

## Oil Palm Plantations And Deforestation In Indonesia What

In the tradition of Eric Schlosser's *Fast Food Nation*, a groundbreaking global investigation into the industry ravaging the environment and global health—from the James Beard Award–winning journalist Over the past few decades, palm oil has seeped into every corner of our lives. Worldwide, palm oil production has nearly doubled in just the last decade: oil-palm plantations now cover an area nearly the size of New Zealand, and some form of the commodity lurks in half the products on U.S. grocery shelves. But the palm oil revolution has been built on stolen land and slave labor; it's swept away cultures and so devastated the landscapes of Southeast Asia that iconic animals now teeter on the brink of extinction. Fires lit to clear the way for plantations spew carbon emissions to rival those of industrialized nations. James Beard Award–winning journalist Jocelyn C. Zuckerman spent years traveling the globe, from Liberia to Indonesia, India to Brazil, reporting on the human and environmental impacts of this poorly understood plant. The result is *Planet Palm*, a riveting account blending history, science, politics, and food as seen through the people whose lives have been upended by this hidden ingredient. This groundbreaking work of first-rate journalism compels us to examine the connections between the choices we make at the grocery store and a planet under siege.

*Grabbing Power* explores the history of agribusiness and land conflicts in Northern Honduras focusing on the Aguán Valley, where peasant movements battle large palm oil producers for the right to land. In the wake of a military coup that overthrew Honduran president Manuel Zelaya in June 2009, rural communities in the Aguán have been brutally repressed, with over 60 people killed in just over two years. United States military aid--spent in the name of the War on Drugs--fuels the Honduran government's ability to repress its people. A strong and inspiring movement for land, food and democracy has grown over the last two years, and it shows no sign of backing down.

Oil palms are ubiquitous—grown in nearly every tropical country, they supply the world with more edible fat than any other plant and play a role in scores of packaged products, from lipstick and soap to margarine and cookies. And as Jonathan E. Robins shows, sweeping social transformations carried the plant around the planet. First brought to the global stage in the holds of slave ships, palm oil became a quintessential commodity in the Industrial Revolution. Imperialists hungry for cheap fat subjugated Africa's oil palm landscapes and the people who worked them. In the twentieth century, the World Bank promulgated oil palm agriculture as a panacea to rural development in Southeast Asia and across the tropics. As plantation companies tore into rainforests, evicting farmers in the name of progress, the oil palm continued its rise to dominance, sparking new controversies over trade, land and labor rights, human health, and the environment. By telling the story of the oil palm across multiple centuries and continents, Robins demonstrates how the fruits of an African palm tree became a key commodity in the story of global capitalism, beginning in the eras of slavery and imperialism, persisting through decolonization, and stretching to the present day.

Oil palm plantations can be a significant contributor to rural livelihoods in Indonesia. The government seeks to capitalize on this commodity and strengthen Indonesia's position as the global leader in palm oil production by expanding plantation estates. As the

land for new plantation investment in Kalimantan and Sumatra becomes scarce, plantation developers are looking east to acquire land in Papua Province. The rising interest in oil palm plantations in Papua presents potential opportunities but also poses challenges.

This study comprises a review of oil palm development and management across landscapes in the tropics. Seven countries have been selected for detailed analysis using surveys of the current literature, mainly spanning the last fifteen years. Indonesia and Malaysia are the obvious leaders in terms of area planted and levels of production and export, but also in literature generated on social and environmental challenges. In Latin America, Colombia is the dominant producer with oil palm expanding in disparate landscapes with a strong focus on palm oil-based biodiesel; and small-scale growers and companies in Peru and Brazil offer contrasting ways of inserting oil palm into the Amazon. Nigeria and Cameroon represent African nations with traditional groves and old plantations in which foreign 'land grabs' to establish new oil palm have recently occurred.

Academic Paper from the year 2010 in the subject Environmental Sciences, grade: 1,0, University of Göttingen (Centre for Nature Conservation), language: English, abstract: In recent years, palm oil, due to its versatile usages in the food and mechanic industry, experienced a rapidly growing demand on the world market. Market researchers predict an even increasing importance of the already leading oil seed crop, because of its role as a feedstock for biofuel. Despite its unexcelled yield per unit of cultivated area, oil palm "*Elaeis guineensis*" is among the most controversially discussed agricultural products. There is a confusingly high number of stakeholders involved, and strong lobbying from both, proponents and opponents of palm oil, make any impartial balancing of the potential uses and/or destructiveness a difficult task. Beyond dispute is the fact, that with the growing demand, ecologically justifiable acreage becomes increasingly scarce which enhances the pressure for land conversion. Unfortunately, the climatic tolerance limits of "*E. guineensis*" restrict its successful cultivation to tropical realms, eco-sensitive areas with the highest biodiversity levels. Scientists watch with despair how mono-cultures are spreading at an ever-increasing pace, often replacing food crops and subsistence farming plots nourishing local people, and even more often at the expense of the world's few virgin forests remnants. Various policies and strategies on an international (REDD, CDM, RSPO) and national (national laws) level have been pronounced and partially implemented, to ensure a more sustainable palm oil production. Currently, however, political incapacity, corruption, loopholes and beguilements, paralyze the intentions to capitalize the factual benefits of palm oil as a productive feedstock for renewable energy, and as an economy and welfare booster for less developed areas. Under present conditions an increased productivity of palm oil is overpaid for dearly, by the local people and the international community with widespread deforestation, resulting GHG (Green House Gas) emissions, an incredible loss of biodiversity and ecological integrity. In short, palm oil has great potential to help meet the growing energy demand in a more sustainable way, but it is a long way to go and currently the impacts crucially outweigh the benefits.

Highlights Zero-deforestation commitments are emerging rapidly in Indonesia. They already encompass a large portion of crude palm oil production and almost all the pulp and paper (P&P) sector; typically, they reflect the values of the "no-deforestation, no-

exploitation (social) and no-peat” policies. These commitments depend on definitions of ‘forests’ for their identification and conservation, which in turn rely on methodologies such as High Conservation Value and High Carbon Stock. Early implementation has revealed that the palm oil sector is facing a number of governance challenges to achieve commitments: the legal framework is not systematically supportive of the pledges, and the government promotes a different vision of sustainability. Of note is the fact that the P&P sector is more advanced. Integration of smallholders into sustainable value chains poses another challenge for the palm oil sector: traceability, better environmental performance and improved yields require urgent action. Legalization of smallholder operations is critical and goes beyond commitments, because it determines access to financing and certification, among others. To be effective, zero-deforestation commitments must align public and private governance arrangements. This requires an agreement on visions of sustainability supported by public policies; progress on land tenure; enforcement of progressive regulations at national and regional levels; and the implementation of strong policies to rationalize the expansion of small and medium holdings of oil palm. Legacy issues must also be addressed for the main palm oil and P&P groups: land restitution through due processes, support to smallholders and investments in land restoration are some promising avenues worth pursuing.

The oil palm is the world's most valuable oil crop. Its production has increased over the decades, reaching 56 million tons in 2013, and it gives the highest yields per hectare of all oil crops. Remarkably, oil palm has remained profitable through periods of low prices. Demand for palm oil is also expanding, with the edible demand now complemented by added demand from biodiesel producers. The Oil Palm is the definitive reference work on this important crop. This fifth edition features new topics - including the conversion of palm oil to biodiesel, and discussions about the impacts of palm oil production on the environment and effects of climate change – alongside comprehensively revised chapters, with updated references throughout. The Oil Palm, Fifth Edition will be useful to researchers, plantation and mill managers who wish to understand the science underlying recommended practices. It is an indispensable reference for agriculture students and all those working in the oil palm industry worldwide.

The Congo Basin is rich in biodiversity and stores an estimated 25%-30% of the world's tropical forest carbon stocks. As agricultural land becomes increasingly scarce in Southeast Asia, and regulatory pressures continue to intensify, the Congo Basin could become the next frontier for oil palm expansion. Most of the roughly 280 million hectares (Mha) of additional land suitable for oil palm in the Congo Basin are found in the Democratic Republic of Congo (60%), Cameroon (11%) and the Republic of Congo (10%). Many heavily forested countries in the Congo Basin are setting national targets to increase production to meet national and regional demands. Land area allocated to oil palm increased by 40% in the Congo Basin and five additional top-producing countries in Africa between 1990 and 2017. Without intervention, future production increases in the region will likely come from expansion rather than intensification due to low crop and

processing yields, possibly at the expense of forest. Sustainability strategies initiated by companies and aimed at certifying palm oil mills are unlikely to be effective at curbing deforestation in the Congo Basin. Smallholder farmers are an engine of growth in the region's palm oil sector, and recent evidence suggests they are actively clearing forest to expand. Because of the proliferation of non-industrial processing facilities (artisanal mills), a substantial fraction of the palm oil produced by smallholders never passes through a company's jurisdiction. Smallholders are also disadvantaged by power imbalances and limited access to technical and financial resources. Including smallholders in sustainability strategies offers opportunities to achieve multisectoral goals. Recommendations to improve the sustainability of the palm oil sector in the Congo Basin include (1) improving access to finance for smallholders and non-industrial mill managers; (2) implementing policies to safeguard natural resources and facilitate access to appropriate market opportunities that offer incentives to prevent future deforestation; (3) intensifying production by replanting aging plantations, rehabilitating abandoned plantations with disease-resistant and high-yielding varieties, and increasing fertilization, without further expansion into high conservation value or high carbon stock forest areas; and (4) improving processing capacity and extraction rates by upgrading mill technologies. Sustainable palm oil development in the Congo Basin will require careful consideration of the governance, institutional, environmental and socioeconomic factors that underpin the complex regional supply chains.

Key Messages National and provincial emissions reduction goals and efforts to slow deforestation may come into conflict with provincial and district level economic ambitions based on agricultural development. Around half of existing oil palm concessions in East Kalimantan are on forested and peatland areas. If developed, these plantations will release ~206 MtCO<sub>2</sub>e into the atmosphere. The expansion of oil palm plantations on currently allocated concessions will lead to the conversion of forested lands and swamp areas, including peatland, and represents a critical source of carbon emissions. To ensure the sustainability of plantation expansion the government needs to undertake a review of all existing plantation permits to ensure that they align with existing sustainability criteria. Green Growth does not present a win-win strategy and therefore requires strong political commitment, and awareness of social and environmental tradeoffs.

Food and Society provides a broad spectrum of information to help readers understand how the food industry has evolved from the 20th century to present. It includes information anyone would need to prepare for the future of the food industry, including discussions on the drivers that have, and may, affect food supplies. From a historical perspective, readers will learn about past and present challenges in food trends, nutrition, genetically modified organisms, food security, organic foods, and more. The book offers different perspectives on solutions that have worked in the past, while also helping to anticipate future outcomes in the food supply. Professionals in the food industry, including food scientists,

food engineers, nutritionists and agriculturalists will find the information comprehensive and interesting. In addition, the book could even be used as the basis for the development of course materials for educators who need to prepare students entering the food industry. Includes hot topics in food science, such as GMOs, modern agricultural practices and food waste Reviews the role of food in society, from consumption, to politics, economics and social trends Encompasses food safety, security and public health Discusses changing global trends in food preferences

A STUNNING PICTURE BOOK ABOUT ONE LITTLE GIRL AND HER ORANGUTAN FRIEND, BASED ON THE GREENPEACE FILM THAT BECAME A VIRAL SENSATION When a little girl discovers a mischievous orangutan on the loose in her bedroom, she can't understand why it keeps shouting OOO! at her shampoo and her chocolate. But when Rang-tan explains that there are humans running wild in her rainforest, burning down trees so they can grow palm oil to put in products, the little girl knows what she has to do: help save the orangutans! Published in collaboration with Greenpeace, featuring a foreword from Emma Thompson and brought to life by award-winning illustrator Frann Preston-Gannon, this is a very special picture book with a vital message to share. This timely picture book focusing on the environmental crisis we all face includes information about orangutans and palm oil plus exciting ideas about how young readers can make a difference.

During the past decade there has been a growing interest in bioenergy, driven by concerns about global climate change, growing energy demand, and depleting fossil fuel reserves. The predicted rise in biofuel demand makes it important to understand the potential consequences of expanding biofuel cultivation. A systematic review was conducted on the biodiversity impacts of three first-generation biofuel crops (oil palm, soybean, and jatropha) in the tropics. The study focused on the impacts on species richness, abundance (total number of individuals or occurrences), community composition, and ecosystem functions related to species richness and community composition.

The palm oil sector in Indonesia has seen the adoption of zero deforestation commitments by the larger companies in the form of various pledges around No Deforestation, No Peat, and No Exploitation (NDPE). At the same time, at the national and sub-national

Over the last two decades global production of soybean and palm oil seeds have increased enormously. Because these tropically rainfed crops are used for food, cooking, animal feed, and biofuels, they have entered the agriculture, food, and energy chains of most nations despite their actual growth being increasingly concentrated in Southeast Asia and South America. The planting of these crops is controversial because they are sown on formerly forested lands, rely on large farmers and agribusiness rather than smallholders for their development, and supply export markets. The contrasts with the famed Green Revolution in rice and wheat of the 1960s through the 1980s are stark, as those irrigated crops were primarily grown by smallholders, depended upon public subsidies for cultivation, and served largely domestic sectors. The overall aim of the book is to provide a broad synthesis of the major supply and demand drivers of the rapid expansion of oil crops in the

tropics; its economic, social, and environmental impacts; and the future outlook to 2050. After introducing the dramatic surge in oil crops, chapters provide a comparative perspective from different producing regions for two of the world's most important crops, oil palm and soybeans in the tropics. The following chapters examine the drivers of demand of vegetable oils for food, animal feed, and biodiesel and introduce the reader to price formation in vegetable oil markets and the role of trade in linking consumers across the world to distant producers in a handful of exporting countries. The remaining chapters review evidence on the economic, social, and environmental impacts of the oil crop revolution in the tropics. While both economic benefits and social and environmental costs have been huge, the outlook is for reduced trade-offs and more sustainable outcomes as the oil crop revolution slows and the global, national, and local communities converge on ways to better managed land use changes and land rights.

**Key messages** This brief examines two contrasting policy options: the implementation of zero deforestation commitments by the private sector and a complete moratorium on the expansion of large-scale oil palm plantations, and compares them to a situation without policy action. The zero deforestation commitments and the moratorium on large-scale oil palm plantations expansion could reduce cumulative deforestation by 25% and 28%, respectively, compared to a situation without policy action. They could also cut greenhouse gas emissions from land use and land-use change by 13% and 16%, respectively, over the period 2010-2030. Even under the zero-deforestation and moratorium scenarios, Indonesia is projected to increase palm oil production between 124%-97% over 2010-2030, which is partly due to higher production originating from smallholders. Both measures - the zero deforestation commitments and a moratorium of future large-scale oil palm plantations expansion - would be especially beneficial to limit future deforestation in Indonesia in a context in which global demand for palm oil is expected to keep increasing. Foresight tools can equip stakeholders and policy makers with data and information to allow for evidence-based policy making. This will permit planning for reducing deforestation and greenhouse gas emissions, and finding options acceptable to all stakeholders involved.

The biota of the earth is being altered at an unprecedented rate. We are witnessing wholesale exchanges of organisms among geographic areas that were once totally biologically isolated. We are seeing massive changes in landscape use that are creating even more abundant successional patches, reductions in population sizes, and in the worst cases, losses of species. There are many reasons for concern about these trends. One is that we unfortunately do not know in detail the consequences of these massive alterations in terms of how the biosphere as a whole operates or even, for that matter, the functioning of localized ecosystems. We do know that the biosphere interacts strongly with the atmospheric composition, contributing to potential climate change. We also know that changes in vegetative cover greatly influence the hydrology and biochemistry of a site or region. Our knowledge is weak in important details, however. How are the many services that ecosystems provide to humanity altered by modifications of ecosystem composition? Stated in another way, what is the role of individual species in ecosystem function? We are observing the selective as well as wholesale alteration in the composition of ecosystems. Do these alterations matter in respect to how ecosystems operate and provide services? This book represents the initial probing of this central question. It will be followed by other volumes in this series examining in depth the functional role of biodiversity in various ecosystems of the world. The oil palm industry has transformed rural livelihoods and landscapes across wide swathes of Indonesia and Malaysia, generating wealth along with economic, social, and environmental controversy. Who benefits and who loses from oil palm development? Can oil palm development provide a basis for inclusive and sustainable rural development? Based on detailed studies of specific communities and plantations and an analysis of the regional political economy of oil palm, this book unpicks the dominant policy narratives, business

strategies, models of land acquisition, and labour-processes. It presents the oil palm industry in Malaysia and Indonesia as a complex system in which land, labour and capital are closely interconnected. Understanding this complex is a prerequisite to developing better strategies to harness the oil palm boom for a more equitable and sustainable pattern of rural development.

The palm oil sector has been targeted by NGOs for its alleged negative environmental and social impacts. In this regard Indonesia represents a major challenge because it is home to some of the largest tropical forests in the world. A recent wave of corporate sustainability commitments peaked with the New York Declaration on Forests in September 2014, which emerged amidst the development of other standards and initiatives toward sustainable palm oil production. This process has made this field very complex, especially in Indonesia. The present study aims at clarifying the positions taken by the various stakeholders and assesses the level of political support and the functioning of policy networks. Results from our Policy Network Analysis based on the survey of 59 institutions representing all types of stakeholders (e.g. government, corporate, NGO) at all levels (international, Indonesian and local) show that standards and initiatives for sustainability have contrasting visibility and impact among stakeholders. In this context, RSPO stands as a reference, with the efforts by the Government of Indonesia to promote its own standard with ISPO yet to gain traction. While IPOP was a well-appreciated initiative and a symbol of zero-deforestation commitments, opposition to it by the government and conflicting interests have resulted in its disbandment. Overall, the lack of progress for sustainable palm oil practices on the ground, in the view of respondents, seems to be caused by political and legal barriers rather than technical challenges or economic losses at a country level.

This paper proposes an overview of the development of oil palm production in Indonesia combining two levels: (i) a national and historical perspective of the development of the sector; (ii) a regional approach considering two contrasting provinces, Riau and Jambi. Starting with colonial times, the national approach deals first with the main periods that punctuate the development of oil palm plantations up to the contemporary period, marked by the liberalization of the economy. It emphasizes several factors that played a strategic role in the development of palm oil production, such as the role of the State and migration. After presenting the different models that structure the relationships among stakeholders and how these relationships have evolved, the role of small family planters is analyzed. This section ends with a review of some controversial issues: livelihood improvement, land tenure and customary rights, inclusion versus exclusion, market risks, forest and environmental threats and governance. The regional approach gives context to the development of palm oil production within two territories that have different historical backgrounds, with Jambi entering into production relatively recently. In each of the two provinces, the themes and issues involved in palm oil development identified at national level are analyzed, with specific emphasis on stakeholders' strategic behaviours. The paper concludes with a comparative perspective on both provinces.

This book aspires to be a comprehensive summary of current biofuels issues and thereby contribute to the understanding of this important topic. Readers will find themes including biofuels development efforts, their implications for the food industry, current and future biofuels crops, the successful Brazilian ethanol program, insights of the first, second, third and fourth biofuel generations, advanced biofuel production techniques, related waste treatment, emissions and environmental impacts, water consumption, produced allergens and toxins. Additionally, the biofuel policy discussion is expected to be continuing in the foreseeable future and the reading of the biofuels features dealt with in this book, are recommended for anyone interested in understanding this diverse and developing theme.

Palm oil production has increased rapidly over the past two decades in response to rising demand for its use in food, energy, and industrial applications. Expansion of oil palm plantations presents a dilemma, as they can displace forests and peatlands, leading to biodiversity losses

and increased greenhouse gas emissions. Although projections show that expansion of oil palm area will slow with faster yield growth, important concerns remain that will require careful attention from policymakers.

Seminar paper from the year 2019 in the subject Business economics - Business Ethics, Corporate Ethics, grade: 1,0, Ruhr-University of Bochum (Englisches Seminar), language: English, abstract: Palm oil is a multiplayer, functioning as an ingredient in our everyday food, as an essential ingredient in our cosmetic products and as an energy supplier. We use it on a daily basis, while brushing our teeth with the "Colgate" toothpaste after we ate "Nutella" on toast. After we filled our diesel car with palm oil biodiesel, we probably wash our hands with a "Dr. Bronner's Magic Soap". In all these products, palm oil is the fundamental ingredient. But where does it come from and how can we identify the problems that occur within the palm oil production? The edible oil seems to be promising, but in fact causes deforestation, carbon dioxide emissions and the loss of biodiversity. The industries, as well as the end consumers are not aware or do not want to be aware of the fact, that the climate is changing and one essential reason for that is the irresponsible production of palm oil. With the help of organizations like "Greenpeace" and "Amnesty International", it is possible to find out what consequences palm oil production already has. According to Greenpeace UK "An area the size of a football pitch is torn down in Indonesia's rainforest every 25 seconds, with palm oil driving the destruction." (Nicholls). This leads to my research question: Is it possible to produce sustainable palm oil? In order to answer my research question, I want to connect its history, as well as the biological process onto the consequences palm oil production already has. Within my essay I will focus on the business and usage of palm oil, showing its unique variety. With the help of examples of different companies, which use palm oil as an ingredient for their products, one has the possibility to form his own opinion on the aspects of sustainability within the palm oil sector. My goal is to raise awareness of the use of palm oil products and to eliminate preconceptions according the palm oil industry in general.

The rapid development of oil palm cultivation feeds many social issues such as biodiversity, deforestation, food habits or ethical investments. How can this palm be viewed as a 'miracle plant' by both the agro-food industry in the North and farmers in the tropical zone, but a serious ecological threat by non-governmental organizations (NGOs) campaigning for the environment or rights of local indigenous peoples? In the present book the authors – a biologist and an agricultural economist- describe a global and complex tropical sector, for which the interests of the many different stakeholders are often antagonistic. Oil palm has become emblematic of recent changes in North-South relationship in agricultural development. Indeed, palm oil is produced and consumed in the South; its trade is driven by emerging countries, although the major part of its transformations is made in the North that still hosts the largest multinational agro industries. It is also in the North that the sector is challenged on ethical and environmental issues. Public controversy over palm oil is often opinionated and it is fed by definitive and sometimes exaggerated statements. Researchers are conveying a more nuanced speech, which is supported by scientific data and a shared field experience. Their work helps in building a more balanced view, moving attention to the South, the region of exclusive production and major consumption of palm oil.

"A decade and a half ago, lush forests with evergreen fruitbearing rambutan trees surrounded the home of Leni, a 43-year-old Iban Dayak woman and mother of two, in Jagoi Babang district of West Kalimantan province--an area her Indigenous community has inhabited for centuries. Today, they have little land to farm and no forest in which to forage after the land was cleared to make way for an oil palm plantation run by an Indonesian company."--Publisher website, viewed October 15, 2019.

The Bitter Fruit of Oil Palm Dispossession and Deforestation Palm oil and likely futures Assessing the potential impacts of zero deforestation

commitments and a moratorium on large-scale oil palm plantations in IndonesiaCIFOR

There is abundant literature focusing on the palm oil sector, which has grown into a vigorous sector with production originating mainly from Malaysia and Indonesia, and on increased palm oil consumption in many countries around the globe, particularly European Union states, China and India. This sector expansion has become quite controversial, because while it has negative social and environmental impacts, it also leads to positive benefits in generating fiscal earnings for producing countries and regular income streams for a large number of large- and small-scale growers involved in palm oil production. This document reviews how the social, ecological, and environmental dynamics and associated implications of the global palm oil sector have grown in complexity over time, and examines the policy and institutional factors affecting the sector's development at the global and national levels. This work examines the geographies of production, consumption and trade of palm oil and its derivatives, and describes the structure of the global palm oil value chain, with special emphasis on Malaysia and Indonesia. In addition, this work reviews the main socioenvironmental impacts and trade-offs associated with the palm oil sector's expansion, with a primary focus on Indonesia. The main interest is on the social impacts this has on local populations, smallholders and workers, as well as the environmental impacts on deforestation and their associated effects on carbon emissions and biodiversity loss. Finally, the growing complexity of the global oil palm value chain has also driven diverse types of developments in the complex oil palm policy regime governing the sector's expansion. This work assesses the main features of this emerging policy regime involving public and private actors, with emphasis on Indonesia. There are multiple efforts supporting the transition to a more sustainable palm oil production; yet the lack of a coordinated public policy, effective incentives and consistent enforcement is clear and obvious. The emergence of numerous privately driven initiatives with greater involvement of civil society organizations brings new opportunities for enhancing the sector's governance; yet the uptake of voluntary standards remains slow, and any push for the adoption of more stringent standards may only widen the gap between large corporations and medium- and smallscale growers. Greater harmonization between voluntary and mandatory standards, as well as among private initiatives is required. Commitments to deforestation-free supply chains have the potential to reduce undesired environmental impacts from oil palm expansion, and while this risks excluding smallholders from the supply chains, such commitments may function to leverage the upgrading of smallholder production systems. Their success, however, will require greater public and private sector collaboration.

Forests hold a significant proportion of global biodiversity and terrestrial carbon stocks and are at the forefront of human-induced global change. The dynamics and distribution of forest vegetation determines the habitat for other organisms, and regulates the delivery of ecosystem services, including carbon storage. Presenting recent research across temperate and tropical ecosystems, this volume synthesises the numerous ways that forests are responding to global change and includes perspectives on: the role of forests in the global carbon and energy budgets; historical patterns of forest change and diversification; contemporary mechanisms of community assembly and implications of underlying drivers of global change; and the ways in which forests supply ecosystem services that support human lives. The chapters represent case studies drawn from the authors' expertise, highlighting exciting new research and providing information that will be valuable to academics, students, researchers and practitioners with an interest in this field.

Oil palm basics. Oil palm and palm oil. Historical summary. Palm oil biology, products and productivity. Oil palm cultivation. Yield and its improvement. Palm oil production and global trends. Palm oil production. Biofuel development, demand and expansion.

Palm oil prices. The boom continues. A driver of deforestation?. Greenhouse gas emissions.

Over the past decade, the Brazilian government has actively promoted oil palm in the Amazon biome as an alternative biodiesel feedstock to soy. Because of oil palm's comparatively high productivity, it places less demand on land than soy and could thereby contribute to reducing pressure on the Amazonian forest. Although oil palm has long been a leading driver of deforestation and social conflict in major producer countries in Southeast Asia, the Brazilian government has put in place a number of mechanisms to ensure oil palm is cultivated sustainably and the sector is inclusive of the rural poor. Through research conducted in Brazil's leading palm oil producing state of Pará, this paper analyzes the evolution and dynamics of the Brazilian palm oil value chain and the economic, environmental and social challenges faced by the sector. In so doing, it shows that under the right institutional and regulatory conditions, the palm oil sector can expand sustainably and inclusively within forested ecosystems. This though translates into considerably higher production costs for producers, thus undermining the international competitiveness of the Brazilian palm oil sector.

Key messages The land-use change caused by oil palm expansion results in adverse impacts on ecosystem functions and services provided by natural forests. This study assesses the impacts of oil palm expansion on key ecosystem services and analyzes the trade-offs among ecosystem services under four plausible future land-use scenarios in Central Kalimantan, Indonesia: business as usual, moratorium, zero gross deforestation and sustainable intensification. A trade-off between carbon benefit and habitat quality was observed in the area with low carbon stock. Providing some habitat quality in areas of oil palm expansion enhanced the carbon benefit. A synergy between carbon sequestration and water yield was evident due to oil palm expansion on Dry Rice Land with Mixed Scrub under the zero gross deforestation scenario. Among the four plausible LULC scenarios, zero gross deforestation is the most desirable option for the study area in Central Kalimantan. A successful implementation of zero gross deforestation requires a review of the forest moratorium to encompass all forest types, a clear land-use policy strategy and a detailed land-use plan involving all jurisdictions and engagement of stakeholders. Sustainable intensification is the second-best land use and land cover option for oil palm expansion with an assumed average yield enhancement to 5 tCPO ha<sup>-1</sup> yr<sup>-1</sup>. However, enhancing yield in smallholder farms by 78% is highly challenging. It may be achievable by providing appropriate and adequate technical and management supports to smallholder farms and by ensuring off-take markets for oil palm produced by smallholders.

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