market rates. Efforts by the Brazilian government to address past illegalities in land titling and prevent future land-grabbing have been much less successful than those relating to other types of illegalities related to forest conversion (Barreto and da Silva 2013).
2. **Legal reserves:** All properties are legally required to maintain a minimum of natural vegetation within each property (the “legal reserve”). This minimum has varied over time and is higher in the Brazilian Amazon than elsewhere in Brazil. Since 1997, the legal reserve in the Amazon has been 80 percent; prior to that it was 50 percent. In the cerrado, it is 35 percent. It has been estimated that 90 percent of forest clearance in Mato Grosso state between 2001 and 2009 was in excess of the legal reserve (Stickler et al. 2013; see main text for additional details).

General Quantitative Estimates of Illegality

One recent study (Soares-Filho et al. 2014) estimated that a cumulative area of forest larger than California (between 44 and 56 Mha) had been illegally cleared on private farm properties in Brazil up to 2011, in contravention of the Forest Code. This figure includes both breaches of legal reserves and the additional requirement to protect conservation forests along the banks of rivers. Earlier studies (Sparovek et al. 2010; Sparovek et al. 2012), using a different methodology and including breaches of other Forest Code requirements (such as protection of natural vegetation on steep slopes, areas of high elevation, and hilltops), came up with an even higher estimate of 87 Mha of natural vegetation cleared in contravention of the Forest Code.

These national-level studies used proxy data and modelling, and did not seek to directly measure the areas of deforestation within individual properties that were non-compliant with the Forest Code, or the proportion this represented of the total area deforested within such properties. These studies also did not clearly discriminate between forest and non-forest “natural vegetation” when considering the areas cleared illegally, or seek to assess levels of compliance during different time periods.

Stickler et al. (2013) sought to overcome these limitations through a more direct analysis of Forest Code compliance, which examined such compliance between 1997 and 2009 in the state of Mato Grosso, which was responsible for 40 percent of all deforestation in the Brazilian Amazon between 1996 and 2005. Their study found that between 2001 and 2009, 90 percent “of this clearing was illegal” on the basis of compliance with the legal reserve requirement alone (see Table 4). Supplementary findings to the study using alternative forest cover data suggest a similar, though slightly lower, proportion of illegality (87 percent) between 2000 and 2005.

TABLE 4

Illegal Deforestation in Mato Grosso State due to Commercial Agriculture, Brazil, 1997 to 2009

Period	Area of illegal deforestation	% of deforestation illegal
1997 to 2001	18,782 km ²	88%
2001 to 2005	27,062 km ²	90%
2005 to 2009	6,681 km ²	90%

Source: Stickler et al. 2013.

Additional evidence from Greenpeace (2009a), based on a comparison of satellite imagery with permits for deforestation obtained from government agencies, suggests that these findings are typical for the broader Brazilian Amazon, estimating that 90 percent of the deforestation from July 2006 to July 2007 was illegal. This represented a substantial increase compared to 2004, when a similar analysis found that only 70 percent of conversion was illegal (Greenpeace 2009a).²³

²³ The analysis excluded the states of Tocantins and Maranhão, but these encompass less than two percent of the Brazilian Amazon forest.

The Government Response

Amendments to Brazil's Forest Code, signed by the President in 2012, granted amnesty for violations of legal reserve limits prior to 2008. Previously, all areas illegally deforested were required to be fully restored. Now, small farms less than 400 ha are not required to conduct any restoration, while larger farms must restore only a portion, and can choose to do so with non-native species or through the purchase of deforestation rights from other compliant landowners, once the non-compliant landowner has properly registered their property with the State and obtained the required environmental certification. However, this 2012 amendment to the Forest Code is being challenged in Brazil's Supreme Court (WWF UK 2013). It has been estimated that when combined, the various amendments to the Forest Code will forgive 23 to 36 Mha of illegal land clearance that took place prior to 2008 (between 48 percent and 64 percent of the total area of such illegal clearance up to 2011) (Soares-Filho et al. 2014). There is a risk that such a blanket amnesty could encourage future illegality, by leading to the "perception that illegal deforesters are unlikely to be prosecuted and may even be exonerated in future law reforms" (ibid.) or shift the production to smaller farms that are exempt from mandated conservation measures. This said, Stickler et al. (2013) conclude that whatever emerges from the Forest Code must be accompanied by an effective set of options for forestland owners to come into compliance, coupled with incentives that cover, at least in part, their opportunity costs for providing public environmental benefits.

In addition to amending the Forest Code to enable this amnesty, the Brazilian government has taken a number of other steps to try to tackle illegal deforestation in the Amazon (see Box 4). Some of the most important steps (such as the rural environmental registry, CAR, and other amendments to the Forest Code) have not yet been fully implemented, however, and the problem remains widespread. In November 2013, Brazil's environment minister attributed a 28 percent rise in deforestation in the Brazilian Amazon over the previous year to increased illegal ranching and soybean production in the states of Mato Grosso and Pará, and criticized those state authorities for failing to effectively tackle illegal forest conversion (AFP 2013). The minister promised action against those responsible, which she described as "mafias" involving both land-grabbers and corrupt officials, and stated that there were almost 4,000 ongoing police investigations into illegal conversion (Rocha 2013).

Evidence Specific to Cattle Ranching

For the period 2008 to 2009, Greenpeace (2009a) examined 28 cattle ranches in Mato Grosso and Pará, covering approximately 0.5 Mha. All 28 ranches had cleared more than the legal maximum area of forest. Indeed, most (64 percent) had cleared more than 70 percent, and many (36 percent) had cleared more than 90 percent. Between them, the 28 ranches had illegally converted more than 150,000 ha, 150 percent more than the legally permissible area. In total, more than 70 percent of the pasture within the 28 ranches was illegally deforested.²⁴ The same study also documented cases of illegal forest conversion for cattle pasture in protected areas and indigenous lands (see Case Study 1).

In October 2009, four of Brazil's largest meat processing companies (JBS, Bertin—later purchased by JBS—Marfrig, and Minerva) signed a public agreement (known as the G4 Cattle Agreement) to no longer purchase cattle from ranches within the Amazon biome where deforestation had occurred after the date of the agreement, unless those companies could prove compliance with land tenure and environmental legislation (Walker et al. 2013). The companies also agreed to ban the purchase of cattle from ranches that deforested prior to the agreement, where these ranches had been accused by government agencies of invading indigenous lands, "embargoed" by IBAMA, or fined by state or federal authorities for invading protected areas. Such ranches could only be accepted as suppliers if they could prove that fines had been paid, environmental damages had

²⁴ Calculated from data in Tables 4,5,7,8 and 9 in Greenpeace (2009a).

BOX 4

Actions to Address Illegal Deforestation Taken by the Brazilian Government

Since 2004, the Brazilian government has taken a number of steps to to reduce deforestation. These actions have been credited as the key drivers behind the dramatic 70 percent decline in deforestation seen in the country in the years 2004-2012 (Nepstad et al. 2014). While the most effective government action during 2004-2006 was a massive increase in the area of protected forest (including indigenous reserves) (Soares-Filho et al. 2010), “command and control” actions specifically targeted at illegal deforestation have been found to have been particularly important from 2008 onwards, when the most substantial declines in deforestation were seen (Arima et al. 2014). Steps taken by the government that were specifically targeted at illegal deforestation include:

- 2004—“Plan for the Protection and Control of Deforestation in the Amazon” (PPCDAm) improved coordination between relevant enforcement agencies.
- 2008—The Critical Counties Program prohibited government agencies from providing loans to properties on Brazil’s environmental agency (IBAMA)’s list of “embargoed” properties found to have cleared forest illegally, while an associated resolution of the Brazilian Central Bank required documentation proving compliance with environmental regulations by farms in the Amazon biome as a condition for financing.
- 2008—The federal prosecutor’s office (MPF) in Pará took civil action against 20 ranchers and 11 major meat packers, and recommended to major supermarkets and other buyers to halt purchases from them; the MPF then used the case as leverage to obtain important commitments from the meatpackers concerned.
- 2009—The Rural Environmental Registry (Cadastro Ambiental Rural (CAR)) went into effect in the states of Mato Grosso and Pará. By requiring landholders to submit their property boundaries to the state environmental regulatory agency (SM), it increased capacity to enforce legal reserve requirements (though it did not assess legality of land tenure).
- 2012—The new Forest Code required every state to establish a CAR and required individual properties to report their level of compliance with the legal reserve and plans for achieving compliance.
- 2012—Issuance of the Plan of Prevention, Combat and Alternatives to Illegal Settlements Deforestation in the Amazon (also called the Green Settlements Program), seeking to reduce illegal deforestation in agrarian farm settlements.

Arima et al. (2014) examined the indirect drivers that led the government to enact relevant policies and increase its efforts at enforcement. The authors consider that an accumulation of detailed evidence (including annual data series from satellite monitoring programs) of widespread and growing deforestation (much of it illegal) was an important factor, as was the increased support of the Brazilian public for action, and reforms in the Brazilian judiciary that created the Federal Prosecutor’s Office (MPF), which is able to act as an independent watchdog over other relevant agencies. The authors also concluded that a relatively well-crafted legal framework helped in tackling illegalities.

Though the actions taken thus far have been effective, there remains much that needs to be done. Implementation of the crucial CAR requirements remains at an early stage in much of the country. Barreto and da Silva (2013) highlighted three factors that continue to stimulate deforestation in Brazil: the failure to prevent illegal land-grabbing; as well as the failure to address fraud and money-laundering related to the taxes on rural properties (ITR) and rural incomes (IRR). All three factors relate to illegalities involved in commercial agro-conversion.

been repaired, and that they were now in full legal compliance. The buyers also committed to refusing cattle from ranches accused by relevant government agencies of land-grabbing, until such accusations were dropped. In the longer term, the companies agreed that they would ensure all suppliers had the necessary environmental permits within two years, and would only accept suppliers who could prove they were in possession of legal land titles within five years. All of this was to be ensured through the establishment of supply chain tracking systems.²⁵

Though it was an impressive achievement, the G4 Agreement stopped well short of preventing all purchasing of cattle from land which was illegally deforested prior to 2009. First, though it encompassed the largest four companies in the industry, the voluntary deal only covered one-third of the total cattle slaughtering in the Amazon (Walker et al. 2013) and allowed purchases to continue if the farm was “legalized” through payment of fines or other measures. Such purchases could only be prevented where the illegal deforestation was detected by government agencies (and the relevant areas thereby “embargoed”). The agreement also did not apply to deforestation outside the Amazon biome, such as in Brazil’s cerrado forests.

Even for those illegalities that were captured, there is evidence of problems with implementation of the agreement. In June 2012, Greenpeace published a review of the effectiveness of the G4 Agreement in which it claimed to have evidence showing that the largest of the companies involved (JBS) was continuing to buy from farms deforesting illegally and occupying indigenous lands (Greenpeace 2012a). Greenpeace claimed that two farms that supplied JBS up to November 2011 were “embargoed” by IBAMA for illegal deforestation as late as December 2011, and that this demonstrated that the company’s supply chain system was failing to determine whether or not suppliers were engaged in illegal deforestation. Greenpeace also claims that JBS failed to properly monitor its indirect suppliers (Greenpeace 2012b). JBS has challenged Greenpeace’s assertions (Mongabay 2012b).

Meanwhile, illegal deforestation for beef production has continued. In April 2013, federal and state authorities sued 26 slaughterhouses in the states of Amazonas, Mato Grosso, and Rondônia for buying cattle from farms involved in illegal deforestation. The fines issued total \$280 million. One of Brazil’s largest slaughterhouse firms, BR Foods (not among those which signed the G4 Agreement), was among those cited. According to the Federal Public Ministry, it had bought cattle from six farms in areas embargoed by IBAMA (Greenpeace 2013c).



Beef cattle in Mato Grosso, Brazil © Markus Mauthe / Greenpeace

²⁵ Minimum Criteria for Industrial Scale Cattle Operations in the Brazilian Amazon Biome (also known as the G4 Cattle Agreement), October 4, 2009. Note that the agreement was known as the G4 Agreement as it initially involved four companies, but two subsequently merged.

CASE STUDY 1

Cattle Ranching in Marabá, Pará, Brazil

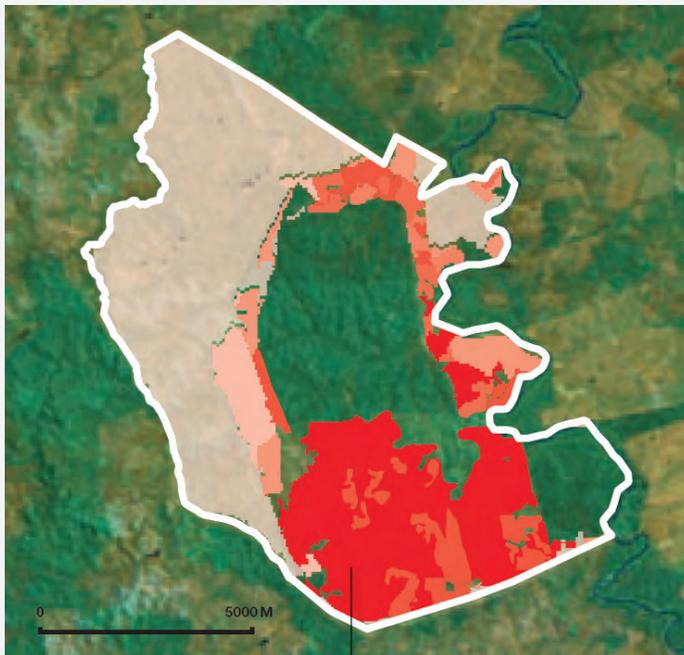
In March 2007, the World Bank's International Finance Corporation (IFC) approved a loan to Brazilian company Bertín for the expansion of a slaughterhouse in Marabá, Pará.

Prior to the investment, the IFC's own summary of the proposed investment admitted that "numerous farmers in Bertín's supply chain have no legal title to land or have fraudulent documentation" (IFC 2006). For this reason, the loan included conditions meant to minimize the impact of the new facility on surrounding forests and to ensure it did not take cattle from illegally deforested land.

However, Greenpeace researched six ranches supplying cattle to the slaughterhouse after the loan was approved, and found all had deforested far more than the "legal reserve" maximum of 20 percent of the land under their control. All had deforested at least 60 percent, and two had cleared more than 90 percent. The slaughterhouse also sourced cattle indirectly from ranches that had been raided by IBAMA and found to be involved in illegal deforestation. The deforestation rate within the surrounding area was estimated to have increased by 40 percent since the loan was agreed. Greenpeace has also documented cattle from an illegal ranch inside an indigenous Indian forest reserve being supplied to a separate Bertín slaughterhouse in Tucuma (Greenpeace 2009a).

FIGURE 8

Deforestation in Excess of the "Legal Reserve" 20 Percent Limit inside Itacaiúnas Ranch, which was Supplying Cattle to Bertín's Slaughterhouse in Marabá in 2008.



Source: Greenpeace 2009a. Areas marked in red were deforested in 2008.

Evidence Specific to Soy

There is also evidence that much of the deforestation for soy production in the Amazon has also been illegal. For instance, an investigation in 2002 by the International Finance Corporation found that legal reserve requirements were not being met on soy farms covering two-thirds of the land owned by Grupo André Maggi (GAM), Brazil's largest soy producer (Stickler et al. 2004). The head of GAM, Blairo Maggi, was elected governor of Brazil's Mato Grosso state in 2002. Though Maggi oversaw a major reduction in deforestation in Mato Grosso after 2004, most existing soy plantations remained illegal (in that the land on which they were growing had been cleared illegally, and this had not been addressed through fines or other forms of restitution). In 2009, as governor, he offered an amnesty to soy farmers operating illegally in the state, giving them four years to achieve compliance with the Forest Code's legal reserve limits (Perlroth 2009).

Breaches of the legal reserve requirement are not the only documented illegalities relating to soy deforestation in Brazil. According to the National Land Reform Institute, for example, millions of hectares of forested public land were fraudulently transferred to private individuals in Mato Grosso and subsequently exploited for soy production. Local governments have also built roads into forested areas to serve soy expansion without the required Environmental Impact Assessments (Greenpeace 2006).

In 2006, the largest soy producers in Brazil signed a voluntary moratorium on forest conversion for new plantations. While direct deforestation for soy in the Brazilian Amazon (both legal and illegal) has been almost eliminated (GTS Soy Task Force 2012), the moratorium only applies to the Amazon biome, which only represents 5 percent of the area of soy planting in Brazil. In the cerrado, which contains 60 percent of Brazil's soy planting, there has been much less attention to the issue, and though information is sparse, there is evidence that much of the conversion of Brazil's cerrado for soy is also illegal. Although 8 percent of the cerrado is officially designated for environmental protection, the Government of Brazil's own studies have shown that more than 4 million m³ of protected cerrado forest was destroyed between 2002 and 2008 (Ministério do Meio Ambiente 2010). Even outside protected areas, the Forest Code requires that 35 percent of native vegetation in the cerrado is preserved, yet it is claimed that "few producers comply" with this requirement (ibid.).

Evidence Specific to Timber Plantations

There is also evidence of illegalities regarding other major crops grown at the expense of forest in Brazil, though they have had less impact than the agro-commodities mentioned above, and have been studied far less. For example, Kröger (2012) interviewed activists and government officials and found the majority believed that pulp companies in Brazil had obtained land for plantations through illegal means, similar to the land grabbing that plantations and ranches have been accused of, outlined above (Kröger 2012).

In 2008, Veracel, which is responsible for around one-tenth of Brazil's pulp production,²⁶ was fined \$12.5 million by a federal court for illegal deforestation of tropical forests from 1991 to 1993, and ordered to pull up almost 100,000 ha of eucalyptus plantation and replace it with natural forest (Federal Court in Eunápolis 2008). Veracel, which denies the allegations, lodged an appeal and the sentence has been suspended pending its conclusion. As of November 2013, the case had still not been resolved (Rainforest Alliance 2014). IBAMA has also fined Veracel for \$136,000 (Lang 2008). Veracel is involved in numerous other disputes with local communities (who claim it has illegally developed on indigenous land) and other civil cases regarding environmental damage and tax evasion (SGS Qualifor 2012; Lerrer and Wilkinson 2012), and has been repeatedly found by Forest Stewardship

²⁶ Veracel's website (<http://www.veracel.com.br/default.aspx?tabid=147>) states that the company produces 1 million metric tons (mt) per year; industry association BRACELPA gives total Brazilian production as 14 million mt per year (BRACELPA, Brazilian Pulp and Paper Industry, October 2013, http://www.bracelpa.org.br/bra2/sites/default/files/estatisticas/booklet_eng.pdf).

Council (FSC) auditors to be in breach of health and safety regulations in its treatment of workers (SGS Qaulifor 2012). Veracel exports nearly all of its pulp (Lang 2008).

Two other large Brazilian pulp producers have also been involved in converting natural forests for timber plantations, Aracruz (now part of Fibria) and Suzano, and are alleged to have planted on lands which were previously the subject of illegal land grabs (Kröger 2012).

4.1.4 Percentages Used in Analysis

TABLE 5

Deforestation and Commodity Analysis—Brazil

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000-2012 deforestation due to commercial agriculture	90%	Morton et al. (2006) found that 91% of newly deforested land in Mato Grosso (the Brazilian state responsible for approximately 40% of national deforestation) became cattle pasture or cropland in 2002 and 89% in 2003. Grieg-Gran et al. (2007) estimate that 98% of Brazilian deforestation from 1996 to 2005 could be attributed to soy and cattle. Karstensen et al. (2013) state that the share of land use in the year of deforestation in most Brazilian states is 34.7% for soy and 65.3% for pastures (i.e. that 100% of initial deforestation is for agriculture). While there has been a dramatic rise in the proportion of Amazon deforestation taking place in small lots (< 25 ha) since 2007, it is unclear whether such deforestation can nevertheless be classified as commercial agriculture according to the definition used in this report (i.e. if smallholders form enterprises or participate in outgrower schemes) (Rawling 2014). In addition, even if the percentage of annual deforestation caused by subsistence had increased (which has not been shown) in recent years, this would make little difference to the proportion of cumulative deforestation from 2000 to 2012, which was due to commercial agriculture, given that most of that deforestation occurred in the early part of that period.
% of 2000-2012 deforestation for commercial agriculture which was illegal	68%–90%	Stickler et al. (2013) found that 90% of agro-conversion in the Brazilian Amazon from 2001 to 2009 was illegal due to clearance in excess of forest reserve limits. Though it is possible that the proportion of illegal agro-conversion for the study period 2000 to 2012 was lower, another study posits that a relatively small proportion of the deforestation that took place from 2000 to 2012 occurred during those years (INPE 2014), so a slight change in the illegal percentage for those years would not make much difference to the overall figure. The 90% figure matched that from a separate study published in 2009, which examined the period July 2006 to July 2007 (Greenpeace 2009a). Three-quarters of Brazilian deforestation over the period 2001 to 2012 was in the Brazilian Amazon (deforestation data sets from INPE (Amazon); UFG-LAPIG (cerrado)). There are no quantitative measures of the proportion of illegality in deforestation in the cerrado; for the mid-range estimate it is assumed that this biome had the same proportion of illegal clearing as the Amazon (based on WWF's assertion that "few producers comply" with laws in the cerrado too); if illegality in the cerrado were instead assumed to be zero, the overall proportion would decrease to 68%. It is assumed that the proportion of illegality prior to 2001 was the same as that during 2001 to 2009.
% of illegal commercial agricultural deforestation 2000-2012 embodied in exports	30%	Karstensen et al. (2013) found that 30% of Brazilian deforestation during 2000 to 2010 was embodied in exports of soy and beef. It is assumed that soy and beef from illegally deforested land are no more or less likely to be exported than the average.

Factor	Estimate	Justification
COMMODITY ANALYSIS		
Soy		
% of area of soy in 2012 which displaced forest	59%–61%	In total, soy was found to have led to 7.2 Mha of deforestation in Brazil in the 10 years to 2005 (Grieg-Gran et al. 2007), during which time the total area planted with soy increased by 11.1 Mha (FAOSTAT/USDA FAS). This suggests that at least 65 percent of new soy production during that period occurred at the direct expense of forest. Since 2005, a further 2 Mha of soy have been planted in Brazil (FAOSTAT 2014). Given the widespread evidence of the success of the soy deforestation moratorium in reducing the amount of deforestation due to soy in the Amazon after 2006 (GTS Soy Task Force, 2012), it is assumed that the proportion of post-2005 planting that displaced forest has been substantially lower (between 0% and 20%—almost all in cerrado rather than Amazon forests). For the period prior to 1995 (during which 11.7 Mha were planted), it is assumed that the proportion displacing forest was the same as for the subsequent 10 years (65%). So in total the figure is $(11.7 \text{ Mha} \times 65\%) + 7.2 \text{ Mha} + (2 \text{ Mha} \times 0\% - 20\%) / 25 \text{ Mha} = 59\% - 61\%$.
% of soy deforestation up to 2012 which was illegal	49%–69%–90%	It is assumed that the proportion of illegality in conversion of forest for soy prior to 2001 was the same as that during 2001 to 2009. Of a total of 7.2 Mha of soy-related deforestation estimated to have occurred during 1996 to 2005, 3.3 Mha (46%) was in the cerrado and the balance in the Amazon (Grieg-Gran et al. 2007). The low range overall estimate assumes zero illegality in soy-related deforestation in the cerrado, while the mid-range estimate assumes this to be 45% (thus, for example, the total mid-range percentage is calculated as $(54\% \times 90\%) + (46\% \times 45\%) = 69.3\%$).
COMMODITY ANALYSIS		
Tropical Timber		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	19%	Grieg-Gran et al. (2007) estimate volumes of tropical forest conversion timber at between 4.7 million m ³ and 14.7 million m ³ in 2004, compared with total production that year of 24.5 million m ³ , suggesting that it represents between 19% and 60% of production. However, their analysis also concludes that much forest clearance for agriculture involves little commercial harvesting. For this study, the lowest end of the implied range is therefore assumed for tropical wood exports. The same percentage found in 2004 has been assumed to persist over the entire reference period.
% of forest clearance illegal	90%	90% of Brazil's naturally grown tropical timber originates in the Amazon forests (Viana et al. 2002), where 90% of forest conversion during 2001-2009 was found to be illegal (Stickler et al. 2013).
Beef & Leather		
% of area of cattle in 2012 which displaced forest	79%	According to official government data, 45 Mha of cattle displaced forests in the Brazilian Amazon to 2007 (INPE 2011) to which can be added 3.9 Mha displacement in the cerrado between 1995 and 2005 (Grieg-Gran et al. 2007). Meanwhile, official data show a total of 62 Mha of land in Brazil occupied by cattle up to 2010 (INPE, Projeto PRODES, 2011). Combined, these figures suggest that a minimum of 79% $((45 \text{ Mha} + 3.9 \text{ Mha}) / 62 \text{ Mha})$ of cattle pasture in Brazil displaced forest.
% of cattle deforestation up to 2012 which was illegal	73%–82%–90%	Of a total of 21 Mha of cattle-related deforestation estimated to have occurred during 1996-2005, 3.9 Mha (19%) was in the cerrado and the balance in the Amazon (Grieg-Gran et al. 2007). The low range overall estimate assumes zero illegality in cattle-related deforestation in the cerrado, while the mid-range estimate assumes this to be 45% (thus, for example, the total mid-range percentage is calculated as $(81\% \times 90\%) + (19\% \times 45\%) = 81.5\%$).

4.2 Indonesia

4.2.1 Background

Indonesia is one of the three largest tropical forest countries in the world, with 131 Mha of forests, or approximately 68 percent of the country's land area as of 2011 (Ministry of Forestry 2011). Emissions due to land use change have made Indonesia among the world's top three greenhouse gas emitters, with 37 percent of emissions due to deforestation and 27 percent due to peat fires (National Council on Climate Change 2010).

Recent analyses of high-resolution satellite data show that Indonesia lost more than 6 Mha of natural forest between 2000 and 2012, with an increase in annual forest loss over this period (Margono et al. 2014). Deforestation was highest in 2012, the last year of the study. In that year, for the first time, a higher percentage of forest was lost in Indonesia than in Brazil, making Indonesia the new number one country in the world for tropical deforestation (though Brazil still maintains a higher rate of deforestation in all forest categories). The new figures contrast with the Indonesian government's claims that deforestation has been declining; part of the reason for the discrepancy is that the government only measures loss in areas designated as part of the "forest estate" (Mongabay 2014b).

Over the last 20 years, deforestation has been driven predominantly by the expansion of commercial agriculture, especially of monoculture oil palm and forest plantations. Other drivers of deforestation include logging (both legal and illegal), infrastructure development (including roads), aquaculture, small-scale and subsistence agriculture, forest fires, and, increasingly, mining (Indrarto et al. 2012).

4.2.2 Forest Conversion for Commercial Agriculture and Associated Exports

Though there is general consensus that commercial agriculture (particularly oil palm and timber plantations) is the largest driver of deforestation in Indonesia, there have been relatively few attempts to put a firm figure on its importance (see Box 5). One complicating factor is the common (yet illegal) use of fire by oil palm and timber plantation developers to clear land of forest (see Box 6). These fires regularly extend well beyond the boundaries of the intended area, and it is often difficult to attribute the cause of the initial fire. Another complicating factor is that, within licensed areas, clearance of forest may occur faster than planting, leaving large areas deforested but not planted (Grieg-Gran et al. 2007). In some cases, the developer may have used the plantation license to gain access to the timber with no intention of planting (FWI/GFW 2002); in others, planting may simply be lagging behind clearance (Boucher et al. 2011). Because of such complicating factors, deforestation caused by commercial agriculture is likely to be much greater than the total area of land actually planted. Unfortunately the former is more difficult to measure than the latter.

Only one of the studies in Box 5 included other types of commercial agriculture beyond the two main drivers (oil palm and timber or pulp plantations). Examination of FAOSTAT data for the area planted with alternative crops suggests that their contribution may be substantial, however. Between 2000 and 2010, only 45 percent of the increase in the total area of cropland (which does not include industrial timber or fiber plantations) in Indonesia was attributed to oil palm. The area under other crops increased by 4.7 Mha between 2000 and 2012 (FAOSTAT 2014). If even a small proportion of this expansion was at the expense of forests, it would represent a significant proportion of the total of 6 Mha of forest lost during that period and add substantially to the contribution to deforestation of commercial agriculture (i.e., beyond that measured in the studies in Box 5 as being attributed solely to oil palm and timber plantations).

BOX 5

Studies Estimating Forest Loss in Indonesia due to Oil Palm and Timber Plantations

- Between 1982 and 2007, 36 percent of the forest in Riau Province on the island of Sumatra—the province with by far the greatest area of recent deforestation in Indonesia (MOF 2011)—had been cleared for oil palm, and 24 percent had been cleared for timber plantations (Uryu et al. 2008). A further 5 percent had been cleared relatively recently (and thus not yet planted with crops), but may also be cleared for oil palm or timber plantations. Additional forest (less than 16 percent, approximately) had been cleared for other industrial agriculture, such as rubber and coconut plantations. Thus, 81 percent of all forest loss may potentially have been the result of clearing for commercial agriculture. A more detailed examination by the same study of deforestation within the Tesso Nilo-Bukit Tigapuluh-Kampar landscape (representing 55 percent of Riau) found that between 1990 and 2007 timber plantations contributed 46.5 percent of forest loss and oil palm plantations a further 34.2 percent—a combined total of 80.7 percent.
- Based on areas planted at the time of measurement, oil palm plantations were responsible for approximately 57 percent of deforestation between 2000 and 2010 in Indonesian Borneo (Kalimantan) (Carlson et al. 2013). The indirect effects are likely to have been much more extensive, however. An earlier study, covering just one of the four provinces of Kalimantan, found that 93 percent of deforestation between 1989 and 2009 was due to forest fires (Carlson et al. 2012). While only a small proportion of this land had been planted with oil palm at the time of the study, other evidence suggests that up to 80 percent of fire-related deforestation in Indonesia can be attributed to plantation development (FWI/GFW 2002), leading to a backlog of unused land (Boucher et al. 2011).
- Examining deforestation over nearly the whole of Indonesia during 2000 to 2010, Abood et al. (2014) found that 30.1 percent had occurred within mapped oil palm and timber plantation concessions. The total included 12.8 percent in areas solely licensed for timber plantations, 11 percent in areas solely licensed for oil palm plantations and 6.3 percent in “mixed concessions” (usually areas licensed for oil palm that overlap with areas also licensed for logging or mining). The study did not seek to estimate the drivers of forest lost outside the boundaries of concessions; for example, as a result of illegal encroachment or fires started within concessions that then burn, uncontrolled, outside the concession; nor did the study seek to estimate the proportion of forest outside such areas lost as a result of other commercial agriculture. A separate study by Greenpeace (2013f), using a similar methodology, found that 24 percent of deforestation between 2009 and 2011 took place within oil palm concessions.

Most of the conversion timber from natural forests, as well as the palm oil and plantation-grown wood produced at the expense of natural forests in Indonesia, are destined for export. In 2011, Indonesia exported between 70 and 80 percent of the palm oil the country produced.²⁷ Most of the plantation-grown wood produced in Indonesia is used in the production of pulp and paper. This study has calculated that in 2011, Indonesia exported around half of all the pulp it produced and also exported around half of the paper made from the pulp that was consumed domestically. Combined, these figures suggest that 75 percent of plantation wood used in the manufacture of pulp is exported.²⁸

²⁷ Low-end figure calculated from figures for palm oil production and exports for 2012/13 in USDA Foreign Agricultural Service, Oilseeds: World Markets and Trade, November 2013, Table 11: Palm Oil: World Supply and Distribution; high-end figure calculated from FAO data for production and exports in 2010 (FAOSTAT). A World Bank study from 2010 found that half of palm oil production is exported unprocessed, while around half of processed oil is exported as well, implying total exports represent at least 75 percent of production (World Bank 2010).

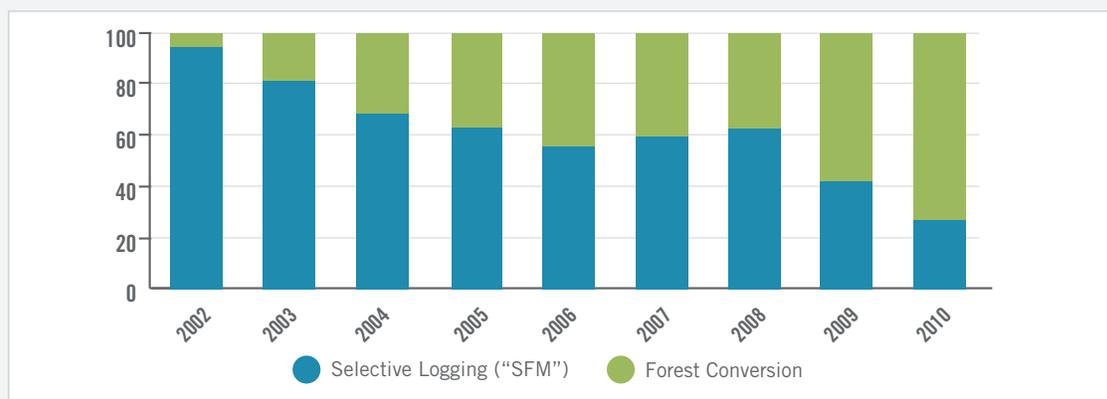
²⁸ Ministry of Forestry figures show 6.2 million metric tons (mt) of wood pulp production and 2.9 million mt of pulp exports (Ministry of Forestry 2011); Indonesia produced around 10 million mt of paper the same year (APKI, forthcoming), and exported 4.3 million mt (UN COMTRADE data).

According to official statistics, Indonesia exports the majority of the timber it produces. In 2010, for instance, the Ministry of Forestry reported total timber production of 42 million m³,²⁹ while total wood product exports reported the same year (in roundwood equivalent terms) were more than 40 million m³.³⁰ In reality, there is a large volume of illegal wood production that goes unreported (Blundell 2014). Indonesia consumes an estimated 10 million m³ of timber domestically (Klassen 2010), which (when considered alongside imports of 9 million m³ in 2010)³¹ implies that the real proportion of total wood supply (including natural forest and plantation wood) exported is around 80 percent.³² The proportion of natural forest conversion timber exported from natural forests is assumed by this study to be the same as the overall figure.

The importance of conversion timber in the legal supply is also increasing. Official figures from 2010 state that almost three-quarters of wood harvested that year from natural forests was from conversion (mostly from forests cleared for new timber plantations), up from just 6 percent eight years earlier (see Figure 9). The actual volume and proportion of conversion timber is almost certainly much higher, because a great deal of forest conversion is illegal (see Section 4.2.3) and the timber harvested is likely unrecorded in official figures (Blundell 2014). Estimates of real (recorded and unrecorded) conversion wood production (based on the area of new planting of timber and oil palm and assuming a conservative average volume of salvage production per hectare) suggest the true figure for conversion timber may be as much as 85 percent of the timber produced from natural forests. These estimates also suggest that the proportion of timber coming from conversion increased a lot earlier than the official figures suggest. As described in Section 4.2.3, recent analysis indicates that at least 75 percent of forest conversion in Indonesia is likely illegal; combining this with the estimate of real conversion production implies that at least 60 percent of all tropical wood produced in Indonesia is from illegal conversion.

FIGURE 9

Indonesian Natural Tropical Timber Production, 2002-2010 (Official Figures)



Source: Indonesian Ministry of Forestry production statistics (excluding plantation-grown wood), analyzed by the author.

²⁹ This volume is the equivalent volume in round wood of the volume of processed products reportedly produced by mills that use more than 6,000 m³ per year (Ministry of Forestry 2011).

³⁰ RWE export figures for all wood products (including furniture and pulp and paper) calculated by James Hewitt, based on Indonesian government data, available at <http://www.globaltimber.org.uk/indonesia.htm>.

³¹ RWE import figures for all wood products (including furniture and pulp and paper) calculated by James Hewitt for Forest Trends, based on Indonesian government data.

³² Calculated by comparing domestic consumption with total wood supply (production and imports). Total supply is 42 million m³ of domestic production plus 9 million m³ of imports (total of 51 million m³). Domestic consumption is 10 million m³, implying that the rest of the total supply must be 41 million m³ (51 minus 10) for export, which means that the proportion of total wood supply exported is 41 million/51 million, or 80 percent. It is assumed that products manufactured from domestic production and imports are equally likely to be exported.

4.2.3 Illegalities in Conversion

The main types of illegality documented in relation to the conversion of forests for commercial agriculture (defined in this study to include timber plantations) are corruption in the issuance of relevant licenses and conversion of forests without (or in advance of) all required permits.

Former governors of two of the four provinces most badly affected by deforestation have been sentenced to long jail terms for the corrupt issuance of licenses to convert forest to oil palm and timber plantations (see Box 7 for more information and evidence regarding such corruption). The most common failure in properly issuing permits involved forestry and environmental permits (the latter known as an AMDAL in the Indonesian acronym). When a proposed plantation is located on forest land, Indonesian regulations require that the land is formally “released” from the forest estate before conversion can begin; once this is accomplished, a separate permit (often a clearing permit; IPK in the Indonesian acronym) that licenses the felling of commercially valuable trees may be required. It is very common for companies to fail to obtain either of these documents.

Aside from these two broad categories of illegality, there are numerous documented instances of companies clearing forest outside concession boundaries (including in protected areas), clearing in prohibited zones within license areas (such as areas of deep peat or river buffers), the illegal use of fire to clear forest (see Box 6), the felling of protected tree species, and the conversion of more than the maximum 90 percent of natural forests within each concession.

Most information that one can use to attempt to measure the overall extent of illegality comes from independent studies or government audits covering certain types of permits within specific districts or provinces. Most suggest levels of illegality of at least 70 to 80 percent (see sections on timber plantations and oil palm below). There are two additional sources at a more holistic level, both of which also suggest a level of illegality in excess of 80 percent.

The first such national-level estimate of potential illegality comes from a comparison of volumes of timber officially reported as having originated from the conversion of forests for plantations with an independent estimate of the actual volume of timber that was likely to have been produced (using official data on areas planted, and assumptions regarding the volume of salvage timber produced per hectare). The study, by Forest Trends, estimated (based on a conservative assumption of an average of 38 m³ harvested per hectare during forest clearance) that 258 million m³ of conversion timber was likely to have been produced in Indonesia through clearance for timber and oil palm plantations between 2000 and 2010, as compared with just 46 million cubic meters of conversion timber officially reported as having been used in mills.³³ The analysis suggests that if used by these mills, then at least 82 percent of timber production from conversion for oil palm and timber plantations in Indonesia during that period was unreported and therefore illegal (Blundell 2014).

The second national-level estimate relates to the legal status of Indonesia’s forests and the issuance of licenses by the relevant government ministries for development. As of 2012, only 11 percent of Indonesia’s 131 Mha “Forest Zone” had been formally gazetted (Wells et al. 2012), a legally required process whereby ownership of the land is clarified and boundaries demarcated. This calls into question the legality of licenses issued outside the gazetted area (Colchester et al. 2003), which has recently been further underlined by two Constitutional Court decisions. In February 2012, the first of these court decisions reinforced the legal basis requiring that forestland must be gazetted (Wells et al. 2012), and the second decision (in May 2013) ruled that Indigenous Peoples’ customary forests should not be classified as “state forest” (AMAN 2013). One result of the failure to properly recognize indigenous and other local communities’ customary tenure has been widespread conflicts between local people

³³ By mills that use > 6,000 m³/yr.

and plantation developers. In 2012, Indonesia President Yudhoyono's office received reports of 8,495 agrarian conflicts, of which 2,002 were "likely to erupt into violence" (Human Rights Watch 2013).

BOX 6

Illegal Use of Fire to Clear Land for Oil Palm and Timber Plantations³⁴

It is illegal in Indonesia to use fire to clear forests, and yet every year, satellite data pinpoint hundreds of fire "hotspots" within areas of forest licensed for the development of oil palm and timber plantations. Examining fire hotspots that were detected in Riau between 1997 and 2007, 80 percent of the fires were associated with oil palm or timber plantations (Carlson et al. 2013). More than 60 percent of the land associated with fire in 2006 had been planted with oil palm or acacia a year later (Uryu et al. 2008). Global Forest Watch (2002) estimated that 80 percent of forests lost to fires nationwide during the peak period in 1997 to 1998 could be attributed to plantation development (FWI/GFW 2002). More recently, the World Resources Institute (WRI) reported that the fire events in Sumatra in June 2013 were mostly occurring within areas licensed for conversion (Sizer 2013).

Examination of all relevant published reports of allegations of illegalities in oil palm development in Indonesia shows that fire hotspots have been identified within almost every Indonesian oil palm concession. Though locating hotspots within concessions is easy, it is very hard to prove that these fires were started deliberately by the company to clear forest. Indeed, a study of a sample area in Riau that burned in the spring of 2014 showed that most fires that occurred within concessions either started outside those concessions or on land occupied by local or migrant communities within the concessions (Gaveau 2014). In the majority of published cases, however, most hotspots were found to occur at the same time that forest was being cleared, with planting ensuing shortly thereafter. In a small number of cases, more concrete evidence has been uncovered by authorities and prosecutions brought.

Even if fires were not started by concessionaires, this does not absolve them of legal responsibility. Aside from prohibiting the deliberate lighting of fires, Indonesian legislation also requires oil palm concessionaires to prevent fires on land under their control, and to have plans and equipment in place to tackle fires that do start. Proving a lack of compliance with these rules is easier, and few plantations in which this issue has been independently assessed have been found to comply.

³⁴ Sources for published NGO allegations regarding fire hotspots in oil palm plantations in Indonesia: Aidenvironment 2009; Atus 2009; BSI-CUC 2010; EIA/Telepak 2012b; Friends of the Earth Europe 2010a; Greenpeace 2007; Greenpeace 2008; Greenpeace 2009b; Greenpeace 2010; Greenpeace 2013b; Greenpeace 2013g; Milieudefensie 2007; Rainforest Action Network 2010a; Wakker et al. 2004; Gaveau 2014.

BOX 7

Corruption Relating to Conversion of Forests for Oil Palm and Timber Plantations

A number of major cases have exposed the extent of corruption in the issuance of licenses for conversion of forests to oil palm and timber plantations in Indonesia. Indeed, most of the \$100 million in assets recovered by the Indonesian Corruption Eradication Commission (Komisi Pemberantasan Korupsi, or KPK, a government agency established to fight corruption) has come from the forest sector, and most of this has come from illegal conversion cases (U4 2011).

- Riau (Sumatra):** In March 2014, the former governor of Riau was jailed for 14 years for the illegal issuance of permits to nine companies, all of them suppliers to Asia Pulp & Paper (APP 2014; Mongabay 2014a). The head of Riau's Pelalawan district had previously been jailed for issuing timber plantation licenses illegally between 2001 and 2006, including to companies owned by members of his family (Dermawan et al. 2011). The head of Riau's Siak District has also been jailed for timber plantation-related corruption (Tempo 2012). Ten of twelve wood suppliers for one of the largest pulp mills (Asia Pacific Resources International Limited (APRIL)) operating in the Kampar Peninsula obtained their licenses from the heads of these two districts (Eyes on the Forest 2012). APRIL suppliers received annual cutting licenses from three Riau Forestry Agency chiefs who have since been jailed for corruption (ibid.). The Provincial Forestry Department Head was also jailed in connection to the case, which is estimated to have caused losses to the state of \$131 million (U4 2011).
- East Kalimantan:** In 2007, a company was found to have illegally obtained through bribery 11 oil palm plantation licenses covering 147,000 ha between 1999 and 2006, then clear-felled the forest for timber but never planted oil palm. The company was fined \$36 million, and the Governor of East Kalimantan and a senior provincial forestry official were jailed, along with the company's director (Tempo 2008).
- Central Sulawesi:** In 2013 a prominent businesswoman was jailed for two years for paying a \$300,000 bribe to a district chief in Central Sulawesi in exchange for an oil palm license issued in contravention of national legislation (Antara News 2013). The district chief was in turn jailed for seven and a half years (Jakarta Globe 2013).

In addition to the corrupt issuance of licenses, there has been a long history of misuse of the Indonesian Reforestation Fund, a subsidy program intended to support development of timber plantations, from which US\$5.2 billion was embezzled in the mid-1990s (Barr et al. 2010). Among those convicted since is (former President) Suharto's half-brother, who was found to have fraudulently claimed that his company had planted almost twice the area of forest that it had (Jurgens et al. 2005). Corruption and misuse of the Reforestation Fund remained a problem in the post-Suharto era (Barr et al. 2010).

In 2012, the KPK established an Action Plan to address the widespread corruption in the forest sector, and obtained a commitment from 16 government ministries/agencies to implement the Plan through the signing of a Memorandum of Understanding (Government of Indonesia 2013).

Evidence Specific to Timber Plantations

Two companies, APP and APRIL, dominate the industrial timber plantation sector in Indonesia. They jointly control over 75 percent of pulp production capacity (Barr 2007) and 3.5 Mha of timber plantation concessions (Barr 2010), and produce 80 percent of Indonesia's paper (Barr 2008). Investigations by the Indonesian government and NGOs over many years have documented widespread illegalities in natural forest conversion for timber plantations by both companies, including:

- An Indonesian government audit report published in 2009 found that 19 pulpwood plantation licenses (out of an unknown number examined) had been issued illegally between 2002 and 2008; all of the companies subsequently supplied APP with conversion wood from the illegally licensed areas (BPK-RI 2009, cited in Greenomics 2011).
- In 2012, Indonesia's Ministry of Environment told reporters it was planning to bring a civil case against fourteen companies in Riau for illegalities in the conversion of forests for timber plantations; six of the companies are reportedly linked to APP and six to APRIL. Damages in the case are estimated at \$225 billion. The case builds on evidence from a province-wide criminal police investigation that took place in 2007 (Mongabay 2012a).
- In September 2013, the Indonesian government announced that five pulpwood suppliers had been named as suspects in relation to fires that ravaged Sumatra during the summer of 2013, leading to a regional smog crisis that made worldwide headlines. According to local NGOs, three of the named pulpwood producers are suppliers to APP, while another is a supplier to APRIL (Eyes on the Forest 2013a).
- In 2013, Eyes on the Forest, a coalition of environmental NGOs, including WWF Indonesia and Friends of the Earth Indonesia, examined compliance with three key regulations by APP and APRIL's suppliers in Riau province (where the majority of Indonesia's pulp plantations are located) and found that:
 - 77 percent of APP's conversion during 1985 to 2012 was "legally questionable" in one or more ways, for example: within areas not zoned for conversion (35 percent), in areas of peat more than 3 meters deep (34-44 percent), and/or in excess of the maximum 90 percent conversion allowed in each individual concession (4 percent) (Eyes on the Forest 2013a);
 - conversion by companies supplying APRIL was also "legally questionable:" in areas of deep peat (40-50 percent) and/or in forests not zoned for conversion (46 percent);³⁵
 - a Greenpeace investigation in 2011 found that large volumes of legally protected ramin (*Gonystylus* spp.) was being processed in APP's Indah Kiat pulp mill (Greenpeace 2012a). This followed the discovery the previous year of ramin fiber in paper products made in Indonesia on sale in the US (WRI 2010). In 2012, Indonesia's Forestry Ministry started an official government investigation into Greenpeace's findings and later confirmed that two APP group companies had supplied the mill with ramin logs (Greenomics Indonesia 2013);

In February 2013, APP announced a total moratorium on natural forest conversion, pledging to only develop non-forested areas (rather than High Conservation Value (HCV) and High Carbon Stock (HCS) areas) to ensure that forest peatland is protected and to implement a set of legal consultation principles to respect indigenous

³⁵ Eyes on the Forest's interactive mapping function, <http://maps.eyesontheforest.or.id/>. An overall figure for the proportion of conversion found to be legally questionable was not available in this case. Again, it should be noted that since some areas were illegal in more than one way, the individual percentages do not sum.

and local communities' customary rights (APP 2013). APP's fiber supply should now be reliant on plantation wood grown on land it previously deforested, or on non-forested land. In contrast, APRIL continues to source around two-thirds of its wood fiber from logging of natural forests.³⁶

Evidence Specific to Oil Palm Plantations

In 2011, an Indonesian government task force announced the results of a province-wide assessment of permit compliance by oil palm concessions in Central Kalimantan. The task force found that 81 percent of oil palm plantations were operating without required Forest Relinquishment permits from the Ministry of Forestry; the majority of these also lacked IPKs (Greenomics 2011). A separate investigation across all of Indonesian Borneo, published the following year, found that two-thirds of mining and plantation companies were operating without required environmental impact assessments (EIA/Telapak 2012b).

In October 2012, the Indonesian REDD+ Task Force announced that it was working with various authorities to pursue nine forest crime cases against oil palm plantations (Lestari Post 2012). The crimes involved converting forest without a conversion permit (IUP), clearing forest within moratorium areas, and land clearing through burning. Three oil palm concessions are also among those named as suspects in relation to the forest fire crisis of the summer of 2013. Two are apparent repeat offenders: one of these companies was convicted of illegally clearing forest using fire ten years earlier (AFP 2003),³⁷ while another was previously alleged to have done so.³⁸

The extent of illegality has been further confirmed by a recent in-depth study of compliance by all oil palm plantations in one district in Central Kalimantan commissioned by Forest Trends and Chatham House (AidEnvironment, forthcoming). The study collected and examined official permits and maps, and compared these with satellite data to assess various aspects of legal compliance. The results (which indicate apparent violations, though these have yet to be proven in court) show that 20 of the 35 oil palm plantations (57 percent) involved permits being issued improperly and/or without other required permits (such as AMDALs). Twelve of the 33 (36 percent) active plantations were found to have begun clearing forest before receiving all necessary permits, while 20 (61 percent) were also found to have cleared forest outside concession boundaries. Of the two oil palm concessions in the district with forest on deep peat, one had converted 85 percent while the other had converted 100 percent of the peat area. Two concessions also illegally overlapped with and had cleared forest within a National Park. Of a total of 35 plantations that were assessed against one or more of these aspects of legality, 32 (89 percent) were found to be associated with at least one apparent illegality, while 64 percent were associated with two or more (AidEnvironment, forthcoming).

In addition to the general evidence above, there have been numerous individual documented case studies of alleged illegalities in the conversion of forest for oil palm plantations in Indonesia. Forest Trends has collated and analyzed all available published evidence and allegations (up to the end of 2013).³⁹ While not exhaustive (see Figure 10 for a full list of sources), the collated information nevertheless includes cases associated with 100 separate plantations, or around 10 percent of the total number of plantations in the country. In many cases, multiple breaches have been exposed within the same plantation. In some cases, illegalities have been exposed in specific concessions on multiple occasions. The most common illegalities documented are clearance without all required permits (50 cases), evidence of use of fire to clear forest (50 cases), and improper license issuance (48

³⁶ Government data cited by Greenpeace shows that 60 percent of fiber supply to APRIL's Riau Andalan Pulp & Paper pulp mill is from natural forest conversion (Greenpeace 2013a).

³⁷ PT Adei Plantation was previously convicted in 2003 of illegally using fire to clear 3,000 ha of land. The Director of the company was jailed, and a \$1.1 million fine was levied (AFP 2003).

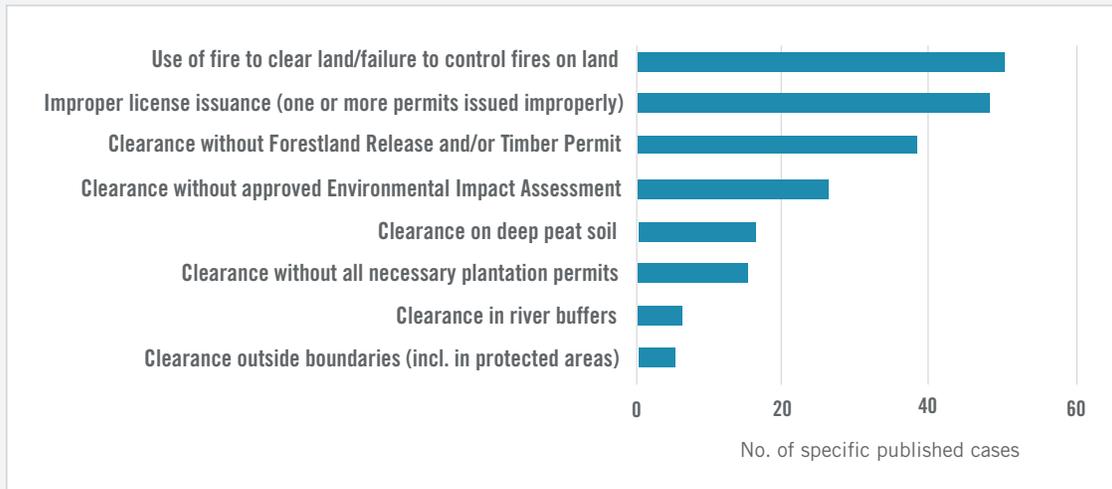
³⁸ PT Jatim Jaya Perkasa. See Wakker et al. 2004, as cited in Milieudefensie 2007.

³⁹ The majority of these cases were investigated and exposed by NGOs, but many cases have been confirmed by independent experts or have been uncovered by the Indonesian authorities themselves.

cases) (Figure 10). Oil palm companies were found to have begun converting forests without having an approved Environmental Impact Assessment (AMDAL) in 26 cases, which would render irregular all subsequent licenses issued because these other permits are not supposed to be issued before the AMDAL is approved. It is commonly reported that officials sign off on permits without or in advance of the previous permit having been issued.

FIGURE 10

Summary Data on Specific Named Cases of Alleged Illegalities and Irregularities in Oil Palm Conversion in Indonesia, 1999-2013



Note: Summary analysis of published cases, based on NGO reports, independent verification missions, and press reporting of cases prosecuted by government.⁴⁰

⁴⁰ Sources consulted include AFP 2003; Aidenvironment 2008; Aidenvironment 2009; Antara News 2013; Atus 2009; BBC 2010; BSI-CUC 2010; Center for Orangutan Protection 2010; EIA/Telapak 2009; EIA/Telapak 2011a; EIA/Telapak 2011b; EIA/Telapak 2012a; EIA/Telapak 2012b; Equator Online 2007; Friends of the Earth et al. 2008; Friends of the Earth Europe 2010a; Friends of the Earth Europe 2010b; Greenpeace 2007; Greenpeace 2008; Greenpeace 2009b; Greenpeace 2009c; Greenpeace 2010; Greenpeace 2013b; Greenpeace 2013g; Milieudefensie 2007; Mongabay 2013b; News 24 2000; NGO Coalition 2011; Rainforest Action Network 2010a; TÜV Rheinland 2011; Wakker 2014; Wakker et al. 2004.

CASE STUDY 2

PT Suryamas Cipta Perkasa (PT SCP; a Subsidiary of PT BEST Group) Oil Palm Plantation

In 2012, the Environmental Investigation Agency (EIA) and Telapak (a national civil society organization) published the findings of their extensive investigations into one oil palm concession in Pulang Pisau district of Central Kalimantan, Indonesian Borneo (EIA/Telapak 2012b). Analysis of permits and satellite images, field investigations and interviews with members of the local community provided evidence of a series of illegalities related to the concession. The investigation showed that the plantation business permit (IUP) for the concession had been illegally issued without the required Environmental Impact Assessment (AMDAL) having been approved. The investigation also showed how the company breached numerous regulations while clear-felling the forest between 2007 and 2010. For example, the company had cleared the forest within its concession without it having been formally released by the Ministry of Forestry, and without a legally issued timber exploitation permit. It had also begun clearing forest and planting oil palm before its AMDAL had been approved. The company had cleared thousands of hectares of forest on peat soils deeper than the maximum allowable by law, and had even cleared forest and planted oil palm up to 2 km outside the boundaries of its concession.

Numerous fire “hotspots” that were found within the concession during the period when the forest was being converted also suggest that—at a minimum—the company failed to mitigate the risk of fire during land clearing and failed to deploy firefighting to extinguish any fires, as required by law. Members of the local community (which is in conflict with the company after promises of compensation were repeatedly broken) also alleged that the company had cut protected ramin (*Gonystylus spp.*) trees and even paid people to hunt and kill orangutans within the concession. Another company within the PT BEST group operating elsewhere in Central Kalimantan had previously been found to have illegally cleared 2,500 ha of forest within Tanjung Puting National Park.

EIA and Telapak provided a dossier of evidence to the authorities, but there was little or no meaningful action taken. Thus, the case also raised major concerns over both the ability and the willingness of relevant branches of the Indonesian government to enforce laws related to oil palm development.

Evidence Relating to Other Crops

Though this report focuses on oil palm and industrial timber plantations, other crops may also be important, including coffee, cocoa, and sugarcane. Case studies demonstrate illegalities in forest conversion for these crops too. For instance, WWF Indonesia (2007) found that 18 percent of Bukit Barisan Selatan National Park in Sumatra had been illegally degraded or deforested for growing coffee, and concluded that at least 10 percent of all coffee exports from that part of Sumatra were illegally produced. The coffee was documented as being exported to the US, Europe, and Japan. Meanwhile, the legality of numerous licenses issued recently for large-scale food estates (for sugarcane, maize, soy, and other plantation crops including oil palm) covering more than 2.5 Mha of mostly forested land in Merauke district of Papua province has been called into question by civil society and community organizations (Forest Peoples Programme 2013), including Indigenous Peoples living in Merauke who have taken their complaints to the United Nations.

4.2.4 Percentages Used in Analysis

TABLE 6

Deforestation and Commodity Analysis—Indonesia

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	80%	Uryu et al. (2008) examined Riau (the province with the greatest area of deforestation in the country) and found that between 1982 and 2007, 81% of deforestation appears to have been related to commercial agriculture. That is, 36% of forest had been cleared for oil palm (including smallholder commercial plantations) and 24% for timber plantations. A further 5% had been cleared relatively recently and may also have been due to be planted for oil palm and/or timber plantations. Additional forest (less than 16%) had been cleared for other industrial agriculture, such as rubber and coconut plantations. Though other studies have attributed smaller proportions of total deforestation to oil palm and timber plantations, such studies do not assess other commercial crops and they suffer from other methodological issues that likely significantly understate the true proportion of deforestation attributable to oil palm and timber plantations (see Section 4.2.2 and Box 5 for further explanation and analysis).
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	80%	Four separate sources suggest a figure between 80% and 90%. Firstly, a government audit found that 81% of oil palm plantations in Central Kalimantan (the province with the second largest area of such plantations in Indonesia—PwC Indonesia 2012) were non-compliant (BPK 2009, cited in Greenomics Indonesia, 2011). Secondly, a recent analysis by Forest Trends comparing officially reported use of conversion wood with estimates of actual production found that from 2000 to 2010, 82 percent of conversion wood consumption may not have been officially reported and would, therefore, be illegal (Blundell 2014). Thirdly, an analysis of compliance by oil palm plantations in one sample district in Central Kalimantan found 89% were associated with one or more illegalities (Aidenvironment, forthcoming—see report text for additional details). Finally, as of 2012, only 11% of Indonesia's 131 Mha "Forest Zone" had been formally gazetted as required by law (Wells et al. 2012). This calls into question the Ministry of Forestry's authority over the majority of the country's forests, and thus the legality of licenses issued for the development of oil palm and timber plantations in areas of ungazetted state forest (Colchester et al. 2003).
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	75%	Indonesian government data show roughly similar areas planted with oil palm and timber plantations during the reference period (Ministry of Forestry 2011), while the evidence for illegality proportions for each is also similar (e.g., BPK 2009, cited in Greenomics Indonesia 2011, Eyes on the Forest 2013a—see Section 4.2.3). Therefore the overall export percentage assumes that half of the total illegal agro-conversion during the reference period was for oil palm and the other half for timber plantations. Proportions of palm oil production assumed to be exported (75%) is the mid-range of three available figures cited in Section 1.2.3 (USDA 2013—70%; FAO 2010—80%; World Bank 2010—75%). It is assumed that 75% of timber plantation production is also exported. This is based on evidence from pulp and paper (which is likely the destination of most of the conversion wood, as well as the plantation-grown acacia that replaces it). Analyses of official data suggest half of all pulp production is exported directly, while another quarter is exported after being processed into paper (details of the calculation are provided in the reference in Section 1.2.4 of the report). Thus, the final overall export percentage is calculated from the above as follows: $(50\% \times 75\%) + (50\% \times 75\%) = 75\%$.
COMMODITY ANALYSIS		
Oil Palm		
% of area of oil palm in 2012 which displaced forest	69%	69% of land in Indonesian Borneo (Kalimantan) converted to oil palm during 1990 to 2010 was forested (Carlson et al. 2013). The analyses herein assume that the same proportion applies to oil palm plantations developed before and since, as well as elsewhere in Indonesia. This is considered reasonable given that around a third of Indonesia's oil palm plantations in 2010 were found in Kalimantan (PwC Indonesia 2012), and most of Indonesia's oil palm planting has taken place since 1990 (Rainforest Foundation UK 2013).

Factor	Estimate	Justification
% of oil palm deforestation up to 2012 which was illegal	80%	See justification for illegality percentage in deforestation analysis above.
COMMODITY ANALYSIS		
Tropical Timber		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	75%	Official data from the Ministry of Forestry suggest that 73% of wood sourced from natural forests (i.e., excluding plantation-grown wood) in 2010 came from conversion. The real proportion originating from conversion is likely considerably higher, given that independent estimates suggest that a great deal of conversion wood is not captured in official statistics (Blundell 2014).
% of forest clearance illegal	80%	Comparison of official conversion wood production volumes with conservative estimates of volumes actually harvested (based on areas converted and typical yields) suggest that over the period 2000-2010, if used by commercial mills (using > 6000 m ³ /yr), 82% of timber production from conversion of forests for oil palm and timber plantations went unreported and was therefore illegal (see report text—calculated from data presented in Blundell 2014).
Pulp & Paper		
% from conversion wood	37%	Two large companies, APP and APRIL, produce 80% of Indonesia's paper production (Barr 2007). The two companies are similar in size (ibid.), and for the purposes of this study they are assumed to be equal (each producing 40% of total exports). The overall estimate of the proportion of pulp and paper exports sourced from conversion wood in 2012 assumes that none of APP's production is from conversion wood (based on the company's zero deforestation commitment), while two-thirds of APRIL's is from conversion (Greenpeace 2013g). For the remaining production (20%), the analysis assumes that half is from conversion wood and the remainder produced from plantation-grown wood. Thus, $(40\% \times 0\%) + (40\% \times 66\%) + (20\% \times 50\%) = 37\%$.
% displacing forest	50%	Grieg-Gran et al. 2007, citing FWI/GFW 2002, estimate that 50% of all pulp plantations in Indonesia have directly displaced natural forest.
% illegal	80%	75% of natural forest conversion for timber plantations in Riau during 1985 to 2012 was "legally questionable" (Eyes on the Forest 2013a). Their study did not assess compliance with a number of regulations known to be commonly breached (see report text), so for the analyses herein, the overall rate of illegality is assumed to be slightly higher, i.e., 80%.

4.3 Malaysia

4.3.1 Forest Conversion for Commercial Agriculture and Associated Exports

In Malaysia, most conversion of natural forests for timber plantations in the last ten years has occurred in Malaysian Borneo (Sabah and Sarawak). The majority of recent deforestation in Malaysia has been in the large state of Sarawak in Malaysian Borneo. A study published in 2011 found that Sarawak was losing its forests at a rate of more than 2 percent per year in the late 2000s, a rate faster than any major tropical forest nation during the same period.⁴¹ Analysis by the author for this report suggests that of the roughly 900,000 ha of forest lost in Sarawak between 2006 and 2010, 43 percent was converted to oil palm and 21 percent was converted to timber plantations.⁴²

⁴¹ Calculated from forest area data for 2005 and 2010 in FAO Global Forest Resources Assessment 2010.

⁴² Satellite image analysis by SarVision (2011) found that 865,836 ha of forest were lost in Sarawak in the five years to 2010. Analysis of official data from the Malaysian Palm Oil Board and the Sarawak Forest Department shows that 376,000 ha of new oil palm plantations and 184,500 ha of new timber plantations were planted during the same period.

Oil palm plantations have been the main driver of forest conversion in Malaysia in recent decades. Initially, much of the expansion of oil palm took place at the expense of rubber and coconut plantations rather than natural forest. By the early 2000s, however, most such areas had been repurposed, and most new oil palm developments since have been on newly deforested land. Grieg-Gran et al. (2007) concluded that of about 1.1 Mha deforested in Malaysia between 1995 and 2005, 70 percent was cleared to make way for oil palm plantations. Malaysia exports 90 percent of the palm oil it produces.⁴³

Since 2000, conversion of forests to industrial timber plantations has been another important driver of deforestation. In Sarawak, timber plantation development did not begin in earnest until 2004 (Sarawak Forest Department 2011), so few plantations are mature and production remains low. In Sabah, most plantation wood is used for pulp and paper production, the vast majority of which is exported.⁴⁴ Available data suggest that Malaysia as a whole exports at least 70 percent of the timber it produces.⁴⁵ Comparison of export and production figures for Sarawak in Malaysian Borneo suggests that it exports nearly 100 percent of the timber it produces.⁴⁶ As in Indonesia, the proportion of conversion wood exported is most probably similar to the total.

There are no official published figures for the volume of conversion timber produced in Malaysia (the world's largest tropical wood exporter) or how much this represents of total tropical wood production in the country. However, analysis for this study (see Box 8) suggests that two-thirds of timber production in Sarawak (the state responsible for the majority of Malaysian production) in 2010 may have originated from conversion, an increase from a little over half compared to four years earlier.



Forest being cleared for oil palm within a proposed National Park, Sarawak, Malaysia © Sam Lawson / Earthsight / Global Witness

⁴³ Calculated from figures for palm oil production and exports for 2012/13 in USDA Foreign Agricultural Service, Oilseeds: World Markets and Trade, November 2013, Table 11: Palm Oil: World Supply and Distribution.

⁴⁴ There is one large pulp and paper producer in Sabah, Sabah Forest Industries (SFI). Between 90 and 100 percent of its production is exported (<http://sabahforest.en.gongchang.com/about>).

⁴⁵ Calculated from figures for exports and domestic consumption in 2007 in Lawson and MacFaul (2010).

⁴⁶ Sarawak Forest Department (2011) gives log production as 9.6 million m³; official export figures for the same year from Sarawak Timber Industry Development Corporation (STIDC), converted into round wood equivalent (RWE) using typical factors, show exports of 9.5 million m³.

BOX 8**Estimating Conversion Wood Production in Malaysia**

New research has been carried out for this report in order to inform an estimate of the proportion of tropical timber produced and exported from Malaysia that originates from conversion of forests for agriculture and timber plantations, as opposed to selective logging.

The first piece of new analysis examines the Malaysian state of Sarawak in Borneo, which is responsible for 60 percent of Malaysia's production of logs from natural forests.⁴⁷ The estimate of conversion wood production is based on satellite measurements of the area deforested, and a conservative assumption of an average of 38 m³ of salvage wood production per hectare from heavily degraded forest (Blundell 2014) (as opposed to a typical standing stock of as much as 300-400 m³/ha in virgin tropical forest). The results (Table 7) suggest that two-thirds of timber production in 2010 may have originated from conversion, an increase from a little over half compared to four years earlier.

TABLE 7

Estimates of Conversion Timber Production in Sarawak, Malaysia⁴⁸

Year	Area deforested (ha)	Area planted with oil palm & timber plantations (ha)	Estimated timber production from conversion (assuming 38m ³ /ha) (m ³)*	Total official log production (m ³)	Implied proportion of log production originating from conversion
2006	169,649	84,000	6,446,662	11,864,495	54%
2007	169,649	143,500	6,446,662	11,890,244	54%
2008	174,503	120,000	6,631,114	11,335,577	58%
2009	174,503	110,500	6,631,114	10,367,392	64%
2010	177,532	102,500	6,746,216	10,151,766	66%

* The estimate of timber production from conversion is calculated from the area measured as deforested in a given year, rather than the area recorded as having been planted with oil palm and timber plantations; salvage timber is produced at the time the forest is destroyed, while planting may occur some time later.

This estimate is supported by analysis of detailed Indian customs data for shipments of logs from Malaysia over a one-month period in 2013 (India is the destination for about two-thirds of reported Malaysian log exports, 93 percent of which come from Sarawak).⁴⁹ About two-thirds of the shipment records include information on the diameter and species of the logs concerned, and 58 percent of those records describe the logs as "small" or "super small." Based on the standard minimum cutting diameters in selective logging of the different species involved, it can be shown that of the logs for which diameter information

⁴⁷ Calculated from data from 2012 Annual Reports for Sabah Forestry Department, Peninsular Malaysia Forestry Department, and Sarawak Forestry Department.

⁴⁸ Sources: Area Deforested: SarVision 2011. (Note that figures for 2006/2007 and 2008/2009 are identical as they are averages from measurements covering a two-year period.); Area converted to oil palm plantations: based on annual figures for planted area published by Malaysian Palm Oil Board; Area converted to timber plantations, and total official log production: Sarawak Forest Department website (www.forestry.sarawak.gov.my); Log production per hectare in degraded forest: Blundell 2014.

⁴⁹ Calculated from figures in MTIB 2012.

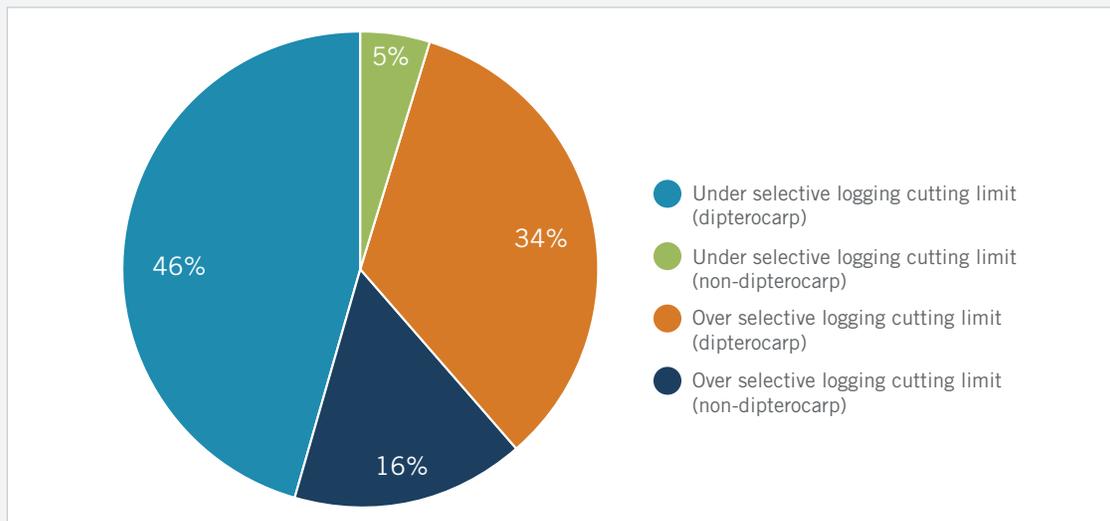
BOX 8, cont.

Estimating Conversion Wood Production in Malaysia

is available, just over half were below the legal cutting diameter for selective logging, and therefore most likely, came from forest conversion (see Figure 11). Though it is possible that a small proportion of these logs were illegally harvested within selective logging concessions (and did not, therefore, originate from forest conversion), this is unlikely to be true for the vast majority of such logs.⁵⁰ Including those logs for which diameter information was not available, the data shows that *at least* 32 percent, and possibly as much as 69 percent (if all unspecified logs were small), of the logs being imported by India from Malaysia originated from conversion.

FIGURE 11

Conversion Timber in Indian Imports of Malaysian Tropical Logs, July 21 to August 20, 2013



Detailed shipment records for all imports of logs (HS4403) into India from Malaysia between July 21 and August 20, 2013, sourced from www.zauba.com and collated and analyzed by the author. Records for 60 percent of the volume involved note whether the logs are "regular," "small," or "super small;" these terms refer, respectively, to logs which have diameters greater than 60 cm, between 45 and 60 cm, and below 45 cm. In Sarawak, the minimum cutting diameter is 60 cm for dipterocarps and 45 cm for non-dipterocarps.

Other sources: Blundell 2014; SarVision 2011.

⁵⁰ Based on the author's experience carrying out field research on logging compliance in Sarawak.

4.3.2 Illegalities in Conversion

Agricultural and timber plantations being developed in natural forest areas in Malaysia generally have the requisite licenses from the forestry authorities, are in compliance with land laws, and pay all due taxes on timber harvested during conversion. Environmental Impact Assessments are also normally obtained where this is required (though the requirement is sometimes circumvented via legal loopholes). Regulations on peat depth and forest fire prevention are also less stringent than in Indonesia, so there are fewer laws available to be broken.

However, there is a wealth of evidence to suggest that many plantations are developed in violation of indigenous land rights (known as Native Customary Rights (NCR) in Malaysia). There are also many cases of alleged corruption in the issuance of relevant licenses, although—unlike in Indonesia—no cases have actually been successfully prosecuted. There is also evidence to suggest that breaches of regulations during plantation development are common across the country.

A study commissioned by Forest Trends identified 53 separate documented case studies from the last ten years of alleged illegalities in forest conversion for commercial plantations in Malaysia (see Table 8). This included case studies from every major forested state in the country. The majority of the case studies relate to oil palm plantations, though there are also multiple case studies relating to rubber and industrial timber plantations. In East Malaysia (Sabah and Sarawak) all of the cases relate to corruption and/or violations of NCR in the issuance of plantation concessions. Most of the cases in Peninsular Malaysia relate to alleged breaches of environmental and planning laws in permitting and during development, though there are also cases involving NCR and corruption.

TABLE 8

Summary of Published Case Studies of Illegalities and Irregularities in Agro-Conversion in Malaysia

Region	No. of Cases	Alleged Illegalities	Plantation Types
Peninsular Malaysia	13	Violation of environmental and planning laws; corruption; violation of native customary rights	Rubber, oil palm, and timber plantations
Sabah	4	Corruption; violation of native customary rights	Oil palm and timber plantations
Sarawak	36	Corruption; violation of native customary rights	Oil palm (35) and timber (1) plantations

Source: Lim 2013.

Native Customary Rights

Allegations of NCR breaches in the allocation of leases over forestland have been the most contentious issue in plantation development in Malaysia for the last 20 years. Though federal and state laws enshrine the rights of local people to the land on which they have traditionally depended, affected communities and non-governmental organizations claim that these rights have been almost universally abused in the issuance of logging and plantation licenses. NCR conflicts are a feature in almost every new plantation project in Malaysia, with the situation being particularly serious in the states of Kelantan and Sarawak (Lim 2013). In the face of

federal and state governments that insist that all of the leases are legal, communities have turned to the courts to seek redress. There are presently around 200 NCR land cases pending in the Sarawak courts alone (SACCESS 2012), and new cases are being filed every year at a faster rate than old cases are resolved. Some unresolved cases are more than a decade old. Though a number of cases also relate to selective logging concessions and construction of roads and dams, most cases relate to plantation development. Of 139 relevant NCR cases in Sarawak filed between 1995 and 2009, at least half involve plantations, and most of these involve oil palm plantations.⁵¹

Of the four NCR cases involving oil palm and timber plantations that had been concluded by the end of 2009, all had ruled in favor of the plaintiffs.⁵² Since then, a number of additional court decisions have been made in favor of local communities in NCR cases involving logging and plantation companies (Yong 2010). For example, in one recent case involving an oil palm plantation development controlled by Ta Ann, one of Sarawak's largest logging and plantation companies, the Sarawak Court of Appeal ruled that a large part of the oil palm plantation was NCR land and that the lease over it was illegal (Maliasikini 2013; Tawie 2013). One particularly high-profile oil palm-related case that ruled in favor of the community in 2010 was later overturned by a higher court, however (Borneo Post 2013).

Corruption

Three-quarters of the cases of alleged illegalities in agro-conversion in Malaysia documented by the author include allegations of corruption. Almost all of these cases relate to political patronage, cronyism, and nepotism in the issuance of licenses, usually at a very high level. The most serious evidence of corruption comes from the states of Sabah and Sarawak in Malaysian Borneo (which together account for two-thirds of Malaysia's remaining forests). The Chief Ministers of both states have been the subject of investigations by the Malaysian Anti-Corruption Commission for alleged corruption related to the issuance of logging and plantation licenses (Malaysiakini 2012).

In 2011, NGOs released official documents that showed 200,000 ha of land in the Sarawak had been leased for oil palm development to companies with family connections to the Chief Minister, in exchange for payments which appeared to be far below the real value (Sarawak Report 2011). The following year, an investigation by the NGO Global Witness supported these allegations. An undercover investigator posing as an investor seeking land in Sarawak for a plantation approached the relevant government authority and was offered four plots of land. Members of the Chief Minister's family were "direct shareholders in or beneficial owners of three of these land leases, while the fourth deal was, according to an intermediary, proposed on [sic] the understanding that Taib would receive a multimillion dollar kickback from the selling party." Global Witness was also told by a senior government official and a timber industry executive that companies seeking plantation licenses needed to make "unofficial payments" to the Chief Minister. The Chief Minister and other individuals investigated have vigorously denied the allegations made by Global Witness (Global Witness 2013a).

Other Illegalities and Irregularities

Malaysia's National Auditor General, reviewing the performance of State Forestry Departments in 2008, noted that many of Peninsular Malaysia's forest reserves had been encroached by oil palm and rubber plantations. Concerns were raised by the Auditor General about the extent to which regulations had been properly followed when the licenses for these plantations were issued. In one forest reserve in Johor state, for instance, the Forestry Department had issued licenses in excess of the maximum permitted size and in areas of intact forest

⁵¹ Analysis by the author of list of cases in Appendix 1 of Yong (2010).

⁵² Analysis by the author of list of cases in Appendix 1 of Yong (2010).

(Wakker 2010). A joint government and donor study found that the procedures followed for de-gazetting protected areas for conversion were “clearly not according to legal principles” (ibid.).

In addition to problems related to license issuance, the Auditor General also found many cases where conversion for plantation development had taken place without required Environmental Impact Assessments; either the requirement had simply not been followed, or it had been circumvented in a legally questionable manner. Field investigations also uncovered a number of cases where illegal clearance had taken place in river buffers and on steep slopes, and where clearance had extended beyond licensed boundaries (ibid.).

The relative paucity of information on compliance with environmental and other regulations during forest conversion in Sarawak and Sabah is due to a lack of interest in documenting such matters amongst NGOs and local communities, and cannot be taken to imply that compliance is good. NGOs, local communities, and activists in Sarawak and Sabah are focused on the overarching legality of the concessions themselves, in terms of customary rights and corruption, and view compliance issues during conversion as being secondary if (as they allege) the concession was illegally issued and therefore its entire operations are illegal. The state governments, on the other hand, do not provide any information on their own monitoring and assessments of compliance. On the few occasions where such issues have been investigated, apparent illegalities have been documented. Illegal clearance on steep slopes was recorded in one industrial timber plantation in Sarawak in 2009 (Norwegian Council on Ethics 2010), while illegal clearance of steep slopes and along river banks was documented in an oil palm concession in the same state in 2011 (Global Witness 2012). Given the well-documented close and allegedly corrupt relationships between the major oil palm and timber plantation companies in Sarawak and senior officials in government, it is unlikely that there is significant enforcement of regulations. This interpretation is supported by the much more extensive independent information available related to compliance by some of the same companies with regulations governing selective logging (Norwegian Council on Ethics 2012a; 2012b).

4.3.3 Percentages Used in Analysis

TABLE 9

Deforestation and Commodity Analysis—Malaysia

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000-2012 deforestation due to commercial agriculture	87%	Grieg-Gran et al. (2007) found that 70% of Malaysian forest loss 1995-2005 was due to oil palm and an additional approximately 17% due to pulp plantations, making a total of 87%. It is assumed that the proportion of deforestation attributable to these two drivers was the same in 2000-2012. Deforestation for other commercial plantation crops is not considered, as oil palm has largely displaced rubber, cacao, and other formerly cultivated plantation crops.
% of 2000-2012 deforestation for commercial agriculture which was illegal	0%–43.4%–86.7%	No suitable quantitative data exist on which to base estimates, though plentiful qualitative data demonstrate that problem is widespread, especially in Sarawak (Lim 2013), which was the location of 57% of oil palm planting in 2000 to 2012 (Malaysian Palm Oil Board 2013). The mid-point of the range assumes the problem is 50% of the measured average of Indonesia, Cambodia, and PNG; high-end analysis assumes it is equal to the average for these three countries.

4. EVIDENCE OF ILLEGAL CONVERSION OF TROPICAL FORESTS FOR EXPORT-DRIVEN AGRICULTURE

Factor	Estimate	Justification
% of illegal commercial agricultural deforestation 2000-2012 embodied in exports	86%	Assume 78% of illegal agro-deforestation is for oil palm. This is based on proportion of total deforestation attributed to oil palm for 1995 to 2005 by Grieg-Gran et al. (2007) (70%), which concluded that pulp plantations, infrastructure, and urban development represented the other drivers; assuming that the latter two represented 10% of remaining deforestation, then this suggests that oil palm was 78% of agro-deforestation (70% x 90%). Ninety percent of Malaysian palm oil production in 2012 was exported (USDA FAS 2013) and this is assumed to have remained the same over the reference period. Remainder of agro-conversion is for timber and other plantations, with 70% exported (rough estimate, based on the fact that the sole pulp producer in Sabah exports 90%-100% of production (see Section 4.3.2), and conservatively assuming slightly lower percentages for other plantation wood and other agro-conversion crops). The final overall export percentage is calculated from the above as follows: (78% x 90%) + (12% x 70%) = 86%.
COMMODITY ANALYSIS		
Oil Palm		
% of area of oil palm in 2012 which displaced forest	55%	Grieg-Gran et al. (2007) estimated the total new oil palm planting during 1995-2005 was 1.46 Mha, of which 0.76 Mha (52%) was at the expense of forest, with the remainder due to conversion of rubber, cocoa, coconut, and other agricultural plantations. It is assumed that the same proportion applied to planting prior to 1995 (2.54 Mha). From 2006 to 2012, a further 1.03 Mha of oil palm was planted (calculated from Malaysian Palm Oil Board data). During that latter period, the reduction in area planted with other crops (rubber, cocoa, coconut) slowed (FAOSTAT), such that a lower proportion of new oil palm planting can be attributed to conversion of these plantations as during the previous ten years (during 1995-2005, FAOSTAT data show 36% of oil palm expansion could be attributed to reductions in these three crops; in the 2006-2012 period the FAOSTAT data show that the proportion was only 14%). It is assumed that the proportion of oil palm planting during 2006-2012 that occurred at the expense of forest was therefore higher, at 70%. Overall therefore, the percentage is ((2.54 Mha x 52%) + 0.76 Mha + (1.03 Mha x 70%)) / 5.08 Mha = 55%.
% of oil palm deforestation up to 2012 which was illegal	0%-43.4%-86.7%	No suitable quantitative data exist on which to base estimates, though plentiful qualitative data demonstrate that problem is widespread, especially in Sarawak (Lim 2013), which was the location of 57% of oil palm planting in 2000-2012 (Malaysian Palm Oil Board 2013). The mid-point of the range assumes the problem is 50% of the measured average of Indonesia, Cambodia, and PNG; the high-end analysis assumes it is equal to the average of the three countries.
Tropical Timber		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	65%	The area of forest cleared and typical salvage volumes in heavily degraded forest suggest that 66% of log production in the Malaysian state of Sarawak in 2010 was likely from conversion (see text). Sarawak is responsible for 59% of Malaysia's total natural forest tropical log production (calculated from production data in 2012 Annual Reports from forest departments of Sarawak, Sabah, and Peninsular Malaysia).
% of forest clearance illegal	0%-43.4%-86.7%	See justification for deforestation analysis, above.
COMMODITY ANALYSIS		
Pulp & Paper		
% from conversion wood	30%-90%	Malaysia's largest, and only integrated, pulp and paper producer is Sabah Forest Industries (Roda and Rathi 2005; Avantha Group, undated). As of 2005, 90% of its log input was of tropical hardwoods, and only 10% of plantation-grown acacia (Roda and Rathi 2005). As an overall net importer of paper, some of the country's exports may be produced from imported paper (although the largest supplier is Indonesia, another high risk country) (UN COMTRADE 2013). Thus the proportion assumed here is estimated to range from a possible low of 30% to a high of 90%.
% displacing forest	0%-55%-82.5%	No suitable quantitative data on which to base estimates. Mid-point estimate assumes that the same proportion applies as applies to oil palm plantations (55%—see above). High end assumes 150% of that percentage (i.e., 82.5%).
% illegal	0%-43.4%-86.7%	See justification for deforestation analysis, above.

4.4 Papua New Guinea

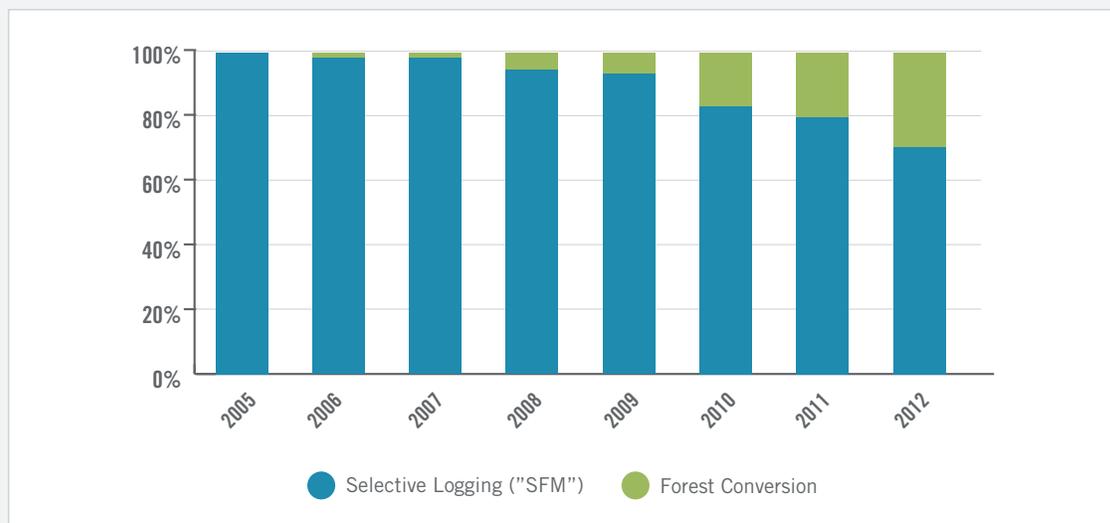
4.4.1 Forest Conversion for Commercial Agriculture and Associated Exports

Until at least 2002, most deforestation in Papua New Guinea (PNG) was due to subsistence rather than commercial industrial agriculture (Shearman et al. 2008). However, this is likely to have changed in the last few years. Since 2003 (and mostly since 2007), 5 Mha (16 percent of the accessible commercial forest area in the country) of PNG's forests have been licensed for conversion for large-scale agricultural plantations, mostly oil palm but also cocoa and other crops (Greenpeace 2012d). If even a small percentage of this area is converted as planned, it will easily outstrip the past rate of mostly subsistence-driven deforestation (of around 140,000 ha/year).⁵³

In PNG, 30 percent of log exports in 2012 originated from forest conversion, up from just 1 percent five years earlier (see Figure 12). Equivalent figures for log production are not available, but given that around 90 percent of log production in PNG is exported unprocessed, then the proportions must be similar. This increase in conversion has stemmed from the growth of Special-purpose Agricultural Business Leases (SABLS) and associated Forest Clearance Authorities (FCAs), mostly for oil palm. All of the tropical timber being produced from agro-conversion in PNG is exported, as is all of the country's palm oil production.

FIGURE 12

Papua New Guinea Log Exports from Selective Harvesting and Conversion, 2005 to 2012



Source: SGS log export monitoring annual reports, analyzed by the author. The SGS log monitoring reports break down annual exports based on the concession or license of harvest. Exports classified as "conversion" above originated from SABL-licensed areas issued Forest Clearance Authorities by the PNG Forest Authority.

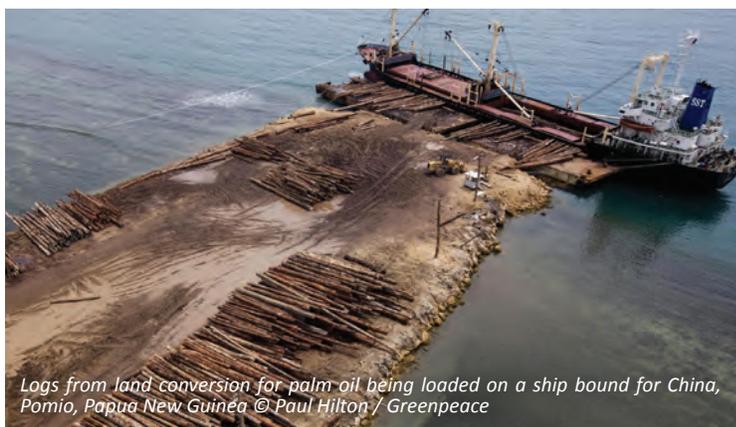
⁵³ Calculated using FAO data for 2005 to 2010.

4.4.2 Illegalities in Conversion

The principal type of illegality documented in PNG is the illegal issuance of licenses to convert forests for commercial agriculture plantations. Numerous protests by local landowners and a series of exposés by NGOs led the government to institute a Parliamentary Commission of Inquiry in 2012 to investigate the large number of SABLs that had been issued for the conversion of millions of hectares of the country's forests into large-scale agricultural plantations. The results of the inquiry were tabled in Parliament in September 2013. Of 42 SABLs examined, only four had proper landowner consent and viable agricultural projects. The remainder—more than 90 percent—was obtained through fraudulent or corrupt means (Pacific News Agency 2013; Numapo 2013; Mirou 2013). The findings confirmed suspicions published in a peer-reviewed academic study, which assessed the plausibility of 36 oil palm plantation projects issued under SABLs covering almost 1 Mha, and found that only five were likely to actually be planted, while the rest were most likely simply covers for obtaining valuable timber (Nelson et al. 2014). In June 2014, the Prime Minister announced that the government would cancel all illegal SABLs recommended to be revoked by the Commission of Inquiry, and would also set up a Ministerial Committee to examine the legality of those SABLs not already assessed by the Commission (PNG Prime Minister's Media Unit Office 2014). The following month, the Department of Lands and Planning issued a public notice demanding the submission of 29 SABL licenses for cancellation (The National (PNG) 2014), including most (but not all) of those recommended for cancellation by the Commission.

The principal illegality in relation to the SABLs is that they were issued without obtaining the legally required Free, Prior and Informed Consent (FPIC) of customary landowners. However, numerous other breaches of procedures and regulations by various government agencies have been documented. The Parliamentary Inquiry Commissioners found that legal requirements governing license issuance were “deliberately breached and proper processes either by-passed or simply ignored” (Numapo 2013). Analysis by Greenpeace shows that

130,000 ha of the SABLs even overlap with protected areas, while some of those that had already begun clear felling did so without the required Environmental Permit (Greenpeace 2012d).



Logs from land conversion for palm oil being loaded on a ship bound for China, Pomio, Papua New Guinea © Paul Hilton / Greenpeace

There is little published information relating to compliance with regulations governing the process of forest clearance (such as protection of river buffers or steep slopes) in PNG. The Commission of Inquiry did not seek to address such matters.

CASE STUDY 3

Independent Timber & Stevedoring (PNG) Ltd, Papua New Guinea

By far the largest controversial Special Agricultural Business Lease (SABL) issued over forestland in PNG was in relation to a project implemented by Independent Timber & Stevedoring (PNG) Ltd (IT&S). It is also one of the most egregious in terms of documented illegalities and irregularities. Initially a project to build a road, encompassing just 2,400 ha of forest, the project ballooned in size to cover more than 2 Mha (Mousseau 2013). Had it gone ahead in full, the project would have been the largest tropical logging project in the world, and could potentially have doubled global tropical timber production and exports.⁵⁴

The Parliamentary Commission of Inquiry uncovered numerous irregularities relating to the issuance of the IT&S SABLs. The legally required consultation with local landowners was found to have been inadequate, and the leases based on counterfeit land registration. One landowner representative told the Inquiry that the signature under his name on one of the official documents was not his. The land investigation and Environmental Impact Assessment were not performed as required by law. The company also did not hold the Forest Industry Participant Certificate needed to apply for a Timber Permit or Forest Clearance Authority. The Inquiry heard how IT&S had hijacked the approval process, including preparing official documents that should have been prepared by the government. The Provisional Lands Officer who approved the leases claimed that he had been misled by IT&S about what he was signing (Mousseau 2013; Mirou 2013).

The Inquiry concluded that the company had “conducted unlawful and unethical actions,” while there was also evidence of malpractice by various officials (ibid.). In July 2014, three SABL licenses covering 1.25 Mha of the IT&S project were among those that were ordered to be cancelled, following the recommendations of the Commission of Inquiry (The National (PNG) 2014).



Local people protesting a SABL license issued for forest conversion for commercial agriculture in Papua New Guinea, 2011 © Paul Hilton / Greenpeace

⁵⁴ Estimated by the author. Assuming a very conservative estimate of 100 m³ of merchantable timber per hectare, the project could potentially produce 200 million m³ of logs. Current global tropical timber exports (primary products) are approximately 44 million m³ in roundwood equivalent (trade data as analyzed by James Hewitt for Forest Trends).

4.4.3 Percentages Used in Analysis

TABLE 10

Deforestation and Commodity Analysis—Papua New Guinea

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	10%	Shearman et al. (2008), examining the period 1972 to 2002, found that commercial agriculture was only a minor driver of deforestation. Given the massive expansion of agricultural conversion licenses (see text), it is likely this may have changed, especially since 2007. For this study, a conservative overall average of 10% is assumed for the 2000 to 2012 reference period.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	90%	A 2013 Parliamentary Inquiry found that 90% of the leases issued for clearing forest for agriculture during the previous decade were illegally issued (Pacific News Agency 2013; Numapo 2013; Mirou 2013).
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	100%	All commercial agro-conversion is export-oriented. 100% of palm oil production is exported (Indexmundi.com production and export data 2011), as is 99.9% of coffee production (Bourke and Allen 2009).
COMMODITY ANALYSIS		
Tropical Timber		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	30%	Log export monitoring reports (SGS PNG 2012) analyzed by the author (see text).
% of forest clearance illegal	90%	See justification for deforestation analysis, above.

4.5 Latin America: The Southern Cone (Argentina and Paraguay)

4.5.1 Forest Conversion for Commercial Agriculture and Associated Exports

In Argentina as in Brazil, commercial soy and beef farming are the primary drivers of deforestation, as acknowledged by the Argentine government (Secretaria de Ambiente y Desarrollo Sostenible de la Nación (SAyDS) 2010). Grieg-Gran et al. (2007) concluded that about 50 percent of the 2.2 Mha of forest lost between 1996 and 2005 can be attributed to soy and 50 percent to cattle grazing. While earlier deforestation was driven by sugar, tobacco, and tree plantations (Bertonatti and Corueca 2000), conversion for industrial soybean plantations has been the main driver of deforestation in Paraguay since the late 1990s (Dros 2004). The other main driver of deforestation is cattle ranching (Grieg-Gran et al. 2007). In the eastern region of Paraguay, the push to expand soy production has resulted in near total deforestation of the native forests, with less than 5 percent still standing (World Bank 2003). The Government of Paraguay has estimated that 40 percent of forest loss in the east was due to cattle ranching, and the rest due to soy production (Republic of Paraguay 2008).

Almost all of the soy produced in Argentina and Paraguay is exported, and the European Union is the largest destination for exports from both countries (see Table 11). Argentina typically exports between 10 and 20 percent of beef production, though in 2006 only 6 percent was exported due to trade restrictions stemming from an outbreak of foot and mouth disease.⁵⁵ The EU was the largest destination for Argentine beef exports in 2012, followed by Chile, China, and Israel.⁵⁶ Paraguay exported 60 percent of its beef production in 2012,⁵⁷ with 70 percent of exports destined for Russia and the rest mostly to other Latin American countries.⁵⁸ There is no information available on the proportion of the timber that is produced during conversion of forests for agriculture in either country, nor how much is exported, nor the proportion this represents of overall timber production.

TABLE 11

Soy Production in and Exports from Argentina and Paraguay, 2012

Country	Soy production (tonnes, million)	% of soy exported	Main destinations
Argentina	48.5	92%	EU 26%, China 18%, SE Asia 22%
Paraguay	8.4	94%	EU 46%, Latin America 20%

4.5.2 Illegalities in Conversion

The Argentine government has accepted that forest law enforcement mechanisms in the country have “been totally inadequate” (SAyDS 2010). In an attempt to gain better control of the situation, a new National Forest Law was passed at the end of 2007, which placed a moratorium on all new deforestation until each province had implemented a participatory forest land use plan. The law gave each province a maximum of one year in which to produce its plan; as of March 2014, only 14 of 23 provinces had done so (SAyDS 2013). This means that all deforestation that took place in the remaining provinces during the five years from 2008 to 2012 was illegal.

One of the provinces most badly affected by soy-driven deforestation in the last ten years is Salta in Argentina’s Chaco region. While the Forest Law was being prepared, the then-governor of Salta rushed through approvals for hundreds of thousands of hectares of forest conversion. A new governor elected at the end of 2007 described the situation up to that point as having been a “festival” of illegal forest clearance authorizations. In late 2008, Argentina’s National Supreme Court ruled that the province had breached national legislation by continuing to allow deforestation during the moratorium and demanded a halt to forest clearance in four of the province’s departments (Seghezzo et al. 2011). Clearance continued, however; NGO investigations later found that more than 50,000 ha of forest were cleared in violation of the Court order. Though the provincial government finally passed the required forest zoning map into law in July 2009, official data show that in the two subsequent years, one-third of all the deforestation in the province occurred in areas of forest zoned in the map as protected. A recent Greenpeace (2013d) investigation uncovered a number of other systematic breaches of regulation and a total failure to monitor compliance with the law.

⁵⁵ Calculated from figures (in carcass weight equivalent) from USDA Foreign Agricultural Service, Livestock & Products Annuals for Argentina for 2006 to 2013.

⁵⁶ Based on weight, calculated from customs data for 2012 reported to UN COMTRADE. Hong Kong is included as part of China.

⁵⁷ Calculated from figures (in carcass weight equivalent) from USDA Foreign Agricultural Service, Livestock & Products Annual 2013 Paraguay.

⁵⁸ Based on weight, calculated from customs data for 2012 reported to UN COMTRADE. Hong Kong is included as part of China.

Illegal deforestation for soy is common in Paraguay, where soy production is by far the largest recent driver of deforestation (Dros 2004). A 2004 total ban on forest conversion in the eastern part of the country (where only 5 percent of the original forest remains) has been regularly violated, especially in districts along the border with Brazil, with land being converted for pasture or agriculture (Portal Paraguayo de Noticias (PPN) 2009). WWF Paraguay (2013) recently published satellite images showing more than 12,000 ha were illegally deforested between 2010 and 2013 for a single ranch in the Department of San Pedro. In Teixeira, illegal deforestation is now occurring in protected areas, nature reserves, and parks in both the Upper Parana Atlantic Forest (on the Brazilian border) and the Chaco biosphere reserve in the north of the country (America Economia 2013).

Soy expansion elsewhere has displaced livestock producers into the forests of the Chaco, where illegal conversion is widespread (*ibid.*). In 2012, Paraguayan authorities confirmed that a cattle-ranch owned by a major Spanish conglomerate had been found to have illegally cleared forest. NGOs claim the forest concerned is inhabited by a group of un-contacted Ayoreos Indigenous Peoples (Survival International 2012). In 2013, NGOs alleged that satellite images showed another company illegally clearing for cattle pasture in the area, and called for a boycott of Paraguayan beef exports (Lainformacion.com 2013). According to local WWF officials, compliance with environmental laws in Paraguay is “poor or non-existent” (America Economia 2013).

4.5.3 Percentages Used in Analysis

TABLE 12

Commodity Analysis—Argentina

Factor	Estimate	Justification
COMMODITY ANALYSIS		
Soy		
% of area of soy in 2012 which displaced forest	9%	Between 1995 and 2005, one-fifth of all soy expansion of Argentina took place in the northern, forested states, of which 40% (1,135,595 ha) was at the expense of forests (Grieg-Gran et al. 2007; Table 4, p.77). Thus, at least 8% of all new soy planted in Argentina during this period was on plantations that caused deforestation. (The study also found that the proportion of planting in the forested north was increasing (to 30% between 2000 and 2005), suggesting that more than 12% of new soy planned across the entire country may be at the expense of forests).
% of soy deforestation up to 2012 which was illegal	30%–75% (mid 52.5%)	The only quantitative data is from Salta province (the province with the greatest area of deforestation, where soy is the principal driver (Seghezze et al. 2011)). In that province, official data show that from July 2009 to June 2011, 30% of all deforestation occurred in areas zoned as protected in the legally approved forest zoning map (calculated in Greenpeace 2013d, pages 7-8). This figure only assesses one form of illegality and one small time period, however. In addition, between December 2007 and July 2009, all deforestation in Salta was illegal, because federal law in December 2007 placed a moratorium on conversion until an approved forest land use plan had been produced, and Salta did not produce one until July 2009 (see text). Nine provinces had still not produced such a plan by March 2013 (SAyDS 2013), making all deforestation in those provinces since 2008 illegal. Salta's governor has admitted that up to the end of 2007, there was a “festival” of illegal forest clearance authorizations in the province.
Beef & Leather		
% of area of cattle in 2012 which displaced forest	17%	As of 2002, 62% of Argentina's cattle stock was in the Pampas, 14% in semi-arid regions, 2% in Patagonia and 22% in the Chaco region (Grieg-Gran et al. 2007). Of these regions, only the Chaco was originally forested. For this study, it is assumed that 75% of the cattle from the Chaco are being reared on land that displaced forest (given that the whole region was originally forested).
% of cattle deforestation up to 2012 which was illegal	30%–75% (mid 52.5%)	See justification for soy, above.

TABLE 13

Deforestation and Commodity Analysis—Paraguay

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	79%	Of the 2.5 Mha of deforestation, 58% was in East Paraguay (where 40% was driven by livestock and 60% by soy) and 42% in the Chaco (where cattle ranching is the most important driver of deforestation, fire the third, and advance of agriculture the sixth) (Republic of Paraguay 2008). Assigning percentages to the first, third, and sixth most important drivers following Hosonuma et al. (2012) suggests that 50% of Chaco deforestation was due to one of these three, giving an overall estimate that $(100\% \times 58\%) + (50\% \times 42\%) = 79\%$ due to commercial agriculture. On the other hand, Grieg-Gran et al. (2007) found that during 2000-2005, 11% of deforestation was due to cattle-ranching, and also concluded that of an average of 179,000 ha of deforestation per year during that time, 124,000 ha was due to soy (69%).
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–42.3%–84.5%	Mid-point assumes the problem is 50% of the measured average of Brazil and Bolivia; high-end assumes it is equal to their average. The mid-point is supported by the fact that according to local WWF officials, compliance with environmental laws in Paraguay is "poor or non-existent" (America Economia, 2013), and also by plentiful anecdotal data on illegalities in conversion of forests (see text).
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	80%	60% of beef and 94% of soy were exported in 2012 (USDA FAS 2013); it is assumed that these proportions have remained static over the course of the reference period. A 60/40 split in illegal agro-deforestation is assumed between soy and beef, based on the proportions of total deforestation attributed to each by the Paraguayan government (Republic of Paraguay 2008), and in the absence of evidence suggesting that deforestation for each commodity is more or less likely to be illegal. The final overall export percentage is calculated from the above as follows: $(60\% \times 40\%) + (94\% \times 60\%) = 80\%$.
COMMODITY ANALYSIS		
Soy		
% of area of soy in 2012 which displaced forest	71%	Grieg-Gran et al. (2007) concluded that 100% of soy expansion between 1996 and 2000 involved direct or indirect forest clearance, while 80% of soy expansion during 2001-2005 involved such clearance (based on a very substantial reduction in 2005, as a result of the zero deforestation law implemented for the east of the country the previous year). In total, the authors estimate that 736,000 ha of soy planting from 1996 to 2005 involved forest clearance. 960,000 ha of soy were already planted prior to 1996, and for this analysis it is assumed that the same proportion of this involved deforestation as in the subsequent four years (i.e., 100%). From 2006 to 2012, a further 1.03 Mha of soy expansion occurred (FAOSTAT). It is conservatively assumed that a lower proportion (40% of this new planting occurred at the expense of forest (the mid-point between the previous rate of 80% and zero); while the existence of the zero deforestation law does imply a substantially lower proportion than previously recorded, the high deforestation figures for Paraguay (Hansen et al. 2013) post-2005 and the evidence of poor compliance with the ban (see text) argue against a higher proportion than that assumed. In total, these assumptions give a figure of $(960,000 \text{ ha} \times 100\%) + 760,000 \text{ ha} + (1.03 \text{ Mha} \times 40\%) / 3 \text{ Mha} = 71\%$.
% of soy deforestation up to 2012 which was illegal	0%–42.3%–84.5%	See justification in deforestation analysis, above.
Beef & Leather		
% of area of cattle in 2012 which displaced forest	0%–48%–79%	Mid-point is average of those countries from the same region (Brazil and Argentina) for which point estimates were possible. High-end is the highest estimated figure for a country from the same region.
% of cattle deforestation up to 2012 which was illegal	0%–42.3%–84.5%	See justification in deforestation analysis, above.

4.6 Latin America: The Andean States

4.6.1 Forest Conversion for Commercial Agriculture and Associated Exports

According to the Peruvian government, small-scale agriculture and cattle ranching is responsible for 75 percent of deforestation, while medium-to-large-scale agriculture is the second most important driver (Ministerio del Ambiente 2013). All of the latter and perhaps three-quarters of the former is commercial in nature.⁵⁹ Recent projections suggest that expansion of oil palm monoculture is fast-becoming the main driver of deforestation in the Peruvian Amazon (Dourojeanni et al. 2010). Ninety percent of the 5 Mha of Peruvian land with potential for oil palm is forested (Burneo 2011).

Soy has been the main driver of deforestation in Bolivia since the late 1990s, along with industrial wheat, sorghum, and sunflower production (Matthews et al. 2010). Around 75 percent of all deforestation in Bolivia takes place in the department of Santa Cruz, and is driven by large-scale agro-conversion for soy and other crops (Plurinational State of Bolivia 2008). In Colombia, 75 percent of deforestation is due to expansion of the agricultural frontier; more than a third of forest cleared between 2000 and 2005 was converted to cattle pasture alone (Government of Colombia 2011). In 2008, it was estimated that 2.2 Mha of Colombian forest had been lost during the previous 15 years to make way for cocaine production (Mongabay 2008).

The proportion of production of the relevant commodities exported from the three countries varies. Three-quarters of Bolivia's soy production is exported.⁶⁰ Colombia typically exports between 10 and 20 percent of its beef, though in 2012 the proportion was just 2 percent as a result of trade restrictions stemming from outbreaks of foot and mouth disease.⁶¹ Thus far, it appears that most palm oil production in Peru is being consumed domestically. There is no information available on the proportion of the timber that is produced during conversion of forests for agriculture and that is exported from the three countries, nor for the proportion this represents of overall timber production. None of the three countries feature in the top 12 global exporters of tropical timber, and they have therefore not been specifically assessed in this paper in relation to legal and illegal conversion wood production and trade.

4.6.2 Illegalities in Conversion

In Peru, while oil palm development is only just starting in earnest, there is already a growing body of evidence that much of this development is illegal. Companies have been illegally authorized to develop oil palm plantations in areas of primary forest zoned for sustainable selective timber harvesting. Companies are also alleged to have abused small-scale permits for subsistence agriculture by getting local people to clear forest and apply for such permits, then buying up and combining these permits to create an oil palm plantation. There have also reportedly been cases of companies clear-felling forests and planting oil palm without any permits at all (Urrunaga 2013).

By far the largest current oil palm grower in Peru is the conglomerate Grupo Romero, which has three large oil palm estates in San Martín and Loreto provinces in the Peruvian Amazon. Allegations of illegalities involving two of these estates have been made by a legal advisor to the regional government of San Martín, who is reported to have claimed that the subsidiary operating one of the estates, Palmas del Shanusi, had “not respected the

⁵⁹ A regional study of Latin America published in 2011 found that 75 percent of small-scale agriculture is commercial (Berdegue and Fuentealba 2011).

⁶⁰ Calculated from figures for soy production and soybean, soy oil, and soy meal exports in USDA Foreign Agricultural Service, Oilseeds and Products Annuals 2013 for Bolivia.

⁶¹ Figures calculated based on UN COMTRADE data and Government of Colombia official, published production data.

30 percent forest coverage provided by the Law” and had constructed roads and a private airport “without the authorization of the competent authorities” and without an adequately approved environmental impact study. He also claimed that the owner of a second Grupo Romero estate, Palmas del Oriente, had failed to comply with the terms of its Environmental Impact Assessment, and logged the forest in less than five months instead of doing it gradually over three years (CEPES 2010).

Governance has been described as “virtually non-existent” in the Bolivian Amazon, where deforestation and agro-conversion are concentrated; corruption is also said to be rampant (Mongabay 2013a). This has led to widespread illegal conversion, even within National Parks (Bolivian Thoughts 2011).⁶² Bolivia’s environmental police lack the advanced tools for detecting illegal deforestation available in neighboring Brazil, and are also severely understaffed and underfunded (ibid.). According to the Regulatory Agency for the Social Control of Forests and Lands, 3.3 Mha of forest were illegally deforested in Bolivia between 1996 and 2009 (Urioste 2013), or an average of 0.25 Mha/year. Recently published satellite image analysis, on the other hand, shows that Bolivia’s *total* average annual forest loss between 2000 and 2012 was around the same figure.⁶³ This suggests that almost all deforestation in Bolivia in the last 10 to 15 years has been illegal. Given that soy and cattle ranching are considered to have been responsible for the vast majority of deforestation in the country during this period, this also implies that almost all deforestation for these purposes during the last decade has been illegal. In light of this, the Bolivian government—under pressure from the agribusiness lobby—recently passed a land use law that will enable landowners who illegally deforested land prior to 2011 to pay nominal fines in order to legalize their farms (Mongabay 2013a).

There is little information on the nature and extent of illegality in conversion of tropical forests for commercial agriculture in Colombia. However, given the poor general forest governance situation (it has been estimated that 42 percent of Colombian timber production is illegal) (World Bank 2006), it is likely that the country suffers similar problems as those documented elsewhere in Latin America. All of the deforestation for coca production is illegal.

⁶² Analysis for this study of recent global high-resolution deforestation maps appears to confirm large scale illegal conversion in this protected area.

⁶³ Calculated from total deforestation in square kilometres over the 12 year period given in Hansen et al. 2013, Table S2.

4.6.3 Percentages Used in Analysis

TABLE 14

Deforestation Analysis—Peru

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	66%	Small-scale agriculture and cattle ranching are responsible for 75% of deforestation, but medium-to-large-scale agriculture is the second most important driver (Ministerio del Ambiente 2013). For this analysis, medium-to-large-scale agriculture (all of which is commercial) is assumed to represent 10% of total deforestation, and it is also assumed that 75% of small-scale agriculture is also commercial (based on an analysis of smallholder farming in Latin America as a whole, which found that 100 Mha out of a total of 400 Mha could be classified as subsistence (Berdegue and Fuentealba 2011)). This results in an overall estimate of $(75\% \times 75\%) + 10\% = 66\%$.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–42.3%–84.5%	Mid-point assumes the problem is 50% of the measured average of Brazil and Bolivia; high-end assumes it is equal to their average. Mid-point is supported by evidence of compliance issues relating to two out of three oil palm developments controlled by the largest oil palm grower in Peru (Urrunaga 2013; CEPES 2010).
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	0%–49%–74%	Mid-point is average of the four other countries in Latin America for which specific estimates were produced. High-end is 150% of that average.

TABLE 15

Deforestation and Commodity Analysis—Bolivia

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	75%	Agriculture (mainly large-scale for soy and other industrial crops) is responsible for 75% of total deforestation (Plurinational State of Bolivia 2008).
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	90%	According to the Regulatory Agency for the Social Control of Forests and Lands, 3.3 Mha of forest were illegally deforested in Bolivia between 1996 and 2009 (Urioste 2013), or an average of 0.25 Mha/year. Recently published satellite image analysis shows that Bolivia's total average annual forest loss between 2000 and 2012 was around the same figure (Hansen et al. 2013). Together, these suggest that almost all deforestation in Bolivia in the last 10 to 15 years has been illegal. Given that soy and cattle ranching are considered to have been responsible for the vast majority of deforestation in the country during this period, this would also imply that almost all deforestation for these purposes during the last decade has been illegal.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	56%–75%	R-PIN (Plurinational State of Bolivia 2008) states that 75% of deforestation is for soy and other industrial crops; Hecht (2005) reports wheat and sunflower as the other main industrial plantation crops; FAOSTAT (2012) data for areas planted with these three crops show 75% of the total area is soy. Seventy-five percent of soy is exported (USDA FAS 2013). Low-end assumes 0% of wheat and sunflower is exported, giving overall total export percentage of $75\% \times 75\% = 56\%$. High-end assumes the proportion of these other crops exported is the same as for soy, resulting in an overall estimate of 75%.
COMMODITY ANALYSIS		
Soy		
% of area of soy in 2012 which displaced forest	45%–100%	FAOSTAT data show that soy represented 34% of the total area of crops in Bolivia in 2012, while Urioste (2013) shows that almost all of this is in Santa Cruz. R-PIN (Plurinational State of Bolivia 2008) states that 75% of total deforestation is said to be attributed to crops. Analysis of Hansen et al. (2013) data gives 1.97 Mha loss in Sta Cruz from 2001 to 2012. This results in an estimate of $1.97 \text{ Mha} \times 75\% \times 34\% = 0.5 \text{ Mha}$ of soy having displaced forests. This compares with the total planted area of soy of 1.1 Mha in 2012 (FAOSTAT), and total growth of the planted area of soy of 0.47 Mha between 2000 and 2012 (ibid.). If it is assumed that the same percentage of soy planted prior to 2000 displaced forest, then this implies that 100% of soy displaces forest (as $0.5 \text{ Mha} > 0.47 \text{ Mha}$), whereas if it is assumed that none of the soy planted prior to 2000 displaced forest, it implies that 45% ($0.5/1.1 \text{ Mha}$) displaced forest.
% of soy deforestation up to 2012 which was illegal	90%	See justification for illegality percentage in deforestation analysis, above.

TABLE 16

Deforestation and Commodity Analysis—Columbia

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	75%	In Colombia, 75% of deforestation is due to expansion of the agricultural frontier; more than a third of forest cleared between 2000 and 2005 was converted to cattle pasture alone (Government of Colombia 2011).
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–42.3%–84.5%	Mid-point assumes the problem is 50% of the measured average of Brazil & Bolivia; high-end assumes it is equal to their average.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	20%	Assume 70% of illegal agro-deforestation is for beef (based on proportions of overall agro-deforestation during 2000-2010 attributed to cattle (Nepstad et al. 2013, Table 3.4)), with an average of 15% exported (USDA FAS reports 2000 to 2013), and the remainder for palm oil and sugar, with 30% exported (rough average between 25% of palm oil exported and 37% of sugar; proportions calculated from production and export data (FAOSTAT 2013)). So the overall figure is $(70\% \times 15\%) + (30\% \times 30\%) = 20\%$.
COMMODITY ANALYSIS		
Leather		
% of area of cattle in 2012 which displaced forest	0%–48%–79%	Mid-point is average of those countries from the same region (Brazil and Argentina) for which point estimates were possible. High-end is the highest estimated figure for a country from the same region.
% of cattle deforestation up to 2012 which was illegal	0%–42.3%–84.5%	See justification in deforestation analysis, above.

4.7 Mekong Basin

4.7.1 Forest Conversion for Commercial Agriculture and Associated Exports

In Cambodia, a government report acknowledged that the main reason for the recent dramatic decline in forest cover is the conversion of forestland to large-scale agricultural plantations under controversial Economic Land Concessions (ELCs) (Government of Cambodia 2011). By the end of 2012, 2.6 Mha of land had been handed out. Of the proportion of this area for which information is available (1.5 Mha), official government data show that 1.2 Mha (80 percent) is slated for rubber plantations (Vannarin and Lewis 2013). In neighboring Laos, conversion of forests for agricultural plantations is also acknowledged as the primary driver of deforestation. Permits covering at least 1.1 Mha—5 percent of the country's land area—have been issued so far. More than a third of the allocated area is forested (Schönweger et al. 2012), and rubber plantations are estimated to account for 34 percent of this land (Global Witness 2013b). In Vietnam, too, the growth of industrial export crops such as coffee, rubber, and cashew is now the principal driver of deforestation; conversion of natural forests into monoculture timber plantations is also an important driver (Socialist Republic of Vietnam 2011). In the Central Highlands, coffee plantations accounted for the conversion of 500,000 ha between 1990 and 2000, and 79 percent of new rubber plantations from 2007 to 2012, were converted from natural forestland (To and Tran 2014). In Myanmar, agro-conversion is considered to be the major cause of deforestation (Conservation International, undated), and this is increasingly driven by large-scale, export-oriented agribusiness. Notably, there has been a recent surge in foreign interest in agricultural investments; as of July 2013, Forest Trends

reported that leases covering 1.4 Mha had been issued since March 2012 (Woods 2013).⁶⁴ The main hotspots for new agricultural plantation developments are also two of the most heavily forested parts of the country: Kachin State (a target for biofuel crop and rubber plantations) and Tanintharyi Region (mostly palm oil and rubber investments) (ibid.). The conversion of forest to agriculture is also considered the major cause of deforestation in Thailand (Department of National Parks, Wildlife and Plant Conservation 2013), though there has been little detailed analysis of the extent to which this is due to large-scale commercial agriculture or associated with exports.

4.7.2 Illegalities in Conversion

The principal relevant illegality documented in the Mekong Basin has been the illegal issuance of licenses to convert forests for large-scale industrial timber and other plantations, though there have also been many documented cases of breaches of regulations during plantation development, especially the commencement of clearance without required Social and Environmental Impact Assessments (SEIAs).

The available evidence—including UN reports and government statements, as well as press and NGO reports—demonstrates that most, if not all, of the deforestation taking place in Cambodia under the controversial Economic Land Concessions (ELCs) is illegal in some way. Though the regulatory framework is confusing and conflicting, existing laws make clear that areas of intact forest are not permitted to be converted, yet the government has issued ELCs covering 2.6 Mha (Global Witness 2013b), including most of the country's remaining forest estate. Numerous laws and regulations are alleged to have been breached in the issuance of these concessions.

Many concessions have even been issued that encompass national parks and wildlife sanctuaries, including 70 percent of the concessions given out during 2012 (ibid.). Many ELCs cover a total area far in excess of the maximum 10,000 ha per company defined in regulations. Comparing the list of ELCs with over 10,000 ha with the overall area allocated to ELCs suggests that between 35 and 50 percent of all ELCs allocated are above the maximum.⁶⁵ ELCs have also been issued on officially declared community forest areas, and without legally required public consultations (Subedi 2012). Of the 117 concessions listed on a government website in 2012, only three were recorded as having conducted the SEIAs required before an ELC is ever allocated, and all of these were carried out *after* the concession was issued (ibid.). The Cambodian Ministry of Environment has publicly stated that only about 5 percent of major development projects (including ELCs and others) between 2004 and 2011 had conducted the required EIAs (Lewis and Narim 2012).

Illegalities during clearance and development are also common. Many concessionaires have commenced activity before the signature of contracts. A number of concessions have blocked paths, roads, and streams used by villagers in contravention of regulations, and companies have also been allowed to retain concessions despite failing to begin developing them within the maximum permitted period (Special Representative of the Secretary-General for Human Rights in Cambodia 2007). Newspaper reports and NGO investigations regularly cite instances of companies logging outside their concession boundaries. Companies have also felled protected rosewood and resin trees, and there have been violent responses to the many protests by local communities against illegal agro-conversion. One of the largest companies involved in developing rubber plantations on ELCs in Cambodia has publicly admitted in official filings that some of its projects are illegal (see Case Study 4).

⁶⁴ Figure in acres converted to hectares.

⁶⁵ List of ELCs issued to companies in excess of 10,000ha limit provided by Licardho, December 2011. Forest Trends, unpublished.

CASE STUDY 4

Hoang Anh Gai Lai (HAGL) Rubber Plantation, Cambodia

An investigation by the Global Witness, published in May 2013 (Global Witness 2013b), provides evidence of a range of illegalities relating to ELCs issued to the Vietnamese company Hoang Anh Gai Lai (HAGL) in Cambodia. The report notes that the company has been issued with ELCs covering almost 50,000 ha, five times the maximum allowed under Cambodian law to be issued to one company. In addition, official documents show that 28,000 ha of these concessions were issued for areas of forest inside a Wildlife Sanctuary and National Park, in contravention of legislation. Global Witness was also unable to find any evidence of the company having conducted Environmental Impact Assessments (EIAs) for any of its ELCs, as required. It also found that the company had illegally cleared intact forest (in breach of its concession contract), and harvested rosewood and other protected timber species. The company had also “overlooked legal requirements for consultations with local people” affected by its concessions. Incredibly, the company admitted to operating illegally in an official public filing relating to a market listing. Its submission stated that “certain of our existing projects are being developed without necessary government approvals [sic]” and that “operation of certain projects are not fully in compliance with applicable laws and regulations.” Villagers protesting the activities of the company on their land had been fired on with live rounds by military police, according to eyewitnesses. HAGL denied the Global Witness allegations and claimed that the public admission of illegality was due to a translation error.

In June 2013, shortly after the Global Witness report was published, HAGL committed to implement a four-month freeze on all clearing and planting on its concessions, and to discuss with and address the issues faced by local people. However, subsequent investigations in July and August 2013 by Global Witness showed that HAGL had failed to abide by its promises (Global Witness 2013c). In April 2014 HAGL again declared that it had suspended forest clearing at three of its seven rubber plantations in Cambodia, this time following a request from the IFC (Peter and Pheap 2014). The IFC, which has been helping fund the developments, took action in response to a formal complaint filed by local communities alleging that HAGL had breached IFC lending safeguards, including (among other things) by breaking Cambodian laws. IFC has since begun a dispute resolution process between the company and the local community (Compliance Advisor Ombudsman 2014).

TABLE 17

Deforestation Analysis—Cambodia

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	40%–80%	The "main" driver of deforestation is large-scale agricultural plantations under controversial ELCs (Government of Cambodia 2011). For the purposes of this study, it is assumed that a single "main" driver represents 40%-80% of the total.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	90%	Of 117 concessions listed on a government website in 2012, only three were recorded as having had impact assessments completed, and all of these were carried out after the concession was issued (Subedi 2012).
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	0%–72%–100%	Mid-point is the average of the ten other countries for which specific estimates were produced. High-end is 150% of that figure.

Neighboring Laos has also seen a vast area of forested land licensed for agricultural plantations in recent years, and these leases have also allegedly involved numerous breaches of regulations. At least 1.1 Mha have been licensed, with rubber plantations estimated to account for around one-third of this area. Local laws state that only degraded forests may be allocated, yet many plantation licenses have been issued for areas of intact forest. As in Cambodia, some concessions have even been issued that overlap with National Parks. Most concessions have been issued in contravention of a 2007 ban on individual concessions greater than 100 ha. Meanwhile, regulations requiring prior consultations with affected communities and actions to minimize environmental risk are also being ignored (Global Witness 2013b).

Many of the companies involved in developing new rubber plantations of dubious legality in Cambodia and Laos are registered in Vietnam, where illegalities in rubber plantation development are also reported to be common. To and Tran (2014) documented many instances of abuse and concluded that "conversion of forest to rubber plantations takes place on a massive scale with little control or even without control at all." There is little information available related to illegalities in the conversion of forests elsewhere in the Mekong Basin, though there are known to be substantial problems with broader forest governance. In Myanmar, for instance, a recent study found that 72 percent of log exports between 2000 and 2013 had been illegal (EIA 2014).

4.7.4 Percentages Used in Analysis

TABLE 18

Deforestation and Commodity Analysis—Laos

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	73%	For 2012 to 2020, approximately 51% of deforestation is projected to be driven by large concessions (including timber and rubber) and a further 22% by smallholder cash crop production (Lao PDR Department of Forestry 2010). This study assumes that these projections reflect trends from the previous 12 years.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–43.4%–86.7%	Mid-point assumes the problem is 50% of the measured average of Indonesia, Cambodia and PNG; high-end assumes it is equal to their average.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	0%–72%–100%	Mid-point is the average of the ten other countries for which specific estimates were produced. High-end is 150% of that figure.
COMMODITY ANALYSIS		
Tropical Timber		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	0%–55%–75%	Mid-point is based on the average of five equivalent countries in the region for which point estimates exist; high point is calculated as 150% of the mid-point.
% of forest clearance illegal	0%–43.4%–86.7%	See justification in deforestation analysis, above.



Deforestation for a rubber plantation in Laos © Rhett A. Butler / mongabay.com

TABLE 19

Deforestation and Commodity Analysis—Myanmar

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	33%	There are no published quantifications, but agro-conversion is considered to be one of three main drivers of deforestation (Conservation International, Myanmar Deforestation guide, undated), while it is also estimated that as much as half of all commercial timber production may be coming from such conversion (Woods and Canby 2011). For the purposes of this study, it is assumed (following Hosonuma et al. 2012) that each main driver represents one-third of total deforestation.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–43.4%–86.7%	Mid-point assumes the problem is 50% of the measured average of Indonesia, Cambodia and PNG; high-end assumes it is equal to their average.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	10%	Most agro-conversion areas are not yet planted or not yet mature, but UN COMTRADE data suggest that exports are estimated to be a maximum of 10% of total illegal agro-deforestation.
COMMODITY ANALYSIS		
Tropical Timber		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	50%	It has been estimated that as much as half of all commercial timber production may be coming from such conversion (Woods and Canby 2011).
% of forest clearance illegal	0%–43.4%–86.7%	See justification in deforestation analysis, above. For tropical timber, the mid-point estimate is further supported by the poor general governance situation within the country, the fact that most forest land conversion for commercial agriculture is taking place in areas of ethnic conflict (Woods 2013), and recent evidence of widespread corruption and criminality in the logging sector, with 72% of log exports during 2000 to 2013 likely illegal (EIA 2014).

TABLE 20

Deforestation Analysis—Vietnam

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	40%–80%	Industrial export crops such as coffee, rubber, and cashew are the "principal" drivers of deforestation, another important driver is monoculture timber plantations (Socialist Republic of Vietnam 2011). For the purposes of this study, it is assumed that a "principal" driver represents 40%-80% of the total.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–43.4%–86.7%	Mid-point assumes the problem is 50% of the measured average of Indonesia, Cambodia, and PNG; high-end assumes it is equal to their average.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	90%	The two most important commercial crops driving deforestation are rubber and coffee (Socialist Republic of Vietnam 2011). Ninety percent of natural rubber production is exported (Vietrade 2011); ninety-four percent of coffee is exported (IPSOS 2013).

4.8 West Africa

4.8.1 Forest Conversion for Commercial Agriculture and Associated Exports

Cocoa production has been a primary driver of deforestation in West Africa, where nearly all production is destined for export (Brack 2013). In Ghana, for example, cocoa has been the major driver of land use change in the country's high forest zone for over a century, and new full-sun varieties have accelerated the pace of deforestation. In total, agriculture is estimated to be responsible for half of all deforestation (Forestry Commission Ghana 2010). In neighboring Côte d'Ivoire (the world's largest cocoa producer), agricultural expansion, especially for cash crops of cocoa, rubber, and palm oil, is acknowledged by the government to be the most important driver of deforestation (MINESUDD 2013). Agricultural expansion (including pasture) is the dominant driver of deforestation in Nigeria, though most is for subsistence needs (Federal Republic of Nigeria 2014).

There is no official data on the proportion of tropical timber production and exports from Ghana or Côte d'Ivoire (the two significant regional exporters) that originate from forest conversion as opposed to selective harvesting. Ghana has published data on the number of "salvage permits" that were issued in 2012, however. Assuming an average of 2 m³ of timber per tree, these permits may have produced 76,000 m³ of timber during that year, compared with total wood demand of 4 million m³ (in 2006, the last year for which data are available) and Ghana's total round wood equivalent exports of 0.5 million m³ in 2012. This suggests that conversion timber represents a relatively small proportion of total production and exports (less than 2 percent). In Côte d'Ivoire, the majority of recent exports have been of rosewood. Such high-value species are normally removed from accessible natural forests selectively well in advance of forest clearance. It is therefore likely that the current proportion of total exports originating from conversion is very low, a conclusion supported by earlier findings.⁶⁶

⁶⁶ ITTO 2005, p. 87 states that 90% of production as of 2005 was selective "high-grading" of forests in the *domaine rural*.

4.8.2 Illegalities in Conversion

Weak law enforcement and civil strife have led to widespread illegal conversion of protected forests for production of cocoa and coffee in Côte d'Ivoire during the last 15 years. In some cases, corrupt officials have been directly involved in this process (IRIN News 2013). There is also a long history of widespread illegality in the conversion of forest reserve areas for cocoa production in Ghana, the region's second largest primary cocoa producer (England 1993).

Breaches of regulations have also been commonly documented in other countries in the region. In recent years, examples have emerged of illegalities relating to development of oil palm plantations. Three large oil palm companies have in recent years obtained rights to 830,000 ha of land in Liberia for the development of plantations. Though each company has only cleared and planted a relatively small area so far, evidence or allegations of illegalities have already come to light for all three plantations. Malaysian palm oil giant Sime Darby was fined \$50,000 by the Liberian Environmental Protection Agency in 2011 for breaching the terms and conditions of its Environmental Permit during plantation development (AllAfrica 2011). A formal complaint was filed with the Roundtable on Sustainable Palm Oil (RSPO) in October 2013 against Equatorial Palm Oil, claiming that the company had cleared and planted on customary land in contravention of national legislation (RSPO 2014b). An independent assessment of the operations of the third and largest company, Golden Veroleum, published in March 2013, found that in multiple places the company had breached the terms of its Environmental Permit by converting forests along riverbanks (TFT 2013). Serious conflicts with local communities have arisen in all three companies' concessions.

In Nigeria, a local NGO has claimed that portions of the land granted for development of the largest new oil palm plantation overlap with Cross River National Park and the Ekinta Forest Reserve, and that Nigerian legislation was breached in the issuance of rights over these areas, because they were never formally gazetted as required (Rainforest Resource & Development Centre 2013).

4.8.3 Percentages Used in Analysis

TABLE 21

Commodity Analysis—Ghana

Factor	Estimate	Justification
COMMODITY ANALYSIS		
TROPICAL TIMBER		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	0%–2%	Salvage permits were issued for a total of 38,000 trees in Ghana in 2012 (Global Witness 2013d); assuming an average of 2 m ³ per tree, this would represent 76,000 m ³ of timber volume, compared with Ghana's total round wood equivalent exports of 0.5 million m ³ and domestic demand of 4 million m ³ (in 2006). This suggests conversion timber represents only a very small proportion of exports (less than 2%).
% of forest clearance illegal	0%–42.9%–85.8%	Mid-point assumes 50% of the measured average of Brazil, Bolivia, Indonesia, Cambodia, and PNG; high-end assumes it is equal to their average. Mid-point is supported by previous studies that have estimated that 59–65% of all timber production in Ghana is illegal (Lawson and MacFaul 2010).

TABLE 22

Commodity Analysis—Côte d'Ivoire

Factor	Estimate	Justification
COMMODITY ANALYSIS		
TROPICAL TIMBER		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	4%	Average of mid-points of other regional countries (Cameroon, Gabon, Republic of Congo, Ghana) for which estimates were produced.
% of forest clearance illegal	0%–42.9%–85.8%	Mid-point assumes 50% of the measured average of Brazil, Bolivia, Indonesia, Cambodia, and PNG; high-end assumes it is equal to their average.

4.9 East Africa

4.9.1 Forest Conversion for Commercial Agriculture and Associated Exports

Though commercial agriculture is a less important cause of deforestation in East Africa than in most other tropical regions, it is becoming increasingly important. Industrial forest plantation development is an increasingly important driver in some parts of Mozambique, for example, as are both commercial banana and cotton plantations. Other commercial cash crops responsible for deforestation include tobacco and sugar cane. A study of drivers of deforestation from 2007 to 2010 in one sample area in Manica Province found that the largest driver (responsible for 46 percent of deforestation) was large-scale agriculture (Ministry for Coordination of Environmental Affairs 2012). Though subsistence agriculture, firewood, and charcoal remain by far the most important drivers of deforestation, commercial plantations for biofuel production have been an increasingly important threat to Tanzanian forests in recent years (United Republic of Tanzania 2010).

The Land Matrix database lists 179 contracted, ongoing, or concluded large-scale land deals for commercial agriculture or forestry plantations in East Africa, with an aggregated current area under contract of 4 Mha (The Land Matrix 2014). Southeast Asia is the only region with a greater number of such deals. The most common planned crops are eucalyptus, acacia, jatropha, oil palm, and sugarcane.⁶⁷ Very little is known about most of these investments, and there is therefore no information on the proportion that may involve conversion of natural forest, or the proportion that is intended to be primarily export-oriented. Many of the developments are for the production of feedstocks for biofuel, however, for which the main driver is overseas demand. And of the handful of cases that have been investigated in depth, a number have involved conversion of woodlands.

⁶⁷ Only includes concluded agreements which have not since been cancelled or abandoned.

4.9.2 Illegalities in Conversion

Though there are no systematic studies or data, case studies from Uganda and Tanzania suggest that the kinds of illegalities seen in other regions are being replicated during large-scale land conversion for agricultural and timber plantations in East Africa.

In Uganda, the country's first commercial oil palm plantation project has been mired in controversy. The development, a 40,000 ha joint venture involving (among others) the Ugandan government and international oil palm giant Wilmar, is located on the Kalangala islands in Lake Victoria. Around 7,500 ha have been planted so far. The development, which was estimated to have destroyed 3,600 ha of forest by May 2013 and is also converting small farmers' land, has been accused of violating numerous local laws. The compulsory purchases of land for the project are alleged to be in breach of the Ugandan Constitution and the Land Acquisition Act. The clearance and planting that has taken place so far is also alleged to have violated environmental buffers and the deforestation is alleged to have caused pollution of water sources. The expansion of the project is also reportedly proceeding without the required EIA. Though the palm oil from the plantation development was originally slated for local use, when it is complete the project is expected to produce double the current consumption when it is complete, suggesting that a large proportion will actually be destined for export (FoE International 2013). It is not yet clear what implications Wilmar's "zero deforestation" policy, issued in December 2013 (Wilmar 2013), will have for the completion of the project.

There have also been many controversial "land-grabs" in recent years for the planting of biofuel feed stocks in East Africa. In Tanzania, for example, during the global bio-fuels boom of 2005 to 2008, more than 200,000 ha of land was leased to foreign companies for the planting of biofuel feed crops such as sugarcane and jatropha. Many of the projects are located within the East African Coastal Forests, an eco-region regarded as a globally important conservation priority (WWF Tanzania 2009). The Tanzanian government has admitted that these industrial plantations have become an increasingly important driver of deforestation in the country (United Republic of Tanzania 2010). Some of these projects have involved the conversion of natural forests in questionable legal circumstances (see Case Study 5).

CASE STUDY 5

Bioshape Jatropha Plantation, Tanzania

One of the largest planned agricultural plantation projects in Tanzania in recent years was a 34,000 to 80,000 ha jatropha plantation to be developed by Dutch company Bioshape in an area of East African Coastal Forest near the town of Kilwa on the coast of southern Tanzania. In 2009, the NGO Resource Extraction Monitoring (REM) worked with the Tanzanian authorities to examine the legality of the development. By that time, Bioshape had cleared and planted a 70 ha “trial plot.” Government officials confirmed to REM that Bioshape had cleared the area before all required procedures had been completed and payments made. Local officials also told REM that Bioshape were already cutting timber outside the trial plot, which central government officials claimed was illegal because the full forest inventory for the plantation had not yet been produced. In its official report, REM also highlighted concerns raised by NGOs regarding the legality of the Environmental Impact Assessment (EIA) for the project. Two of the three persons listed as authors on the EIA did not in fact contribute text, see a copy prior to publication, or agree to be listed as authors. The inclusion of these well-respected scientists’ names on the report may have influenced the decision to allow the project to go ahead. REM noted that Tanzanian law makes it an offense to misrepresent the authorship of EIAs. REM noted that Bioshape had the largest and busiest sawmill in Southern Tanzania at the time and calculated that, if the entire plantation area was developed, the company was likely to become the largest logging company in the country (REM/HTSPE 2009).

Allegations were also made that regulations had been breached in the manner in which the rights to the land were obtained from local villagers by the local government and handed over to the company. Though villagers signed relevant documentation, later research showed that they did not fully understand the implications of what was being signed. One villager claimed that when they eventually obtained a copy of the agreement they had signed, they found some of the key terms did not match what had been agreed (Oxfam 2013).

As with many other biofuel projects of the period, the Bioshape plantation never came to fruition. After its energy-company backers pulled out, Bioshape went bankrupt in June 2010 (Massay 2012). The villages affected remain barred from the land, yet never saw the benefits they were promised. With help from NGOs, they have brought formal complaints to the local and national authorities, demanding that the lease is cancelled and their land returned (Oxfam 2013).



4.9.4 Percentages Used in Analysis

TABLE 23

Deforestation Analysis—Mozambique

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	0%–35%–53%	Mid-point is average for Africa from Hosonuma et al. 2012; high-end is 150% of that average.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–42.9%–85.8%	Mid-point assumes the problem is 50% of the measured average of Brazil, Bolivia, Indonesia, Cambodia, and PNG; high-end assumes it is equal to their average.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	0%–51%–77%	Mid-point is average of the ten other countries for which specific estimates were produced. High-end is 150% of that figure.

TABLE 24

Deforestation Analysis—Tanzania

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	0%–35%–53%	Mid-point is average for Africa from Hosonuma et al. 2012; high-end is 150% of that average.
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–42.9%–85.8%	Mid-point assumes the problem is 50% of the measured average of Brazil, Bolivia, Indonesia, Cambodia, and PNG; high-end assumes it is equal to their average.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	0%–51%–77%	Mid-point is average of the ten other countries for which specific estimates were produced. High-end is 150% of that figure.

4.10 The Congo Basin

4.10.1 Forest Conversion for Commercial Agriculture and Associated Exports

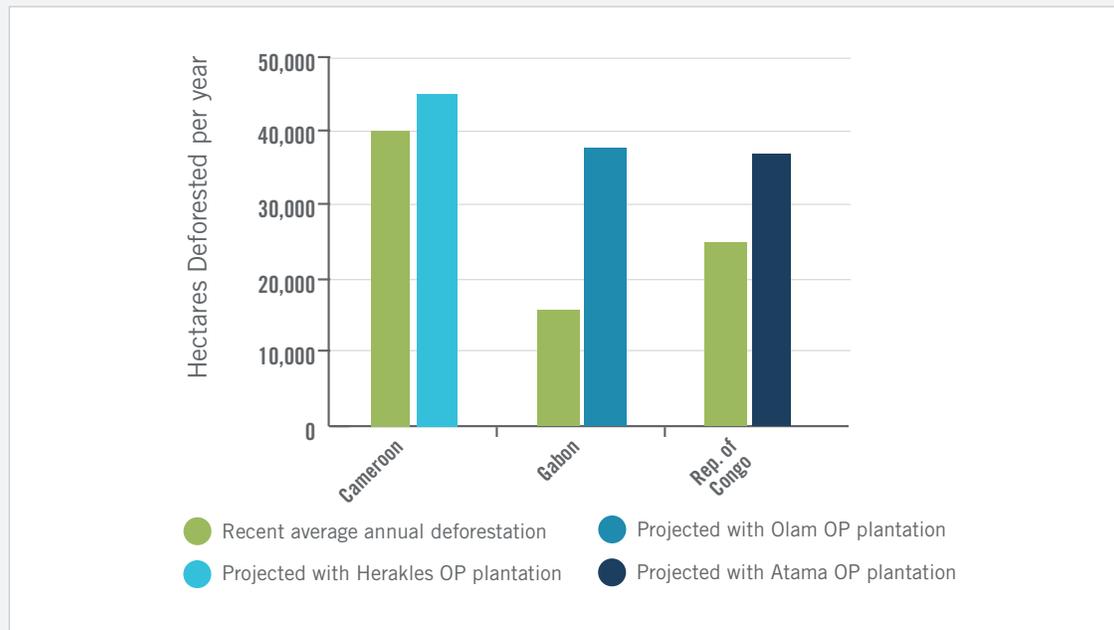
Commercial Agriculture as a Driver of Deforestation

The Congo Basin has a much lower rate of deforestation than the Amazon Basin or the tropical forests of Southeast Asia.⁶⁸ This is mainly due to the fact that large-scale industrial agricultural development has been much more limited to date in this region than elsewhere in the tropics. However, the last few years have seen the beginning of a boom in industrial oil palm development, and this threatens to dramatically increase deforestation rates. Three large new oil palm plantation developments have recently broken ground in Cameroon, Gabon and the Republic of Congo; all are converting natural forest (Rainforest Foundation UK 2013a). If they are developed to their full extent over the planned timescale, these three projects alone are projected to increase the deforestation rate in each country by between 12 and 140 percent (see Figure 13) (Rainforest Foundation UK 2013b). Many other large oil palm developments in the Congo Basin have been announced or are in the pipeline, especially in Cameroon. A number of large new rubber plantations are also now being developed in forested areas. As a result of these new developments, in 2013, industrial agro-conversion may already have become the largest driver of deforestation in the Congo Basin.

⁶⁸ Recently released data show that Latin America lost 4.3 percent of its tropical rainforests between 2000 and 2012, while Asia lost 11 percent. During the same period, Africa lost just 2.8 percent (see Hansen et al. 2013; supporting material, Table S2).

FIGURE 13

Estimated Impact of Three New Oil Palm Plantations (already broken ground) on Annual Deforestation in the Congo Basin, from 2015⁷⁵

**Conversion Timber Production**

Until very recently, little to no conversion timber was produced in the Congo Basin. However, the proportion of tropical timber production originating from conversion is set to rise dramatically in the next few years as a result of large new oil palm developments.

In Cameroon, clear-felling began in 2012 at the Herakles oil palm plantation (see Case Study 6). Twenty thousand hectares of tropical forest are due to be felled at the project site over a period of just four years (Rainforest Foundation UK 2013a); assuming a return of around 90 m³/ha of saleable timber from this logged but still dense forest, this would imply a possible total production of 1.8 million m³, compared with annual selective harvesting of under 2 million m³ in the rest of the country. If this timber was produced over a four year period, then this one project alone could result in the proportion of Cameroonian production from conversion rising from zero to almost 20 percent. A number of other large oil palm projects are under negotiation in Cameroon (ibid.), and if these come to fruition then the amount of conversion timber production could soar even further.

⁶⁹ Recent average annual deforestation calculated from figures for total deforestation in each country 2000 to 2012, measured by Hansen et al. 2013. Projected annual deforestation assumes baseline average from 2000 to 2012, plus projected annual deforestation from the specified oil palm development. The projected annual deforestation for each oil palm development is the total area of planned planting (Rainforest Foundation UK 2013a; Herakles corrected to reflect reduction in license area (see Section 2.6)), divided by the period over which the company concerned is expected to complete development. Herakles has stated its intention to complete its development in Cameroon over a period of four years, while Olam has stated it expects to clear and plant its plantation in Gabon over six years (Rainforest Foundation UK 2013a). It is assumed that Atama will be aiming for a similar rate of development (six years) for its plantation in Republic of Congo.

In Gabon, international agro-commodity giant Olam also broke ground on a 300,000 ha oil palm and rubber development in 2012. In the first phase of the project, Olam is planning to plant 50,000 ha of oil palm over a period of four to five years (Olam 2013), plus 28,000 ha of rubber over six years (Olam 2012). Though Olam has committed to not convert high conservation value (HCV) forests, the areas chosen for development so far are almost entirely forested and, though not classified as HCV, nevertheless contain significant timber and carbon value (Rainforest Foundation UK 2013a). Olam cleared and planted around 3,000 ha for oil palm in 2012;⁷⁰ at an estimated rate of 45-90 m³/ha of saleable timber, this may have yielded 130,000-260,000 m³ of logs, representing 6 to 13 percent of total national production in the formal sector of 1.7 million m³ that year.⁷¹ If clearance and planting accelerates to planned target rates, Olam could be producing as much as 0.75-1.5 million m³ of logs per year in 2014 and 2015.⁷²

In Republic of Congo, clearance also began in 2012 on a 180,000 ha oil palm plantation being developed in an area of pristine primary forest. When an official inspection team visited the first area of conversion in October 2012, it found the company had cleared around 120 ha and produced more than 15,000 m³ of logs (125 m³/ha) (DDEFS 2012). At that rate, the plantation could produce a total of more than 22 million m³ of tropical conversion timber—almost 15 times the country's current annual harvest from selective logging. If the concession is developed on as rapid a time frame as those in Gabon and Cameroon, three-quarters of the country's tropical timber production could soon be coming from conversion, as a result of just this one project. Recent maps of Republic of Congo from the World Resources Institute's Global Forest Watch show additional new oil palm plantation licenses in forest areas, which if realized will increase conversion timber production even further.

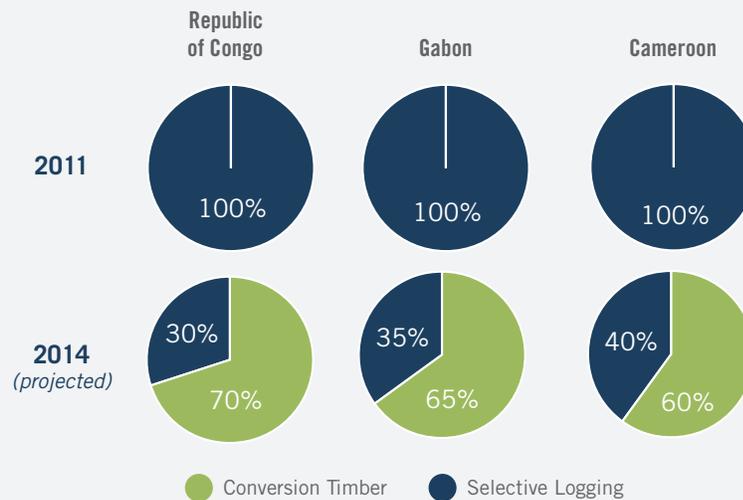
⁷⁰ Olam recorded planting 1,370 ha from July 2011 to June 2012, and a further 4,448 ha from July 2012 to June 2013. Assuming an even rate of planting, this suggests a total planting of 2,909 ha during calendar year (drawn from data in Olam's 2012 and 2013 annual reports, available at <http://olamgroup.com/investor-relations/financial-information/annual-reports>).

⁷¹ DGEF data on OFAC database, accessed July 11, 2014.

⁷² Combined planned planting rates for oil palm and rubber are 17,166 ha/year (50,000 ha/4 years + 28,000 ha/6 years). Multiplying by 45-90 m³ of timber per hectare gives 772,470 m³—1,544,940 m³.

FIGURE 14

Projected Growth in the Proportion of Tropical Timber Production in Republic of Congo, Gabon, and Cameroon Originating from Forest Conversion, 2011 to 2014

**Exports**

Nearly all of the industrial tropical timber production in the Congo Basin is destined for export, and the same is likely to be true of conversion timber produced from large-scale land conversion for agriculture (de Wasseige et al. 2010). None of the large new oil palm developments in the region have yet begun production, so it is unclear what proportion may be destined for export. One of the largest developments has stated that it expects most production to be exported to the EU, however (Rainforest Foundation UK 2013a).

4.10.2 Illegalities in Conversion

Though large-scale agro-conversion in the Congo Basin has barely begun, there are already numerous documented illegalities involving both licensing and operations. Of the three large oil palm plantations that have started operations so far in the Congo Basin, two have been found by government inspections to be clearing illegally. This is despite the fact that neither plantation has yet cleared more than a small portion of the forest that they plan to convert.

In Cameroon, the largest project, the Herakles oil palm plantation in the southwest, has been “dogged by allegations of illegality from the very start” (ibid.). Local courts, forest department inspectors and an independent observer have all documented breaches of regulations, while NGOs also claim that the license itself was illegally issued (see Case Study 6). Once the Herakles plantation is fully developed and productive, it will nearly double Cameroon’s palm oil production,⁷³ and thus almost half of Cameroon’s production will be associated with alleged illegalities related to the project.

⁷³ Estimate by the author. FAO data show Cameroon produced around 100,000 metric tons (mt) of palm oil in 2010. The Herakles project (as revised) covers 20,000 ha, which at a typical palm oil yield of 3.5 mt/ha could produce 70,000 mt each year.

The largest forest conversion project in the Congo Basin is the oil palm concession issued to Malaysian company Atama Plantation in the Republic of Congo. The agreement covers an area of 470,000 ha, of which at least 180,000 ha is expected to be planted. The area is almost entirely made up of primary rainforest, home to numerous endangered species, including chimpanzees, gorillas, and forest elephants (ibid.).

In October 2012, an inspection by the provincial forestry office of forest clearance in the first 5,000 ha zone of the concession uncovered numerous breaches of regulations. More than 350 trees had been cut but not recorded in official felling reports. Records had been illegally altered, and there was evidence that illegal logs are possibly being laundered into supply chains by repeated use of the same log numbers. The inspection team concluded that Atama was in breach of its forest clearance license and issued an official infraction notice (DDEFS 2012). Two months later, a joint investigation by the forest service and the official Independent Observer of Forest Law Enforcement and Governance (OI-FLEG) uncovered further illegalities. The Observer found that Atama had illegally cleared forests for roads for a distance of more than 2 km outside the boundaries of the licensed area, and had also sub-contracted a company to carry out timber harvesting that did not have the proper registration. The Observer could also find no evidence of any Environmental Impact Assessment having been completed for the Atama oil palm plantation project, as required by law. The Observer recommended that the operations should be suspended and that the government should prosecute the company for breach of its license (ibid.).

Though it will be some years before Atama's plantation reaches maturity and begins production and export of palm oil, it will represent almost 100 percent of the country's exports. All of those exports will be from land cleared illegally of natural forest. Long before that, the project will result in a large percentage of log exports from the Republic of Congo being associated with illegal agro-conversion (see Section 1.3.2).

No large new agro-conversion projects have yet broken ground in the Democratic Republic of Congo. However, questions have already been raised regarding the issuance of one new oil palm concession in Bas-Congo province, which has yet to begin operations. A study by the Forest Peoples Programme of the 10,000 ha concession contract issued to Congo Oil & Derivatives SARL in Muanda territory concluded that "it is in blatant violation of the Forest Code." Among other things, the concession is located within two Forest Reserves, which are only supposed to be used for non-commercial purposes; it was issued for 40 years, while the law only allows for terms of 25 years; there is no management plan or agreement with local communities; and the researchers could also find no evidence of any EIA having been conducted (Forest Peoples Programme 2013).

CASE STUDY 6

Herakles Oil Palm Plantation, Cameroon

In 2009, the Cameroonian government issued a lease for an oil palm plantation covering 73,000 ha in the southwest of the country. The lease was issued to Sustainable Oils Cameroon (SGSOC), now owned by US company Herakles Farms. Almost the entire site is forested, and it is surrounded by a number of important protected areas, including globally significant Korup National Park. Surveys have confirmed that the area is home to populations of chimpanzees and forest elephants, among many other threatened species (Waltert 2013). Herakles plans to plant 60,000 ha of oil palm over a period of four years, and broke ground in 2011. Evidence of a whole range of breaches of regulations in the licensing and operation of the Herakles plantation has come to light in the years since.

In February 2012, a local court found that the company began clear-felling forest before receiving its environmental permit. A forestry department inspection in April 2012 found that the company had breached regulations, and this was confirmed in a follow-up visit alongside the official Independent Observer of Forest Law Enforcement and Governance in May 2012, which found that the company had cleared forest which had not yet been excised from the Permanent Forest Estate, and resulted in the issuance of a “notification primitive” to pay \$48,000 in fines and damages. In addition, local non-governmental organization Centre pour l’Environnement et le Développement (CED) claims that the lease agreement itself is in breach of the law, since it did not obtain the required Presidential approval and exceeds the maximum of five years allowed (Rainforest Foundation UK 2013a). Herakles operations were briefly suspended by the Cameroonian government in May 2013, yet Greenpeace has documented log markings which suggest that operations continued illegally during the suspension (Greenpeace 2013e). Greenpeace also claims to have evidence which suggests that Herakles’ employees may have used bribery to win support for its project (Greenpeace/Oakland Institute 2013a). In November 2013, the Cameroonian government issued a provisional land lease to Herakles for a reduced area of 20,000 ha; NGOs alleged that this confirmed that the plantation had previously been operating without all necessary permits (Greenpeace/Oakland Institute 2013b). In January 2014, Cameroon’s Minister of Forests issued a logging permit to a company called Uniprovince (controlled by Herakles via SGSOC) for 2,500 ha of land within the Herakles concession.

Greenpeace has alleged that the issuance of the permit was in “flagrant violation” of Cameroon’s forestry legislation, because it was not awarded by competitive public auction as required. During early 2014, Uniprovince is alleged to have used this license as a cover to transport large volumes of timber that were felled illegally between 2010 and 2013 by SGSOC, prior to the company’s land lease being finalized. Greenpeace field investigations showed that these old logs were being “laundered,” with log markings being changed. (Greenpeace 2014).



4.10.3 Percentages Used in Analysis

TABLE 25

Deforestation Analysis—Democratic Republic of Congo

Factor	Estimate	Justification
DEFORESTATION ANALYSIS		
% of 2000 to 2012 deforestation due to commercial agriculture	0%	At present only a very small percentage of deforestation in DRC is driven by commercial agricultural development. A synthesis of a series of quantitative and qualitative studies published in 2012 found that subsistence agriculture, artisanal timber harvesting, fuelwood and charcoal, industrial logging, and mining were the most important drivers (MECNT 2012)
% of 2000 to 2012 deforestation for commercial agriculture which was illegal	0%–42.9%–85.8%	Mid-point assumes the problem is 50% of the measured average of Brazil, Bolivia, Indonesia, Cambodia, and PNG; high-end assumes it is equal to their average.
% of illegal commercial agricultural deforestation 2000 to 2012 embodied in exports	0%	UN COMTRADE shows no significant exports of relevant commodities from Angola.

TABLE 26

Commodity Analysis—Cameroon

Factor	Estimate	Justification
COMMODITY ANALYSIS		
TROPICAL TIMBER		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	5%	Though this is projected to rise in the near future, only a small proportion of Cameroon's current tropical timber exports are assumed to originate from forest conversion, based on the estimated clearance and timber production at the Herakles oil palm plantation in 2012
% of forest clearance illegal	90%–100%	The only oil palm development currently known to be converting forest in Cameroon is the Herakles plantation. It is alleged that all of the timber produced by this project is of questionable legality, since there are overarching legal issues with the license. Official government and independent monitor inspections have confirmed illegalities in the conversion of forest for the oil palm plantation and subsequent timber production (see Case Study 6).

TABLE 27

Commodity Analysis—Gabon

Factor	Estimate	Justification
COMMODITY ANALYSIS		
TROPICAL TIMBER		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	6%–13% (mid-point 10%)	Gabon's formal logging sector produced a total of 1.7 million m ³ of logs in 2012 (OFAC 2014). Olam, which is developing a large new oil palm plantation in forested land in Gabon (Rainforest Foundation 2013), cleared and planted a total of 4,448 ha in the year to June 2013 (Olam 2013), and a further 1,370 ha the previous year (Olam 2012). This suggests a possible planting of 2,909 ha during 2012. Based on a conservative estimate of 45-90 m ³ of salvageable commercial timber per hectare, this rate of clearance could potentially have produced 130,000-260,000 m ³ from that area, representing between 6% and 13% of total national log production.
% of forest clearance illegal	0%	All of the conversion timber production and exports estimated in this analysis originate from the Olam oil palm plantation development. There is no evidence of illegalities in relation to this development, and thus it is assumed that all such production is legal.

TABLE 28

Commodity Analysis—Republic of Congo

Factor	Estimate	Justification
COMMODITY ANALYSIS		
TROPICAL TIMBER		
% of primary tropical timber product production from conversion for commercial agriculture / timber plantations	2%	The only major known source of conversion timber for export is the Atama oil palm plantation. Up to October 2012 it had produced 15,000 m ³ of logs (DDEFS 2012); assuming the rate of production continued at the same rate for the rest of the year would suggest an annual total of 20,000 m ³ . This represents approximately 2% of total roundwood equivalent exports in 2012.
% of forest clearance illegal	80%–100%	The only major known source of conversion timber for export is the Atama oil palm plantation. This has been found to be operating illegally by the official independent monitor of forest governance (REM/CAGDF 2013; see text).

5. DISCUSSION

The scale of illegality in the conversion of tropical forests for commercial agriculture and associated exports including conversion timber has important implications for global efforts to reduce deforestation and carbon emissions. At present, however, the scale of the problem is not sufficiently well understood or even acknowledged, and the implications rarely taken on board in relevant national and international initiatives. The following discussion examines the implications of this study's findings for existing initiatives designed to address the broader problem of tropical deforestation, and identifies actions that producer countries, consumer countries, and companies involved in relevant commodity product chains might take to tackle the problem of illegal agro-conversion and associated trade.

5.1 How Should Illegality Be Addressed?

Faced with the scale, breadth, and diversity of the illegalities documented in this report, and the weak governance underlying them, it would be easy to despair of ever tackling these issues and to focus on other actions to address deforestation. This would be a mistake, both because it is unlikely that those other actions will work in isolation, and because these problems are not insurmountable. For producer countries, the key actions will depend on the particular circumstances. Important lessons can however be learned from the successful efforts in Brazil (see Section 4.1). For all of these actors, there are important lessons to be learned from efforts to tackle trade in illegally sourced wood. There are especially important lessons for efforts under the banner of REDD+, which must pay less attention to measuring carbon and building incentive structures, and more to investing in policies and reforms designed to improve governance (Karsenty and Ongolo 2012).

It is important to bear in mind that this report does not argue that all of the current or past illegal deforestation could or should be detected, prosecuted or reversed. Neither could or should all associated trade in commodities “linked to illegal deforestation” necessarily be halted. That said, enforcement and prevention are vital to establishing good governance over forest and land use.

Some previous illegal deforestation has already been forgiven by relevant legal reforms; other such deforestation may have taken place too long ago to be readily detected or the relevant statute of limitations for prosecution may have expired. However, this does not mean that efforts should only relate to future illegalities and associated trade. It is essential that efforts are made to address past illegalities where possible, and to block markets for the associated commodities until such illegalities are addressed. Deciding which past illegalities to accept, which to forgive, and which to address, is a matter that should ideally be decided in each affected country through a broad multi-stakeholder dialogue, including the private sector, civil society and affected communities. There are important lessons to be learned from past efforts to tackle illegal logging and associated trade in how to

achieve this. This is one area where the experience in Brazil should not be used as a template (see Section 4.1.3 regarding recently enacted and wide-ranging amnesty).

Similarly, how current and future illegalities are dealt with will also vary across and within countries. Some illegalities should be of higher priority than others. Not all of them should necessarily be addressed through greater enforcement. In some cases, the solution may be to amend the relevant laws. In deciding these matters, lessons can be learned from processes under the EU's bilateral Voluntary Partnership Agreements, where these choices were made through a multi-stakeholder process, and helped identify which laws required amendment or clarification. Companies that have made zero deforestation commitments have an important role to play in encouraging and assisting in this process. They must also be willing to demand higher standards of legality from their suppliers, and exercise greater due diligence, if they believe this is justified. Although the clarification and improvement of the regulatory framework is essential, producer countries should not weaken environmental and social safeguards in the name of economic development. In many countries, the legal frameworks should in fact be strengthened to include statutory recognition of Indigenous Peoples' and other local communities' customary tenure, in line with international commitments such as the UN Declaration on the Rights of Indigenous Peoples (UN-DRIP).

5.2 Challenges Posed by Illegality for Existing Strategies to Address Deforestation

5.2.1 Voluntary Efforts by the Private Sector

A number of studies have demonstrated the increasing importance of overseas demand for commodities in driving the conversion of tropical forests. For example, an academic study in 2013 sought to assess the extent to which the experience of export-driven agro deforestation in Mato Grosso state in Brazil could be expected to be replicated in other tropical forest countries. The study concluded that between 41 and 54 percent of tropical deforestation outside Brazil between 2000 and 2005 occurred in countries where export-driven agriculture was also an important driver. The study found evidence that export-oriented agriculture had grown in importance as a driver of tropical deforestation worldwide since the beginning of the 2000s (DeFries et al. 2013).

Cuypers et al. (2013) concluded that around one-quarter of “embodied deforestation” in agricultural products produced at the expense of forest between 1990 and 2008 was exported. This is an overall average, however, and given that exports of key commodities have grown as a proportion of production,⁷⁴ the current proportion exported is most likely considerably higher.

On the international demand-side, the main scope of activity to date on reducing tropical agro-conversion has been on voluntary efforts by major producers, traders, and consumers of relevant products to reduce tropical agro-conversion while trying to meet the growing demand for commodities to feed the world's burgeoning population. These efforts have been generally driven by NGO-led consumer campaigns (Brack 2013) and fall under two broad categories. The first is the development of generic global standards, often under the auspices of multi-stakeholder roundtables, which allow for the production of different commodities to be independently “certified” as legal and sustainable. The second is the adoption and implementation of company-specific commitments to zero “embedded” deforestation by producers, traders, or buyers of relevant commodities. Though there is normally some element of legality assessment involved, efforts to date have focused more broadly

⁷⁴ For Brazilian beef, for example, studies show the proportion of embodied deforestation exported grew between 1990 and 2008 (see Karstensen et al. 2013).

on sustainability, defined as avoiding the clearance of High Conservation Value (HCV) or High Carbon Stock (HCS) forests, or eliminating deforestation altogether, and often encompass commitments related to land and human rights. Many of the companies that have made such commitments are members of the Consumer Goods Forum (CGF), a large network of consumer goods manufacturers and retailers, which has sought to drive further change through strategic partnerships with governments, civil society, and banks, through initiatives such as the Tropical Forest Alliance (see Box 9 for more information on existing private sector initiatives).

These voluntary efforts have made significant progress in recent years, especially in relation to palm oil with 16 percent of global production now being certified (RSPO 2014) and more than half of the commodity trade being controlled by companies that have made zero deforestation pledges (Shankleman 2014). However, issues of legality pose a number of major challenges.

Firstly, there are serious concerns over whether these policies and standards can effectively prevent trade in products from illegal agro-conversion. There are issues with both the standards themselves and their implementation. The legality criteria in these voluntary policies and certification schemes do not capture all of the different types of common illegalities documented in this report, such as whether relevant licenses were legally issued. Most do not sufficiently address past illegalities. Many voluntary policies and schemes also do not include sufficiently well-designed and implemented systems for monitoring compliance with the aspects of legality. The weakness of these monitoring systems has been regularly exposed by individual cases by certified suppliers uncovered by third parties (Greenpeace 2013f; RSPO 2013a).

- With regard to beef, the G4 Cattle Agreement in the Brazilian Amazon does not preclude purchases of cattle from areas illegally deforested prior to 2009, except where that illegal deforestation has been detected by the authorities. Even where detected, purchases are still permitted once fines are paid. There is also evidence that one of the largest parties to the agreement has failed to become compliant (see Section 4.1.3).
- With regard to palm oil, almost all of the area certified by the RSPO to date is made up of plantations that were established long before the certification process was started. RSPO certification rules do not require any rigorous assessment of the legality or sustainability of the forest conversion that took place in the past. Though more meaningful legality criteria do apply to new plantations established by RSPO members, the available evidence calls into question how meaningfully these may be applied. A comparison of RSPO data with the collation of published allegations of illegalities in oil palm development in Indonesia (see Section 4.2.3) indicates that of the 15 plantations that filed “new planting” assessment notifications by RSPO members in 2013, eight were subject to past or current allegations of illegality. This includes two plantations in Indonesia previously confirmed by an independent study to have cleared forest illegally (Wakker 2009),⁷⁵ and two more plantations about which complaints have been filed with RSPO alleging illegal clearance outside concession boundaries (RSPO 2013a).⁷⁶ The voluntary commitment by Wilmar, the world’s largest palm oil trader (see Box 9), encompasses a larger proportion of global trade than the RSPO, but only applies to oil palm plantations developed *after* the policy was implemented in December 2013 (Wilmar 2014)⁷⁷—it does not require any checks on the legality of oil palm plantations supplying Wilmar that were planted prior to that date.

⁷⁵ PT Karya Makmur Bahagia and PT Windu Nabatindo Lestari.

⁷⁶ PT Teguh Jayaprima Abadi and PT Prima Mitrajaya Mandiri (subsidiaries of MP Evans Group PLC).

⁷⁷ Wilmar, “Clarification on media’s misreporting about Wilmar’s ‘No Deforestation, No Peat & No Exploitation’ policy,” undated.

- With regard to pulp and paper, the zero deforestation policy of Indonesia's largest producer, Asia Pulp and Paper (APP), also only applies to future activities (APP 2013) and does not address the company's past transgressions, which the evidence suggests are substantial (see Section 4.2.3). Though the company claims it will no longer produce pulp made from tropical wood fiber, the plantation-grown acacia it now uses instead is grown on land that is likely to have been illegally cleared.

In theory, standards and criteria could be improved, as could monitoring and enforcement. But even if these were to occur for every broad initiative and individual policy, the potential of these voluntary efforts would still be limited by their voluntary nature which will never encompass all relevant production and trade. Most of them currently only capture a small minority of the commodity trade of concern. There will always be companies who will not sign up. And there will always be the challenge with new entrants. The largest new oil palm plantation in the Congo Basin, for instance, is being developed by a firm with no previous experience in the sector (see Section 4.10). So long as some companies are able to continue producing and trading products from illegal deforestation, they will be able to undercut the price on their more conscientious competitors, holding back both the expansion and improvement of voluntary commitments. One of the many lessons from successful previous efforts to tackle illegal and unsustainable timber production (see Box 10) is that voluntary certification struggled to achieve critical mass while having to compete on price with products that were illegally sourced.

The final challenge posed by legality for voluntary private sector actions is the weak governance in many producer countries. A lack of access to official government documents and unclear, and sometimes conflicting, laws and regulations often make it hard for companies and their employees to establish with confidence whether a product was produced legally or not. Ultimately, illegalities relating to commercial agriculture and timber plantations can only be fully addressed by governments, and voluntary efforts will be held back by having to compete with products that were illegally sourced. Recognizing this, companies involved in relevant sectors must actively promote and support the actions by both producer and consumer governments recommended in Chapter 6 below.

BOX 9

Private Sector Initiatives to Address Tropical Deforestation Driven by Commercial Agriculture

Certification schemes: Several multi-stakeholder roundtables have emerged at the national and international level to coordinate efforts to ensure minimum levels of sustainability in the production and trade of specific commodities including soy, beef, leather, and palm oil. These roundtables typically establish standards and criteria for certifying that production is sustainable and for tracking products through supply chains. The standards normally include a requirement for compliance with national laws, and also preclude clearance of High Conservation Value (HCV) forests, but many continue to allow for legal conversion of other forests. The Roundtable for Sustainable Palm Oil (RSPO) is the earliest and most developed of these commodity-specific roundtables. RSPO certifications for sustainable palm oil now encompass 16 percent of the world's palm oil production (RSPO 2014). Other commodity roundtables have made less rapid progress: the Roundtable on Responsible Soy certified 0.5 percent of global production in 2012 (Brack 2013). The Roundtable on Sustainable Beef is not seeking to establish any certification system. Aside from those established by commodity roundtables, a number of other sustainability certification systems have been established for relevant commodities (including soy, cocoa, and coffee). All require compliance with national laws, though this is not their principal focus.

BOX 9, CONT.

Private Sector Initiatives to Address Tropical Deforestation Driven by Commercial Agriculture

Individual company commitments: Many large multinational companies have decided to make their own individual commitments to address concerns over deforestation in their supply chains. This includes producers, traders, and buyers of relevant commodities (including soy, beef, leather, palm oil, and pulp and paper). Some such commitments simply aim to source certain percentages of relevant goods via the established certification schemes by certain dates. However, in recent years a number of major companies have declared policies that extend beyond the standards set out by relevant certification schemes, and normally seek to entirely preclude all deforestation. Among the earliest such commitments were the soy moratorium (2006) and the G4 Cattle Agreement (2009) in Brazil (see Section 4.1). More recently, a number of the largest producers, traders, and buyers of palm oil and tropical wood pulp have also made “zero deforestation” pledges. In addition to the standards typically encompassed by certification schemes, these pledges also preclude conversion of High Carbon Stock (HCS) forests and forests on peat soils; in some cases they also include stronger human rights requirements. One of the most impactful of such commitments came in December 2013, when Wilmar, the world’s largest trader of palm oil, announced a zero deforestation policy, which would apply to both its own production and that of its third-party suppliers. Coming in the wake of similar commitments by a number of large international palm oil buyers (including Nestlé and Unilever) and by Golden Agri Resources (one of the world’s largest palm oil producers) during 2010 to 2012, the Wilmar commitment means that more than half of global palm oil in trade now falls under such a policy (Shankleman 2014). In 2013, Indonesia’s largest pulp plantation developer, Asia Pulp and Paper (APP) also announced a zero deforestation commitment (APP 2013). Many large buyers of leather and paper products have also made zero deforestation commitments in recent years. How strong these zero deforestation commitments will turn out to be depends in part on the definition of forest. The definition of High Carbon Stock (HCS) forest remains especially open to different interpretations. Under the strictest interpretation, only scrubland would be excluded, but individual companies may choose to take a less broad approach. Another potential drawback is that not all of the policies require transparency and third-party monitoring.

Other partnerships: Companies are not only scrutinizing their own operations, but also teaming up with new partners to implement wide standards and certification at scale. In 2010, for example, the Board of the Consumer Goods Forum (CGF), a network of consumer goods manufacturers and retailers that counts many of the world’s largest buyers of forest-risk commodities among its members, announced a pledge to achieve zero net deforestation by 2020, by both individual company initiatives and by working collectively in partnership with governments and NGOs (Consumer Goods Forum 2010). In 2012, the CGF partnered with the US government to launch the Tropical Forest Alliance (TFA), a public-private partnership in which business, government, and civil society partners take voluntary actions to reduce the tropical deforestation associated with the sourcing of commodities. The TFA now counts a number of other governments and many international forest NGOs (including Forest Trends) among its members (TFA 2014). In 2014, the CGF also reached an agreement with eight major international banks to work together to leverage the financial sector to help achieve the goal of zero net deforestation through addressing production and trade of relevant commodities (Banking Environment Initiative 2014).

5.2.2 International Forest Policy Initiatives

Reducing Emissions from Deforestation and Forest Degradation (REDD+): Since 2007, climate policy has increasingly driven international efforts to protect forests for their carbon storage via a multilateral effort known as REDD+, by which governments or forest owners in developing countries receive payments to maintain standing forests and their associated carbon stocks. To this end, policy makers are seeking methods to measure forest carbon and establish procedures, safeguards, and monitoring systems by which such payments might occur.

Though some donor financing has been channeled to address broader forest governance issues and illegality in recipient countries such as Brazil and Indonesia, REDD+ has failed to fully recognize that half of the deforestation it seeks to prevent is already illegal.

Very few REDD+ national strategies and proposals for action directly acknowledge the importance of illegal agro-conversion as a driver of deforestation. Even fewer make clear distinctions between the mechanisms that can be called upon to address illegal deforestation as opposed to planned and legal deforestation.

The official Decision on drivers of deforestation agreed by parties to the UN's Framework Convention on Climate Change (UNFCCC) in November 2013 does not directly state the importance of illegal agro-conversion (UNFCCC 2013). Prior to this Decision, the Cancun Agreement (2010) established clear safeguards for undertaking REDD+ activities, and mandated transparent and effective forest governance (taking into account national legislation) and respect for the rights of indigenous and local communities (taking into account international obligations and national laws) (UNFCCC 2010). However, countries have since struggled to implement these safeguards. Until the widespread illegality in forest conversion is meaningfully addressed, the potential impact of REDD+ is severely limited. There is little point in encouraging a government to reform forest policies through the promise of REDD+ payments until existing ones are implemented and enforced (Karsenty and Ongolo 2012). Forest owners, on the other hand, may struggle to fulfill promises to protect tracts of forest nominally under their control in the absence of meaningful governance and secure tenure.

Degraded lands policies: Significant funds have been spent to promote policies to direct new commercial agriculture onto "degraded land" rather than expanding into natural forests. Efforts have included mapping and measuring degraded land, encouraging producer governments to pass laws limiting development on forest lands, and persuading companies with concessions to voluntarily "swap" natural forests for degraded lands.

The potential effectiveness of this strategy is questionable given the widespread illegalities documented in this report. Companies that ignore legal requirements will likely also ignore voluntary commitments, and are likely to favor forested over non-forested land especially when conversion timber revenues can help offset their development costs of establishing commodity plantations. The most effective way to drive agricultural development away from forests is by limiting new land concessions to land that is already degraded. This would require new government regulations, which cannot be expected to work if governments are already shown to be unable to implement and enforce existing laws.

Financing illegal conversion through imports and development aid: The developed nations that are bankrolling REDD+ are also undermining their own efforts by continuing to buy billions of dollars' worth of beef, soy, palm oil, and timber grown on illegally deforested land. In some cases, they are directly or indirectly financing the companies responsible. The Norwegian Government's sovereign wealth fund, for example, had investments in a range of logging and oil palm plantation companies, many of which were the subject of evidence or allegations of illegal agro-conversion, until it recently blacklisted them and divested (Rainforest Foundation Norway 2013). Governments and multilateral institutions such as the World Bank's International Finance Corporation also commonly provide loans and free services to large companies involved in relevant commodity supply chains. The World Bank's lending to a

large meat-processing company in Brazil (see Case Study 1), for example, demonstrates how weak safeguards can result in the financing of companies processing products from illegal forest conversion.

5.2.3 Applying Existing Demand-side Measures to Conversion Timber

During the clearance of forest for agriculture, it is common for the profits from the timber salvaged during clearing to help finance the up-front cost of clearance and planting the subsequent agricultural crop. In some cases, such profits may be large enough to be the principal reason for the project. If such timber can be prevented from reaching the market in cases of illegal conversion, it may lead the developer to abide by the law, shift development on to degraded land, or even render the project unviable completely.

Existing demand-side measures on illegal natural forest timber, though mostly developed with selective logging in mind, do encompass conversion wood but are not being used for this purpose to their full potential. This is partly because policy makers do not yet fully comprehend the proportion of tropical wood production in most countries originating from forest conversion, or the extent to which this is likely to increase.

Bilateral VPAs between the EU and producer countries could be an important tool to capture this illegal conversion timber. However, Forest Trends' research has shown that these VPAs are not effectively preventing illegalities related to conversion timber (Hewitt 2013). This applies to both the criteria for assessing legality, and the definitions by which relevant government documents must be made transparent. Though most VPAs permit at least one type of conversion timber, they do not mention all such permits nor address whether these permits have been issued legally. None of the VPAs examined relevant permits that are issued by agencies other than the forestry department. It is also unclear whether any of the VPA licensing systems currently under development will include meaningful field checks on compliance with regulations governing forest clearance or planting (such as legal reserves, and prohibitions on clearing using fire, on deep peat, river buffers or steep slopes).

As a result of these deficiencies, it is unlikely that timber sourced from most kinds of illegal agro-conversion documented in this report would be effectively prevented from reaching markets under the EU VPAs. More broadly, if illegal conversion wood is able to leak into licensed supply chains, it risks undermining the credibility of the VPA process as a whole. Urgent efforts are needed in producer countries to ensure that VPAs capture conversion timber effectively. It is also unclear whether the new legislation governing the legality of timber import and sale in the US, EU, and Australia is addressing conversion timber as effectively as it should. Even where relevant illegalities are encompassed, there is a risk that implementation and enforcement of these laws may focus solely or disproportionately on selective logging. To date, there has not been a seizure, investigation or prosecution under these laws relating to conversion timber, despite all the publically available information on illegalities. So far, all of the cases brought under these laws have been related to selective logging.

Legality definitions and licensing schemes established through multi-stakeholder processes for agricultural commodities akin to the EU's existing FLEGT VPAs on timber could not only help consumer countries implementing new laws governing imports (by distinguishing legal from illegal products), but would also help industry seeking clarity on relevant laws and regulations. The extension of processes such as the VPA legality and licensing development to agro-commodities holds perhaps the greatest potential among possible demand-side regulatory measures, because they also have the ability to simultaneously improve the supply-side response of producer countries (as demonstrated in the case of timber; see Box 10).

All of these potential actions face considerable challenges, but have a model in the case of timber where most are already being implemented. Supply chains for many of the commodities concerned are complex, but the same is true of timber. In some ways the commodity supply chains are actually simpler, with tracking

already established throughout the entire supply chain (to allow product recalls to protect human health, for example), less secondary processing and re-export, and a much larger proportion of production handled by a small number of major companies. While regulatory arrangements in many producer countries are unclear or conflicting, the same is true for timber and this is being gradually addressed, partly under the auspices of VPAs and other bilateral agreements.

One unique challenge for agro-commodities is the delay between the illegal conversion and the commodity production and export. It takes time to grow the commodities that are produced at the expense of forests, from 6 to 12 months for soy to up to 20 years for plantation wood. Assessing the legality of conversion that took place some years before is challenging, but not impossible. Many academics and NGOs have successfully compared archived satellite imagery with official concession maps in order to identify past illegalities in forest conversion. Though no one expects legality of conversion that took place 100 years ago to be assessed, a cut-off date of around 10 years is eminently feasible for all of the relevant commodities.

Though making best use of existing measures on conversion timber is an essential first step, not all tropical forests converted for agriculture contain much valuable timber. Indeed, most conversion takes place in forests that are already degraded to some extent. Where there has been extensive illegal selective logging, and most trees of valuable timber species have already been extracted, it is common for conversion wood to simply be burned, buried, or piled up and left to rot. Even where profits from conversion timber sales are helping to underwrite plantation development, the removal of these profits alone may be insufficient to prevent the forest conversion from taking place. Ultimately action is needed to address the demand for commodities produced at the expense of forests that were cleared illegally. If these commodities cannot be sold, the economic rationale for the illegal conversion disappears entirely.⁷⁸

BOX 10

Lessons from Efforts to Tackle Illegal Logging and Associated Trade in Timber

In addressing agro-conversion and associated commodity trade, there are many useful lessons that can be learned from decades of experience of trying to reduce illegal and unsustainable logging and the associated timber trade. Though it has been a long road, there is increasing evidence that these efforts are paying off, with illegal logging falling substantially in three key producer countries, and the amount of illegal wood in international trade also falling dramatically. This is estimated to have resulted in the saving of billions of metric tons of carbon dioxide emissions and a substantial increase in tax revenues for producer countries (Lawson and MacFaul 2010). Previously, illegal logging had likely depressed world timber prices by more than 15 percent due to an uneven playing field caused by companies bypassing the law (Seneca Creek Associates 2004).

The experience from timber includes lessons on both what does and what does not work, and on both the supply-side, by producers and producer country governments, and the demand-side, by sourcing and purchasing companies and government agencies. Adopting lessons from these successful efforts could jump-start solutions to tackling illegal agro-conversion. Specific and transferrable lessons include:

⁷⁸ For further background and detail on the potential applicability of consumer-country measures used to exclude illegal timber to illegal or unsustainable agricultural products associated with deforestation, please see Brack and Bailey. 2013. "Ending Global Deforestation: Policy Options for Consumer Countries." Chatham House and Forest Trends, London and Washington. <http://www.chathamhouse.org/publications/papers/view/194247>

BOX 10, CONT.

Lessons from Efforts to Tackle Illegal Logging and Associated Trade in Timber

Private Sector:

- Voluntary private sector measures will not be able to address illegality unless they are accompanied by action by governments, both in producer and consumer countries. On the one hand, voluntary efforts to improve “sustainability” on timber were held back by having to compete with products sourced illegally. On the other, a lack of clarity in laws and regulations and poor transparency of relevant government documents made it difficult for certification systems to effectively check for compliance.

Producer Countries:

- Laws and regulations must be made clear, consistent, and coherent if they are to be enforceable. Where laws are unclear or incomplete, it is difficult to prosecute offenders and may preclude responsible companies from investing in a particular country.
- Systems of official independent monitoring of law enforcement and governance should be implemented (Lawson and MacFaul, 2010).
- Transparency of relevant government information (such as licenses and concession maps) is important, for a number of reasons. It can help prevent corruption, enable enforcement, and empower third parties such as NGOs to expose wrongdoing.

Consumer Countries:

- Policies requiring the use of only legal and sustainable timber in government purchases can prove to be an important catalyst. Such policies have helped expand the market for and raise standards in voluntary verification and certification of legality and sustainability, and forced many companies to explore legal supply chains for the first time (from “forest floor” to point of purchase). In doing so these policies have (among other things) helped pave the way for broader legislation governing all imports and sales of wood products (see next point).
- Regulations governing all imports are needed if the whole market is to be captured, and there are advantages to having these regulations focus on legality. Laws that make it an offence to import illegally sourced timber and wood products have now been enacted in the US, Australia, and the EU, which also requires companies to practice due diligence. These laws are starting to drive the broadest changes yet in purchasing, with major effects in producer countries. By focusing on legality (as opposed to sustainability) these laws have respected sovereignty and the right of producer countries to pursue economic development, while also avoiding WTO compliance issues.
- Bilateral engagement between producer and consumer countries is essential, both to enable implementation of demand-side regulations and to support parallel supply-side action. This has been most notably demonstrated by the EU’s Voluntary Partnership Agreements (VPAs). These agreements, though ostensibly demand-side measures with the purpose of excluding illegal wood through the establishment of licensing schemes, are actually having much broader impacts, including on the supply side (FERN 2013). In effect, these are government to government trade agreements voluntarily entered into by both parties, but once signed are legally binding at the highest level of international law. They provide and guarantee consumer market access in exchange for improved forest and land use governance, combined with mutually created institutions that monitor partnership or treaty compliance. They are distinct from voluntary company-specific or roundtable commitments, which are not legally binding. Impacts include clarifications of relevant laws and regulations, improvements in stakeholder engagement, increased transparency and the introduction of independent third party monitoring.

5.3 Conclusion

In summary, the evidence presented in this report indicates that the phenomenon of illegal forest clearing for commercial agriculture and associated exports has continued at an alarming rate since at least the start of the 21st century. Indeed, this problem is worse than previously thought—and is likely occurring to a greater extent than the conservative estimates in this analysis show. While rising global incomes and demand for agricultural products will continue, we are currently responding with a flawed development model. It is increasingly clear that much of the forest land conversion for large-scale agricultural projects is in violation of some of the producer countries' most basic laws and regulations and incurring high social and environmental costs. These illegalities will become more pronounced as producer countries encourage agricultural investments as a way to catalyze growth. Deforestation will increase in regions such as the Congo Basin where little commercial agriculture previously existed, unless we ensure that forest land converted for production is acquired legally and sustainably. The following chapter looks forward to how this can be achieved.

6. RECOMMENDATIONS

6.1 The Private Sector

Most companies involved in developing new commercial agriculture and timber plantations in tropical forest countries claim their operations abide by all relevant laws and regulations, but complain that legal arrangements are unclear or impractical, and that it is difficult and costly to demonstrate legality. Companies that produce, consume, or trade in the relevant commodities will likely need to engage in more in-depth due diligence to ensure that their products and purchases are not associated with illegality. They should join forces with other concerned stakeholders to call upon governments to clarify laws and regulations, and refrain from development projects in high-risk situations. While many international banks, private investors, and financial services providers have committed to the Equator Principles, many have not been able to develop sufficient due diligence to ensure that financing is only provided to responsible companies and projects where legality can be demonstrated. However, not many regional and national banks have committed to the Equator Principles. To be robust, all these efforts will require third-party monitoring and the publication of relevant information. Without these systems in place, investors and lenders risk default and undermining their supply chains when producers or traders are forced to confront illegalities within their operations. In other words, when illegalities occur, industry actors throughout the supply chain face financial risk. Independent analysis has shown, for example, that ignoring both statutory and customary community or land rights presents a significant financial risk to land developers and investors in the form of increased operating costs—as much as 29 times over a normal baseline scenario (The Munden Project 2012). Thirty-one percent of industrial concessions (including, but not limited to commercial agriculture) in emerging economies are estimated to overlap with community lands, equating to \$5 billion in value of agriculture production (The Munden Project 2013).

Knowing that these systems are not yet sufficiently robust to ensure legality, companies should seek to strengthen existing certification schemes, or even go above and beyond their standards and due diligence. The best way for companies to ensure that they are not involved in the illegal clearance of forests may be to ensure that they are not involved in clearance of forests at all, through the implementation of strong “zero deforestation” commitments (including commitments relating to rights of affected communities and customary landowners), backed with third-party monitoring.

RECOMMENDATIONS

Companies producing or trading relevant commodities should

- comply with all national laws when developing new commercial agricultural and timber plantation projects in forested countries and when purchasing products;
- refrain from engaging in such projects in countries where it is not possible to ensure legality;
- purchase and trade only commodities that are legally produced and traceable back to their source;
- verify that relevant policies such as zero deforestation commitments are properly implemented via independent third-party monitoring and by publishing relevant information;
- improve existing certification schemes to ensure that these more effectively preclude commodities from illegal conversion;
- conduct comprehensive assessments of past illegalities by existing concessions (i.e., that examine the processes by which licenses were issued and that use archived satellite imagery to examine whether clearance began in advance of permitting);
- promote and support actions by producer country governments to tackle the problem (see Recommendations for producer countries), including the resolution of legal uncertainties, conflicting regulations, and unclear tenure;
- promote actions by consumer-country governments to tackle the problem, including through demand-side regulation; and
- adopt policies that extend beyond national laws, such as avoiding embedded deforestation entirely and requiring the Free, Prior and Informed Consent of Indigenous Peoples and local communities (as per established international standards).

Banks, investors, and financial services providers should

- ensure that financing is only provided to relevant companies, shipments, and projects where legality can be demonstrated.

Certification bodies and associated roundtables should

- develop or strengthen standards and assessment, monitoring, and compliance mechanisms to ensure that they can meaningfully guarantee that no certified products are associated with any of the types of illegalities described in this report;
- strengthen monitoring and enforcement of standards, including through independent monitoring, transparency of information, and appropriate procedures for handling third-party complaints. These mechanisms should have the capacity to conduct a clear assessment of members' compliance with national laws; and
- lobby for regulatory action by consumer country governments to ensure that only legally produced products can be imported or sold, thereby creating a level playing field on which companies can compete on broader issues of sustainability.

6.2 Producer Countries

The most important responsibility in tackling illegal agro-conversion lies with producer country governments. Actions will need to be country-specific, given the nature, extent, and where a particular country is in the process of taking steps to address the problem. However, some broad principles can be outlined:

- a. Improve enforcement:** While a lack of resources is often cited as the greatest impediment to effective enforcement, greater coordination and data-sharing among the government agencies at the central, provincial, and district levels is critical. Government agencies could also make better use of existing technologies, such as satellite imagery, to detect illegalities. If necessary, in the worst cases, a full review of the legality of all relevant licenses may be necessary to be carried out by an independent body (as has recently occurred in Papua New Guinea). In many countries, however, forest law enforcement is operating within a national context of weak governance. Anti-corruption efforts, for example, would work more effectively if applied across all sectors and complemented by nation-wide judicial reform, the establishment of freedom of information processes, uncontrolled media, and the regulation of lobbying.
- b. Clarify and improve laws and regulations:** Unclear, inconsistent, or conflicting laws and regulations lead to confusion over the responsibilities between different levels of government, unnecessarily complex licensing procedures, and lack of clarity regarding land rights and land use planning. Successful efforts over the past 15 years to tackle illegal logging and associated trade (see Box 10) have shown how processes that clarify, simplify, and streamline relevant laws, regulations, procedures for compliance, and rights have brought transparency of relevant government information, helped to implement official systems of independent monitoring and reduced corruption. Producer countries can also learn from some of the innovative actions already taken to address illegal agro-conversion, particularly those taken in Brazil (see Section 4.1). Lessons can also be learned from other countries that fail to create a viable set of regulations and a functional governance structure for monitoring and enforcement. Improved laws and regulations must also be sensitive to the needs of smallholder forest producers, which are often the least able to meet complex requirements.
- c. Address past illegalities:** Blanket amnesties to address past illegalities have garnered criticism that they uphold impunity and undermine the rule of law. Although it may be impractical to demand that established plantations that were developed illegally are returned to native forest, these plantations must only be considered legal after genuinely dissuasive penalties are applied to the companies involved, impacts mitigated or offset, and damaged parties (such as customary landowners) are properly compensated. In the most serious cases, the only appropriate action may be to revoke the license and appropriate and auction the land or return it to its rightful owner(s).
- d. Work with consumer countries:** Another important lesson to be learned from successes under the FLEGT VPAs is that benefits can be gained by working in partnership with consumer countries (see Box 10). Many producer countries, including those with little or insignificant trade to the EU, see the benefits of VPAs extending far beyond that of a trade agreement. They have used the technical assistance and political space opened by FLEGT VPA negotiations to support multi-stakeholder processes to clarify laws and regulations, draft new legality standards, and create legality assurance systems necessary to demonstrate the compliance of their exported products.

Where illegality is widespread and it is likely to take a long time to address legal and institutional failings and resolve past illegalities, countries may consider instituting broader measures, such as a complete moratorium on forest conversion, at least until the governance situation has been substantially improved—as Indonesia has done for new licenses. In more comprehensive or extreme cases, such moratoria could be applied retroactively to areas already licensed but not yet developed.

Producer countries must also ensure that international commitments regarding the rights of local communities and Indigenous Peoples, including customary land ownership, are reflected in national laws that are fully implemented and enforced. Aside from directly ensuring legality in this regard, such a step may serve to help reduce other forms of illegality, given the mounting evidence that granting local and indigenous communities rights to forestland protects forests while simultaneously improving livelihoods (Seymour et al. 2014; Stevens et al. 2014).

RECOMMENDATIONS

Producer country governments should

- ensure that the legal and regulatory framework governing the licensing and implementation of relevant developments on forest lands is clear, consistent, and non-conflicting;
- improve enforcement of relevant laws and regulations by increasing necessary resources, improving inter-agency coordination and information sharing, increasing penalties making best use of technology (such as satellite images), using anti-corruption and anti-money laundering bodies and laws, and putting in place systems of officially-mandated independent monitoring;
- consider commissioning a full review of the legality of all relevant licenses, to be carried out by an independent body;
- resolve past illegalities in a manner that is practical but which ensures transgressors do not stand to gain and that those affected are properly compensated. Resolve any conflicting land rights claims arising from regulatory conflicts or inconsistencies through clear legal frameworks;
- collate and publish all relevant information (including licenses and permits, associated maps, and land use planning and land ownership maps) and make such publication a legal requirement;
- request the assistance of donor and consumer countries, supported by bilateral arrangements such as the EU FLEGT VPAs (see Box 10);
- consider implementing strict and enforceable moratoria on conversion until regulatory arrangements have been clarified, land rights conflicts and past illegalities resolved, and enforcement systems improved;
- draft or revise national REDD+ policies that acknowledge the importance of illegal agro-conversion as a driver of deforestation and outline specific steps to reduce illegalities; and
- ensure that international commitments regarding rights of local communities and Indigenous Peoples are fully reflected in national laws and properly implemented and enforced.

6.3 Consumer Countries

Refocusing REDD+ and Other Donor Finance: Many of the key consumer countries of relevant commodities are also important contributors to multilateral efforts on REDD+ or directly involved on a bilateral level in REDD+-related initiatives. If global efforts to reduce climate emissions from deforestation are to be effective, it is essential that these countries take action to refocus efforts under the REDD+ banner to ensure that they address—as a priority—illegalities and poor governance relating to the clearance of forests for commercial agriculture and timber plantations. In addition to re-aligning their own bilateral REDD+ programs, this will involve advocating for multilateral and national producer country REDD+ policies and programs to properly address these issues.

Donor governments must support relevant efforts by producer countries through both financial and technical assistance, but also advocate and require that meaningful steps be taken to tackle these problems as a precondition for any broader donor assistance on forests. Such countries must also ensure that they are not inadvertently contributing to the problem by investing in or financing, directly or indirectly, the companies involved.

Though there is plentiful evidence to demonstrate that it is a major problem in many countries, this report has also shown that there is a shortage of independent, systematic research on the nature and extent of illegalities in commercial agricultural development and its role in deforestation. International donors should prioritize further research in this area. They should also provide increased financial assistance to civil society groups involved in relevant efforts to address the issues raised in this report.

Creating New Demand-side Measures to Curb Illegal Agro-Conversion: Most of the measures used to block market access to illegally-sourced timber (see Box 10) also hold potential for agro-commodities. The UK has already implemented a policy requiring that all government purchases of palm oil are legal and sustainable, though it is built around the RSPO certification system and needs to be strengthened by requiring higher standards over time. Such public procurement policies can be replicated for other forest-risk commodities and in other important consumer countries. In doing so, lessons from timber can be applied: good guidance is essential for purchasers, systems need to be established to monitor implementation, and alignment of policies across countries has greater impact and efficiencies for marketplace actors. However, although these policies do have some broader impacts, government purchasing only represents around 12 percent of all trade (OECD 2011). To address the entire market, consumer countries should consider regulations that govern all imports. Such laws, already passed in relation to timber in the US, EU, and Australia, could make it an offense to import or sell agricultural commodities that were produced on land illegally cleared of forest, or require that importers carry out due diligence in order to minimize the risk of purchasing such products.

RECOMMENDATIONS

Consumer country governments should

Refocus REDD+ and donor financing:

- provide technical and financial assistance for the necessary actions to be taken by producer countries to eradicate illegal forest clearing and resolve outstanding issues of illegality (see recommendations for producer countries above), including (among other things) reforms to land tenure regimes to protect the legal rights of forest communities;
- ensure that donor assistance on forests makes legality and improvements to forest governance a priority and precondition for further assistance;
- advocate for producer country REDD+ policies and programs that directly address legality and forest governance;
- advocate for relevant multilateral institutions such as the World Bank and UNEP to better address this issue in their work on and assistance to producer countries under REDD+ and otherwise;
- advocate for REDD+ monitoring, reporting, and verification (MRV) standards in international climate policy forums such as the UNFCCC that will provide oversight to further prevent illegal clearing of natural forests;
- require pension funds, sovereign wealth funds, and other nationally-governed financial instruments to carry out necessary due diligence and refuse to do business with companies found to have a high risk of being associated with illegal forest clearance;
- provide technical and financial support to civil society groups tackling these issues; and
- support further research to better understand the nature and extent of relevant illegalities, and measures effective at reducing their occurrence;

Create new demand-side measures to curb agro-conversion:

- ensure that existing demand-side measures on timber (including procurement policies, regulations governing all imports and bilateral agreements such as VPAs) are revised to ensure that they encompass conversion timber to the maximum possible extent;
- in countries where no such timber-related demand-side measures exist, enact these as a matter of urgency;
- ensure that these demand-side measures are fully implemented and enforced, with an appropriate proportion of attention and resources paid to cases related to conversion and sufficiently dissuasive penalties. Implement policies requiring that all government purchases of relevant commodities are proven to have been legally and sustainably sourced and ensure that new or existing procurement policies include standards that are high enough to ensure that products associated with the kinds of illegalities documented in this report are excluded;
- consider passing legislation making it an offense to import or sell agricultural commodities produced on land illegally cleared of forests and/or requiring that importers carry out due diligence in order to minimize the risk of purchasing such products;
- establish bilateral trade agreements with important supplier countries, following the model of the EU's Voluntary Partnership Agreements; and
- ensure that penalties are sufficiently high and monitoring and enforcement sufficiently robust to guarantee compliance with these regulations.

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ANNEX A

Area of Tropical Deforestation (A)

The analyses presented here used Hansen et al. (2013) dataset on total gross forest loss of tropical forests with canopy cover greater than 51 percent. A sensitivity analysis was conducted using two alternative datasets: gross loss of forest with canopy cover greater than 1 percent (Hansen et al. 2013); and net forest loss from 2000 to 2010 as defined by FAO (FAO 2010). There was no substantial difference in results (Figure 5).

There are issues with all three datasets. The Hansen et al. analysis measures tree cover only and therefore does not distinguish between natural forests and plantation forests, and the research team did not conduct ground verification at sample sites. The FAO dataset also has drawbacks, including inconsistent methods between countries, reliance on self-reporting, a definition of “forest” based on official land use rather than land cover, forest area changes only reported as net values, and forest definitions that changed over time (Hansen et al. 2013).⁷⁹

Proportion of Deforestation Driven by Commercial Agriculture (B)

For most of the 17 countries examined in detail in the deforestation analysis, sufficient data was available with which to produce either single-point estimates or ranges for the proportion of deforestation driven by commercial agriculture. In those countries where commercial agriculture was described in the literature as the single “main” or “principal” driver of deforestation, this was assumed to represent between 40 and 80 percent of total deforestation. For three countries (Mozambique, Tanzania, and Angola) insufficient country-specific data were available with which to produce either point estimates or ranges. For these countries, the overall average regional figure (35 percent) for Africa due to commercial agriculture for 2000 to 2010 estimated by Hosonuma et al. (2012) was used as the mid-point, while the sensitivity analysis used zero as the low-end estimate and 1.5 times the regional average (53 percent) as the high-end estimate. For the rest of the world, the same methodology was applied, using the regional averages from Hosonuma et al. (2012) for the total remaining deforestation attributable to each region (68 percent for Latin America and 35 percent for Asia).

All of the final low-end, mid-point, and high-end percentages used for the proportion of deforestation driven by commercial agriculture are provided in Table A2. Full justifications for individual countries are provided in the country sections in Chapter 4.

⁷⁹ Independent assessments of deforestation in individual countries based on satellite imagery have recently demonstrated that the official FAO deforestation figures for many countries are extremely inaccurate. The area deforested in Indonesia, Malaysia, and Paraguay, for instance, is more than double the official FAO figure for each country, while the area deforested in Nigeria is less than one quarter the amount reported (Hansen et al. 2013).

Proportion of Deforestation for Commercial Agriculture that was Illegal (C)

Quantitative data on levels of illegality in the conversion of tropical forests for commercial agriculture and timber plantations was available for five countries (Brazil, Indonesia, Bolivia, Cambodia, and Papua New Guinea (PNG)), which in total represent 58 percent of measured deforestation during the reference period. None of the available figures for these countries capture all types of illegality, and as such the report almost certainly understates the true overall level of illegality.

For Brazil, there are good data for the Amazon, but no data for the cerrado forests, so a range was created for the overall figure whereby the high-end estimate assumes the same level of illegality in the cerrado as in the Amazon and the low end estimate assumes zero illegality in the cerrado.

Though there are no quantitative data to produce national-level estimates for other countries, this study has collected qualitative evidence from 15 other countries (see Chapter 4). For some of these countries, only single case studies are documented, while for others there is a wealth of evidence demonstrating widespread breaches across a range of different laws/regulations. For these countries, and for tropical deforestation elsewhere, ranges were constructed as follows:

- Low-end: Assumes that there is no illegal deforestation for commercial agriculture.
- Mid-point: Assumes that illegalities are half (50 percent) of the regional or global average.
- High-end: Assumes that illegalities equal the regional or global average.

The regional/global averages are based on the measured level of illegality of countries for which quantitative data exist. The regional average for Latin America was thus produced from the point estimates for Brazil and Bolivia, and that for Asia from Cambodia, Indonesia, and PNG. As there were no individual country estimates for Africa, the global average (of the five countries) was used. See Table A1 for the full data.

TABLE A1

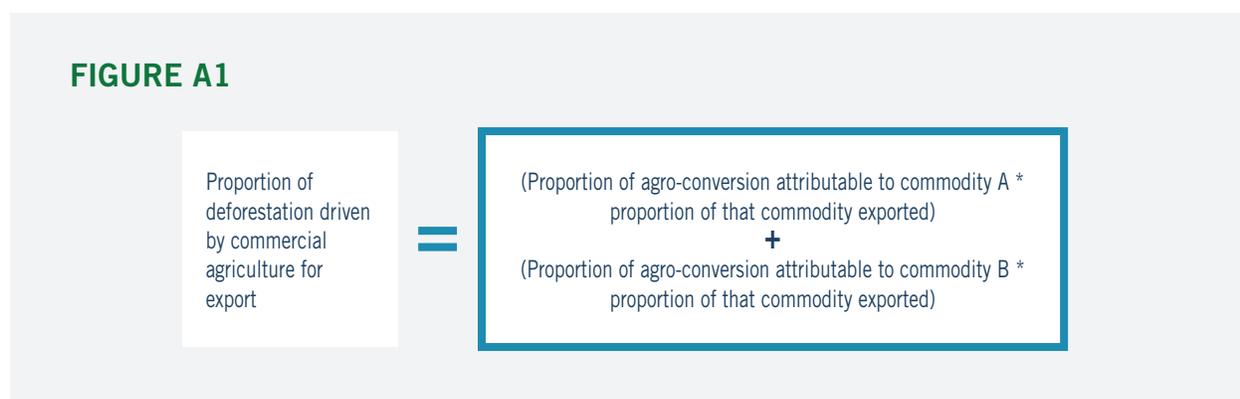
Calculations for Mid-Point and High-Point Estimates of Illegality for Countries without Specific Data

Region	Countries for Which Quantitative Evidence Exists Used to Construct Average Applied	Average Illegality Proportion for Measured Countries (Used for High-End for Each Region)	50% of Average Illegality for Measured Countries (Used for Mid-Point For Each Region)
Latin America	Brazil (mid-point of range 79%), Bolivia (90%)	84.5%	42.3%
Asia	Indonesia (80%), Cambodia (90%), Papua New Guinea (90%)	86.7%	43.4%
Africa	(Brazil, Bolivia, Indonesia, Cambodia, Papua New Guinea)	85.8%	42.9%

All of the final low-end, mid-point, and high-end percentages used for the proportion of deforestation for commercial agriculture that was illegal are provided in Table A2. Full justifications for individual countries are provided in the country sections in Chapter 4.

Proportion of Products of Commercial Agriculture Exported (D)

Data related to exports were obtained from various sources. For Brazil, the proportion of agro-conversion exported was drawn directly from the published literature (Karstensen et al. 2013). For other countries, the figure was estimated based on a comparison of production and export data for the most relevant commodities. Production and export data were obtained from USDA Foreign Agricultural Service (FAS) reports and the UN COMTRADE database. Where the data allowed, the analysis weighted individual commodities according to the proportion of total estimated agro-conversion attributable to each. The equation (in the example case, assumes two key commodities involved) is as follows (Figure A1):



It was generally assumed that the proportion of illegal agro-conversion commodities exported in each country was the same as the proportion of overall agro-conversion commodities exported—i.e. that commodities grown on illegally deforested land are not disproportionately likely to be consumed domestically. This is considered to be a reasonable assumption given that nearly all commodities associated with illegal deforestation are nevertheless considered legal by the authorities in the country of origin, and given the small proportion of total production and exports of relevant commodities that are independently certified or verified.

For those countries where insufficient data were available, and for the rest of the world, averages were used, i.e. for Asia and Latin America the mid-point estimates used the average figures for countries in the same region for which estimates had been produced, whereas for Africa, the global average was applied. High-end percentages were calculated as 1.5 times the mid-points. The low-end of the sensitivity analysis used zero percent in all such instances.

All of the final low-end, mid-point, and high-end percentages used for the proportion of products of commercial agriculture exported are provided in Table A2. Full justifications for individual countries are provided in the country sections in Chapter 4.

TABLE A2

Percentages Used in Tropical Deforestation Analysis (Parameters B, C, and D)

	% Due to Comm. Agriculture			% Illegal			% Exported		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
Brazil	90%	90%	90%	68%	79%	90%	30%	30%	30%
Indonesia	80%	80%	80%	80%	80%	80%	75%	75%	75%
DR Congo	0%	0%	0%	0%	43%	86%	0%	0%	0%
Malaysia	87%	87%	87%	0%	43%	87%	86%	86%	86%
Paraguay	79%	79%	79%	0%	42%	85%	80%	80%	80%
Bolivia	75%	75%	75%	90%	90%	90%	56%	66%	75%
Colombia	75%	75%	75%	0%	42%	85%	20%	20%	20%
Mexico	60%	60%	60%	0%	42%	85%	0%	49%	74%
Mozambique	0%	35%	53%	0%	43%	86%	0%	51%	77%
Tanzania	0%	35%	53%	0%	43%	86%	0%	51%	77%
Angola	0%	35%	53%	0%	43%	86%	0%	0%	0%
Peru	66%	66%	66%	0%	42%	85%	0%	49%	74%
Myanmar	33%	33%	33%	0%	43%	87%	10%	10%	10%
Cambodia	40%	60%	80%	90%	90%	90%	0%	72%	100%
Vietnam	40%	60%	80%	0%	43%	87%	90%	90%	90%
Laos	73%	73%	73%	0%	43%	87%	0%	72%	100%
Papua New Guinea	50%	50%	50%	90%	90%	90%	100%	100%	100%
Other—Africa	0%	35%	53%	0%	43%	86%	0%	51%	77%
Other—Asia	0%	35%	53%	0%	43%	87%	0%	72%	100%
Other—Latin Amer.	0%	68%	100%	0%	42%	85%	0%	49%	74%

Notes: Figures colored green are estimates for which sufficiently good data was available for a range not to be used. For figures colored yellow, data for the relevant country was only sufficient to produce a range. For figures colored orange, no quantitative data were available and a full range of estimates were included in the sensitivity analysis, with the mid and high estimates drawn from regional or global averages, according to the methodology described in the text.

Total Quantity and Value of Relevant Commodity Exports (E)

Data on the total quantity and value of exports of those commodities examined were sourced from USDA FAS reports, the UN COMTRADE database, FAO, and other national-level sources. For soy, a simple total of exports of whole beans, meal, and soy oil were used. For palm oil, only data on trade in crude and simply refined palm oil was assessed. Other palm product exports such as palm kernel oil, palm meal, or secondary products fractionated or made from palm oil were not included. For tropical timber, the analysis only examined exports of primary timber products (logs, sawn timber, plywood, veneer, and mouldings) from producer countries. For plantation-grown solid wood products, the analysis examined logs, sawn timber, veneer, mouldings, plywood, other wood panels, joinery, and wood furniture. For both tropical timber and plantation-grown timber, raw data were converted into volumes in round wood equivalent, using standard conversion factors.

The countries specifically assessed for each commodity are listed in Table A3. These countries were selected as being both important exporters of the relevant commodity and high-risk countries for illegal agro-conversion.

TABLE A3

List of Individual Countries Assessed in Commodity Export Analysis

Soy	Beef	Leather	Palm Oil	Tropical Timber	Pulp & Paper	Plantation-Grown Solid wood
Brazil Argentina Paraguay Bolivia Uruguay	Brazil Argentina Uruguay Paraguay Mexico	Brazil Argentina Uruguay Paraguay Mexico Colombia	Indonesia Malaysia	Malaysia Indonesia Papua New Guinea Cameroon Myanmar Laos Solomon Islands Brazil Gabon Côte d'Ivoire Republic of Congo Ghana	Indonesia Malaysia	Indonesia

Proportion of Production of Relevant Commodities that Displaced Forests (F)

Various sources were used to populate the data on the proportion of production of relevant commodities in key countries that were estimated to have displaced forests. In some cases, direct estimates could be obtained from the published literature. Each of the published estimates applies only to part of the reference period (all dates up to 2012); unless evidence suggested otherwise, in these cases it was assumed that the same percentages applied throughout the reference period. Where evidence did suggest otherwise (such as soy planting in Brazil since 2006), appropriate adjustments were made. In a number of cases where no direct estimates were available in the literature, estimates were calculated using a mixture of deforestation data (from Hansen et al. 2013) and data for areas under pasture and planted with specific crops. The latter were obtained from FAOSTAT or other national government or industry sources. For those countries and commodities for which insufficient data was available, the sensitivity analysis used a mid-point estimate based on an average of those countries within the same region for which estimates had been possible, and a high-point estimate based on the highest among those countries.

For soy, beef, and leather, this report is conservative as the analysis assumed that no exports from countries other than those specifically examined displaced forest. But this assumption is based on the fact that most of the remaining exports are from non-tropical countries. For palm oil, the mid-point estimate for the “rest of the world” (61 percent) was based on an average of the estimated figures for Indonesia and Malaysia, while the high-end estimate used the highest measured figure (for Malaysia). The use of an average mid-point is justified on the basis that other significant producers (e.g. PNG, Colombia) are also tropical forest countries. Changes to this assumed figure make very little difference to the global numbers, however, given that 90 percent of exports originate from Indonesia and Malaysia. For tropical timber, the “rest of the world” mid-point estimate for the proportion from agro-conversion was calculated as the average of the specified countries for which it had been possible to produce estimates, while the high-end was the highest estimated proportion among those countries. Again, the figure used makes little difference to the global total, because 96 percent of global exports are from the specified countries.

All of the final low-end, mid-point, and high-end percentages used for the proportion of production of relevant commodities that displaced forests are provided in Table A5. Full justifications for individual countries are provided in the country sections in Chapter 4.

TABLE A4

Estimates Used for “Rest of the World” for the Proportion of Exports of Each Relevant Commodity Displacing Tropical Forest

Soy	Beef	Leather	Palm Oil	Tropical Timber
0%	0%	0%	60%	5%

Notes: For pulp & paper and for plantation-wood, no global estimate was produced and so no “rest of the world” estimate was required

Proportion of Forest Displaced for Each Commodity that Was Illegally Cleared (G)

In most cases, the proportions of forest clearance for specific commodities in specific countries estimated to be associated with illegalities were the same as the overall figures for agro-conversion illegality (see “Proportion of deforestation for commercial agriculture that was illegal,” above). In the case of Brazil, and were adjusted to account for differences in illegality relating to conversion for soy (lower than the average) and for beef and tropical timber (higher than the average), these differences relating to the proportion of production of each originating in the Amazon as opposed to the cerrado.

For most of those countries not specifically included in the earlier analysis (Uruguay, for soy, beef and leather; Cameroon, Solomon Islands, Côte d’Ivoire, and Ghana for tropical timber) the same methodology of using regional (or global, for Africa) averages to calculate mid- (50 percent of regional average) and high-point estimates (100 percent of regional average) was applied (with zero used for the low-end). This same methodology (with global averages) was also used in the production of figures for the “rest of the world” for palm oil and tropical timber. For tropical timber from Cameroon, Gabon, and Republic of Congo, specific estimates of illegalities in conversion were produced based on evidence from the sole or main sources of conversion wood.

No illegality estimates were required for the “rest of the world” for soy, beef or leather (because it had already been assumed that no exports displaced forest), or for pulp and paper and plantation wood (because no global analysis was being conducted for those commodities).

All of the final low-end, mid-point, and high-end percentages used for the proportion of forest displaced for each commodity that was illegally cleared are provided in Table A5. Full justifications for individual countries are provided in the country sections in Chapter 4.

TABLE A5

Percentages Used in Commodity Analysis (Parameters F & G)

	% Displacing Forest			% Illegal		
	Low	Mid	High	Low	Mid	High
Soy						
Brazil	59%	60%	61%	49%	69%	90%
Argentina	9%	9%	9%	30%	53%	75%
Paraguay	71%	71%	71%	0%	42%	85%
Bolivia	45%	73%	100%	90%	90%	90%
Uruguay	0%	53%	100%	0%	42%	85%
RoW	0%	0%	0%	0%	0%	0%
Beef/Leather*						
Brazil	79%	79%	79%	73%	82%	90%
Argentina	17%	17%	17%	30%	53%	75%
Uruguay	0%	48%	79%	0%	42%	85%
Paraguay	0%	48%	79%	0%	42%	85%
Mexico	0%	48%	79%	0%	42%	85%
Colombia	0%	48%	79%	0%	42%	85%
RoW	0%	0%	0%	0%	0%	0%
Palm Oil						
Indonesia	69%	69%	69%	80%	80%	80%
Malaysia	55%	55%	55%	0%	43%	87%
RoW	0%	61%	66%	0%	43%	86%
Tropical Timber						
Malaysia	65%	65%	65%	0%	43%	87%
Indonesia	75%	75%	75%	80%	80%	80%
PNG	30%	30%	30%	90%	90%	90%
Cameroon	5%	5%	5%	90%	95%	100%
Myanmar	50%	50%	50%	0%	43%	87%
Laos	0%	55%	75%	0%	43%	87%
Solomon Islands	0%	55%	75%	0%	43%	87%
Brazil	19%	19%	19%	90%	90%	90%
Gabon	6%	10%	13%	0%	0%	0%
Côte d'Ivoire	0%	4%	13%	0%	43%	86%
Congo	2%	2%	2%	80%	90%	100%
Ghana	0%	1%	2%	0%	43%	86%
RoW	0%	29%	75%	0%	43%	86%

		% Displacing Forest			% Illegal		
Pulp and Paper							
Indonesia	50%	50%	50%	80%	80%	80%	
Malaysia	0%	55%	83%	0%	43%	87%	
Plantation Wood							
Indonesia	50%	50%	50%	80%	80%	80%	
		% Conversion Wood			% Plantation Grown Wood		
		Low	Mid	High	Low	Mid	High
Pulp and Paper (% displacing forest made from conversion vs plantation wood)							
Indonesia	37%	37%	37%	63%	63%	63%	

Notes: Figures colored green are estimates for which sufficiently good data was available for a range not to be used. For figures colored yellow, data for the relevant country was only sufficient to produce a range. For figures colored orange, no quantitative data were available and a full range of estimates were included in the sensitivity analysis, with the mid and high estimates drawn from regional or global averages, according to the methodology described in the text.

Note: RoW= Rest of the world

* Colombia was only assessed individually for leather exports, and was included in RoW for beef

ANNEX B

Data Tables for Results of Analysis in Section 3.1

(Using principal deforestation dataset (Hansen et al. 2013 > 51% canopy gross forest loss, 2000 to 2012)

Note: Data tables using alternative deforestation datasets published separately as supporting information

TABLE B1

Mid-Point Calculations for Deforestation Analysis

MID-POINT	Total Gross Forest (> 51% Canopy) Loss in the Tropics 2000 to 2012 (mha) (A)	% Of All Forest (> 51% Canopy) Loss in the Tropics	% Of Deforestation due to Commercial Agriculture (est) (B)	Area of Forest Lost For Commercial Agriculture (mha) -AxB (C)	% Of Agro-Conversion Illegal (est) (D)	Area of Illegal Deforestation for Commercial Agriculture (mha) -CxD (E)
Brazil	30.6	35%	90%	27.5	79%	21.7
Indonesia	15.5	18%	80%	12.4	80%	9.9
DR Congo	5.3	6%	0%	0	43%	0
Malaysia	4.7	5%	87%	4.1	43%	1.8
Paraguay	2.4	3%	79%	1.9	42%	0.8
Bolivia	2.8	3%	75%	2.1	90%	1.9
Colombia	2.4	3%	75%	1.8	42%	0.8
Mexico	2.0	2%	60%	1.2	42%	0.5
Mozambique	0.8	1%	35%	0.3	43%	0.1
Tanzania	0.7	1%	35%	0.2	43%	0.1
Angola	0.8	1%	35%	0.3	43%	0.1
Peru	1.5	2%	66%	1.0	42%	0.4
Myanmar	1.4	2%	33%	0.4	43%	0.2
Cambodia	1.1	1%	60%	0.7	90%	0.6
Vietnam	1.1	1%	60%	0.7	43%	0.3
Laos	1.1	1%	73%	0.8	43%	0.4
Papua New Guinea	0.6	1%	50%	0.3	90%	0.3
Other—Africa	5.5	6%	35%	1.9	43%	0.8
Other—Asia	1.8	2%	35%	0.6	43%	0.3
Other—Latin America	4.9	6%	68%	3.3	42%	1.4
TOTAL	87.0			61.6		42.4
% of total tropical deforestation				71%		49%

% of Illegal Commercial Agro-Conversion Products Exported (F)	Area Ag-def Exported (CXF)	Area of Illegal Deforestation for Agro-exports (mha) ExF (G)	Illegal Agro-Conversion as % of Total Deforestation—E/A (H)	Illegal Agro-Conversion in Each Country as % of Total Deforestation in the Tropics	% Of Total Deforestation due to Illegal Agro-Conversion for Export G/A (I)
30%	8.3	6.52	71%	20%	21%
75%	9.3	7.42	64%	9%	48%
0%	0	0	0%	0%	0%
86%	3.5	1.52	38%	2%	32%
80%	1.5	0.65	33%	1%	27%
66%	1.4	1.24	68%	2%	44%
20%	0.4	0.15	32%	1%	6%
49%	0.6	0.25	25%	0%	12%
51%	0.1	0.06	15%	0%	8%
51%	0.1	0.05	15%	0%	8%
0%	0	0	15%	0%	0%
49%	0.5	0.21	28%	0%	14%
10%	0	0.02	14%	0%	1%
72%	0.5	0.44	54%	1%	39%
90%	0.6	0.26	26%	0%	23%
72%	0.6	0.26	32%	0%	23%
100%	0.3	0.28	45%	0%	45%
51%	1	0.42	15%	1%	8%
72%	0.4	0.19	15%	0%	11%
49%	1.6	0.69	29%	1%	14%
49%	30.7	20.6	49%	39%	24%
	35%	24%			

TABLE B2

Low-End Calculations for Deforestation Analysis

LOW-END	Total Gross Forest (> 51% Canopy) Loss in the Tropics 2000 to 2012 (mha) (A)	% Of All Forest (> 51% Canopy) Loss in the Tropics	% Of Deforestation due to Commercial Agriculture (est) (B)	Area of Forest Lost For Commercial Agriculture (mha) -AxB (C)	% Of Agro-Conversion Illegal (est) (D)	Area of Illegal Deforestation for Commercial Agriculture (mha) -CxD (E)
Brazil	30.6	35%	90%	27.5	68%	18.7
Indonesia	15.5	18%	80%	12.4	80%	9.9
DR Congo	5.3	6%	0%	0	0%	0
Malaysia	4.7	5%	87%	4.1	0%	0
Paraguay	2.4	3%	79%	1.9	0%	0
Bolivia	2.8	3%	75%	2.1	90%	1.9
Colombia	2.4	3%	75%	1.8	0%	0
Mexico	2.0	2%	60%	1.2	0%	0
Mozambique	0.8	1%	0%	0	0%	0
Tanzania	0.7	1%	0%	0	0%	0
Angola	0.8	1%	0%	0	0%	0
Peru	1.5	2%	66%	1.0	0%	0
Myanmar	1.4	2%	33%	0.4	0%	0
Cambodia	1.1	1%	40%	0.5	90%	0.4
Vietnam	1.1	1%	40%	0.4	0%	0
Laos	1.1	1%	73%	0.8	0%	0
Papua New Guinea	0.6	1%	50%	0.3	90%	0.3
Other—Africa	5.5	6%	0%	0	0%	0
Other—Asia	1.8	2%	0%	0	0%	0
Other—Latin America	4.9	6%	0%	0	0%	0
TOTAL	87			54.5		31.2
% of total tropical deforestation				63%		36%

% of Illegal Commercial Agro-Conversion Products Exported (F)	Area Ag-def Exported (CXF)	Area of Illegal Deforestation for Agro-exports (mha) ExF (G)	Illegal Agro-Conversion as % of Total Deforestation— E/A (H)	Illegal Agro-Conversion in Each Country as % of Total Deforestation in the Tropics	% Of Total Deforestation due to Illegal Agro-Conversion for Export G/A (I)
30%	8.3	5.61	61%	17%	18%
75%	9.3	7.42	64%	9%	48%
0%	0	0	0%	0%	0%
86%	3.5	0	0%	0%	0%
80%	1.5	0	0%	0%	0%
56%	1.2	1.06	68%	2%	38%
20%	0.4	0	0%	0%	0%
0%	0	0	0%	0%	0%
0%	0	0	0%	0%	0%
0%	0	0	0%	0%	0%
0%	0	0	0%	0%	0%
0%	0	0	0%	0%	0%
0%	0	0	0%	0%	0%
10%	0	0	0%	0%	0%
0%	0	0	36%	0%	0%
90%	0.4	0	0%	0%	0%
0%	0	0	0%	0%	0%
100%	0.3	0.28	45%	0%	45%
0%	0	0	0%	0%	0%
0%	0	0	0%	0%	0%
0%	0	0	0%	0%	0%
46%	24.9	14.4	36%	28%	17%
	29%	17%			

TABLE B3

High-End Calculations for Deforestation Analysis

HIGH-END	Total Gross Forest (> 51% Canopy) Loss in the Tropics 2000 to 2012 (mha) (A)	% Of All Forest (> 51% Canopy) Loss in the Tropics	% Of Deforestation due to Commercial Agriculture (est) (B)	Area of Forest Lost For Commercial Agriculture (mha) -AxB (C)	% Of Agro-Conversion Illegal (est) (D)	Area of Illegal Deforestation for Commercial Agriculture (mha) -CxD (E)
Brazil	30.6	35%	90%	27.5	90%	24.8
Indonesia	15.5	18%	80%	12.4	80%	9.9
DR Congo	5.3	6%	0%	0	86%	0
Malaysia	4.7	5%	87%	4.1	87%	3.5
Paraguay	2.4	3%	79%	1.9	85%	1.6
Bolivia	2.8	3%	75%	2.1	90%	1.9
Colombia	2.4	3%	75%	1.8	85%	1.5
Mexico	2.0	2%	60%	1.2	85%	1.0
Mozambique	0.8	1%	53%	0.4	86%	0.4
Tanzania	0.7	1%	53%	0.4	86%	0.3
Angola	0.8	1%	53%	0.4	86%	0.4
Peru	1.5	2%	66%	1.0	85%	0.8
Myanmar	1.4	2%	33%	0.4	87%	0.4
Cambodia	1.1	1%	80%	0.9	90%	0.8
Vietnam	1.1	1%	80%	0.9	87%	0.8
Laos	1.1	1%	73%	0.8	87%	0.7
Papua New Guinea	0.6	1%	50%	0.3	90%	0.3
Other—Africa	5.5	6%	53%	2.9	86%	2.5
Other—Asia	1.8	2%	53%	0.9	87%	0.8
Other—Latin America	4.9	6%	100%	4.9	85%	4.2
TOTAL	87.0			65.4		56.6
% of total tropical deforestation				75%		65%

% of Illegal Commercial Agro-Conversion Products Exported (F)	Area Ag-def Exported (CXF)	Area of Illegal Deforestation for Agro-exports (mha) ExF (G)	Illegal Agro-Conversion as % of Total Deforestation— E/A (H)	Illegal Agro-Conversion in Each Country as % of Total Deforestation in the Tropics	% Of Total Deforestation due to Illegal Agro-Conversion for Export G/A (I)
30%	8.3	7.43	81%	23%	24%
75%	9.3	7.42	64%	9%	48%
0%	0	0	0%	0%	0%
86%	3.5	3.03	75%	3%	65%
80%	1.5	1.29	67%	1%	53%
75%	1.6	1.42	68%	2%	51%
20%	0.4	0.31	63%	1%	13%
74%	0.9	0.75	51%	1%	38%
77%	0.3	0.29	45%	0%	35%
77%	0.3	0.24	45%	0%	35%
0%	0	0	45%	0%	0%
74%	0.7	0.62	56%	1%	41%
10%	0	0.04	29%	0%	3%
100%	0.9	0.82	72%	1%	72%
90%	0.8	0.69	69%	1%	62%
100%	0.8	0.71	63%	1%	63%
100%	0.3	0.28	45%	0%	45%
77%	2.2	1.91	45%	2%	35%
100%	0.9	0.82	46%	1%	46%
74%	3.6	3.07	85%	4%	63%
55%	36.4	31.1	65%	52%	36%
	42%	36%			

ANNEX C

Data Tables for Results of Analysis in Section 3.2

Note: Data tables for low-end and high-end estimates for individual commodities published separately as supporting information

TABLE C1

Soy 2012/13 (million metric tons)

Country	Exports (mt) (A)	% Displacing Forest (est) (B)	Exports Displacing Forest (mt) -AxB (C)	% Of Deforestation Illegal (est) (D)	Exports From illegal Deforestation (mt) CxD (E)	Exports From Illegal Deforestation as % of Total Exports—E/A (F)	Value of Exports From Deforestation (\$ mill)*	Value of Exports From Illegal Deforestation (\$ mill)*
Brazil	59.2	60%	35.5	69%	24.5	41%	25,574	17,646
Argentina	44.4	9%	4.0	53%	2.1	5%	2,130	1,118
Paraguay	7.9	71%	5.6	42%	2.4	30%	2,833	1,198
Bolivia	1.7	73%	1.2	90%	1.1	65%	667	600
Uruguay	2.9	53%	1.5	42%	0.7	22%	825	349
RoW	50	0%	0	0%	0	0%	0	0
TOTAL	166.1		47.9		30.7	19%	32,029	20,912

TABLE C2

Palm Oil 2012/13 (million metric tons)

Country	Exports (mt) (A)	% Displacing Forest (est) (B)	Exports Displacing Forest (mt) -AxB (C)	% Of Deforestation Illegal (est) (D)	Exports From illegal Deforestation (mt) CxD (E)	Exports From Illegal Deforestation as % of Total Exports—E/A (F)	Value of Exports From Deforestation (\$ mill)*	Value of Exports From Illegal Deforestation (\$ mill)*
Indonesia	20.3	66%	13.4	80%	10.7	53%	12,541	10
Malaysia	17.2	55%	9.5	43%	4.1	24%	9,280	4,028
RoW	4.2	61%	2.6	43%	1.1	26%	2,434	1,044
TOTAL	41.7		25.4		15.9	38%	24,255	15,104

TABLE C3

Beef 2012 (million metric tons)

Country	Exports (mt) (A)	% Displacing Forest (est) (B)	Exports Displacing Forest (mt) -AxB (C)	% Of Deforestation Illegal (est) (D)	Exports From illegal Deforestation (mt) CxD (E)	Exports From Illegal Deforestation as % of Total Exports—E/A (F)	Value of Exports From Deforestation (\$ mill)*	Value of Exports From Illegal Deforestation (\$ mill)*
Brazil	1.5	79%	1.2	82%	1.0	65%	5,899	4,838
Argentina	0.2	17%	0	53%	0	9%	217	114
Uruguay	0.4	48%	0.2	42%	0.1	20%	985	417
Paraguay	0.3	48%	0.1	42%	0.1	20%	506	214
Mexico	0.2	48%	0.1	42%	0	20%	509	215
RoW	5.6	0%	0	0%	0	0%	0	0
TOTAL	8.1		1.6		1.2	14%	8,117	5,798

TABLE C4

Leather 2011 (million US\$)

Country	Exports (\$ Mill) (A)	% Displacing Forest (est) (B)	Exports Displacing Forest (\$ mill) -AxB (C)	% Of Deforestation Illegal (est) (D)	Exports From Illegal Deforestation (\$ mill) CxD (E)	Exports From Illegal Deforestation as % of Total Exports -E/A (F)
Brazil	2,021	79%	1,597	82%	1,309	65%
Argentina	914	17%	155	53%	82	9%
Uruguay	165	48%	79	42%	33	20%
Paraguay	99	48%	48	42%	20	20%
Mexico	310	48%	149	42%	63	20%
Colombia	122	48%	59	42%	25	20%
RoW	19,466	0%	0	0%	0	0%
TOTAL	23,096		2,086		1,532	7%

TABLE C5Tropical Timber 2012 (million m³ RWE)

Country	Exports (mt) (A)	% Displacing Forest (est) (B)	Exports Displacing Forest (mt) -AxB (C)	% Of Deforestation Illegal (est) (D)	Exports From illegal Deforestation (mt) CxD (E)	Exports From Illegal Deforestation as % of Total Exports—E/A (F)	Value of Exports From Deforestation (\$ mill)*	Value of Exports From Illegal Deforestation (\$ mill)*
Malaysia	15.6	65%	10.1	43%	4.4	28%	2,174	943
Indonesia	10.4	75%	7.8	80%	6.2	60%	2,181	1,745
PNG	3.2	30%	1.0	90%	0.9	27%	85	76
Cameroon	1.8	5%	0.1	95%	0.1	5%	21	20
Myanmar	2.6	50%	1.3	43%	0.6	22%	620	269
Laos	1.6	55%	0.9	43%	0.4	24%	338	147
Solomon Islands	2.1	55%	1.2	43%	0.5	24%	238	103
Brazil	0.5	19%	0.1	90%	0.1	17%	68	61
Gabon	1.1	10%	0.1	0%	0	0%	36	0
Côte d'Ivoire	0.7	4%	0	43%	0	2%	7	3
Congo	0.9	2%	0	90%	0	2%	8	7
Ghana	0.5	1%	0	43%	0	0	1	1
RoW	3.4	29%	1.0	43%	0.4	12%	420	180
TOTAL	44.4	53%	23.6		13.6	31%	6,195	3,555

TABLE C6

Pulp & Paper (Splitting Exports into Salvage and Plantation Wood Sources)

Country	Exp (Million mt)	% Conv Timber	% Plant Wood	Exp (Conv)	Exp (Plant)
Indonesia	20.3	37%	63%	7.5	12.8
Malaysia	17.2	60%	40%	10.3	6.9
TOTAL	37.5			17.8	19.7

TABLE C7

Pulp & Paper (from Conversion Wood)

Country	Exports (mt) (A)	% Displacing Forest (est) (B)	Exports Displacing Forest (mt) -AxB (C)	% Of Deforestation Illegal (est) (D)	Exports From illegal Deforestation (mt) CxD (E)	Exports From Illegal Deforestation as % of Total Exports—E/A (F)	Value of Exports From Deforestation (\$ mill)*	Value of Exports From Illegal Deforestation (\$ mill)*
Indonesia	7.5	50%	3.8	80%	3.0	40%	2,779	2,223
Malaysia	10.3	55%	5.7	43%	2.4	24%	9,144	3,932
TOTAL	17.8		9.4		5.4	31%	11,923	6,155

TABLE C8Plantation-Grown Timber and Other Wood Products (m³ RWE)

Country	Exports (mt) (A)	% Displacing Forest (est) (B)	Exports Displacing Forest (mt) -AxB (C)	% Of Deforestation Illegal (est) (D)	Exports From illegal Deforestation (mt) CxD (E)	Exports From Illegal Deforestation as % of Total Exports—E/A (F)	Value of Exports From Deforestation (\$ mill)*	Value of Exports From Illegal Deforestation (\$ mill)*
Indonesia	3.4	50%	1.7	80%	1.4	40%	784	627
TOTAL	3.4		1.7		1.4	40%	784	627

TABLE C9

Summary

Commodity	Exports From Illegal Deforestation as % of Total Exports			Value of Exports From Deforestation (\$ mil)			Value of Exports From Illegal Deforestation (\$ mil)		
	Scenario	Low	Mid	High	Low	Mid	High	Low	Mid
Soy	11%	19%	27%	30,524	32,029	33,440	13,334	20,912	29,535
Beef	11%	14%	20%	6,117	8,117	9,408	4,372	5,798	8,254
Leather	5%	7%	9%	1,752	2,086	2,302	1,212	1,532	2,018
Palm Oil	27%	39%	52%	22,391	24,825	25,024	10,488	15,560	20,794
Tropical Timber	16%	31%	49%	5,178	6,195	7,100	1,907	3,555	5,966
Pulp & Paper (from conversation wood)				2,779	11,923	23,353	2,223	6,155	20,123
Pulp & Paper (from plantation wood)				4,732	10,828	7,018	3,786	6,407	5,774
Plantation-grown timber products				784	784	784	627	627	627

Totals by country/commodity (US\$ million)

TABLE C9, EXTENSION

	Soy	Beef	Leather	Palm Oil	Trop Timber	Pulp & Paper (Tropical)	Pulp & Paper (Plant)	Plantation Wood	Total	% Of Global Total
Brazil	17,646	4,838	1,309		61				23,854	40.2%
Indonesia				10,488	1,745	2,223	3,786	627	18,869	31.8%
Malaysia				4,028	943	3,932	2,621		11,524	19.4%
Paraguay	1,198	214	20						1,432	2.4%
Argentina	1,118	114	82						1,314	2.2%
Uruguay	349	417	33						799	1.3%
Bolivia	600								600	1.0%
Mexico		215	63						278	0.5%
Myanmar						269			269	0.5%
Laos						147			147	0.2%
Solomon Islands						103			103	0.2%
PNG						76			76	0.1%
Colombia			25						25	0.0%
Cameroon						20			20	0.0%
TOTAL	20,912	5,798	1,532	14,516	3,364	6,155	6,407	627	59,311	

ANNEX D

Previous Global Estimates of the Proportion of Tropical Deforestation due to Agriculture

This annex highlights the methodological issues in two major global studies estimating the proportion of recent global tropical deforestation due to agriculture that may have led to underestimates of the importance of agriculture to tropical deforestation.

Hosonuma et al. (2012)

- **Finding:** 73 percent of tropical/sub-tropical deforestation during the decade to 2010 was caused by agriculture, including 40 percent due to commercial agriculture and the rest to local or subsistence agriculture
- **Why it is likely an underestimate of the current proportion:** Firstly, there is strong reason to believe that commercial agriculture has grown as a driver over the 10-year period of the study (DeFries et al. 2013, Cuypers et al. 2013), which would mean it represented somewhat more than 40 percent at the end of the period and less at the start. Secondly, the estimate was based on FAO deforestation data self-reported by countries, which for a number of important countries have been shown to be inaccurate (Hansen et al. 2013).⁸⁰ Thirdly, the reference documents used to attribute proportions of deforestation to different drivers in individual countries were often of poor quality and in some cases out of date. One key reference document used to establish the importance of different drivers in many countries, for instance, claims 20 percent of deforestation in Indonesia is caused by shifting agriculture, but cites a study published in 1991, ten years before the study reference period and prior to the massive boom in conversion for timber and oil palm plantations.⁸¹

Cuypers et al. (2013)

- **Finding:** 65 percent of deforestation in the tropics and sub-tropics between 2000 and 2008 was due to agricultural expansion.

⁸⁰ The FAO data are based on self-reporting by individual countries. Independent assessments of deforestation in individual countries based on satellite imagery (Hansen et al. 2013) have recently demonstrated that the official FAO deforestation figures for many countries are extremely inaccurate. The area deforested in Indonesia, Malaysia, and Paraguay, for instance, is more than double the official FAO figure, while the area deforested in Nigeria is less than one quarter the amount reported (according to FAO (2010), Nigeria lost 4 Mha of forests from 2000 to 2010—more than any other tropical country except Brazil and Indonesia, but recent satellite measurements suggest that deforestation in Nigeria during this period was actually 0.9 Mha—less than one quarter of the reported amount (Hansen et al. 2013). Though some of the difference might be explained by variations in methodology (including that the recent independent data includes felling of non-natural forest), it is unlikely that this can explain more than a minority of the difference.

⁸¹ The study cites Matthews R B et al. 2010 Development and application of methodologies for reduced emissions from deforestation and forest degradation (REDD+)—phase I Final Report for Project CEOSA 0803, Department of Energy and Climate Change (DECC) as one of the sources for ratio data on drivers of deforestation in Indonesia. The relevant section of that report in turn references Dick, J. (1991). Forest land use, forest use zonation and deforestation in Indonesia: A Summary and interpretation of existing information. Background paper to United Nations Conference on Environment and Development (UNCED) for the State Ministry for Population and Environment (KLH) and the Environmental Impact Management Agency (BAPEDAL).

- **Why it is likely an underestimate of the current proportion:** This study also understates the present importance of agriculture, for the first two reasons as for Hosonuma et al. (see above), but also because it is likely that a large proportion of the deforestation classified by the study as due to “natural hazards” (mostly fire) (17 percent of global deforestation during 2000 to 2008) or “unexplained” (19 percent) were actually due to agriculture. This is because the study only attributed deforestation to land *currently* used for agriculture, as recorded in official FAO statistics. Firstly (as the authors admit), it is possible that those FAO statistics understate the actual area currently being used for agriculture, particularly for subsistence agriculture. A second and likely more important flaw is that this method fails to account for areas of forest which were cleared for or as a result of agriculture, but which are not currently used for that purpose. Evidence from Brazil and Indonesia (the two countries responsible for most of total worldwide tropical deforestation) shows that the proportion this represents of global deforestation is substantial. Most forest fires in Indonesia are associated with commercial oil palm and timber plantation development (FWI/GFW 2002); fires started for the purpose of clearing land for this purpose likely extend far beyond the areas intended. Within concessions, fire may also be one reason that the speed with which forests are cleared for oil palm has outstripped actual planting, creating a backlog of under-utilized land (Boucher et al. 2011). In Brazil, much of the land deforested for cattle pasture in the Amazon has since been abandoned (INPE 2011a), while large areas of steep slopes in the Atlantic forest biome are also now under secondary vegetation, having been abandoned due to increasing mechanization of agricultural production (Lapola et al. 2013). In all these cases, such land would not be attributed to commercial agriculture using the Cuypers et al. 2013 study methodology.
- There are also reasons to believe the study may have understated the proportion of deforestation exported. For instance, the study attributed a great deal of deforestation to crops such as rice, maize, and cassava which are much less likely to be exported than beef, soy, and palm oil. However, for some key countries (such as Nigeria) where large areas of deforestation were attributed to these crops, recent evidence suggests that the real level of deforestation during the relevant period was dramatically lower than the figures reported by the country concerned and used in the study.⁸²

⁸² The new maps of deforestation also show real deforestation to have been much less extensive than previously thought in a number of other countries where the increased areas of rice, maize or cassava were attributed to deforestation by Cuypers et al. 2013 and which have few agricultural exports, such as Tanzania and Myanmar.



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