World Agroforestry Centre

World Agroforestry Centre Occasional paper 23

Indonesia's 'Green Agriculture' Strategies and Policies:

Closing the Gap between Aspirations and Application

Beria Leimona, Sacha Amaruzaman, Bustanul Arifin, Fitria Yasmin, Fadhil Hasan, Herdhata Agusta, Peter Sprang, Steven Jaffee and Jaime Frias

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Correct citation: Leimona B, Amaruzaman S, Arifin B, Yasmin F, Hasan F, Agusta H, Sprang P, Jaffee, Frias J. 2015. Indonesia's 'Green Agriculture' Strategies and Policies: Closing the gap between aspirations and application. Occasional Paper 23. Nairobi: World Agroforestry Centre.

Titles in the Occasional Papers series aim to disseminate information on agroforestry research and practices and stimulate feedback from the scientific community. Other publication series from the World Agroforestry Centre include Technical Manuals, Working Papers and Trees for Change.

Published by the World Agroforestry Centre
United Nations Avenue
PO Box 30677 – 00100, Nairobi, Kenya
Tel: +254 20 7224000, via USA +1 650 8336645
Fax: +254 20 7224001, via USA +1 650 8336646
Email: worldagroforestry@cgiar.org
Website: www.worldagroforestry.org

ICRAF Occasional Paper No. 23

ISBN: 978-92-9059-375-1

Cover photo: Beria Leimona
Proofreading: Betty Rabar
Design & layout: Tabitha Obara

Acknowledgements

The authors gratefully acknowledge the generous support and contribution from colleagues and partners. They include:

Ir Nono Rusono PG.DIP, Agr, Sci., MSc. and his staff from the Directorate of Agriculture and Crops – BAPPENAS (National Planning and Development Agency),

Dr Retno Maryani and colleagues from FORDA (Forestry Research and Development Agency),

Ir D. Johnny P. Kusumo, MBA, Sulistianingsih Sarassetiawaty, SE., MSc. and staff from the Deputy of Environmental Economics – Ministry of Environment,

Dr Gede Wibawa and the researchers from PT.RPN (Nusantara Research Institute for Estate Crops),

Dr Fahmuddin Agus from the Indonesian Soil Research Institute,

Prof Dr Meine van Noordwijk and the colleagues from the World Agroforestry Centre, and the Indonesia Green Agriculture Workshop participants, for contributing their time and energy in providing insightful inputs and comments during different stages of this research.

We acknowledge the financial assistance from The Multi-Donor Trust Fund for Trade and Development 2 and The Green Development Support Program funded by Norway and DANIDA. This work was done as part of a “Greening of Export Agriculture in East and Southeast Asia” study coordinated by Steven Jaffee of the World Bank.

Finally, we dedicated this work to the late Dr Bambang Dradjat who contributed to the process of writing this publication.

The Authors

Beria Leimona is an ecosystem service governance and institution scientist under the CGIAR Forest, Trees and Agroforestry (FTA-3) Program of the World Agroforestry Centre with over 15 years of experience in policy analysis, resource mobilization, project coordination and institutional capacity strengthening in Asia. She holds a PhD in Environmental System Analysis from Wageningen University and Research, in the Netherlands.

Sacha Amaruzaman is an ecosystem services specialist at the World Agroforestry Centre, Southeast Asia. Currenty, he co-manages the Smart Tree Invest (Climate-Smart, Tree-Based, Adaptation and Mitigation in Asia) project in Indonesia, Vietnam and the Philippines. He also carries out various cross-cutting researches under CGIAR Forest, Trees and Agroforestry (FTA-3) Program, mainly focusing on the ecosystem services, socio-economic, and institutional aspect.

Bustanul Arifin is a Profesor of Agricultural Economics in the University of Lampung (UNILA) and Professorial Fellow at the International Center for Applied Finance and Economics of Bogor Agricultural University (InterCAFE-IPB). His areas of expertise include agricultural sector policy, institutional economics, and environmental and economic development strategy. He is also a board and founder member, and senior economist at the Institute for Development of Economics and Finance (INDEF), an independent research institution aimed at providing assessments on a wide range of public policy issues related to economics and finance.

Fitria Yasmin is an independent agricultural and environmental researcher. She is a graduate of the Agricultural Economics Department from Lampung University and Environmental Economics from Wageningen University, the Netherlands. She has been involved in several agri-environment research projects since 2001. Environmental valuation and impacts of economic activities on the environment are her main research interests.

Fadhil Hasan has more than 25 years of experience in conducting economic policy research and consultancy in areas of macroeconomics, industries, agricultural and public policies both in the government and private sectors. He is currently an Executive Director of the Indonesian Palm Oil Association, Senior Economist at the Institute for Development of Economics and Finance (INDEF), and Member of the Supervisory Board of Bank Indonesia (Central Bank). He also teaches at the Program of Business and Management, Bogor Agricultural University (IPB) and Masters Program at the Faculty of Economics, University of Muhammadiyah Malang.

Herdhata Agusta is a senior lecturer and researcher in Bogor Agricultural University. He has been involved in various environmental and plant ecology researches in Indonesia and Germany, where he obtained his doctoral degree. In between his research, he is an active trainer and carries out environmental monitoring and environmental impact assessment as well as auditing the environmental and quality management system of plantation and mining companies in Indonesia.

Peter Sprang has a Dipl Ing degree in Forestry from the University of Freiburg, Germany and has been working in Southeast Asia for more than 10 years. Peter is currently the Program Director at a consulting company called APCS (Asia Pacific Consulting Solutions), providing services related to the FSC, SAN, RSPO and Utz standards. From 2008 till 2014 Peter was the regional manager for sustainable agriculture at the Rainforest Alliance Asia Pacific office, located in Indonesia. In that position Peter worked with the Sustainable Agriculture Network (SAN) standards on coffee, cocoa, oil palm, spices and tea. Peter has worked in both forestry and agriculture certification programs over the last 15 years with the FSC (Forest Stewardship Council), SmartWood, WWF, GIZ, UNEP and NEPCon.

Steven Jaffee is the Lead Rural Development Specialist in the World Bank's Agriculture Global Practice. His research, policy and investment project-related work has spanned multiple areas, including agricultural supply chains, trade and SPS standards, food security, agricultural risk management, and other fields. He has had extensive field experience in Southeast Asia and Africa. He recently co-edited a compendium of papers on rice-related and food security policies in East and Southeast Asia. He currently coordinates a regional study on the "Greening of Export Agriculture in East and Southeast Asia". He has a BA from the University of Pennsylvania and a DPhil. in Agricultural Economics from Oxford University.

Jaime Frias is a Trade and Competitiveness specialist currently leading technical aspects of competitiveness engagements for the World Bank in Paraguay, Guatemala and Southeast Asia. He has more than 15 years' experience in trade, marketing, and development economics. Jaime is a graduate of the Masters in Public Administration and International Development (MPA/ID) programme at the Harvard Kennedy School. Prior to enrolling in this program, he served as the Country Director for International Development Enterprises (IDE) in Hanoi, Vietnam and as a Junior Brand Manager for the Procter and Gamble Company in Chile.

Executive Summary

Indonesia's agricultural policies have recognized the environmental, social and economic imperative of green agriculture, and a significant portion of the national strategy of green growth aims to reduce agriculture's environmental footprint. But while such an approach is often crucial, it can be incomplete and only generates arbitrary good practices. Thus, a gap between aspirations and applications of sustainable agriculture does exist.

This study provides an overview of the state-of-the-art of green agriculture, the policies and strategies associated with it, the commonly applied instruments, and the situation in the field. The study aims to capture recent findings on the following questions: What are prominent environmental adverse drivers and impacts of environmental degradation associated with commercial agriculture? What are the major features of the country's strategy and policy in relation to green agriculture? What mixture of mechanisms, instruments and regulations are being deployed by the government and private sectors to address sustainable agriculture? What are capacity strengths and weakness for implementing green agriculture? And finally, what have been the main factors contributing to the continued gap between green aspirations and applications on the ground?

We focus on five commodities that are particularly important based on their competitive outlook and the degree to which they contribute to environmental and social risks for communities and private enterprises. These commercially valuable commodities are rubber, coffee, cacao, palm oil, and rice. The first four commodities have strong global demand, presenting both a threat for environmental degradation and an opportunity when there is a growing preference among a sub-set of international consumers for sustainably grown products. Rice is a staple food of Indonesian people with high domestic demand. In all cases, the environmental challenges are intertwined with social conflict, rural poverty and livelihood uncertainty in the face of climate change and socio-political shocks.

Indonesia's green agriculture challenge

Adverse environmental impacts from these commodities are highlighted in four categories:

Expansion of agricultural land & conversion of forests leading to ecosystem services and biodiversity loss – These environmental risks are mostly driven by sizable-scale growth of monoculture plantations, particularly estates and clear-cutting operations by timber industries. Intensive agriculture along the border of protected areas has increasingly led to loss of fragile habitats. Land conversion caused not only deforestation and biodiversity loss, but also 'carbon debt' and increased GHG emissions. The process of administrative and fiscal decentralization has, unintentionally, accelerated agricultural expansion into forested areas, as district governments obtain needed operating revenues through land concessions.

Organic and inorganic pollution – Inefficient use of fertilizers, latex processing operations and palm oil mills have led to water pollution and soil contamination. Rice has traditionally been a strong polluter. Further, the study found that oil palm, cacao and rubber have featured high level of problems related to effluent control and misuse of substances.

Uncontrolled use of water resources – Excessive use of water can lead to depletion of aquifers. The Indonesian study confirmed that Indonesian agriculture has been subject to risks from water scarcity, consistent with the expectations. Coffee, cacao and rice have shown signs of potential risk, predominantly through their relatively high water footprint. However, coffee and cacao consume mostly rainwater, not hindering other users from accessing water. In contrast, rice production implies rice farmers have to share their water with other domestic users and producers.

Mismanagement of soil nutrients and poor site selection – selection of loose soil and steep slopes for agriculture, parallel contour ploughing, ground cover clearing and slash-and-burn contribute to

soil degradation and erosion. Land degradation is most common when farmers are unaware of the perils of poor site selection or when they face limited availability of fertile and flat farming lands. Technically inappropriate irrigation can also degrade soils. Soil erosion has been problematic primarily when plantations have been planted on steep slopes. Unshaded production systems require more chemical inputs and lack natural mulch covering from shade trees which degrades the soil faster and increases soil erosion.

Indonesian green agriculture aspirations, applications and capacities

Indonesia has embraced sustainable agriculture, through a variety of national level strategies, such as the National Agenda 21, National Development Programs, and Revitalization Strategy for Agriculture, Fisheries and Forestry. These strategies have been implemented by The Central Planning Agency (BAPPENAS), the Ministry of Agriculture, and the Ministry of Environment. Many of these strategies contain appropriate elements for sound environmental management of export agriculture in Indonesia.

Motivations behind the enactment of these strategies have changed and seem to respond to different trends over time. First, Indonesian national strategies have favoured socio-economic goals over environmentally sustainable ones. Notwithstanding, environmental issues have proved to gain increasing prominence over time, as they appear more frequently in reforms and strategic documents in recent years. Second, strategy documents have also shown a shift in direction with an instrument mix with less exclusive attention to laws and regulations and more market creation instruments and voluntary approaches over time.

A mixed set of capacities, together with conflicts between conservation goals and local revenue raising imperatives, has led to inconsistent patterns and progress in different provinces. Significant improvements have been made to modernize agro-environmental regulations, drawing upon better knowledge and global good practice. Whether environmental risks present local or global threats, the level of environmental degradation in any given commodity, and the availability of legal, enforcement, fiscal and regulatory capabilities for sub-national governments tend to underpin the choice of instrument for policy.

In practice, Indonesian policy makers have deployed a variety of instruments to reduce agriculture's environmental footprint, including direct regulation, incentives that create or correct markets, and voluntary and informational solutions. Policy makers apply legal and regulatory instruments, but presumably targeting plantation states and sizable farms. It is worth noting the presence of mandatory ISPO standards (in local regulatory instruments section), as they these have been a relatively recent adaptation from voluntary standards. Additional considerations that influence policy-makers' decisions to apply any one instrument include the potential effectiveness of introducing the instrument relative to its costs, and the ability of the policy maker to introduce it, in the face of possible political resistance. In this regard, application of regulatory and legal instruments seem to work best for overseeing conspicuous investments, such as in the case of planting prohibitions, and requirements for EIAs. The Indonesian study has also found that international pressure contributed to dissemination of planting prohibitions. In addition, deployment of regulatory instruments may work best when their administrative and monitoring expenses are already embedded into an existing administration, such as indirect product charges for import restrictions. However, applications of land use planning and zoning instruments have shown some limitations, such as inconsistent zoning between national and sub-national government agencies.

Instruments that create or correct markets have gained traction, but they still seem incipient in their application, with the exception of full cost charges for water use control. Payment for ecosystem services has played a growing role at the national level, as witnessed by the increasing number of collaborative programs involving various stakeholders, including the government. Applications of market instruments seem also to be directed towards commodities grown on state

farms. For example, indirect subsidies for organic fertilizer and certification of organic farming have been applied for rice and horticulture products – administered through distributors – but limited to commodity states. Limited tax collection and management capacity have constrained applications of instruments that create or correct markets. For example, the Indonesian budgeting system does not recognize the concept of earmarking and all revenues collected through taxes are assigned to a general purpose budget. Thus, the funds collected through charges for resource use and environmental tax application for certain products cannot be utilized for monitoring of environmental performance or for other applications for minimizing environmental risks. One clear missed opportunity is scaling up of selected successful experiences with payment for environmental services (PES), which remain highly dependent on donor funding.

Information, advocacy and voluntary approaches remain known for commodity quality standards and certification. Certifications were introduced by the private sector through multi-stakeholder forums. The government embraced the initiative afterwards, even to the point of introducing mandatory national standard (i.e. ISPO), for palm oil. Another example of government response is PIS Agro, which is currently backed by 13 companies partnering with the government. This voluntary instrument presents a broad public-partnership program (PPP) which can enable better implementation of Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP) as the basis for certification. Application of voluntary approaches have been more prominent for issues related to natural resource management and quality such as soil, land and water, as opposed to address issues related to environmental protection. However, one limitation from current government standards is its focus on uniform technicalities that ignore the environmental context, specifically not taking into account problems that ail sites. The Indonesian National Standard Body (BSN) standard presents limited market uptake as it is usually perceived as a low rigor standard.

It is worth noting that information approaches are critical for the effectiveness of regulatory instruments. For example, restriction of pesticide use should be coupled with information to raise farmers' awareness and understanding about pesticides and fertilizer dosage. However, the application of extension services, which could convey communication programs for environmental management, remains limited to rice and basic food crops.

Bridging the gap between aspirations and applications

Based on the findings, the Indonesian study recommends the following: First, policy makers should strengthen government functions for environmental management, particularly to harmonize data and standards across sectors under a unified framework and management system. Second, policy makers should build sub-national government financial and planning capacity to manage and expand successful applications of economic instruments and voluntary approaches. Finally, national and sub-national governments should work more closely with private sector players to systematically advance agro-environmental action plans for specific commodities.

In addition, expanding the use of economic instruments and taking advantage of voluntary approaches will require that sub-national governments work in partnership with the private sector to introduce standards that respond to local needs. Moreover sub-national governments would need to rely increasingly on data and science to conduct diagnostics. The Indonesian government should increasingly play the role of enabler of voluntary markets, institutional innovation, and promoter of voluntary action, leveraging the use of instruments on private interest and participation, and moving away from command control systems.

In summary, Indonesian policy makers need to embark on a proactive but selective approach to greening agriculture in Indonesia. By looking at policy options, evaluating their adequacy for specific conditions of landscapes and learning from their own experience and adaptation of their strategies over time, Indonesians will be in a better position to meet their own aspirations.

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List of Abbreviations & Acronyms

AMDAL : Environmental Impact Assessment

AOI : Indonesia Organic Alliance

ASEAN : Association of Southeast Asian Nations

BACP : Biodiversity and Agricultural Commodities Program

BAPPENAS : National Planning Agency

BPS : Biro Pusat Statistik/Central Bureau of Statistics

BMP : Best Management Practices

BOD : Biological Oxygen Demand

BSN : *Badan Standardisasi Nasional*/National Standardization Body

CAFE : Coffee and Farmers Equity

COD : Chemical Oxygen Demand

CPCL : *calon petani/calon lahan/* potential farmer/potential plot

CRF : Crumb Rubber Factories

CSER : Company Social and Environmental Responsibility

CSP : Cocoa Sustainability Partnership

DFG : *Deutsche Forschungs-gemeinschaft*

EU : European Union

FAO : Food and Agriculture Organization of the United Nations

FFB : Fresh Fruit Bunch

FKDC : Forum Komunikasi Cidanau/Cidanau Watershed Forum

FSC : Forest Stewardship Council

GAP : Good Agricultural Practices

GAPKI : *Gabungan Pengusaha Kepala Sawit Indonesia/* Indonesian Association of Palm Oil Producers

GDP : Gross Domestic Product

GERNAS : *Gerakan Nasional/* National Initiative

GHG	: Greenhouse Gas
GMP	: Good Manufacturing Practices
GoI	: Government of Indonesia
HCV	: High Conservation Value
ICCRI	: Indonesia Coffee and Cacao Research Institute/Puslitkoka
ICRAF	: World Agroforestry Centre
IDH	: Sustainable Trade Initiative
IFAD	: International Fund for Agriculture and Development
Inpres	*: Instruksi Presiden*/Presidential Instruction
IRSG	: International Rubber Study Group
ISPO	: Indonesia Sustainable Palm Oil
Keppres	: *Keputusan Presiden*/Presidential Decree
KLH/MoE	: *Kementrian Lingkungan Hidup*/Ministry of Environment
LLNP	: Lore Lindu National Park
MTI	: Market Transformation Initiative
NAMA	: Nationally Appropriate Mitigation Action
NGO	: Non-Government Organization
NTFP	: Non-timber Forest Product
OECD	: Organization for Economic Co-operation and Development
PP	: *Peraturan Pemerintah*/Government Regulation
Perpres	: *Peraturan Presiden*/Presidential Regulation
Permenhut	: Minister of Forestry Regulation
Permenkeu	: Minister of Finance Regulation
Permentan	: Minister of Agriculture Regulation
PES	: Payments for Environmental Services
PIS Agro	: Partnership for Indonesia's Sustainable Agriculture

RAN/RAD-GRK : National/Local Action Plan for Greenhouse Gas Emission Reduction

RED : Renewable Energy Directive

REDD+ : Reducing Emissions from Deforestation and Forest Degradation

RPPK : Revitalization of Agriculture, Fisheries and Forestry

RSPO : Roundtable on Sustainable Palm Oil

RUPES : Rewarding Upland Poor for Environmental Services

SAN : Sustainable Agriculture Network (standard setting group)

SCP : Sustainable Consumption and Production

SIPP : Master Strategy on Agricultural Development

SNI : Indonesian National Standard

SRI : System of Rice Intensification

SS : Suspended Solids

STORMA : Stability of Rainforest Margins

TSR : Technical Specified Rubber

UU : Undang-Undang/National Law/Act

UTZ Certified : a program and a label for sustainable farming

WTO : World Trade Organization

WWF : World Wildlife Fund

1. Introduction

The purpose of this review is to assess national green agriculture policies and strategies in Indonesia, identify their commonly applied instruments, and examine the situation in the field. The review considers four aspects in establishing and implementing the national overview: (1) green challenges for commercial agriculture, (2) green agriculture aspirations, (3) green agriculture applications, and (4) green agriculture capacity and progress towards meeting the aspirations. The study pays particular attention to these dimensions in relation to four export-oriented agricultural commodities: cacao, coffee, oil palm and rubber—together with rice, the country's leading staple food.

What is 'green agriculture' for the purposes of this review? Drawing upon the OECD's broader definition of 'green growth,' we define green agriculture as a way to pursue agricultural growth and development, while preventing environmental degradation, biodiversity loss, and unsustainable natural resource use and, where possible, contributing to ecosystem service benefits. The green agriculture concept stems from the green growth or green economy principles that state that developmental, economic-driven growth must be more resource-efficient, cleaner and more resilient without necessarily slowing growth (Hall and Dorai, 2010; Blanford, 2011; FAO, 2011; Pešić, 2012). According to this principle, the 'greening of agriculture' targets simultaneous maintenance and increase of farm productivity and profitability that increasingly apply agricultural farming practices and technologies while ensuring the provision of food on a sustainable basis, reducing negative externalities and gradually leading to positive ones, and rebuilding ecological resources by reducing pollution and using resources more efficiently (FAO, 2011).

Sustainable ways to produce food and cultivate land are culturally rooted in Indonesian agricultural practices. Across the Indonesian archipelago, there are many examples in which agricultural systems reflect the local wisdom of how people sustainably manage their natural resources through unique agricultural practices. Examples include Subak – the irrigation and water distribution system in Bali, the Simpukng (forest gardens) farming system of the Dayak tribe in Kalimantan, and organic swidden farming of the Baduy tribe in Banten (Java). In Bali, each year, the Subak or 'water temple' rules the use of water resources for agricultural activities such as planting and harvesting. Anything that is decided through Subak becomes the social norm for agriculture (Lansing, 1987; Windia, 2010). Simpukng is an agroforestry system practised by the Dayak tribe in East Kalimantan that helps to maintain natural resources and prevent over-exploitation (Mulyoutami et al., 2009). In Banten, the traditional communal swidden system of the Baduy tribe copes with environmental stresses caused by El Niño and the changing climate pattern (Iskandar, 2007).

The Indonesian Planning Agency or BAPPENAS (2014)[1] reemphasized that green agriculture was one of the necessary components of a green economy that achieves sustainable development (Rusono, 2014). The Indonesian components of sustainable development were to achieve the Millennium Development Goals, apply green economy principles toward better economic structure and sustainable consumption and production, conserve the environment and biodiversity, and practise good governance. Two challenges were underlined to put this framework into operation. First, the government stated that there was a lack of capability to develop good indicators for measuring environmental robustness and its monitoring systems. Second, negative externalities of development activities to the environment had not yet been mainstreamed. Further, BAPPENAS highlighted that the Indonesian green economy principle aimed at increasing human well-being and social justice with a concomitant decrease in environmental risk, ecological crises, and natural resource depletion. Green agriculture has not been explicitly mentioned in this framework.

1 *Presentation of 'Green Agriculture in Indonesia' by the Director of Food and Agriculture, the Indonesian Planning Agency – BAPPENAS, at the 'National Green Agriculture' workshop on April 15, 2014.*

This study on national green agriculture provides an overview of the state-of-the-art of green agriculture, the policies associated with it, the commonly applied instruments, and the situation in the field. Globally, Indonesia is the leading producer of palm oil, the second leading producer of natural rubber and cacao, and one of the top five producers of coffee. We thus pay particular attention to the environmental policy and impacts associated with these commodities. We also pay attention to the policies and impacts associated with rice, the national food staple.

The study first synthesizes the environmental risks/footprints associated with export-oriented agricultural commodities, particularly cacao, coffee, oil palm, and rubber, as well as rice as the staple food and locally oriented market commodity in Indonesia. We highlight the social and cultural aspects that might contribute to challenges in implementing green agriculture principles. Importantly, Indonesian agriculture is dominated by smallholder farmers practicing traditional land management. In the second section, we focus on discussing alternative instruments for managing environmental risks and their implementation and the potential roles of government in managing environmental risks. Finally, the degree and scale of progress in addressing key environmental challenges are reviewed and the factors that contribute to the continued gap between green agricultural goals and field conditions are highlighted. The primary audience for this report consists of policy makers and official technical persons involved in the promotion of green agricultural growth. The secondary audience is a range of other national stakeholders as well as development practitioners. Although the report will be of most interest to Indonesian stakeholders, the experiences and challenges associated with green agriculture in Indonesia can be of interest to stakeholders concerned about environmental impacts in other emerging economies.

2. Green Challenges for Commercial Agriculture

Indonesia is the fourth most populous country in the world, with a total population of 246 million in 2012 (The World Bank, 2014). Its population growth rate is similar to that of the global average.[2] Agriculture has played an important role in the economic development of Indonesia. It currently accounts for 14 percent of GDP, provides employment for 37 percent of the labour force, and approximately 40 million hectares are under cultivation (Pusdatin Pertanian, 2013; BPS, 2014). Globally, Indonesia is the leading producer of palm oil, the second largest producer of natural rubber and cacao, and among the five largest producers of coffee (Table 1). Major destinations for exported commodities include Japan (coffee), Malaysia (cacao), the United States (rubber) and India (oil palm) (FAO, 2011, 2013). In 2013, Indonesia produced about 37 million tons of rice, and consumed 35 million tons. Normally, however, Indonesia needs to import some rice to fully meet domestic demand.

2 *Indonesian human population growth is around 1.2 percent per year, similar to the global average in 2012 (http://data.worldbank.org/indicator/SP.POP.GROW, accessed April 11, 2014).*

2.1 Snapshot of Indonesian agricultural production and exports

Export-oriented plantations in Indonesia stretch along the landscapes of the Sumatra and Sulawesi islands, with coffee and cacao grown in the highland area, oil palm in the lowland area, and rubber in the middle and lowland areas. Besides these two islands, rubber and oil palm plantations are widely grown in West and Central Kalimantan provinces, respectively. The leading growing areas for rice are in the lowlands of Java Island, North Sumatra, and South Sulawesi, where the soil and climatic conditions are highly suitable. Smallholders are the dominant producers of coffee, cacao, rubber and rice (Figure 1). For palm oil, the most common structure is large-scale plantations, as a nucleus estate, together with a range of surrounding smallholder farmers as contracted out-growers.

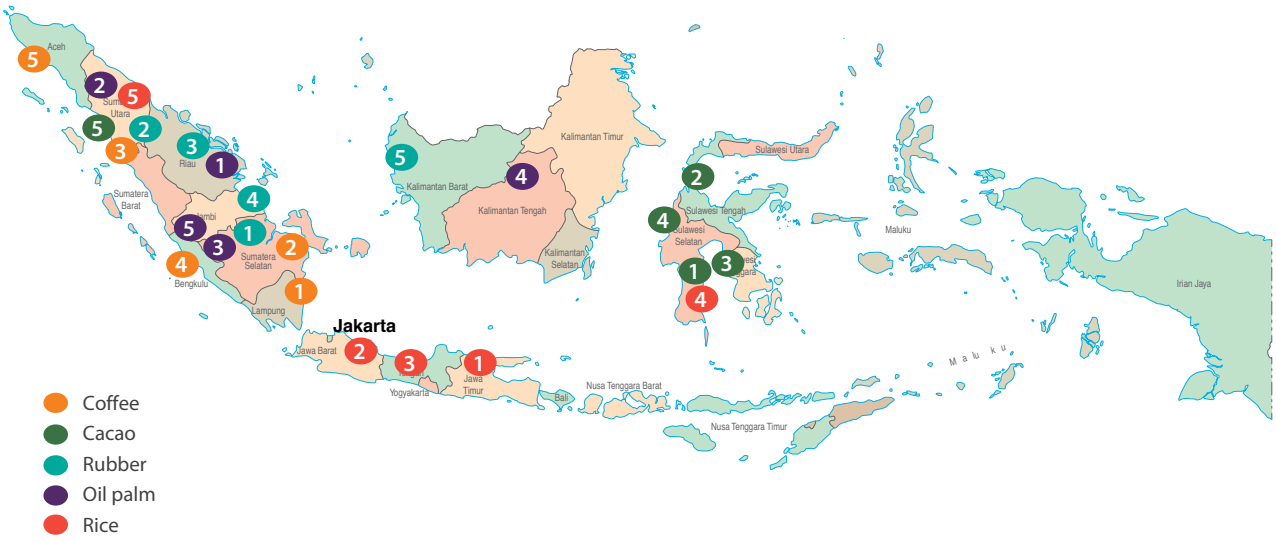
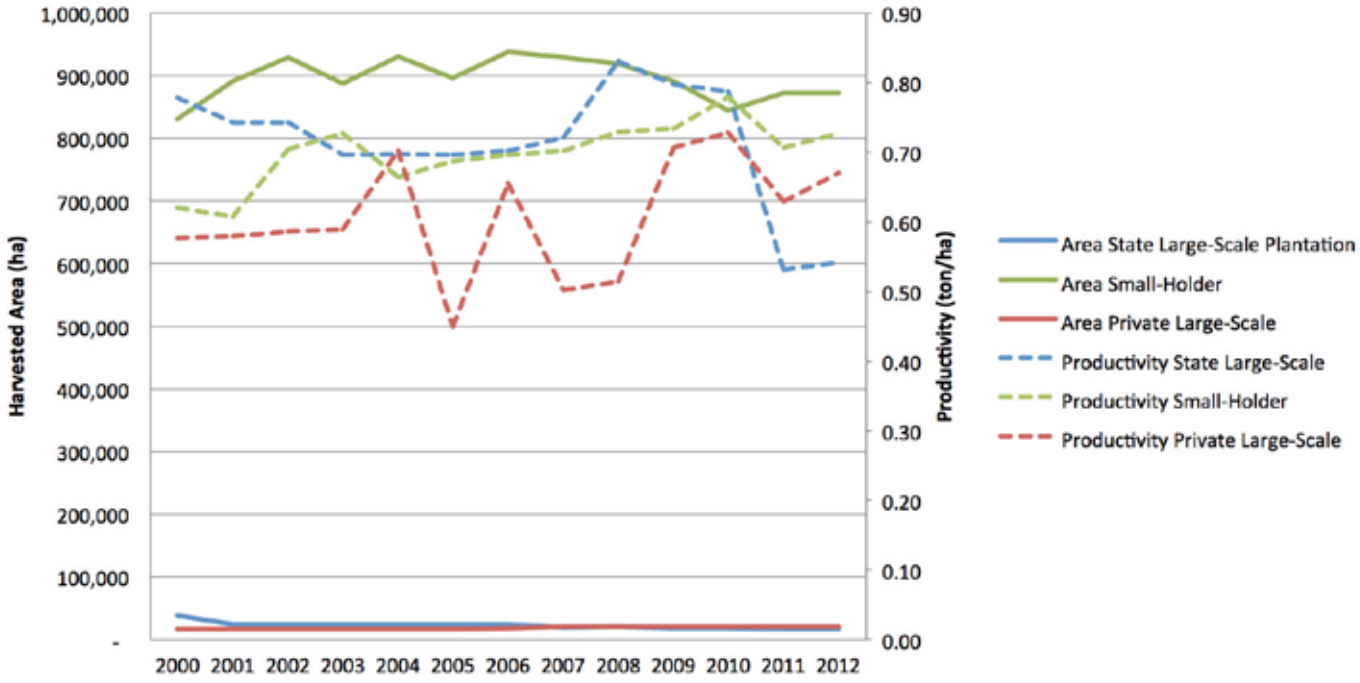


Figure 1. Top five commodities by provinces in 2013 (Pusdatin Pertanian (2013); BPS (2014))

In the period 2000–2012, the land under cacao, rice and oil palm increased, with the highest increment occurring for oil palm production (Figure 2). In contrast, the land under coffee production began decreasing from around 2008. This reduction was as a result of evictions from illegally encroached areas of national parks in Sumatra (mainly in Bukit Barisan Selatan National Park). In the last decade, Indonesia has experienced a boom in palm oil exports. This was associated with a skyrocketing number of new oil palm estates (Figure 3). Some 4 million hectares were converted to oil palm estates during 2003–2012, adding to the 3.5 million hectares under this crop previously. Oil palm now covers 5 percent of Indonesia's total land area and more than 15 percent in two provinces.

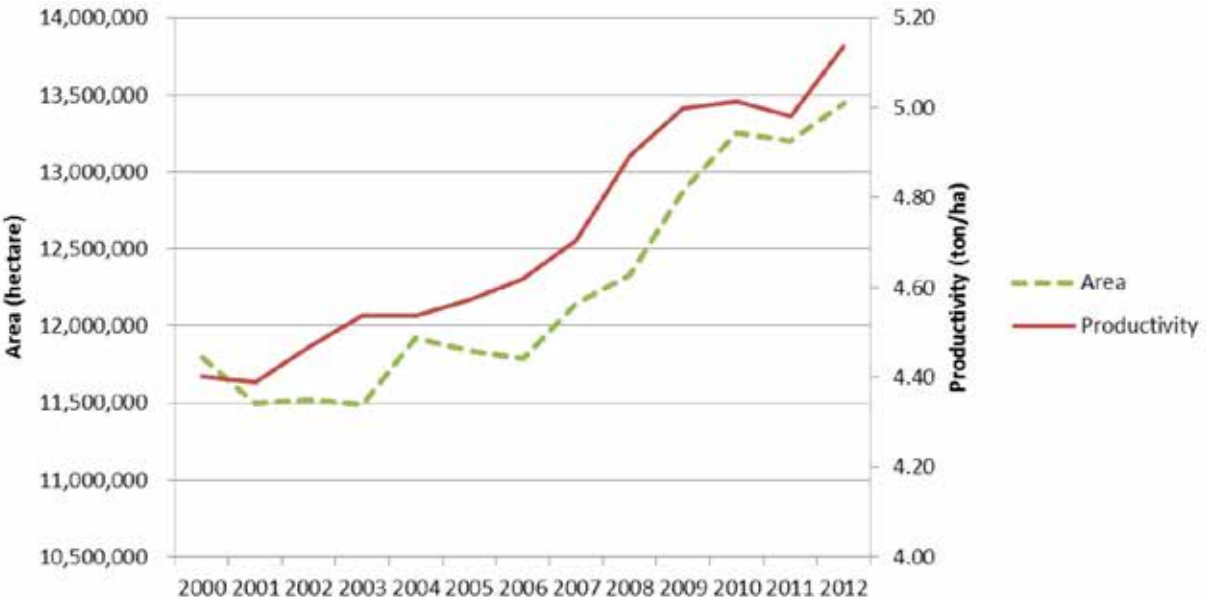
Land expansion for export crops has not generally been accompanied by large improvements in productivity, especially among smallholder farmers. Between 2000 and 2012, the area under smallholder cacao increased by 84 percent, yet the average yield fell by 26 percent (Figure 2 – Cacao). Although some of this yeild loss is associated with the maturation period for new plantings, the increased incidence of cocoa pod and other diseases is the primary factor. The director of Spice and Beverage Crops, Ministry of Agriculture, indicates that 94 percent of cacao plants on smallholder plantations are affected by plant diseases and register low yields (Perkebunan, 2014). To solve this problem, the government launched a National Movement of Cacao program (Gernas Kakao) focusing on rejuvenation, rehabilitation, and productivity-enhancing measures. A contrasting pattern is observed between smallholder and large-scale cacao plantations. The area of large-scale plantations, both private and state-owned, had decreased by 2 percent since 2003, yet their productivity increased by 7 percent (for private large-scale plantations) and 10 percent (for state large-scale plantations). This condition indicates that large-scale plantations might have better and more efficient farming practices leading to better productivity.

Area and Productivity of Coffee

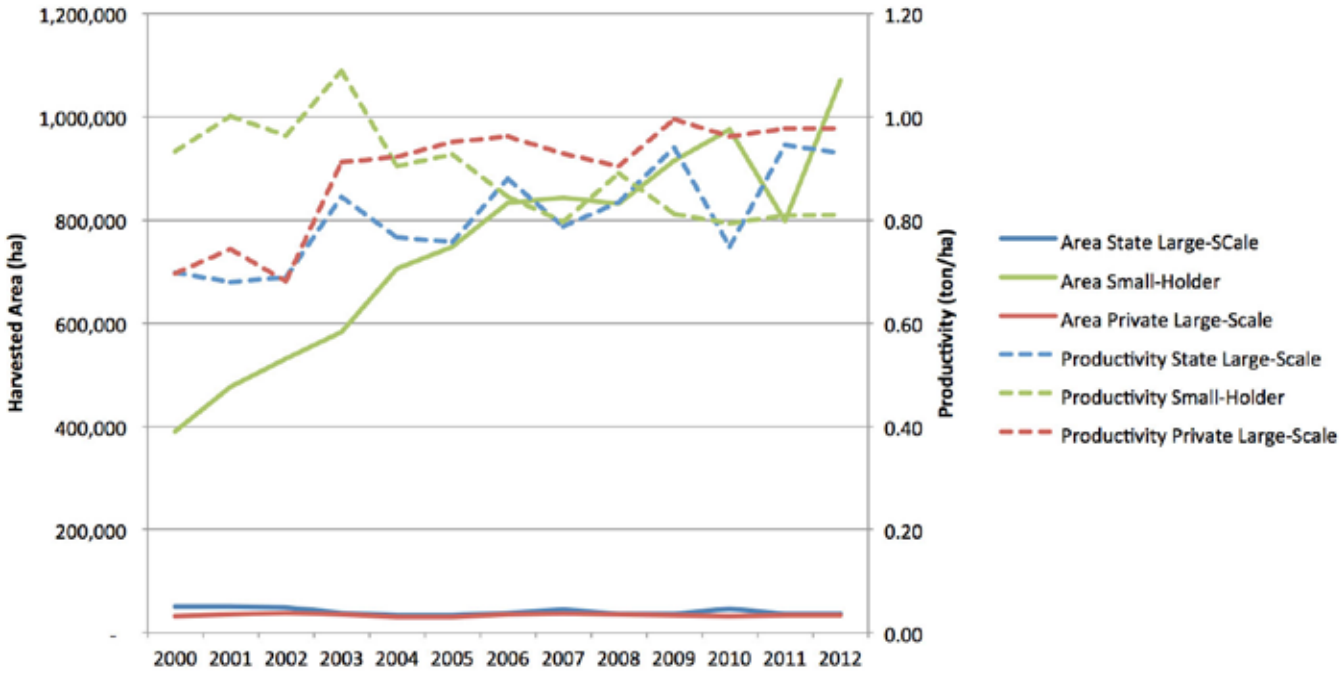


Area and Productivity of Rubber

Area and Productivity of Rice



Area and Productivity of Cacao



Area and Productivity of Oil Palm

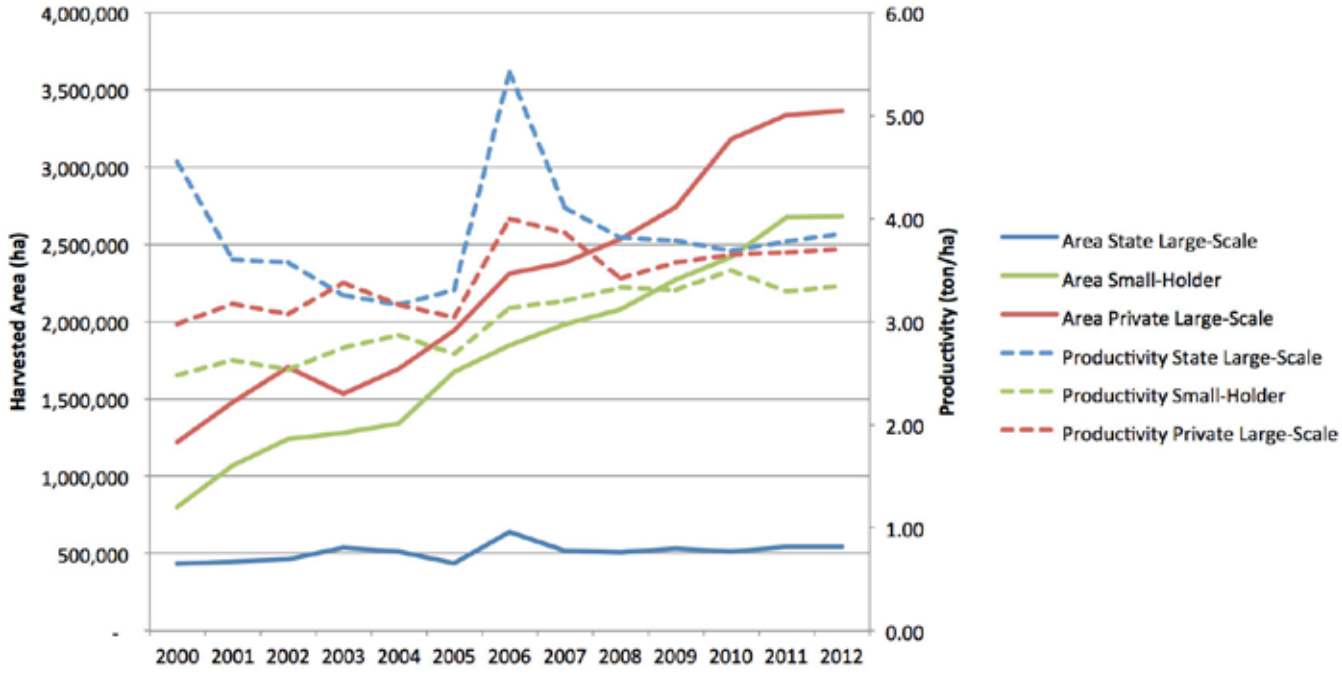
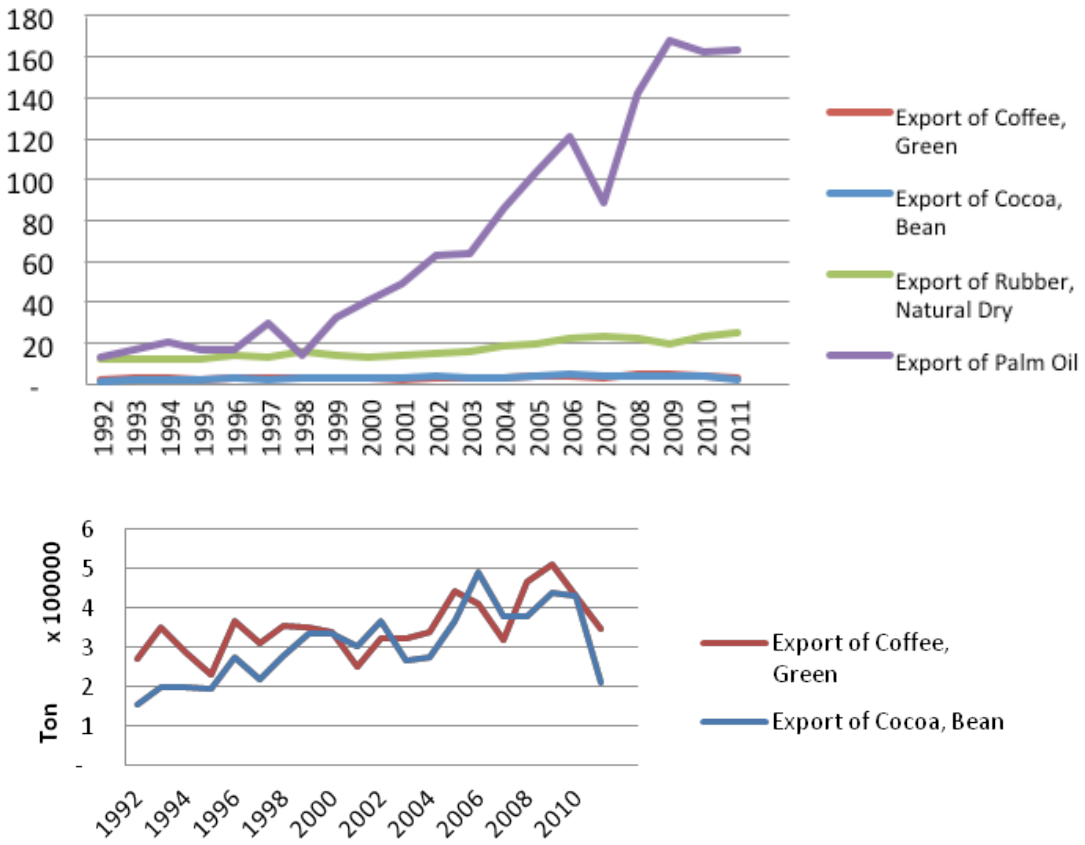


Figure 2. Production, area and yields for major crops



A zoom-in on the coffee and cacao export

Figure 3. Export quantity of selected commodities, 1992–2010, in hundred tons (FAO, 2013)

2.2 Challenges of green agriculture

The adverse environmental impacts associated with agriculture vary depending on agricultural practices, landholders and landscape types. Strong environmental impacts are associated with the expansion of commercial agriculture, especially where this involves encroachment of large-scale monoculture estates into natural habitats, such as undisturbed forest and peat land. Sustainability indicators of environmental risk have conventionally focused on the impacts that farming practices have (i) on-site (maintaining soil quality, soil structure, organic matter content, nutrient levels, and essential soil biota; biological control of pests and diseases, control of weed pressure); as well as (ii) off-site effects (quality, quantity, and regularity of water flows; spread of fire; siltation of reservoirs; landscape-level agro-biodiversity; meso-climate; loss of carbon stocks; and associated increases in net greenhouse gas emissions). In the sections that follow, we highlight various environmental risks associated with Indonesian agriculture, including deforestation, biodiversity loss, land degradation such as erosion and loss of fertile soils, reduction of aboveground carbon stock, increased GHG emissions, high water footprint, and air and water pollution (Table 1).

Table 1: Summary of environmental risks and related agricultural practices.

Environmental risk	Related agricultural practice
Natural forest conversion to agriculture	• Large-scale expansion of monoculture plantations, particularly oil palm estates • Clear-cutting operations by timber industry before planting of commercial agricultural commodities
Habitat loss	• Intensive and monoculture agricultural practices along the border of protected areas • Discontinued vegetative covers from high-conservation-value forests to agricultural lands
Erosion	• Poor site selection such as loose soil and steep slope • Parallel contour ploughing • Ground cover plant clearing • Slash-and-burn • Incorrect perceptions on certain good agricultural cultivation practices, such as contour ploughing can cause root rots and ground cover plants can cause infertile commercial commodities.
Reduction of aboveground carbon stock	• Large-scale conversion originated from natural habitats such as undisturbed forest and peat land, mostly by estates, which causes 'carbon debt.'
Increased GHG emissions	• Persistent flooding of irrigated rice cultivation, causing higher emissions than in rainfed rice cultivation • Excessive use of synthetic fertilizers • High-yielding rice varieties producing higher emissions than local rice varieties
High water footprint	• This varies among commodities and processing
Air and water pollution	• Slash-and-burn particularly in dry season • Commodity processing, particularly latex rubber processing and palm oil mills • Inefficient use of synthetic fertilizer

Beyond technicalities, a dramatic shift in government authority and expenditure from national to subnational government happened in the late 1990s through the decentralization process. The decentralization law on intergovernmental fiscal relationships instituted three components of central to regional transfers: (1) a general allocation fund (*Dana Alokasi Umum* or DAU), (2) a specific allocation fund (*Dana Alokasi Khusus* or DAK), and revenue-sharing arrangements for natural resources. Under the resource-sharing arrangements, producing districts receive a substantial share for natural resource royalties. This is up to 64 percent for forestry, mining, and geothermal. As one of the consequences, perverse incentives exist resulting in environmental degradation.

2.2.1 Natural forest conversion to agriculture

Indonesia is among the five 'leading' countries for the percentage of primary forest lost over the past decade. The expansion of the agricultural frontier is one of the contributing factors (Wich et al., 2011). Of the 50 countries with the highest rates of deforestation in the world, 37 were coffee producing countries (Clay, 2004). This is more than coincidental, pointing toward past decades of agricultural conversion. However, in the past decade in Indonesia, it has been large-scale oil palm plantations, and not smallholder coffee farming, which has caused, by far, the largest conversion.

In Indonesia, the area under smallholder coffee expanded from the 1970s through to the early 2000s, especially in Lampung Province (Verbist *et al.*, 2005; Arifin, 2010). The enforcement of state-forest boundaries has led to the eviction of thousands of people, many of whom had obtained legal land titles during the tenure of the Sukarno government in the 1950s (Verbist and Pasya, 2004). To support the negotiation process of such conflict between coffee farmers and the Forest Service of Lampung Province, World Agroforestry Centre (ICRAF) scientists provided evidence about forest and tree transitions in a landscape of the Sumberjaya watershed in Lampung Province. 'Reforestation' on farmers' land occurred with the conversion of sun coffee into simple and complex shade coffee systems that improved the watershed functions in about 70 percent of the natural forests.

The cacao boom, which led Indonesia to become the world's third largest producer, experienced its most rapid growth in plantings during the 1990s, produced mostly by smallholder farmers (Clough *et al.*, 2009). A study of cacao agroforestry farmers adjacent to Lore Lindu National Park (LLNP), Central Sulawesi, noted that cacao cultivation was a more recent phenomenon. It was not converted from primary forests but rather from older agroforestry-based farms containing coffee and assorted fruit trees, and former annual-crop-focused swidden fields (Belsky and Siebert, 2003). The absence of primary forest clearing for cacao within the park was due to lack of labour to cut and clear the big trees, as well as controls imposed by Lore Lindu National Park guards. The demarcation of Lore Lindu National Park in 1982 effectively made all activities of the local communities that had relied upon forests for hunting, farming and forest products illegal. A decrease in swidden farming by more than 20 percent from 1996 to 1999 happened because of increased LLNP patrolling and the enforcement of the farming ban.

A study on the Stability of Rainforest Margins (STORMA), sponsored by the *Deutsche Forschungs-gemeinschaft* (DFG), concluded that forest degradation and deforestation in Central Sulawesi had occurred at a significantly lower rate (0.6 percent annually between 1972 and 2002) than in the rest of the Indonesian Archipelago (1.2 percent annually in 1990–2000). The degradation and deforestation referred to in that study related to natural forests, while other tree-based farming systems, such as agroforestry and perennial crops, increased by 1.1 and 0.2 percent annually during the same period (Erasmi *et al.*, 2004). This forest conversion was dominated by tree clear-cutting operations by the timber industry.

Gunarso et al. (2013) documented land cover and land-use changes in three palm oil producing countries, Indonesia,[3] Malaysia, and Papua New Guinea, from 1990 to 2010. Forest conversions to establish oil palm were proportionally greatest in Papua (61 percent: 33,600 ha), Kalimantan (44 percent: 1.23 million ha), and Sumatra (25 percent: 883,000 ha).[4] These forests had included undisturbed and disturbed forest in both upland and swamp forest habitats. Oil palm plantations on peat soils increased during 1990 to 2010. In many cases of natural forest conversion, the permission to clear millions of hectares without committing to forest rehabilitation was associated with the contested tenure system[5] (Kartodihardjo and Supriono, 2000), corruption, and increased regional autonomy (Fitzherbert *et al.*, 2008).
Data on deforestation have to be treated carefully since the definition of 'forests' varies. 'Forest' can refer to land cover without trees as long as the area is defined as 'kawasan hutan' or 'state-forest land'[6]. The Ministry of Forestry provides licenses to convert some of these 'state-forest lands' to other land-

3 *In Indonesia, the highest absolute expansion occurred in Sumatra between 1990 and 2000 (167,000 ha/year) and 2001 to 2005 (219,000 ha/year). In Kalimantan, the main expansion period was 2006 to 2009–2010 (360,197 ha/year).*

4 *In Kalimantan, the largest sources of land for new plantations were actually shrub and grassland (48 percent: 1.3 million ha), whereas, in Sumatra, oil palm was converted from other crop lands (59 percent: 2.1 million ha). Sumatra has the largest absolute extent of oil palm plantations on peat (1.4 million ha: 29 percent), followed by Kalimantan (307,515 ha: 11 percent) and Papua (1,727 ha).*

5 *Eleven percent of the land under large-scale oil palm production in South Sumatra was plagued by tenure conflicts involving local communities. These areas covered 83,000 hectares and involved 81 companies.*

6 *In 2014, the Ministry of Forestry published the total forest area in 2013 as 189.6 million ha. This included the convertible production forest zone (17.8 million ha or 9.4 percent of the total forest land) and the other uses zone (61.3 million ha or 32.4 percent).*

uses, particularly the ones under '*Area Penggunaan Lain*/APL' (Other Uses Zone) and '*Hutan Produksi yang Dapat Dikonversi'* (Convertible Production Forest Zone).

2.2.2 Habitat conversion and biodiversity loss

The conversion of forest – by harvesting timber and other valued forest commodities – to agricultural land, particularly under monoculture systems, entails a loss of biodiversity (Teoh, 2010; Tata et al., 2008). Many studies have pointed to agricultural expansion as a major source of biodiversity loss (Iko Hari et al., 2006; Uryu et al., 2008; Indonesia, 2010; Schrier-Uijl et al., 2013). During campaigns, several environmental NGOs have highlighted the fact that conversion of forests to oil palm plantations has destroyed critical habitats for many endangered species, including elephants, orangutans, and tigers, based on the assumption that the bulk of the deforestation has occurred due to the expansion of plantations (WWF Indonesia, 2007; Greenpeace, 2009; Wich et al., 2011).7 The habitats of these mammals had experienced great pressure from land conversion to oil palm production and other agricultural developments, along with the incidence of illegal logging, illegal hunting and wildlife trade, forest fires and land encroachment by subsistence farmers.

Besides the risk of biodiversity loss, the conversion of forest habitats for agricultural use and human settlement along the edge of protected forest habitats can be problematic, for both people and wildlife. This condition brings humans and wildlife into closer proximity, raising the risks of conflict (Riley and Fuentes, 2011). A study examined the overlapping resource uses of forest and cultivated resources by villagers and tonkean macaques (Macacatonkeana) in Lore Lindu National Park, Sulawesi, and indicated that this overlap had not had a significant effect on humans and wildlife, yet there was potential for future conflict (Riley and Fuentes, 2011). The authors recommended 'the adoption of alternative buffer zone crops that use shade-management systems, the deliberate protection of important macaque food species, and increasing the tolerance of crop raiding by exploring the role of macaques in forest regeneration.' For the villagers, putting in place incentive systems for protecting and tolerating crop raiding might be applied.

In some areas of Indonesia, it is common to find smallholders growing commodity tree crops within a broader agroforestry system. This system combines perennial cash crops with timber and fruit trees, food crops, building and handicraft material, and medicinal plants, and socio-cultural value of the local community (Joshi et al., 2002a). One of the notable agroforestry systems in Indonesia is the natural rubber plantation, which contains primary or secondary forest canopy in some parts of Sumatra and Kalimantan. However, the rubber agroforestry system is now being threatened by the conversion to monoculture rubber and oil palm estate (Joshi et al., 2002b; Tata et al., 2008; Feintrenie and Levang, 2009).

Comparisons of rubber agro-forests and natural forests have suggested that, although species richness of the tree stratum is higher in forest than in rubber agro-forests, species richness of seedlings and saplings is similar between the two land uses (Tata et al., 2008). Several studies in Jambi have shown the similarity of rubber agro-forests and secondary forests. The diversity of rubber agro-forest vegetation could protect about 50 percent more species than rubber estates or monoculture rubber plantations (Michon and Foresta, 1995). Rubber agro-forests play a significant role in supporting forest biodiversity, providing refuge for the Red list and threatened species, and serving as biodiversity corridors that crucially connect remnant rubber agro-forests for mammals living in the surrounding forest (Tata et al., 2008; Zulkarnain et al., 2010)

7 *For example, in the Leuser ecosystem, the conversion of 30,000 ha of forest and peat-swamp area is said to have threatened at least 10,000 plant species, 105 types of mammals, 400 bird species, and 95 types of amphibian and reptile species living in the ecosystem. In 2007, the WWF estimated that, in Sumatra, all that remained were 400 tigers, 210 elephants, 7,300 orangutans, and 300 rhinos. WWF, 2007. Species in Sumatra.*

The discussion about the impact of coffee agroforestry systems on biodiversity, although limited, has similarly pointed to the advantage of coffee agroforestry systems compared with monoculture plantations. Gillison *et al.* (2004) examined the impact of different cropping methods, including coffee agroforestry systems, on the plant species richness in Sumberjaya, Sumatra. They found that the plant richness was lowest under simple, monoculture, non-shaded farming systems and increased progressively through complex and shaded agro-forests. O'Connor (2005) highlighted that the 'multistrata' coffee garden provided the habitat for the greatest number of rainforest birds compared with monoculture, which had almost no attractive value for them. However, the coffee garden is not a substitute for the forest habitats of birds, as frugivores (fruit eaters) and high-conservation-value bird species were poorly represented in the coffee garden area.

In the case of cacao cultivation in Sulawesi, the conversion of annual farms to full-sun cacao adversely affects landscape-level biodiversity conditions, specifically by eliminating secondary forest succession, which occurs when annual farms are left fallow. Farmers cultivate sun-grown cacao, without shade, because of a lack of available uncultivated land near villages, due in part to the establishment of the LLNP. Wanger *et al*. (2010) analysed the effect of land-cover gradient from primary forest, secondary forest, natural-shade cacao agro-forest, and planted-shade cacao agro-forest to open areas. The study indicated that the number of amphibian species decreased systematically along the land-use modification gradient, but that reptile diversity and abundance peaked in natural-shade cacao agro-forests. From a financial perspective, growing monoculture cacao is risky, because, unlike coffee, which can be consumed by the household or traded for rice with villagers in a neighbouring valley, it has no local use or value.

2.2.3 Land degradation

Land degradation, through improper agricultural practices, may lead to a temporary or permanent decline in the land's productive capacity. In Indonesia, some of the common causes of land degradation, include land-clearing activities, poor farming practices that lead to depletion in soil nutrients, inappropriate irrigation, soil contamination and degraded quality of water bodies.

Erosion has been found to occur in coffee and cacao production, especially at the beginning of plantation development. In the Sumberjaya watershed, Lampung, the World Agroforestry Centre monitored the erosion rate for various land-use types (i.e. forest, bare soil, and multistrata and monoculture coffee systems) in two plots in 2001–2005. It found that soil properties had a larger effect on the erosion rate than did the tree cover density. The erosion rates in the first plot were between 4 t/ha/year for forest land and 30 t/ha/year for bare soil, decreasing to between 0.1 (forest) and 4 t/ha/year (bare soil) for the second plot with the same treatments (Verbist *et al*., 2005). The coffee garden erosion rates were between those of the bare soil and forest rates. The highest erosion rate occurred in a 3-year-old coffee garden, gradually decreasing as litter layers established soil cover. The research also showed that catchments with relatively high forest cover (more than 30 percent coverage) also had the highest sediment yield. The case of Saddang watershed in West and South Sulawesi showed that the highest erosion rate resulted from the conversion of forest to slash-and-burn food-crop fields rather than from tree-based farming systems (Wati, 2002).

A case study in Sulawesi, Indonesia, compared the biophysical effects of soil and biodiversity associated with the traditional, complex cacao agroforestry systems with sun-grown monoculture cacao cultivation. The shaded areas were found to feature wider bird species diversity, greater vegetation complexity, a higher percent of ground cover by leaf litter, and higher levels of nitrogen and organic matter in the soil (Siebert, 2002). Furthermore, air and soil temperature, weed diversity, and the percentage of ground cover by weeds were higher on the sun-grown farms than on the shaded farms. Studies on coffee cultivation systems show similar results. Under the coffee multistrata system, high earthworm biomass,

resulting from increased organic matter, maintains soil macro-porosity, thus leading to better soil fertility (Hairiah *et al.*, 2006).

2.2.4 Aboveground carbon stock and greenhouse gas (GHG) emissions

The quantity of carbon in a pool or carbon stock is information necessary to conduct carbon accounting and for calculating CO_2 emissions due to land-use change (IPCC, 2003). Agus *et al.* (2013) found that natural habitats, such as undisturbed upland, swamp forests, and mangroves, ranked highest in terms of aboveground carbon stock, followed by disturbed habitats of these types (Figure 4). Next, in order, were rubber plantations, mixed-tree crops, and timber plantations. Oil palm plantations and swamp shrub land had lower aboveground carbon stock. At the lowest end were intensive annual crops, swamp grasslands, and rice fields.

Anticipating the requirement of the Renewable Energy Directive (RED) of the European Union[8], the World Agroforestry Centre reviewed 23 oil palm plantations in Indonesia to estimate the performance of such plantations in meeting the minimum EU standards (Khasanah *et al.*, 2013). These plantations voluntarily joined the study. Ten of the 23 plantations had converted more than 60 percent of their area from forests to oil palm. When oil palm plantation[9] is converted from land cover with higher carbon stock, such as forest and tree-based farming systems, 'carbon debt' is more likely to happen. In this case, the carbon debt occurred in 91 percent of the plantations assessed.

8 *The Renewable Energy Directive (RED) of the European Union includes a commitment to substitute part of the Union's transportation fuel with biofuels to reduce carbon dioxide emissions. The directive also takes partial responsibility for increases in emissions that may occur outside the national accounting framework.*

9 *The time-averaged aboveground carbon stock of oil palm based on a typical replanting cycle of 25 years is 40 ± 5 t C/ha. Land covers with the ranges of time-averaged aboveground carbon stock higher than that of oil palm are forest (150–250 t C/ha) and tree-based systems (50–150 t C/ha) on mineral soils (or nonpeat soil).*

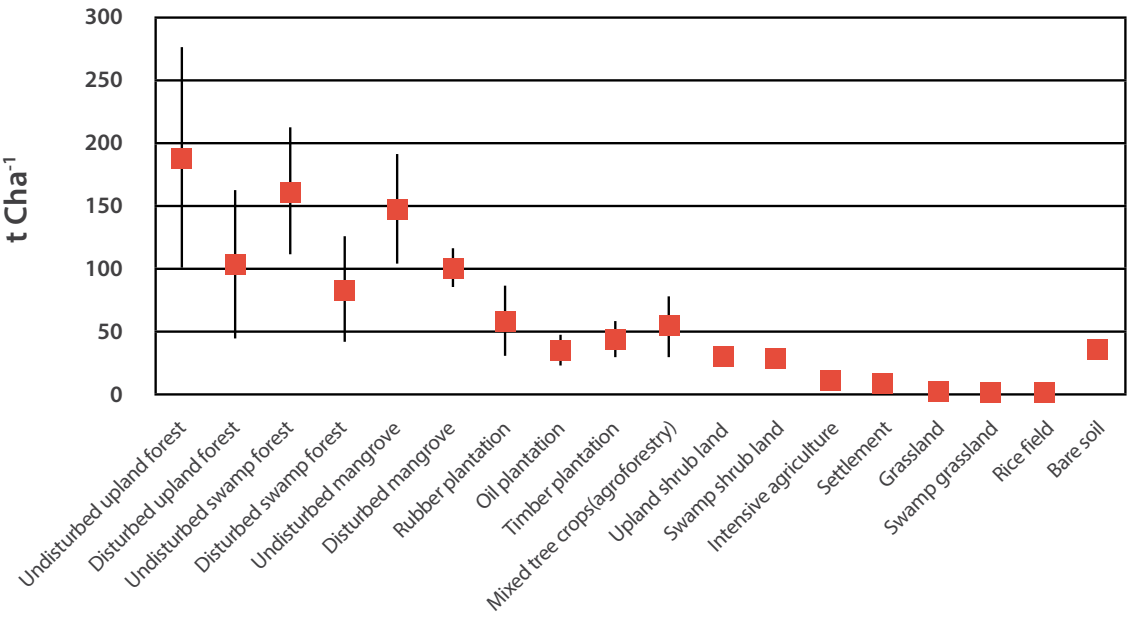


Figure 4. Aboveground carbon stocks of different land-use classes (Agus et al., 2013).

Land-use type	Description
Undisturbed upland forest	Natural forest with dense canopy, no sign of logging roads
Disturbed upland forest	Natural forest area with logging roads and forest clearing
Undisturbed swamp forest	Forest wetland with temporary or permanent inundation
Disturbed swamp forest	Swamp forest with signs of logging canals or degradation
Undisturbed mangrove	Area along the coastline with high density of mangrove trees
Disturbed mangrove	Logged-over and partly degraded mangrove area
Rubber plantation	Including rotational agroforestry rubber
Oil palm plantation	Large-scale plantations recognizable in satellite images
Timber plantation	Monoculture timber plantation
Mixed tree crops	Agroforestry
Upland shrub land	Upland (well-drained soils), small trees, and shrubs
Swamp shrub land	Wetland (periodically or permanently inundated), small trees, and shrubs
Intensive agriculture	Open area, usually intensively managed for annual row crops
Settlements	Homestead, urban, rural, harbour, airports, industrial areas
Grassland	Upland (well-drained soils), dominated by grasses
Swamp grassland	Wetland (periodically or permanently inundated) dominated by grasses
Rice field	Paddy field usually irrigated
Bare soil	Area with little or no woody vegetation; recommended as a default value when modelling CO_2 emissions from land-use change linked to oil palm, because it is a transitional category with various original land cover sources.

GHG emissions from agriculture are primarily in the form of methane and NO_2 (Figure 5). From 2000 to 2005, GHG emissions from agriculture grew by nearly 7 percent, from 75 Gg CO_2-eq in 2000 to 80 Gg CO_2-eq in 2005 (KLH, 2010).

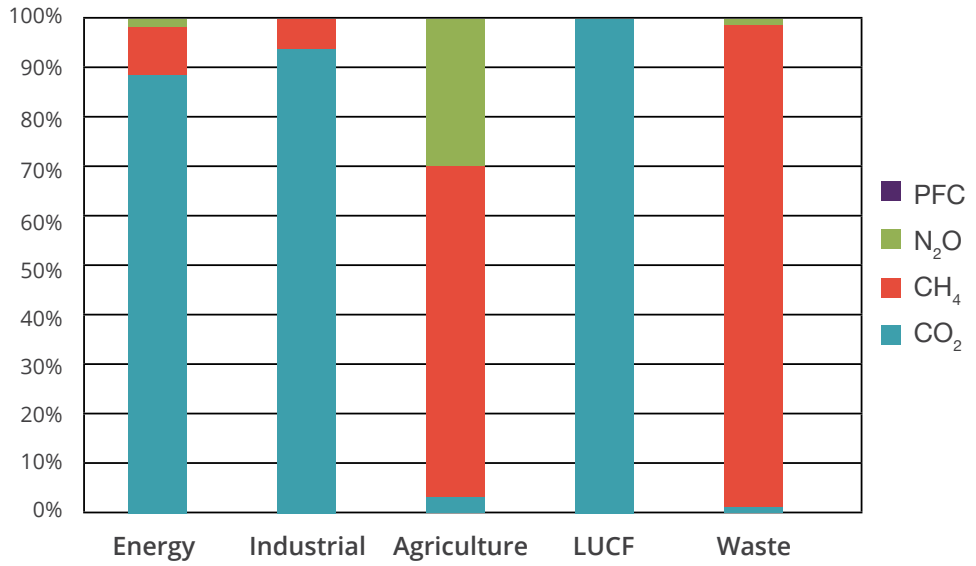


Figure 5. Types of GHG emissions from various sectors in 2000 (KLH, 2010).

Detailed information on agricultural emissions is shown in Figure 6. The three leading sources are rice cultivation, synthetic fertilizer use (N_2O), and livestock enteric fermentation. FAO (2013) noted that the fertilizer market in Indonesia is the biggest in Southeast Asia. Its share of regional fertilizer use was 40 percent for nitrogen, 25 percent for phosphate, and 30 percent for potash. Some 2.5 million tons of nitrogen fertilizers are used annually. Table 2 shows that agricultural sector consumed more than 90 percent of the chemical fertilizer compared to industry. The average chemical fertilizer use for paddy fields is 300–500 kg/ha (Rachman 2009). The government's large subsidy for fertilizer has contributed to its inefficient use. For example, rice farmers in Lampung applied an average of 468 kg/ha each growing season, compared with official recommendations of 200–350 kg/ha (depending on soil quality).[10]

10 *The Ministry of Agriculture Regulation 40/2007 recommended the application of N, P, and K fertilizer for rice fields. The doses of these fertilizers should be specific to the location of the fields. The regulation is updated annually.*

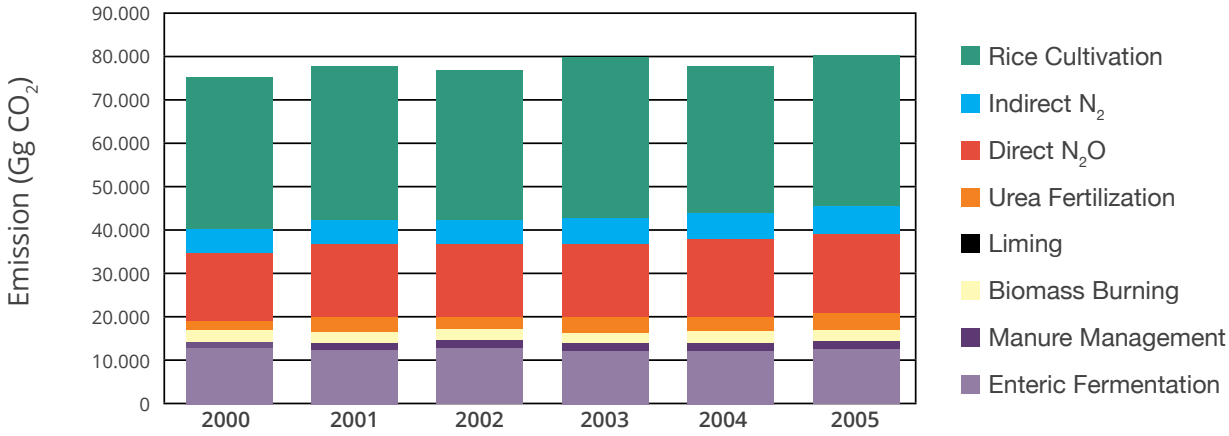


Figure 6. Agricultural GHG emissions by source (KLH 2010).

Table 2. Fertilizer consumption in Indonesia, 2007–2011 (Ditjen Sarpras Pertanian, 2013).

Year	Consumption (tons)					
	Urea		AS	TSP/SP-36	NPK	Total
	Agriculture	Industry				
2007	4,249,409	592,225	701,647	764,821	637,456	6,945,558
2008	4,557,823	516,265	751,325	588,123	955,708	7,369,244
2009	4,623,889	372,096	888,607	706,937	1,417,703	8,009,232
2010	4,279,901	586,225	687,864	644,858	1,473,345	7,672,193
2011	4,528,949	499,238	953,759	731,502	1,794,767	8,508,215

Note: AS = ammonium sulphate; TSP = triple superphosphate; SP-36 = superphosphate 36%; NPK = fertilizer mixtures of various composition.

Plot management of paddy fields can influence methane (CH_4) emissions. Setyanto *et al.* (2000) observed that, throughout the wet and dry seasons, rainfed rice was associated with very low emissions, whereas persistent flooding in irrigated fields resulted in relatively high emission rates (71 to 217 mg CH_4/m^2/day). The use of organic matter led to a much lower CH_4 emission rate in rainfed rice than in irrigated systems. The application of farmyard manure resulted in substantially higher methane emissions in the wet season than in the dry season. Selecting rice cultivars with shorter season lengths can reduce emissions of GHG.[11] Comparative studies by the Interregional Research Programme on Methane Emissions from Rice Fields network showed that local variations in crop management were more important than the impact of soil-and-climate-related factors *(Wassmann et al.*, 2000).[12] These findings also suggest opportunities for reducing methane emissions through deliberate modification of cultural practices for most irrigated rice fields.

2.2.5 Water footprint

The water footprint of a product is defined as the volume of freshwater used to produce the product, calculated over the full supply chain. It is a complex and multidimensional indicator, which describes water consumption volumes by source and polluted volumes by the type of pollution. All components of a total water footprint are specified geographically and temporally. The water footprint calculation includes the total of green water, blue water, and grey water uses of each commodity. The green water footprint refers to the consumption of green water resources, especially rainwater.

The green water use is the minimum of the potential crop evapotranspiration, and the amount of rainfall that enters the soil and will be available in the soil for crop growth. The blue water footprint refers to the consumption surface and groundwater. Blue water use is assumed to be zero in areas that are reported as 'non-irrigated.' The grey water footprint is defined as the volume of freshwater that is required to assimilate the load of pollutants given natural background concentrations and existing ambient water quality standards.

Bulsink et al (2010) found that most agricultural commodities mainly consume rainwater, meaning that other users have access to adequate water. However, this situation might not apply to rice. When rice is planted downstream and near settlements, rice farmers usually have to share their water with other domestic users considering that paddy fields consume a large amount of blue water. All commodities have relatively low consumption of grey water, largely from commodity processing (Table 4). Compared with other commodities, oil palm consumes less water in total. The calculation for coffee did not differentiate between *Coffea arabica* and *C. canephora*, commonly known as 'robusta'. The former is grown as an agroforestry crop in highland areas, yet requires water during wet processing (fermentation, washing, followed by hulling). Robusta coffee is commonly dry processed. The grey water footprint for coffee therefore is most applicable to *C. arabica*. The study did not calculate the water footprint for rubber, but suggested that this crop has a high water footprint.

11 *The early-maturing Dodokan had the lowest emissions (101 and 52 kg CH4/ha) while the late-maturing Cisadane had the highest emissions (142 and 116 kg CH4/ha). The high-yielding varieties IR64 and Memberamo had moderately high emission rates.*

12 *The studies resulted in uniformly high emission rates of about 300 kg CH4/ha in each season for the irrigated rice stations in the Philippines (Maligaya) and China (Beijing and Hangzhou). The station in northern India (Delhi) had exceptionally low emission rates of less than 20 kg CH4/ha in each season based on local practices.*

Table 3. Water footprint of several crops in Indonesia.

Commodity	Water footprint (m3/ton)			
	Green	Blue	Grey	Total
Coffee	21,904 (96%)		1,003 (4%)	22,907
Cacao	8,895 (94%)		519 (6%)	9,414
Rubber	2,787*			
Rice	2,527 (73%)	735 (21%)	212 (6%)	3,473
Oil palm	802 (94%)		51 (6%)	853

Source: Bulsink et al. (2010) for coffee, cacao, rice, and oil palm. * Expert calculation from various sources.

2.2.6 Air and water pollution

In 2002, the ASEAN Agreement on Trans-boundary Haze Pollution was signed, adopting a regional policy to implement zero-burning practices and techniques among plantation companies when these companies open new lands for plantations. However, using fire to clear lands for agriculture or dispose of agricultural wastes has remained common in the region. The government of Indonesia has published a law and set of regulations prohibiting the use of fire to open up land, yet enforcement of these has been lax. The occurrence of air pollution is typically greatest in the early stage of plantation development.

Minor air pollution due to agrochemical use also occurs in all commodities. Rubber, in particular, also generates air pollution from the process of making Technical Specified Rubber (TSR) from raw rubber material. The effluent from rubber processing is also a source of water pollution and foul air in nearby areas. In rubber processing, large volumes of water are consumed by chemicals and other utilities. As a result, processing activities produce enormous amounts of wastes and effluents. The release of these effluents into waterways results in water pollution that has a negative effect on human health. As Crumb Rubber Factories (CRFs) generally lack effective wastewater treatment systems and have no other place to dump solid waste, they typically discharge effluent and solid wastes into rivers. For this reason, almost all CRFs associated with smallholders are situated along rivers. Wastewater discharged from latex rubber processing usually contains a high level of biological oxygen demand (BOD), chemical oxygen demand (COD), and suspended solids (SS).

The overuse of subsidized urea fertilizer not only affects GHG emissions, but also human health. The inefficiency of fertilizer use makes the nitrogen (N) in the urea left unused, resulting in higher rates of N discharged in the soil and pollution in the surrounding water body by flowing through runoff from permanently flooded rice fields (Sudjadi et al., 1987).To reduce yield losses and maintain quality high products, pesticides are widely used to control and prevent pests, diseases and other plant pathogens. Human beings are exposed to pesticides mainly through consumption of food and drinking water contaminated with pesticide. Farmers or agricultural workers are also at high risk of becoming exposed to pesticides applied to their agricultural land. One of the most harmful pesticides is organochlorine, an insecticide that is widely used in crop farming, such as rice in Indonesia. The chlorine-carbon bonds of the pesticide are very

strong, which means that they do not break down easily. This compound is highly insoluble in water and is attracted to fats.[13] Many crop and horticultural areas in Indonesia have been contaminated by organochlorine residues.[14]The adverse impact on the environment includes water, soil and air contamination from leaching, runoff and spray drift, as well as the detrimental effects on wildlife, fish, plants and other non-target organisms. Furthermore, repeated application of pesticides can increase pest resistance over time, while its effects on other species can facilitate the pest's resurgence.

13 *http://www.fws.gov/pacific/ecoservices/envicon/pim/reports/contaminantinfo/contaminants.html.*

14 *Sa'id, E.G. 1994. Dampak Negatif Pestisida, Sebuah Catatan bagi Kita Semua. Agrotek 2(1). IPB, Bogor, hal 71-72.*

3. Green Agriculture Aspirations

This chapter provides an analysis of strategy and policy aspirations in relation to green agriculture. It captures initiatives that directly and indirectly link to reducing agriculture's environmental footprint. The aspirations are broadly categorized into three time periods: the so-called New Order (before 2000), the Reformation Era (2000 to 2005), and the Postreformation Era (since 2006).

3.1 New Order (before 2000)

3.1.1 National Agenda 21 (1997)

Objective: to integrate sustainable development principles into its national development planning.

Components: Indonesian Agenda 21 consisted of sections pertaining to human services, waste management, land resource management, and natural resource management.

In the agricultural domain, Indonesian Agenda 21 proposed a variety of activities to shift effects toward sustainable practices. Major program areas identified included those for:

- The Development of Agricultural Policy, Planning, and Integrated Programs to Promote Food Security and Sustainable Development;
- Improvement in Agricultural Products and Farming Systems through Diversification of Farming and Development of Supporting Infrastructure;
- Enhancing Community Participation and the Quality of Human Resources;
- Conservation and Rehabilitation of Agricultural Land;
- Integrated Pest Control; and
- Nutrients for Increasing Food Production.

Responsible agency: BAPPENAS

Issue: This was a by-product of the global agenda as laid out in the 1992 United Nations Conference on Environment and Development in Rio de Janeiro (the 'Earth Summit'). National Agenda 21 set the broad principles and goals for enhancing environmental quality by applying a multisectoral concept with the inclusion of human dimensions for conservation. As this provided only a broad guideline, more supporting laws and regulations were needed for the applicability of this aspiration.

3.2 Reformation Era (2000 to 2005)

3.2.1 National Development Program (PROPENAS) and the Medium-Term Development Plan (Rencana Pembangunan Jangka Menengah/ RPJM) 2004–2009

Objective: to outline the key policy priorities and direction of the government: a safe, peaceful, just, democratic, and prosperous Indonesia.

Components: The prosperity goal was divided into five targets, of which Target 1 (poverty alleviation), Target 4 (improved quality of the environment and management of natural resources), and Target 5 (improved infrastructure) are the most relevant to water, sanitation, sewage and wastewater treatment.

Responsible agency: BAPPENAS

Issue: Target 4 on environmental management focused narrowly on increasing surface water and groundwater quality, and controlling coastal and marine pollution. In general, the top priority for the government of Indonesia is poverty reduction. This could be understood since the government focused more on how to maintain domestic stability politically, socially, and economically after the economic crisis and national chaos in 1998.

3.3 Post-reformation Era

3.3.1 National Long-Term Development Plan (Rencana Pembangunan Jangka Panjang/RPJP) 2005–2025

Objectives

- To achieve equitable development that pays greater attention to those who are disadvantaged, including poor communities in remote or disaster-prone areas;
- To increase national food security and self-reliance based on local diversified food resources;
- To develop rural areas through the promotion of agricultural production and agro-industry, by building capacity, developing infrastructure, and enhancing access to information, markets, and financial services.

Component

The 2010–2014 National Medium-Term Priority Framework for Agriculture focuses on the revitalization of the agricultural sector and gaining a competitive advantage within the national and global economies. It is underpinned by a strong national land policy framework and a commitment to environmental protection and the sustainable use of natural resources (Figure 7). Priority strategies include:

- Ensuring food security and nutritious diets, producer profitability, and consumer safety;
- Developing sustainable agriculture in the context of changing climatic conditions;
- Creating employment opportunities for those who are more vulnerable.

Source: Rusono 2014.

Figure 7. Milestones of the implementation of sustainable development in Indonesia.

Responsible agency: BAPPENAS

3.3.2 Revitalization of Agriculture, Fisheries, and Forestry (Revitalisasi Pertanian, Perikanan, dan Kehutanan/RPPK) 2005–2025

Objective: an integrated revitalization strategy that covers agriculture, fisheries, and forestry. The initiative combines short- and longer-term perspectives and provides guidelines for coordinating and implementing intersectoral regulations and activities.

Component

The RPPK provides strategies on:

- Food security development (Pembangunan Ketahanan Pangan);
- Agricultural financing (Pembiayaan Pertanian);
- Agricultural export product development (Pengembangan Ekspor Produk Pertanian);
- Use of agricultural land resources (Pendayagunaan Sumberdaya Lahan Pertanian);
- Development of new agricultural products (Pengembangan Produk Pertanian Baru).

The RPPK also provides specific strategies for commodity revitalization, including for rice, oil palm, rubber, and cocoa.

Rice

Objective: to enhance on-farm production (i.e. investments in irrigation, new rice field development, and support for agricultural mechanization) and to improve the downstream value chain (i.e. reduce postharvest losses, improve marketing institutions, stabilize rice prices and improve rice-related logistics). The general policy goal is to reduce Indonesia's reliance on rice imports.

Oil palm

Objective: to improve productivity by rejuvenation, seed industry development, enhancement of seed quality monitoring and appraisal, germplasm protection, and farmer institutional development; to improve downstream industry development and added value through the establishment of PKS (*Pabrik Kelapa Sawit*/palm oil factories) with a production scale of 5–10 tons TBS/hour, establishment of small-scale palm oil, downstream industry development, improvement of partnership in promotion, research, and human resources, biodiesel facility development, and market research and market intelligence development; and to enhance financial support.

Rubber

Objective: to establish a sustainable and highly competitive latex and wood-based rubber agroindustry that can bring prosperity to society. The strategy for this long-term development is (a) improvement of smallholding productivity by the use of superior clones, accelerated rubber rejuvenation, and diversification of farming and cropping pattern; (b) a specific effort for off-farm activity, that is, the enhancement of rubber material (bokar) quality, improvement of marketing efficiency, a credit facility for rubber farmers, infrastructure procurement, and improvement of downstream product added value.

Cacao

Objective: to improve plantation productivity and cocoa quality through optimal research and development, actions to control cacao pod borer pest (PBK/Penggerek Buah Coklat), plant rejuvenation, and clonalization; to improve added value and farmers' income through a downstream industry development strategy, partnership between farmers and the processing industry, and diversification of farming and cropping pattern; and to support access to financial resources.

Responsible agency: Ministry of Agriculture

Issue: RPPK states that agriculture is the way of life and livelihood for the majority of Indonesia's people. It is the source of food, maintains natural conservation and landscape beauty, and provides bio-pharmacy and bio-energy resources. The stated 'revitalization' aims are to meet 90–95 percent of domestic rice consumption needs, to diversity food production and consumption, to increase the availability of fodder/animal feed, to add value to agricultural raw materials, and to enhance export competitiveness. To achieve those objectives, RPPK provides general strategies related to policy formation, infrastructure development, institutional and human resource strengthening, agricultural innovation, and agricultural commercialization.

The agricultural revitalization strategies in RPPK focus primarily on boosting production. Environmental considerations are secondary, although references are made to maintaining the condition of natural resources to support the strategy on food security, and better using degraded land as part of the strategy on agricultural land use. The policies under RPPK supporting various commodities are described in the sections below.

3.3.3 Indonesia Master Strategy on Agricultural Development (Strategi Induk Pembangunan Pertanian/SIPP) 2013–2045

Objective: to achieve 'Agriculture for Development' and a 'Sustainable Agriculture Bio-Industry' system based on the bio-culture paradigm[15] with the long-term vision of agricultural development in Indonesia being "to achieve a sustainable agricultural bio-industry system that produces healthy foods and high value-added products from agricultural biodiversity and marine tropical resources."[16]

Component: The SIPP mainly covers (1) an overview of current conditions of the agricultural sector; (2) its dynamics; (3) directions and conceptual basis; (4) principles, vision, mission, strategies, and prerequirements to achieve its vision and mission; (5) regulation supports needed to implement this strategy.

The SIPP applies seven pillars and four pre-requirements to achieve its vision and mission. The pillars are (1) optimization of natural resources; (2) development of competent human resources; (3) innovation systems through science and bioengineering; (4) agricultural infrastructure; (5) integrated farming systems: bio-/agro-industrial and bio-/agroservices; (6) a bio-industry value chain cluster; and (7) an environmental bio-business enabler. The four pre-requirements are (1) agriculture-bio-industry- oriented political development and decision making; (2) innovation and science-based decision making; (3) efficient logistics and value-chain systems; and (4) trusted and qualified human resources. The strategy will be gradually implemented through seven terms of 5-year National Mid-term Development Planning (Rencana Pembangunan Jangka Menengah Nasional/RPJMN).

Responsible agency: Ministry of Agriculture

Issue: The SIPP considers the agricultural sector as an important sector to support economic development. However, considering its main targets are local government and the private sector, the strategy is filled with 'bio-related' jargon and terms (i.e. bio-industry, bio-refinery,[17] bio-waste,[18] bio-culture, and bio-product). Although there is a written explanation at the beginning of the

15 *The 'bio-culture' paradigm in agricultural development aims to transform awareness, spirit, value, and agricultural implementation (production system, consumption pattern, awareness on ecosystem services) toward the sustainable use of natural resources*

16 *See SIPP 2013-2045 Chapter V.B – Vision.*

17 *A bio-refinery is an overall concept of a processing plant in which biomass feedstock is converted and extracted into a spectrum of valuable products. Considering the importance of agriculture to supply food crops and alternative energy from fossil fuel, in the long term, the agricultural sector is directed not only to fulfil the supply of food crops but also to create high-value products and supply non-food materials to replace fossil fuel for the industrial sector. To replace fossil fuel as the main energy for industry, agricultural development will be integrated with industry under a bio-refinery concept. See www.biorefinery.ie/biorefinery.html.*

18 *Through the integration of biomass sources with industrial development, the dependency of industrial activities on fossil fuel will be gradually replaced with agricultural 'bio-waste' as the source of energy. See SIPP 2013-2045, Chapter IV – Direction and Conceptual Basis.*

document, extra efforts are needed to comprehend those terms for the targets to ensure implementation in the field. In general, the guideline indicators derived from the pillars[19] are required to make sure the pre-requirements are fulfilled on a temporal and spatial scale. The SIPP documents should be transformed into more readable documents so that the targets could easily be translated into local regulations and programs.

3.3.4 National Mitigation Action Plan on Greenhouse Gas Emission Reduction (RAN-GRK)

Objective: to contribute to the national emission reduction target range from 26 percent up to 41 percent emission reductions.

Component: The Nationally Appropriate Mitigation Action (NAMA) provides technical guidelines to the RAN-GRK. The submission of Indonesia's NAMA stated that the reduction would be achieved, inter alia, through the following actions:

1. Sustainable peat-land management
2. Reduction in the rate of deforestation and land degradation
3. Development of carbon sequestration projects in forestry and agriculture
4. Promotion of energy efficiency
5. Development of alternative and renewable energy sources
6. Reduction in solid and liquid waste
7. Shifting to low-emission transportation mode

Each province will need to develop a Local Action Plan on Greenhouse Gas Emission Reduction (RAD-GRK). The contributions of local (provincial) governments are expected to include:

- Calculation of mitigation potential and construction of a provincial business-as-usual baseline
- Development of a strategy for emission reduction
- Proposal for selected local GHG mitigation actions
- Identifying the key stakeholders/ institutions and financial resources

Responsible agencies: Ministry of Environment and Ministry of Forestry

Issues: The Ministry of Environment (MOE) has been the focal ministry for climate change, which means that integration with development priorities has been a problem, and has created certain situations in which government policies, such as a push to expand the use of fossil fuels, work against legislation from the MOE. Good policies exist to reduce the rate of deforestation and protect forests, but there is limited capacity to enforce this legislation at the local level because of institutional and financial constraints. There has been a degree of decentralization of government in recent years, and local authorities are able to develop their own plans for forest conservation; however, the same issues remain regarding the enforcement of these policies.

19 *See Chapter V.E – Pillars and Main Strategies.*

4. Green Agriculture Applications and Gaps

The government and private sector in Indonesia are applying a range of green agriculture approaches and instruments at the national and subnational levels. The instruments are broadly categorized as (1) direct regulation, (2) instruments that correct or create markets, and (3) information, advocacy and voluntary approaches. Table 5 shows the availability of instruments (direct regulations, market creation instruments, and education and voluntary approach) to address the environmental risks identified in Chapter 2. By analysing the trajectory of regulations (Figure 8) and other non-regulatory initiatives from both the government and private sector (Figure 9), this chapter provides a broad picture on how the innovations in mechanisms, instruments and policies are progressing over time. Attention is also given to apparent gaps in green agriculture applications, as reported in the literature and as perceived by experts and other stakeholders. A national workshop and an online survey were undertaken to contribute to the analysis here. The respondents were selected by considering their expertise, experience and familiarity with the green agriculture concept.

4.1 Direct regulation

4.1.1 Land-use and zoning

The government has adopted several regulations to govern land use and zoning. Primary forest and peat-land conversions to estate crops are perceived as one of the major problems causing environmental risks, particularly for biodiversity conservation and carbon sequestration. The direct regulatory instruments include the Minister of Agriculture Regulation (Permentan) No. 14/2009 that provided guidelines for peat-land use for oil palm estates. Other instruments are Government Regulation (PP) No.10/2010 covering mechanisms to change the zoning and functions of forest areas, Minister of Forestry Regulation (Permenhut) No. 20/2011 on guidelines for forest mapping at the district level, Permenhut No. 44/2012 on Forest Area Inauguration, and Permenhut No. 47/2013 on Guidelines, Criteria, and Standards for use in several forest areas. Further, the Minister of Agriculture Regulation (Peraturan Menteri Pertanian/Permentan) No. 48/2006 that regulates Good Agricultural Practices requires that the selection and enactment of agricultural land must always be based on official land-use planning from the local government.

Protecting lands for food production

For rice in particular, the challenge is quite different as rice land is declining rather than increasing because of its conversion for non-agricultural uses. To anticipate the conversion of these lands, the government enacted Law Number 41/2009 on Protecting Land for Sustainable Agricultural Food Production. This law directs national and local officials to ensure the application of sustainable agricultural practices, including managing farm lands for land and water protection and preservation, and pollution control. In 2011, the government enacted PP No. 1/2011 that details the former law by providing the procedures to enact or convert sustainable agricultural land.

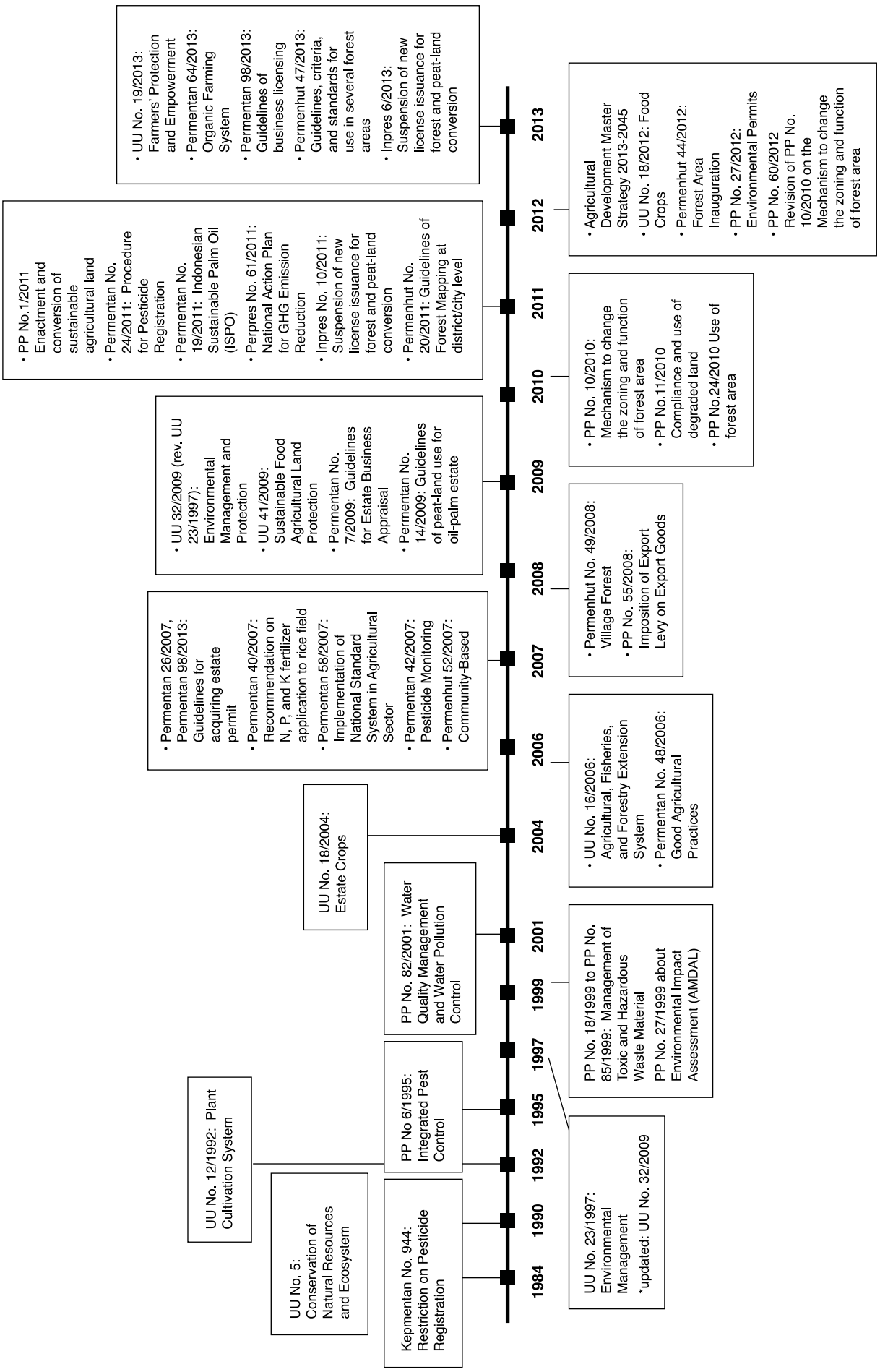


Figure 8. The trajectory of regulations aiming at reducing environmental risks and impacts from agriculture.

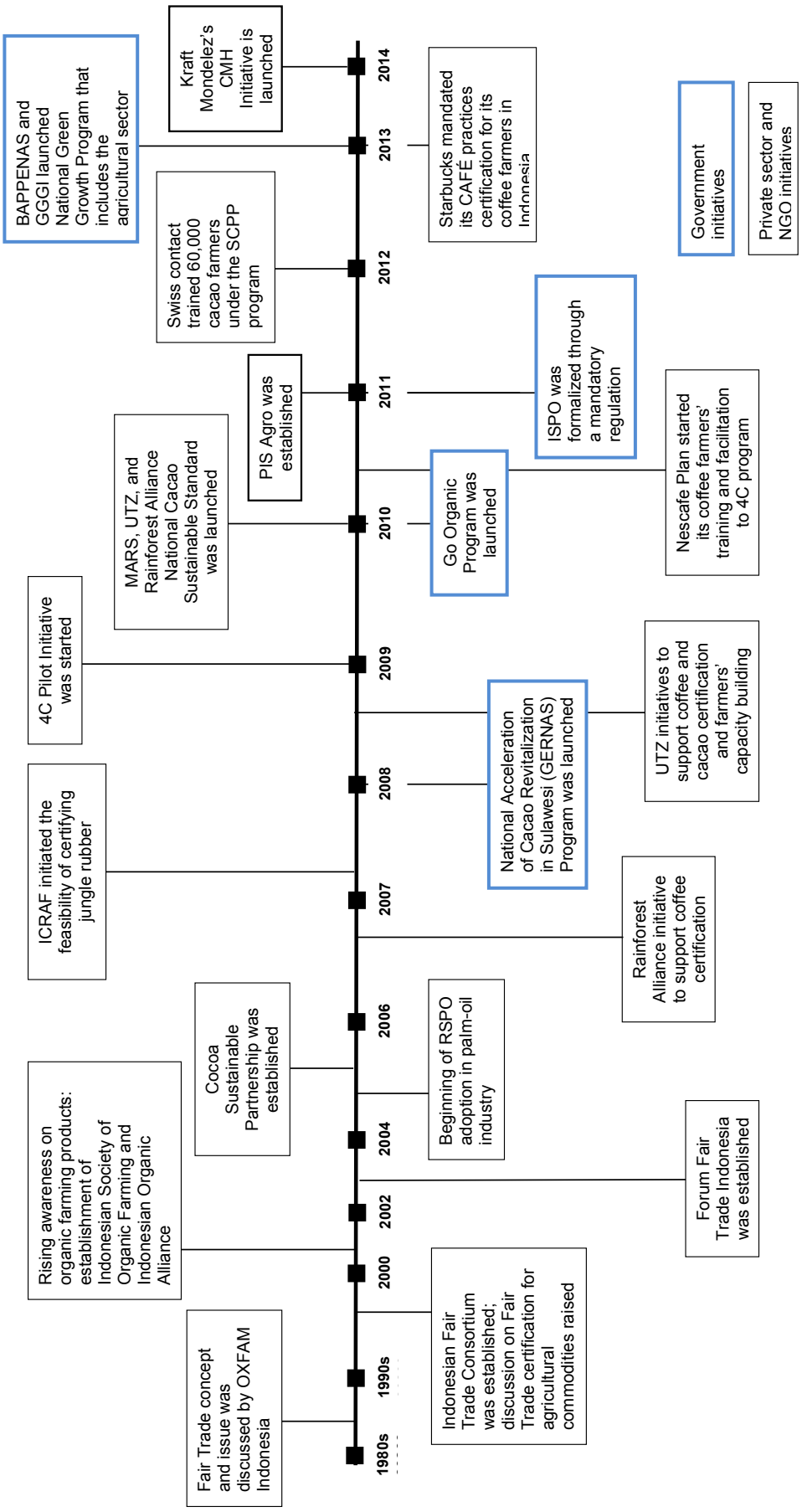


Figure 9. The trajectory of government and private sector initiatives on green agriculture.

Table 4. Environmental risk and existing green agriculture applications.

Environmental risk and related agricultural practice	Direct regulation					Market creation						Education, advocacy, and voluntary approach			
	Land-use zoning	Fines, re-licensing	Prohibition of new investment	EIA	Unpermitted substance	Green procurement	Subsidies for green technology	PES	Green tax	Deposit-refund systems	Charges	Education campaign	Collaborative management	Certification	Organic farming
Natural forest conversion to agriculture															
Large-scale expansion of monoculture plantations, particularly oil palm estates	****	****	**	**								*	*	*	
Clear-cutting operations by timber industries before planting with commercial agricultural commodities	****		**	**								•		•	
Habitat loss															
Intensive and monoculture agricultural practices along the border of protected areas	****			**				+					•	•	
Discontinued vegetative covers from high-conservation-value forests to agricultural lands	**			**				+					•	•	

Environmental risk and related agricultural practice	Direct regulation					Market creation						Education, advocacy, and voluntary approach			
	Land-use zoning	Fines, re-licensing	Prohibition of new investment	EIA	Unpermitted substance	Green procurement	Subsidies for green technology	PES	Green tax	Deposit-refund systems	Charges	Education campaign	Collaborative management	Certification	Organic farming
Land degradation and erosion															
Poor site selection such as loose soil and steep slope								+				•		•	
Parallel contour ploughing												•		•	
Ground-cover plant clearing												•		•	
Slash-and-burn												•		•	
Incorrect perceptions on certain good agricultural cultivation practices												•			
Reduction of aboveground carbon stock															
Large-scale conversion originated from natural habitats such as undisturbed forest and peat land, mostly by estates causing 'carbon debt'	**	**	**	**				+						•	

Environmental risk and related agricultural practice	Direct regulation					Market creation						Education, advocacy, and voluntary approach			
	Land-use zoning	Fines, re-licensing	Prohibition of new investment	EIA	Unpermitted substance	Green procurement	Subsidies for green technology	PES	Green tax	Deposit-refund systems	Charges	Education campaign	Collaborative management	Certification	Organic farming
Increased GHG emissions															
Persistent flooding of irrigated rice cultivation causing higher emissions compared with rainfed rice cultivation												•			
Excessive use of synthetic fertilizers					**		+	+				•		•	•
High-yielding rice varieties producing higher emissions than local rice varieties							+					•		•	•
High water footprint															
Varies among commodities and processing		****		**										•	
Air and water pollution															
Slash-and-burn particularly in dry season	*											•			
Commodity processing, particularly latex rubber processing and palm oil mill		****		**	**				+						

Environmental risk and related agricultural practice	Direct regulation					Market creation						Education, advocacy, and voluntary approach			
	Land-use zoning	Fines, re-licensing	Prohibition of new investment	EIA	Unpermitted substance	Green procurement	Subsidies for green technology	PES	Green tax	Deposit-refund systems	Charges	Education campaign	Collaborative management	Certification	Organic farming
Inefficient use of synthetic fertilizer					**		+		+			•		•	•
Loose restriction and management of pesticides					**							•			

**** = directly regulated by National Laws (Undang-Undang) and regulations at the national level (presidential and ministerial regulations)

*** = directly regulated by National Laws only

** = identified National Regulations only

* = identified Subnational Regulations only

\+ = existing market instruments

• = existing education, advocacy, and voluntary approach instruments

4.1.2 Fines and re-licensing to enforce technical regulations

Law 32/2009 on Environmental Management and Protection as the basis of similar regulations enforces monetary and administrative sanctions for industries that pollute water bodies[20] and their obligation to manage toxic and hazardous waste materials.[21] This law mentions that polluters of air, water, ocean and environment will be imprisoned for at least 3 years and at most 10 years, and fined between US$30,000 and US$100,000. The sanctions can also include closing the disposal of liquid waste pipes, fines and revocation of a license to dispose of waste. Experts stated that revocation of a license to dispose of waste and a business license may be more effective than merely fining polluters when law enforcement is very low.[22]

4.1.3 Prohibitions of new planting or other agricultural investments

The US$1 billion Indonesian-Norway REDD agreement resulted in a moratorium to stop the issuance of new concessions for 43 million hectares of forest and peat land, but exempted 12.5 million hectares of existing concessions prior to the regulation, 'national development' projects, including geothermal, oil and gas, electricity, and land for rice and sugar cane, and the extension of existing permits.[23] The exemptions may also cover oil palm estates that are located on peat land and were converted from primary forest (Austin *et al.*, 2012). This condition might reduce the effectiveness of the moratorium. The moratorium is a Presidential Instruction, which is a non-legislative document with no legal consequences if the moratorium is not implemented.

Apart from the potential to increase productivity on existing oil palm areas, the government has recently suggested that there are 6 million hectares of degraded land that could be used for oil palm expansion. This is sufficient to achieve the country's national target of doubling palm oil production by 2020 without additional deforestation (Gingold, 2010). However, even though the moratorium is still running, growers do not want the moratorium to be extended as it ends in 2020. They promise to ensure non-conversion of the High Conservation Value (HCV) Forests when developing new plantations. The threat of deforestation could be minimized if future expansion of oil palm is directed at degraded land so that it can generate profit, government revenue, and jobs while reducing greenhouse gas emissions from deforestation and forest degradation.

This government aspiration is in line with the suggestions of Greenpeace and Unilever. Both organizations proposed a two- to three-year moratorium on conversion of all types of forests in order to allow the mapping of HCV Forests and High Carbon Value Landscapes. Based on these maps, a new land-use planning policy was proposed to be developed at the national, provincial, and district levels (Unilever, 2009).

4.1.4 Requirements for environmental impact assessment on significant agricultural investments

Government Regulation (PP) No. 27/2012 about Environmental License aims at providing a strong basis for upholding environmental licensing processes, particularly when a business activity is proposed. The instruments include (1) environmental impact assessment (*Analisis Dampak Lingkungan* – AMDAL) and (2) environmental management – monitoring efforts (*Upaya Pengelolaan Lingkungan-Upaya Pemantauan Lingkungan* or in short UKL-UPL). AMDAL, in principle, is a study to evaluate a proposal for any business activity for any significant potential environmental impacts.

The UKL-UPL evaluates environmental monitoring and management efforts performed by business entities. Further, the regulation states that, if the business cannot comply with either AMDAL or UKP-UPL, the government may cancel its permit.

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20 *Government Regulation 82/2001.*

21 *Govervent Regulation 18/199 to Government Regulation 85/1999.*

22 *http://bappeda.jatimprov.go.id/2012/06/01/diabaikan-sanksi-pencemar-hanya-denda/, accessed on September 1, 2014.*

23 *www.redd-monitor.org/2013/05/15/indonesias-president-extends-forest-moratorium-for-two-more-years/.*

Further, business applicants have to obey some procedures to obtain environmental protection and a management license (PPLH license). The PPLH license is to be implemented at the operational stage of the agricultural business activity, while the environmental license is to be implemented at the planning stage. The PPLH license comprises, among others, a license for liquid waste disposal, a license for wastewater use to be applied on soil, a license to manage toxic and hazardous waste (B3 waste), and a license to dispose of wastewater into the ocean. For the plantation sector, crop estates with land of more than 50 hectares have to carry out the UKL-UPL. Meanwhile, for crop estates with land of more than 3,000 hectares, they have to conduct an environmental impact assessment (AMDAL).

AMDAL had been formerly regulated in PP No. 27/1999 about Environmental Impact Assessment; this legislation has been replaced by the aforementioned PP No. 27/2012. The Ministry of Environment's website claims that the current legislation is more implementable and less complicated (KLH, 2012). It takes a shorter time to make the AMDAL (only 125 working days; previously it was 180 working days) and also allows more space for civil society, particularly those who are affected by the activity, to take part in decision-making on the feasibility of the business activity.

Another regulation is the Minister of Agriculture Regulation (Permentan) No. 98/2013 (a revised version of Permentan No. 26/2007). The legislation rules that, prior to establishing an estate, the business entity has to conduct an environmental impact assessment. Moreover, the location of the estate has to be outside the state-forest boundary. The proponent also has to involve the local community in its business activities. The size of the crop estate can be no more than 100,000 hectares to prevent monopoly practices.

4.1.5 Restriction on the use of unpermitted substances

The government publishes restrictions on the use of chemical pesticides and herbicides through Minister of Agriculture Regulation (Permentan) No. 944/1984 about Restriction on Pesticide Registration. The government issued Government Regulation (Peraturan Pemerintah) No. 6/1995 on Plant and Crop Protection, which regulates the efficient use of pesticides to overcome agricultural pests and diseases. The former two regulations were followed by the Minister of Agriculture (Permentan) No. 42/2007 on the monitoring of pesticides in agricultural areas. Although having been applied for almost 20 years, the challenge to implement these regulations in the field, especially to improve the capacity of the responsible institutions to monitor the use of pesticides, is still high.

4.1.6 Gap analysis of applying direct regulations

- Three out of five instruments in the form of direct regulation are perceived as widely applied in the agricultural sector in Indonesia (Figure 10). 'Land use and zoning' and 'fines or re-licensing to enforce technical regulations' were at an early stage of application. In this case, we presume that there were inadequate law enforcement and other issues related to the implementation of such instruments. Particularly for the application of fines, point-source pollution monitoring is very weak and most pollution measurement is conducted in a cumulative source, such as a water body, without knowing where the exact source is. The following issues have been noted in relation to land-use planning and zoning:
- Inconsistent mapping or zoning in some provinces; for example, in Kalimantan, the boundary of forest zone was classified differently by national and subnational government agencies.
- Lack of coordination between government institutions. For example, while the Ministry of Agriculture sets policy to encourage farm or land certification, the process of land certification administration is under the National Land Agency (BPN).

In many cases, farmers have problems in following the procedures required by the BPN to obtain certification of their land. As a result, farmers are reluctant to certify their land.

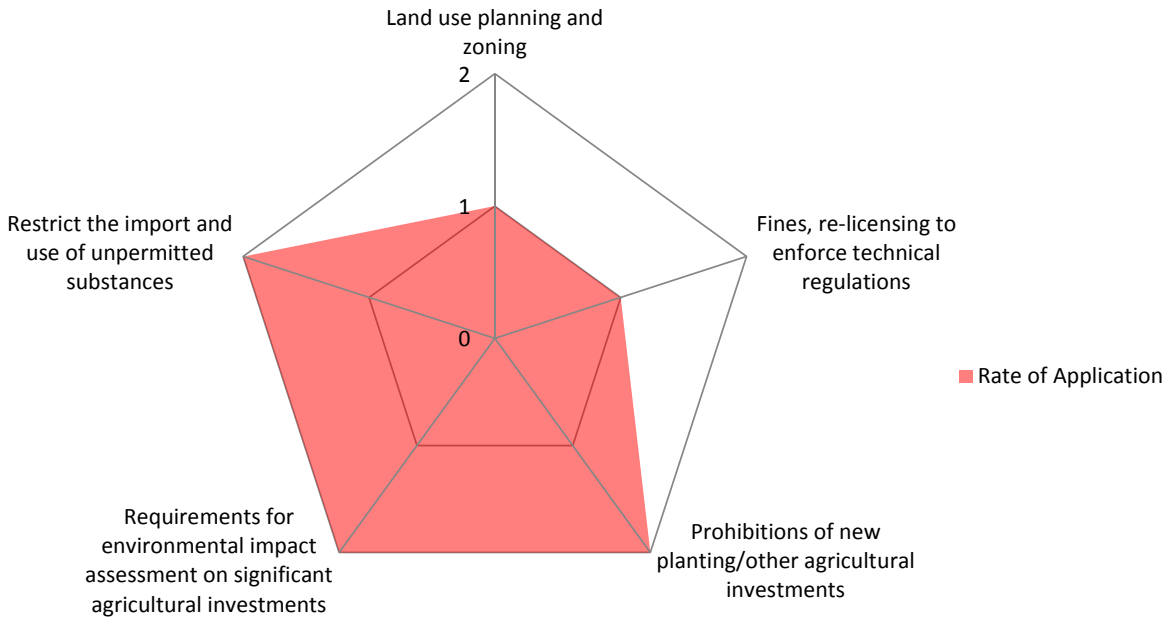
Land-use planning (Rencana Tata Ruang dan Wilayah/RTRW) is sometimes only on paper and application is not according to plan.

'Prohibitions of new planting/other agricultural investment' were considered as 'widely applied.' This might refer to some new regulatory initiatives to limit large estate investment, such as the Permentan 98/2013 on guidelines for acquiring estate permits (Figure 8). Investors raised concerns about this regulation because it might hamper investment in the plantation sector (Sawit Indonesia, 2013).

Selling some of the company ownership to (local) smallholder farmers in the area after several years of operation might discourage investors from investing.

'Restrict the use of unpermitted substances' has been applied for more than a decade as part of the National Agenda 21 of the New Order Era. However, our survey mentioned the lack of institutions that can monitor and control the impact of natural agents used for pest management. Indonesia has some 90 laboratories to monitor and measure negative impacts of unpermitted substances but these laboratories usually have limited facilities and lack human resource skills.[24] An increased government capacity to guide and control agrochemical use is clearly necessary. However, current subsidy regulation deserves a critical review.

24 Input from 'National Green Agriculture workshop, April 15, 2014.



Note: Application rating: 0 = non-existent; 1 = incipient; 2 = widely applied.

Figure 10. Direct regulation instruments.

4.2 Instruments that correct or create markets

4.2.1 Green procurement by government

In Indonesia, green procurement is integrated into the Sustainable Consumption and Production (SCP) activities coordinated by the Ministry of Environment.[25] The initiative started in 2000 and was a collaboration between the Ministry of Environment and the National Standardization Agency to adopt Environmental Management Systems – EMS/ISO 14001. The legal framework to implement green procurement by the government of Indonesia is regulated in the President Regulation (Perpres) No. 54/2010 on Goods and Service Procurement by Government, which was revised to Perpres No. 35/2011. Both legislations are a revised version of the original Presidential Decree (Keppres) No. 80/2003 that had not incorporated green procurement in it.

4.2.2 Subsidies for (adoption of) green technologies

The government provides a subsidy for the production of organic fertilizer by three state-owned enterprises (PT Sang Hyang Seri, PT Pertani, and PT Berdikari), approximately US$800,000 in 2011 and US$1.12 million in 2012 or equivalent to 835,000 metric tons of organic fertilizer.[26] The distribution of such fertilizer applies the 'potential farmer/potential plot' (CPCL – *calon petani/calon lahan*) approach that directly distributes the fertilizer to the targeted farmers by the company.[27] The rationale behind this subsidy is to revive soil fertility degradation due to the application of synthetic fertilizer and boost food security, particularly for rice, as targeted by the government. In 2011, the subsidy did not perform well because there was a lack of coordination between the Ministry of Agriculture, coordinating production, and the Ministry of Trade, coordinating distribution.[28] The Ministry of Trade has not revised its regulation on distribution of subsidized fertilizers; thus, some fertilizers were not distributed, particularly to other islands outside Java. In early 2014, the House of Parliament endorsed the removal of the subsidy for organic fertilizer. The other reason was that the subsidy did not directly benefit the farmers and most of the companies collaborate with local small-medium enterprises, which produce the fertilizer. In this case, the role of state-owned companies is only as a quality controller but they receive the subsidy anyway. At present, the subsidy on organic fertilizer remains in place.

In Bali, the Agriculture and Crop Service directly subsidized 120,000 metric tons of organic fertilizer to farmers as part of the food self-sufficiency program.[29] The source of subsidy is the provincial budget, approximately US$100,000 in 2014. From the price of 9 cents per kilogram, farmers pay only 1 cent per kilogram. This subsidy is allocated to 25,000 hectares of paddy fields or only 15 percent of the total paddy fields. In addition, 419 units of integrated farming program (*sistem pertanian terintegrasi – Simantri*) are self-producing organic fertilizer from cow dung and can support the demand from neighboring farmers.

4.2.3 Payment for environmental services

Payments for environmental services (PES) involve a land manager being compensated (financially or in-kind) for improving and maintaining the ecosystem services provided by that land (Wunder, 2005; Leimona and Munawir, 2012). PES aims to provide an environmentally friendly land production system and management, improve the livelihood of land managers, and protect the environment through socioeconomically sustainable natural resource management.

25 www.menlh.go.id/indonesia-pelopor-integrasi-scp-dalam-kebijakan-nasionalnya/.

26 http://m.bisnis.com/industri/read/20120118/99/60481/subsidi-pupuk-anggaran-untuk-pupuk-organik-naik-jadi-rp1-12-triliun.

27 *The Unit of Organic Fertilizer (Unit Pengolah Pupuk Organic – UPPO) can produce about 80,000 tons, while the demand for subsidized organic fertilizer at the farmers' level was about 760,000 tons in 2013. Source:* www.tempo.co/read/news/2014/02/17/090555123/Anggaran-Subsidi-Pupuk-Organik-Batal-Dicabut.

28 http://organicindonesia.org/web2/0804-beritatext-isi.php?id=469#.VAU-QKMzL1c

29 www.antarabali.com/berita/51732/bali-salurkan-120000-ton-pupuk-subsidi.

Today, the concept of environmental services in Indonesia plays an increasingly significant role in national discourse, as witnessed by the increasing number of collaborative programs – both pilots and full implementation – involving various stakeholders, including the government (especially the Ministry of Forestry), local NGOs, and national and international research and development agencies. At the national level, the government has issued UU No. 32/2009 on Environmental Management. This particular law provides a legal basis for PES implementation in Indonesia. The law had three broad categories for economic instruments in environmental conservation: (1) planning for environmentally friendly development and economic activities, (2) funding for environmental management, and (3) incentives and/or disincentives for conservation. However, this law still needs to be detailed into a technical guideline to implement PES in the field.

Despite the lack of formal technical guidelines from the government, many small initiatives have already been carried out by various stakeholders, often with the involvement of NGOs. In Indonesia, the ecosystem services that are being compensated cover hydrological services, landscape beauty (ecotourism), conservation and biodiversity, and carbon storage (voluntary carbon mechanism, while the REDD mechanism is still being prepared).

From 2003 to 2012, the World Agroforestry Centre coordinated a project called Rewarding the Upland Poor for Environmental Services (RUPES). RUPES has simultaneously promoted the improvement of environmental quality and smallholder farmers' livelihoods through facilitating financial and non-financial incentives under various PES schemes. The notable cases in which farmers are rewarded for their effort to manage their land and improve ecosystem services include the following:

- Bungo (Jambi Province, Sumatra):
  In Bungo, rubber agro-forest farmers obtain the rights to sustainably manage the protected forest located in their village. This non-financial incentive was acquired after the community could assure the government that it would use only non-timber forest products (NTFP), so they could still tap their rubber trees and maintain their livelihoods. The village forest right was given directly by the Ministry of Forestry. A pilot case was coordinated by ICRAF, rewarding smallholders with a micro hydro plant. The reward was for their effort to conserve their agro-forest area and sustainably improve their rubber agro-forest system. Another financial incentive given for farmers that can improve their rubber agro-forest system is access to a direct market. By linking rubber farmers with Bridgestone, a rubber factory, the farmers have direct access to producers, which helps them to obtain a better price.
- Singkarak (West Sumatra Province)
  In order to establish better management of Lake Singkarak and its watershed, the World Agroforestry Centre has facilitated a voluntary carbon scheme, developed an environmental education centre, and revitalized the Ulu Coffee Plantation. Coffee Ulu was a specialty coffee that was developed in Singkarak in 1900–1950, but then abandoned by the community because of the unstable coffee prices at that time. This situation continued until 2009, when ICRAF helped to revitalize the coffee agro-forest area in Singkarak.
- Sumberjaya (Lampung Province, Sumatra):
  In Sumberjaya, the coffee farmers were rewarded with community forestry schemes to sustainably use the state-protected forest. This gave the farmers legal rights to sustainably manage their coffee agro-forest area in the protected forest that was previously a source of conflict. ICRAF also linked the farmers in Sumberjaya with the national electricity company to establish a River Care program. The program was focusing on the protection of upstream watershed area to reduce sedimentation that has a negative effect on the electricity power

plant downstream. In the end, the farmers upstream of the Sumberjaya watershed were rewarded with a micro hydro powerplant by the electricity company for their efforts to reduce sedimentation.

- Cidanau (Banten Province, Java)
  In Cidanau, ICRAF, working together with FKDC (Cidanau Watershed Communication Forum) and Rekonvasi Bhumi, a local NGO, helped to facilitate cash transactions for reforestation schemes on farmers' private land upstream of Cidanau watershed.
- Lembang (West Java Province)
  ICRAF facilitated payment for environmental service transactions between intensive-agriculture farmers and the state-owned drinking water company to change their commodity crop to coffee agroforestry as well as facilitating the establishment of a provincial environmental services working group for Citarum watershed.

4.2.4 Green/environmental tax

Law No. 32/2009 includes a provision on environmental tax. The environmental tax is defined as revenues of central and local governments from individuals who use natural resources, such as groundwater, fuel, and swallow nests. The Indonesian fuel tax has been implemented since the beginning of 1997. The government has endorsed an export levy on exported goods. This instrument is regulated in PP No. 55/2008. Although one of the objectives of the enactment of this regulation is to conserve natural resources as stated in Article 2, the initial reason for the enactment was to ensure the availability of a domestic supply, promote domestic industry, and improve added value from the commodities, and the green part of the tax itself is still debatable. The calculation of export tax for agricultural and forestry products is governed in the Permenkeu (Minister of Finance Regulation) No. 2168/2012 on Export Pricing for Export Tax Calculation of agricultural and forestry products.

4.2.5 Deposit-refund systems

'Deposit-refund systems' exist only for postmining reclamation.[30] The deposit is calculated based on the cost of closing and reclamation and stored in a joint account between the related state-owned company and the contractor in an Indonesian state-owned bank.

4.2.6 Full-cost rates/charges for resource use

The 'full-cost charge for resource use' is applied in Indonesia by imposing charges on the extraction of groundwater and surface water. In principle, it aims to support environmental control and to protect the ecosystem from the impact of groundwater extraction and use. The provision is regulated in subnational (governor) regulations.

4.2.7 Gap analysis of economic incentives and market instruments

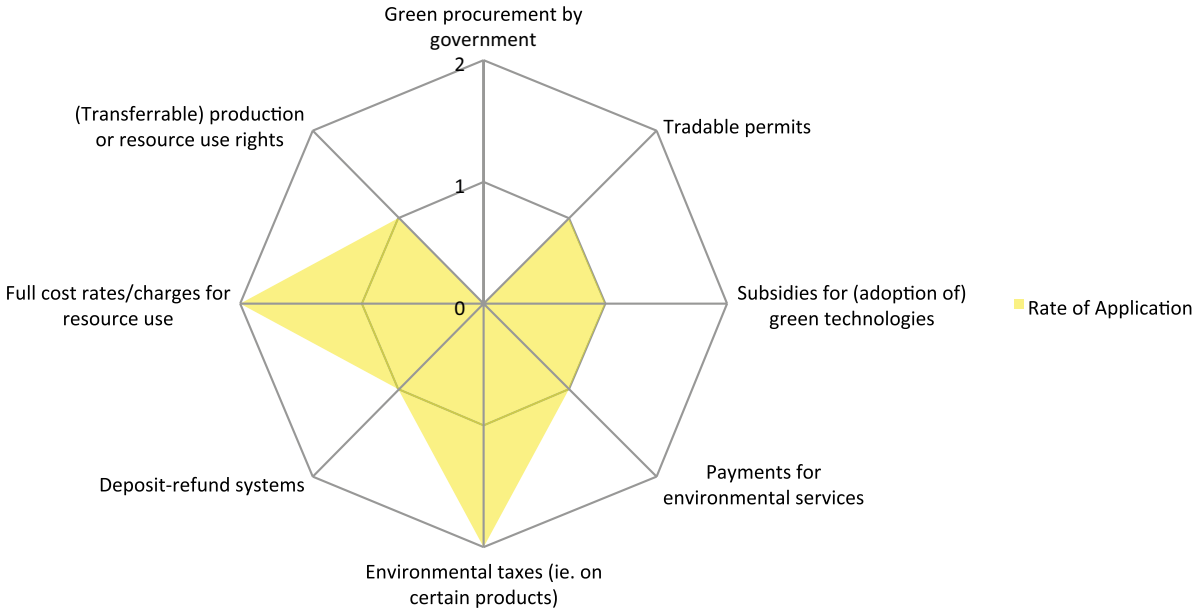
Instruments that can create or correct markets in Indonesia are mostly at an early stage of application (Figure 11). It is obvious that, despite existing regulations on incentives and market instruments, the level of acknowledgment and application of this instrument is still low. Even for the 'green procurement' instrument, the strategy and regulations have existed for almost a decade but the respondents, mostly from the Ministry of Agriculture, were not aware of it since it is mostly applied to non-agricultural industries, such as mining, manufacturing, electronics, and vehicles. Further, the implementation of green procurement in Indonesia faces the following challenges[31]: a low level of political will to address environmental issues; inadequate law enforcement; lack of integrated environmental management policies; lack of a multistakeholder forum at the national/local level; and lack of both financial and knowledgeable human resources. These challenges are appropriately relevant for other instruments as well.

30 *Government Regulation No. 78 and 79, Year 2010.*

31 *www.un.org/esa/sustdev/.../HendayaniAdiseshapaper.pdf.*

'Charges for resource use' and 'environmental tax on certain products' were rated as 'widely applied.' Again, we assumed that the respondents rated these instruments because of their familiarity with the terms, that is, the charges and tax. However, monitoring of environmental output and fund allocation for minimizing environmental risk are unclear. Theoretically, tax from certain economic sectors has to be earmarked to ensure the sustainable management of related natural resources. For example, a groundwater tax has to be earmarked to protect watersheds. However, the Indonesian budgeting system does not recognize the earmarking concept and all revenues from taxes are collected in one budget component for general purposes. Therefore, the instrument may be used as a revenue-raising measure masked with an environmental objective to address fiscal needs. In principle, the allocation of an environmental tax among different levels of government is determined by the scale of environmental externality, monitoring and enforcement capacity, mobility of the polluting industry, and potential effectiveness of the instrument (Chalifour et al., 2012). The ongoing fiscal decentralization in Indonesia is considered as a potential legal framework for environmental taxes at a subnational level (White, 2007). Further, the author recommended that a combination of environmental taxation with fiscal decentralization would give provincial and local governments in Indonesia a much-needed increased revenue stream.

Case studies of payment for environmental services (PES) schemes in many places in Indonesia demonstrate the positive potential for the development of PES widely beyond the pilot level. In many cases, PES in Indonesia is quite unique in targeting conservation on the farmland or in ecosystem services provided by agriculture. Although field experiences have been going on for a decade with up-scaling at the local level, national adoption is still difficult. One of the reasons is similar to that of other instrument applications: the current initiatives depend on external support, that is, a donor funds. Although the local government is interested in adopting this scheme, the main motive is to increase its local budget from the payment without acknowledging environmental management and community development as the essence of the scheme.



Note: Application rating: 0 = nonexistent; 1 = incipient; 2 = widely applied.

Figure 11. Instruments that create/correct markets.

4.3 Information, advocacy, and voluntary approaches

4.3.1 Education campaigns for civil society on environmental risks/management in agriculture

The application of Good Agricultural Practices (GAP) and Best Management Practices (BMP) can reduce environmental risks and problems. GAP refer to 'a collection of principles to apply for on-farm production and post-production processes, resulting in safe and healthy food and non-food agricultural products, while taking into account economic, social and environmental sustainability.'[32] BMP is 'the term for either structural or operational strategies that land managers (including producers) undertake to lower emissions that result from activities underway on the landscape to both air and water resources.'[33] Both GAP and BMP closely link to farmers' capability to efficiently produce their commodities. In Indonesia, UU No. 16/2006 about the extension system (*sistem penyuluhan*) provides the basis for increasing smallholders' capacity to apply GAP and BMP. The law mentions that agricultural extension should provide farmers with knowledge on how to conserve forest and environment. Training materials should include environment-friendly farming practices in all stages of market chains. In the same year, the Minister of Agriculture enacted Regulation (Permentan) No. 48/2006 about GAP. The regulation provides guidelines for farmers and local government to achieve sustainable agriculture through comprehensive GAP, from land preparation to monitoring and maintenance. Examples of environmental campaigns that were synergized with commodity market improvement are the Biodiversity and Agricultural Commodities Program (BACP) and the WWF Market Transformation Initiative (MTI).[34] In the cacao subsector, the Mars Cacao Partnership Initiative program commenced in 2007 and was supported by IFAD and the local government in Sulawesi.

This program's objective is to secure the cacao supply chain, share best practices, and build partnerships between farmers and traders, institutionalized through the Cocoa Sustainability Partnership (CSP).

Further, the establishment of Partnership for Indonesia's Sustainable Agriculture (PIS Agro) seeks to provide an innovative, multistakeholder model for addressing the nation's agricultural opportunities and challenges. Created in June 2011 at the World Economic Forum on East Asia in Jakarta, the partnership was between the GOI and 13 international and national companies. The PIS Agro for palm oil plans to strengthen its value chains where it holds comparative and competitive advantages in markets. However, the palm oil sector faces significant challenges related to environment issues and smallholder farmers need greater market access. In response to opportunities and challenges, the PIS Agro for palm oil is designed to implement GAP on farms and Good Manufacturing Practices (GMP) in the processing industry, as well as other relevant activities, such as the provision of a financing scheme and organizing farmers into cooperatives and marketing plans. The rejuvenation project targets its completion in 2012 and covers 2 million hectares of land, helping 1 million farmers to increase their income by 150 percent, and creating US$6 billion additional revenue per year for smallholder farmers while reducing impact on the environment.

4.3.2 Advocacy or support for green technology adoption

Pest management controls that are environment-friendly such as natural agents are widely used to control and manage pests on agricultural land. In the rice subsector, the government promotes the use of natural agents or predators to control pests. Another strategy is by encouraging farmers to use high-yielding and fertilizer-responsive varieties of rice in order to reduce the impact of excessive and inefficient use of chemical fertilizers. For commodity processing, effluents for the rubber and oil palm subsector are regulated. In the rubber

32 *See FAO discussion on GAP principles at www.fao.org/prods/GAP/home/principles_en.htm.*

33 *See Best Management Practices at http://exension.psu.edu/aec/best-management-practices.*

34 *www.wwf.or.id/program/inisiatif/mti_indonesia/.*

subsector, producers are encouraged to produce clean raw rubber (*bokar*) to accomplish a national standard of SNI-Bokar No. 06-2047-2002 and use a recommended coagulant (acetic acid) to reduce the impact of effluents on water and air. As water and air pollution from rubber processing increases, UNCTAD, together with IRSG (International Rubber Study Group) as international agencies, subsequently responded to the national private sector to support this aspiration.

4.3.3 Collaborative forest management and dispute resolution

Community-based Forestry and Village Forest

Legal land reform is a complex and protracted process, involving national and traditional laws as well as multiple interests of stakeholders. Legal land reform is actually more preferable than alternative legal actions. However, this process might not work because of political constraints. The GoI and the House of Representatives are now dealing with three related draft laws: land conflict, overlapping permits of plantations, and recognition of indigenous people's rights.

A collaborative mechanism with the local community is needed to cope with the limited resources and capacity of the Ministry of Forestry to protect more than 50 million hectares of protected forest and conservation area. To prevent encroachment and to ensure the flow of (economic) benefits from the existence of forest to the local community, the Ministry of Forestry issued Permenhut No. 52/2007 on Community-based Forestry (*Hutan Kemasyarakatan*) and Permenhut No. 49/2008 on Village Forest (*Hutan Desa*).

Those regulations give the local community village the right to sustainably access and manage non-timber forest products (NTFP) in protected state forest. The regulations will protect community livelihoods (i.e. agroforestry practices) and access to forest natural resources, while at the same time preserve the forest. Several notable examples of Village Forest and Community-based Forestry are the ICRAF sites in Muara Bungo Village, Jambi, and in Buntoi Village, Central Kalimantan, where the villages are given legal rights to manage their agroforestry land located in the protected forest and peat-land area.

Dispute settlement facility

The RSPO has already established a dispute settlement facility (DSF) to specifically address land-related disputes (RSPO, 2012). The primary objective is to 'provide a means for achieving fair and lasting resolutions to disputes in a more time-efficient and less bureaucratic and/or legalistic manner, while still upholding all RSPO requirements, including compliance with relevant legislation.' This means that disputes can be handled at an early stage, preventing them from escalating into full-blown conflicts, by using the DSF. How the DSF principle or modified principle can be implemented in Indonesia is of interest for conflict resolution. This, in turn, can be followed with pilot testing of a few cases, such as conflicts in Riau (for pulp and paper cases) and Kalimantan (for logging and oil palm cases).

4.3.4 Certification and voluntary standards/ industry codes of practice

Examples of a voluntary approach instrument implemented in Indonesia are eco-certification for coffee, cocoa and oil palm. Another example is the implementation of ISO 14001 that also reflects green procurement in Indonesia. Another voluntary approach is the Company Social and Environmental Responsibility (CSER), of which some of the programs are directed to support environmental conservation.

Certification is the process in which a third party verifies compliance with a given standard. The requirements for eco-certification have to include ecological criteria. For a sustainability standard, all of the environmental, economic, and social criteria have to be covered. The voluntary certification adds value to commodities by providing the opportunity to negotiate premium prices for the certified commodities and/or providing access to well-established markets.

Many certifications have been applied for various commodities in Indonesia. A few are mandatory, such as ISPO, and most of them are voluntarily, such as RSPO, C.A.F.E. Practices, Rainforest Alliance/ Sustainable Agriculture Network (SAN), UTZ, Organic, etc. Some are locally applied while others are recognized internationally.

Oil palm

Around mid-2000, the international standard issued by the Roundtable on Sustainable Palm Oil (RSPO) was popularly adopted in Indonesia. Later on, the government issued Permentan No. 19/2011 on Indonesia Sustainable Palm Oil (ISPO). ISPO is the first national-level palm oil sustainability standard in the world. The regulation mandates all of the large palm oil estates in Indonesia to acquire ISPO certification by December 31, 2014. It becomes a mandatory instrument; any palm oil producer that does not comply with the regulation is at risk of receiving a penalty and might lose its business license.

The implementation of both certifications in Indonesia was received differently. The pro party received this as an opportunity to improve the sustainability of the sector, and also to synergize with the existing RSPO certification. However, those who do not agree argue that, because many palm oil estates are still struggling to acquire RSPO, the regulation to implement ISPO would be counter-productive and confusing (Table 5). Paoli (2013) shows that RSPO and ISPO cover similar topics; however, ISPO still lacks depth and detail in both environmental and social aspects. Regardless of the critics, ISPO is one of the examples of government-initiated eco-certification, an initiative that is being followed by other countries (Mongabay, 2013).

Table 5. A comparison between RSPO and ISPO.

No.	**Difference**	ISPO	RSPO
1	Scope of implementation	Indonesia	Global
2	Initiator	Government of Indonesia, that is, Ministry of Agriculture	NGO, private sector, and government
3	Year of initiation	2011	2004
3	Mandate	Mandatory, all class 1, 2, and 3 palm oil estates in Indonesia	Voluntary
4	Main principles	1. Estate mnagement and permits system 2. Implementation of technical guidelines on palm oil processing and cultivation 3. Environmental monitoring and management 4. Responsibility to workers 5. Responsibility to community and society 6. Community economic empowerment 7. Sustainable business development	1. Commitment to transparency 2. Compliance with applicable laws and regulations 3. Commitment to long-term economic and financial viability 4. Use of appropriate best practices by growers and millers 5. Environmental responsibility and conservation of natural resources and biodiversity 6. Responsible consideration of employees and of individuals and communities by growersand millers 7. Responsible development of new plantings 8. Commitment to continuous improvement in key areas of activity
5	Number of indicators and criteria	41 criteria and 126 indicators (all mandatory)	39 criteria and 139 indicators (65 major and 74 minor)

Sources: Permentan No. 19/2011 and RSPO.

Cacao

Training in higher productivity has so far been a priority over eco-certification. Initiated by cacao industry players and NGOs, a multistakeholder forum called Cacao Sustainability Partnership (CSP) was established in 2007 in Makassar. The several initiators of this forum were local government authorities (government of South Sulawesi Province), government research agencies (Puslitkoka/ ICCRI and Hasanuddin University), the private sector (Mars), and NGOs (VECO) (CSP, 2013b). One example of the initiatives of CSP members is Swisscontact's *Sustainable Cocoa Production Program* (SCPP) launched in 2012, which targets 60,000 farmers and addresses productivity training needs for cocoa farmers, preparing many to step up toward market-driven certification, which includes environmental requirements.[35] In 2013, the CSP succeeded in finalizing 'the 2020 Roadmap to Sustainable Indonesian Cocoa.' The roadmap aims to sustainably increase farmers' productivity without expanding to more land (CSP, 2013a). Some members of the CSP, such as Rainforest Alliance/SAN and UTZ, represent their own cacao certification and training schemes, mostly applied in Sulawesi. Other members, such as Swisscontact and VECO, provide training in productivity and group formation.

Through the CSP, the aspiration to develop national certification guidelines for cacao is relatively strong. In 2010, Mars, in cooperation with Rainforest Alliance and UTZ, published sustainability indicator standards for cacao farming in Indonesia. Meant to trigger cacao certification in Indonesia, until now follow-up on the standards has not been applied.

Although the CSP facilitates information on market-driven voluntary certification, there is no intention among CSP members for a mandatory certification of cacao farming in Indonesia. The government, however, is planning to develop a mandatory certification for cacao (Indonesian Sustainable Cacao) to maintain the sustainability of cacao in the long term. At the government level, Indonesian Sustainable Cacao (IS-Coco) drafts have been discussed and developed for quite some time among cacao stakeholders, but the timing for implementation has not been decided yet (Jati, 2014).

Coffee

Certification of coffee in Indonesia has been voluntary and market driven for about 10 years. Until recently, there has been no national certification for coffee in Indonesia (Media Perkebunan, 2013). The director of Puslitkoka/Indonesian Coffee and Cacao Research Institute (ICCRI) mentioned the advantage of having national coffee certification such as the reduction in the commission charge compared with global certification. The discussion on Indonesian Sustainable Coffee (IS-Coffee) standards has begun but is still in a very early stage.

All of the existing certifications are global certifications, such as Rainforest Alliance/SAN, UTZ, Organic, Fairtrade, Coffee and Farmers Equity (C.A.F.E.) Practices, and 4C verification. C.A.F.E. Practices was endorsed by a single private entity (Starbucks), while the other coffee certification schemes were chosen by multiple international private sector buyers and producers (Ecom Agroindustrial Corp, OLAM, Ned Commodities, Volcafe/ED&F Man, Louis Dreyfus Commodities, Kraft/Mondelez, Nescafe) as well as local Indonesian traders such as PT Indocafco or PT Sari Makmur. Smallholder farmers are certified under group schemes. Some government coffee plantations (such as PTPN XII in East Java) have followed market-driven certification demands as well. Under the Nescafe Plan, the Indonesian Coffee and Cocoa Research Institute (ICCRI) and partners trained 10,000 coffee farmers on Good Agricultural Practices with additional environmentally sound performance. The most recent initiative in 2014 comes from Mondelez International, the world's second-largest coffee company. In cooperation with 4C, Rainforest Alliance, ICCRI, and Sustainable Trade Initiative (IDH), Mondelez has just launched its 'Coffee Made Happy' program in Indonesia to train 3,000 coffee farmers in Lampung, Sumatra, on farm management, record-keeping, budgeting, and planning (Hamdani, 2014).

35 *Swisscontact report website*

The program is setting up a farmer training centre in South Sumatra, targeting productivity primarily, which can be achieved through improved plant material as well as plant treatment (pruning) and improved fertilizer application. Professional fertilizer application is optimized to be absorbed by the tree, rather than leaked into the environment. A well-maintained coffee tree will be less vulnerable to pests and diseases. The program addresses other health and environmental aspects as well. Waste management is one example; establishment of supportive shade trees is another aspect. Furthermore, the establishment of plantations outside protected areas is an important contribution to green agriculture. For instance, Mondelez does not want to buy coffee from conservation areas and does not want to convert forest areas into farm area. Back in 2007, Mondelez (at that time under the name of Kraft) was accused of sourcing coffee grown in protected areas in a WWF Indonesia campaign, based on the case expressed in 'Gone in an Instant – BBS illegal coffee report.'[36]

Rubber

Globally, rubber has been certified according to the standards of the Forest Stewardship Council (FSC). However, the effort to certify rubber agro-forest areas by ICRAF was an example of how the complex supply chain of the rubber industry makes rubber certification a long and difficult process. In the rubber supply chain, small-scale farmers have difficulty accessing end-market intermediaries and most end-market intermediaries do not market to consumers. This resulted in difficulties in triggering consumer and decision-maker awareness about the benefits and importance of certifying sustainable rubber (Bennet, 2009)

Although certifications for various commodities, global and local, have been developed in Indonesia, the requirements are often out of (small-scale) farmers' reach (Table 6). Much of the certification process requires a relatively high investment, and, since small-scale farmers have limited access to information (Donaughe, 2008) and capital (financial, human, social, physical and natural). This resulted in their inability to get their commodities certified (Bennet, 2009; Wahyudi and Jati, 2012). In light of these limitations, certification of small-scale farmers has been done in Indonesia under a group certification model, in which the training and investment are taken up by a group administrator, for example, a trader.

36 *WWF Indonesia, 2007. http://d2ouvy59p0dg6k.cloudfront.net/downloads/goneinaninstantbbscoffeereport2007lowres.pdf.*

Table 6. Various certification schemes in Indonesia.

No.	Eco-certification	Commodity	Initiating stakeholders	Scope	Working area
1	Indonesia Sustainable Palm Oil/ ISPO	Palm oil	Government	National	All Indonesia
2	Roundtable on Sustainable Palm Oil/RSPO	Palm oil	NGO & private sector	Global	All Indonesia
3	UTZ	Coffee, cacao	NGO-private	Global	All Indonesia
4	Rainforest Alliance based on the Sustainable Agriculture Network (SAN) standard	Coffee, cacao	NGO-private	Global	All Indonesia
5	C.A.F.E.	Coffee	Private sector	Global	Sumatra, Sulawesi
6	Fair Trade	Coffee, cacao	NGO	Global	Sumatra, Sulawesi
7	International Sustainability and Carbon Certification	Palm oil	Private	Global	Sumatra, Sulawesi
8	Organic certification, SNI 01-6729-2002 and SNI 6729-2010	Organic crops	Private sector	National	All Indonesia

4.4 Organic farming

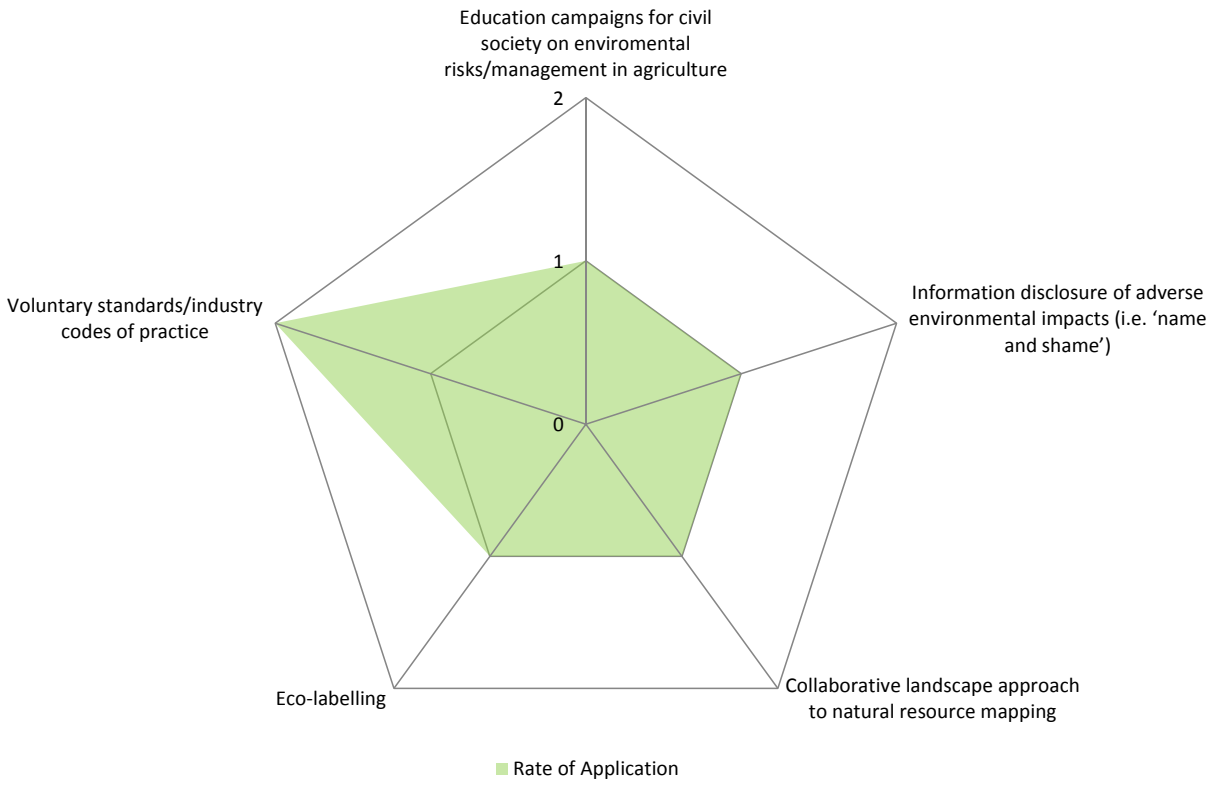
Since 2001, the Government of Indonesia through the Ministry of Agriculture has prepared the framework for developing organic agriculture. This initiative was almost in parallel with the growing trend of organic products, indicated by the growing demand for them, the increasing amount of organic farming area, and the establishment of civil society organizations focusing on advocacy of organic farming (i.e. Indonesian Society of Organic Farming/ Maporina in 2000 and Indonesia Organic Alliance/ AOI in 2002). The growing trend is also indicated by the significant growth of organic farming land in Indonesia from 40,000 hectares in 2004 to 238,800 hectares in 2010 (Husnain and Syahbuddin, 2005; AOI, 2011). In 2002, the Indonesia National Certification Agency (B*adan Sertifikasi Nasional*) issued Indonesian National Standard (SNI) 6729-2002 on organic crop certification standards, which addresses the use of agrochemicals such as pesticides. This National Standard was revised with SNI-6729-2010 in 2010, with the notable revision including social equity as one of the certification requirements.

In 2008, the Ministry of Agriculture (Department of Agriculture at that time) issued guidelines on organic crop certification, followed by Minister of Agriculture No. 64/2013 that gave more detailed legal guidelines for developing organic farming. In 2010, the Ministry of Agriculture launched the 'Go Organic 2010' program, but the development of organic farming since then has been relatively stable. Limitations faced by organic farmers are market constraints, a lack of consumer interest, and a lack of networking with private companies (Mayrowani, 2012).

4.4.1 Gap analysis for applying information, advocacy, and voluntary instruments

Findings from the survey indicated that the level of application of information, advocacy, and voluntary instruments is relatively incipient (Figure 12).
The FGD revealed that the extension system for agriculture in Indonesia may have been ineffective. The government tried to revitalize it by enacting Law no. 16/2006 on the extension system (*sistem penyuluhan*). However, extension workers often have inadequate skills when recruited at the subnational level. The training programs for these extension workers are limited and not updated on current environmental issues. In addition, extension workers and their programs tend to focus on rice and other crops, such as soybean and vegetables, rather than estate commodities (i.e. rubber, coffee, cacao and palm oil), thus excluding estate farmers.

International demand urges greener farming practices to comply with international standards. However, this is problematic for smallholders. Unless farmers are organized under a group model, individual certification generally does not make sense because of the high extra costs since disorganized groups have limited access to finance, information, and technology. In this case, many traders or cooperatives targeting premium prices shoulder costs for training, group management and an internal control system. Due to price fluctuation, sometimes premium prices are based on negotiation. One notable thing is that many of the commodity certifications were initially endorsed by the private sector through a multistakeholder forum and the government subsequently responded to the initiative. Survey results indicated that this instrument is in an emerging (50 percent of the respondents) and developing stage.



Note: Application rating: 0 = nonexistent; 1 = incipient; 2 = widely applied.

Figure 12. Information, advocacy and voluntary approach.

5. Green Agriculture Capacity

In this section, government and private capacity to perform some functions related to green agriculture is assessed and classified following the guidelines provided by the World Bank. Capacity is distinguished into three categories: (1) government and private capacity to perform agro-environment policy development and integration functions, (2) government and private capacity to perform policy implementation functions, and (3) government and private capacity to perform compliance assurance functions.

5.1 Capacity assessment method

The assessment of the capacity of both government and the private sector was carried out through a survey that was conducted during the Green Agriculture Workshop. In this survey, participants who mostly came from the public sector were asked to rate the capacity of the government and the private sector in Indonesia in performing functions related to green agriculture. However, most of the participants were unwilling to fill out questionnaires on private sector capacity reasoning that they were not in a position to answer those questions. Hence, in order to capture the perceptions on private sector capacity, the survey team also conducted an online survey, whose content and structure were similar to those of the survey conducted in the workshop, targeting respondents from non-government sectors. The latter respondents were deliberately chosen on the basis of their expertise, experience and knowledge about green agriculture practices in Indonesia.

5.2 Government and private sector capacity

The results of the survey are presented in the following radar charts reflecting the rating of government and private sector green agriculture capacity as perceived by majority of the respondents.

5.2.1 Agro-environment policy development and integration functions

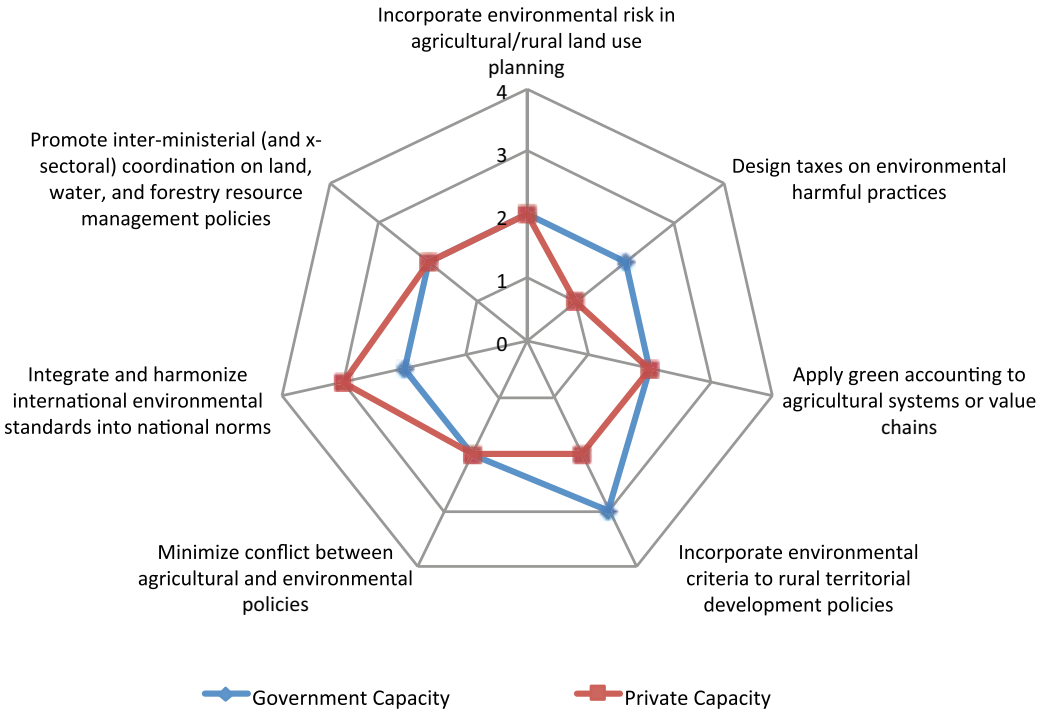
The capacity to perform agro-environment policy development and integration functions is relatively low. The highest scores for this function relate to issues of (1) integrating and harmonizing international environmental standards into national norms by the private sector, and (2) incorporating environmental criteria into rural territory development policies by the government (Figure 13). In line with our green agriculture application analysis, private initiatives in Indonesia have been very rich and diverse for almost all commodities (see Section 4.3.4). Although the government is the one that legalizes and further applies the national standards that may mostly integrate international ones, the initial initiative for this national adoption is mainly driven by international organizations involving the private sector. The most distinctive and advanced example is the adoption of the RSPO to the ISPO in the case of oil palm. The demand for palm oil products and the development of this industry coupled with the pressure to meet international standards have been an effective driver for the private sector to improve its capacity. Later, this initiative was followed by IS-Coco, IS-Coffee, and a similar initial process for rubber.

The government was considered to have high capacity to incorporate environmental criteria into rural territorial development policies. We assumed that this was led by 'sustainable development focusing on rural territories' jargon that had been promoted since the New Order Era. As the government's obligation is to improve the livelihood of smallholders and establish national food security, rural development policy is mostly related to rice production and environmental criteria are basically limited to training/extension and advocacy for integrated pest management and fertilizer use.

The remaining capacity, such as incorporating risk to land-use planning, designing taxes, applying

green accounting, minimizing conflicts between agricultural and environmental policies, and promoting inter-ministerial coordination, is scored low. Although land-use planning instruments have been more advanced, the instruments for environmental taxes and green accounting are relatively new, having been enacted in 2009 (see Section 4.2.4).

From the workshop, the participants highlighted that the capacity of subnational government would automatically be lower than that of the national one. The local government's performance should have been better if the national government had provided it with clear instructions or guidance, sufficient operational budget, and a proper monitoring system.



Note: Capacity rating: 0 = N/A; 1 = non-existent; 2 = low; 3 = high; 4 = world class.

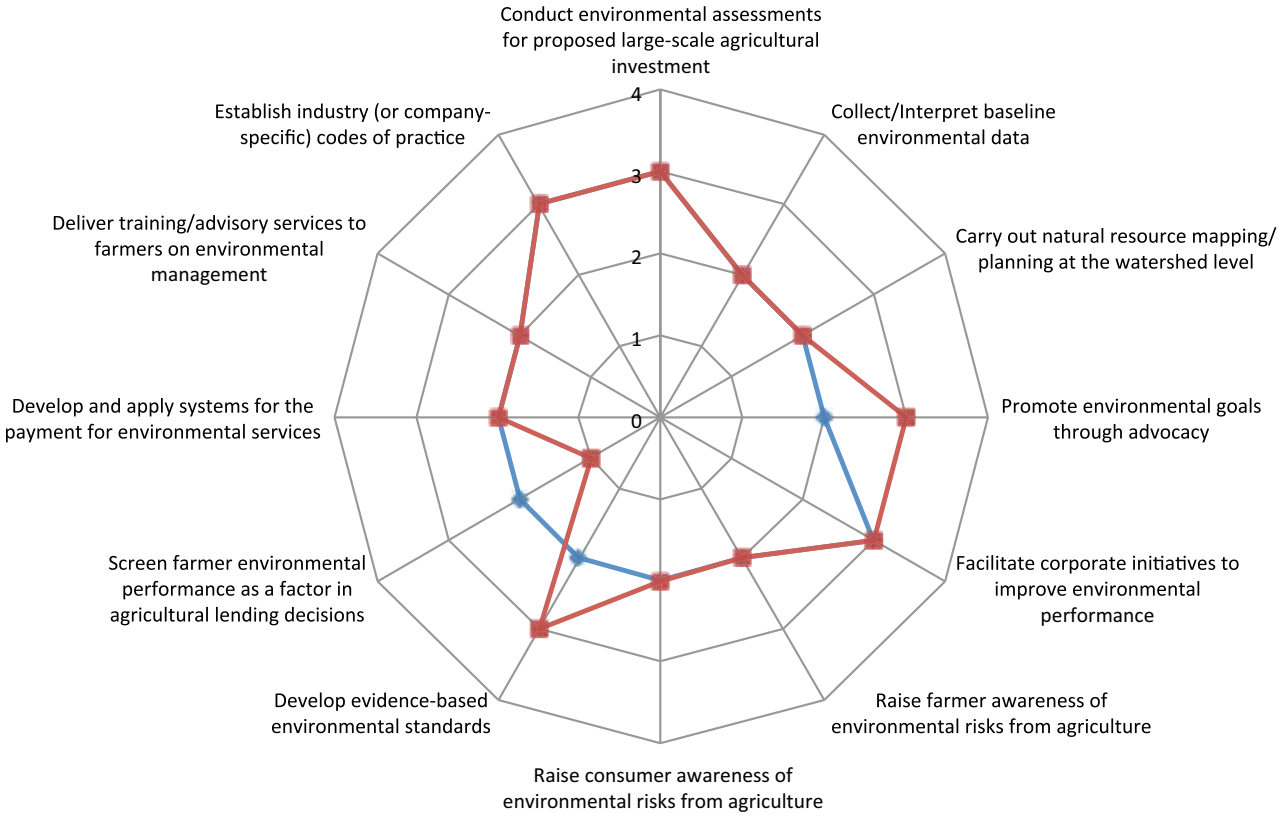
Figure 13. Government and private sector capacity to perform agro-environment policy development and integration functions.

5.2.2 Policy implementation functions

Both government and the private sector exhibited strength in implementing policies related to large-scale investments and companies (Figure 14). These included establishing industry codes of practice, conducting environmental assessment for proposed large-scale investment, and facilitating private initiatives to improve environmental performance. We assume that all of these implementations were triggered by the increased growth of the national oil palm industry and international pressure on its 'green' performance, particularly toward deforestation of tropical forests.

The private sector, somehow, had better capacity to raise awareness, promote environmental goals through advocacy, and develop evidence-based environmental standards than the government sector. This was understandable since the private sector is only a single operational unit, while the government operates on a nationwide scale. It was also highlighted that, for the implementation function, it was better at the subnational level

since the local government mostly has better knowledge on local conditions and is accustomed to communicating with farmers in its area. However, the success of policy implementation at the subnational level many times depends on clear technical guidance from the national level. In many cases, the applications of environmental policy tools, such as payment for environmental services, have been operational at the subnational level when similar initiatives are led at the national level. Developing baseline, mapping and evidence-based standards was not well mastered by both the government and the private sector in Indonesia. Further, these sectors, particularly the government, need to promote more training/advisory services for farmers on environmental management and connect smallholders to financial loans based on environmental performance. The only good performance of extension services by the government is specifically integrated pest management for rice and other food crops, such as vegetables.



Note: Capacity rating: 0 = N/A; 1 = non-existent; 2 = low; 3 = high; 4 = world class.

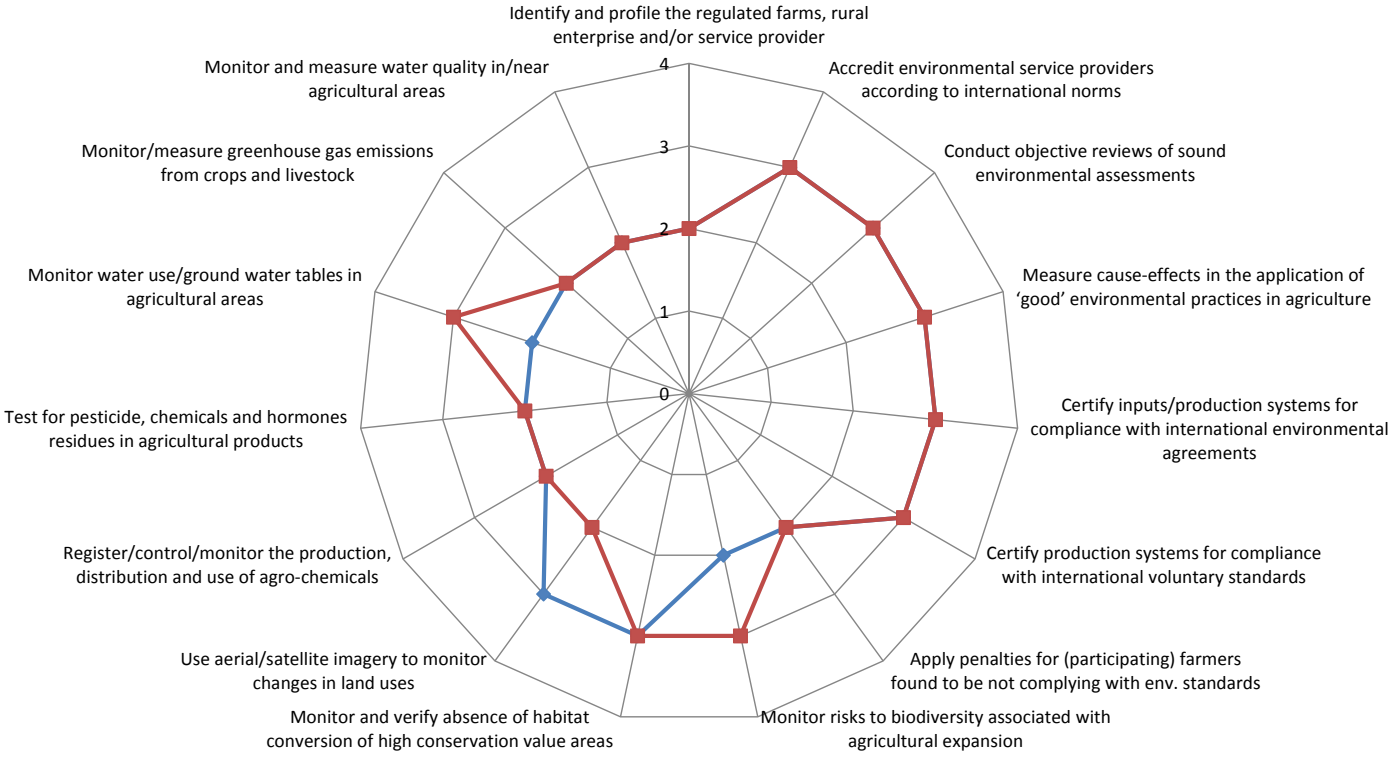
Figure 14. Government and private capacity to perform policy implementation functions

5.2.3 Compliance assurance functions

The survey indicated that both government and the private sector had high capacity in accrediting and certifying environmental compliance according to international norms, environmental agreements, and voluntary standards (Figure 15). However, in contrast, the capacity to identify and profile the regulated service providers and other aspects of accreditation and certification, such as register, control, review, measure, and monitor environmental aspects, was evaluated as low. This could lead to questioning the robustness and validity of such accreditation and certification. High capacity scores also may result from the government's initiatives to adapt international certification schemes to

national ones, even though they are still at an early stage of application. In addition, the private sector is progressing by establishing similar initiatives, such as the Partnership for Indonesia's Sustainable Agriculture (PIS Agro). The PIS Agro entails not only oil palm, but also coffee, cocoa, rubber, rice, potatoes, and tropical fruits.

Among all the capacity to monitor environmental quality, the government has quite good capacity in using aerial images for monitoring land-use change. This capacity may increase because of the high support from international donors a couple of years ago to fund Indonesian readiness on REDD initiatives. Providing a high-quality database on land cover, particularly forest cover, becomes one important step in such preparedness. From the private sector side, the participants observed that it had relatively higher capacity in monitoring water quality and biodiversity risks that are associated with agricultural expansion. Besides the more active roles of NGOs as an 'environmental watchdog' and better public awareness on negative externalities, some direct regulation instruments exist to demand this information from the private sector.



Note: Capacity rating: 0 = N/A; 1 = non-existent; 2 = low; 3 = high; 4 = world class.

Figure 15. Government and private capacity to perform compliance assurance functions.

6. Conclusions and Looking Forward

6.1 Conclusions

6.1.1 Green agriculture challenges

Severe environmental challenges associated with commercial agriculture in Indonesia relate to problems of (1) deforestation and primary forest conversion, (2) land degradation and erosion, (3) decrease in aboveground carbon stocks and increased GHG emissions, (4) high water footprint, and (5) air and water pollution.

Deforestation and primary forest conversion, including peat land, habitat conversion, and biodiversity loss

The current deforestation problems are dominated by conversion to large investment in oil palm plantations and large-scale timber industry. Natural forest conversion to coffee and cacao smallholder plantations mostly happened in the early 1970s up to the end of the last century, while the booming of oil palm estates started in this century. Politically, decentralization is also blamed as one of the drivers of deforestation since districts generate fiscal revenues by resource extraction and the indicator of subnational government performance is based on GDP without incorporating environmental aspects.

Habitat loss is mostly caused by intensive and monoculture agricultural practices along the border of protected areas. A segregated landscape (i.e. monoculture plantation versus natural forest) is caused by discontinued vegetative cover that may contribute to biodiversity loss. This may happen when primary forest is converted to large-scale oil palm estates without any transition between the two land covers. Some species can still be found on established oil palm estates, particularly when these estates leave some high-conservation-value areas being protected. Commercial commodities, mostly cacao, coffee, and rubber under agroforestry systems practiced by smallholders, are scientifically proven to be capable of increasing agricultural ecosystem services by maintaining a variety of tree species in different strata with multiple niches for more diverse wildlife, especially if this goes hand in hand with control of alien invasive species.

Land degradation and erosion

Land degradation is mostly caused by poor site selection for farming because of a lack of awareness and limited availability or access to fertile and flat farming lands. When land resources are limited, farmers tend to expand their farmland into steep slopes and, with their lack of awareness of Good Agricultural Practices, their cultivation practices may cause erosion and other land degradation. These detrimental practices may include parallel contour ploughing, ground cover vegetation clearing, and slash-and-burn.

Decrease in aboveground carbon stocks and increased GHG emissions

Large-scale conversion by estates of originally natural habitats such as undisturbed forest and peat land can cause 'carbon debt.' Therefore, conversion from degraded land or abandoned land is recommended to avoid loss of carbon stocks due to land clearing. Rice cultivation (i.e. persistently irrigated versus rainfed), rice species selection, and fertilizer application can influence GHG emissions from rice planting.

High water footprint, air and water pollution

Coffee (especially *Coffea arabica*) consumes the highest amount of water during its growth and processing. However, the commodity's water footprint is still lower than that of industrial and domestic uses of water. The application and management of agrochemical waste (or wastewater at oil palm mills, including capturing of methane in effluent ponds) are other key areas of opportunity to improve the green footprint of Indonesian agriculture.

6.1.2 Green aspirations and applications

Conceptually, Indonesia has embraced green and sustainable agriculture. The evidence of these aspirations are the enactment of National Agenda 21 in 1997 and its five-year Development Plan until 1999 under the New Order Era and the National Development Program in 2000 and its Target 4 of the Medium Term Development Plan 2004–2009 under the Reformation Era and under the ongoing Postreformation Era. Recent aspirations include the Revitalization of Agriculture, Fisheries, and Forestry; the Indonesia Master Strategy on Agricultural Development; and the National Mitigation Action Plan on Greenhouse Gas Emission Reduction.

The green agriculture aspiration in Indonesia is evolving. In the New Order Era, aspirations focused on Good Agricultural Practices to enhance productivity and broad conservation and environmental management with single or limited applications. The focus commodities of this era were rice and timber. In the Postreformation Era, these policies guided more diverse instruments with pilot-scale applications distributed in many regions of the country. Global aspirations (such as REDD+ and other carbon-market initiatives) and innovations in non-regulatory instruments (such as payment for environmental services, certifications) somehow influence the national direction of green agriculture.

The Indonesian government still focuses on applying direct regulations as the most significant instruments and many of these regulations remain in a high and broad regulatory structure (i.e. Law) and lack operational guidelines for their implementation. Advocacy for collaborative management of state-forestland is exist but slowly materializes with less than 100 collaborative management permits covering less than 1 percent of Indonesian state-forests. Education on Good Agricultural Practices is applied broadly only for rice. Indirect subsidies for organic fertilizer and certification of organic farming are applied for rice and horticultural products but limitedly for estate commodities. 'Indirect' means that state companies as the distributors of organic fertilizer receive the subsidies and not the farmers or producers. Non-public sectors, including internationally funded organizations, national NGOs, and companies, initiated market creation instruments, particularly payment for environmental services, and voluntary approaches such as education campaigns, certification, and organic farming. The market creation instruments have been regulated as one of the instruments for environmental protection and management in Indonesia; however, these instruments have not been broadly applied.

'Land use and zoning' and 'fines or re-licensing to enforce technical regulations' were perceived as direct regulations that still lack application in Indonesia. Point-source monitoring as the basis data for law enforcement is not updated, if available. Land use and zoning have some challenges such as inconsistent mapping or zoning between national and subnational government agencies and a lack of coordination and implementation of the plans. Prohibition of new planting has been applied widely, particularly for oil palm estates, only because of international pressure. Restriction on the use of unpermitted substances has been applied for banning dangerous pesticides and fertilizers; however, to reduce pollution problems, farmers' knowledge about pesticides and fertilizer dosage is essential.

Economic incentives and market instruments are mostly at an early stage of application, expectedly triggered by the law promoted by the Ministry of Environment. 'Charges for resource use' and 'environmental tax on certain products' were assumedly 'widely applied.' However, monitoring of environmental output and fund allocation for minimizing the environmental risk from these budget slots are unclear. The Indonesian budgeting system does not recognize the earmarking concept and all tax revenues are collected into one budget component for general purposes. Case studies of payment for environmental services (PES) schemes in many places in Indonesia demonstrate the positive potential for the development of PES widely beyond the pilot level. Although field experiences have been going on for a decade with up-scaling at the local level, national adoption is still difficult. One

of the reasons is similar to that of other instrument applications: the current initiatives depend on external support, that is, a donor grant.

Information, advocacy, and voluntary instruments are relatively well known but not widely applied yet. Although nationally Indonesia has applied the extension system for agriculture, extension workers and their programs tend to focus on rice and food crops only. Extension workers mostly have inadequate skills and this continues without any efforts to offer further training after their recruitment, particularly at the subnational level.

Commodity certifications were initially endorsed by the private sector through a multistakeholder forum and the government responded to the initiative afterward. Fair Trade was the first initiative of a voluntary approach in the late 1980s, followed by organic farming awareness a decade later and commodity certifications in the early 2000s. Certification has been widespread, covering various food crops and commercial commodities at the centres of production. Adaptation of a voluntary international standard (i.e. RSPO) to a mandatory national standard (i.e. ISPO) is advanced for the case of oil palm. Similar processes happen for other commodities, such as rubber, cacao, and coffee. The PIS Agro backed by 13 companies partnering with the government is recognized as a broad public-partnership program (PPP) that may provide enabling conditions for better implementation of GAP and GMP as the basis for certification. It also covers a wide range of agricultural products, including livestock.

6.1.3 Green agriculture capacity

The private sector has the capacity to integrate and harmonize international environmental standards into national norms, particularly in the case of oil palm. The government somehow is broadly capable of developing sustainability principles for rural development through its national policies as evidenced by various 'sustainable development' aspirations published by the Indonesian government. However, the capacity to incorporate risk into land-use planning, designing taxes, applying green accounting, minimizing conflicts between agricultural and environmental policies, and promoting inter-ministerial coordination is scored low. This indicates that the nature of policy published by the government covers only broad sustainability concepts but lacks operational guidelines on how to implement those principles and to coordinate inter-ministerial efforts.

The government and the private sector exhibited strength in implementing policies related to large-scale investments and companies. The private sector, somehow, had better capacity to raise awareness, promote environmental goals through advocacy, and develop evidence-based environmental standards than the government sector. Developing baseline, mapping, and evidence-based standards was not well mastered by both the government and private sector in Indonesia. Promoting training/advisory services for farmers on environmental management is also limited.

The government and the private sector had high capacity in accrediting and certifying environmental compliance according to international norms, environmental agreements, and voluntary standards. However, in contrast, the capacity to identify and profile the regulated service providers and other aspects of accreditation and certification, such as register, control, review, measure, and monitor environmental aspects, was evaluated as low. This may lead to questioning the robustness and validity of such accreditation and certification. Among all the capacities for monitoring environmental quality, the government has quite good capacity in using aerial images for monitoring land-use change. This capacity may increase because of strong support from international donors a couple of years ago to fund Indonesian readiness on REDD initiatives.

6.2 Looking forward

6.2.1 Potential catalysts for change

International pressure on Indonesia's commitment may induce greater efforts of the government to lower its GHG emissions nationally. The reports from various international bodies mentioned that 3.8 million acres of wetland forest were lost between 2000 and 2012, thus highlighting international attention to the issue of high GHG emissions in Indonesia.[37] Further, deforestation and environmental degradation in Indonesia are still at an alarming rate despite the government's efforts. Conflicting land claims as well as inconsistent law enforcement are other international concerns that enable deforestation and environmental degradation to continue. Incentives for avoided deforestation are already available: 95 percent of the US$1 billion budget pledged by the Norwegian government will be paid if Indonesia can demonstrate scientifically forest protection and rehabilitation.

Multistakeholder cooperation among NGOs, research agencies, the private sector, international donor agencies, and governments has good synergy in driving innovations in designing, piloting, and further implementing green agriculture initiatives in Indonesia. In many cases, the cooperation establishes a network and forum to strengthen the partnership and achieve its goals. To some extent, this partnership is endorsed by a government as well, such as the PIS Agro network with its commodity working groups. Large investments from the private sector, NGOs, and government donors are available to fund green projects. The latest example in July 2014 is the U.S.-funded 'Green Prosperity' of the Millennium Challenge Account – Indonesia, supporting the Cocoa Sustainability Partnership (CSP) objectives.

Private sector initiatives in applying 'green' standards and certification have provided multiple pilots that can potentially be scaled up nationally. These efforts also raise awareness of smallholders under their farmers' group or plasma program and inform them about Good Agricultural Practices to comply with 'green' label requirements. Examples from Mars, ECOM, Unilever, and other national companies have been numerous as discussed under Section 4.6 on private initiatives for green agriculture.

Public awareness to protect the environment is growing strongly, facilitated by a more affluent and growing urban society and strong social networks that share information rapidly. Available technology has improved in Indonesia in recent years, making it possible to quickly identify where environmental problems are occurring, including negative behaviour toward the environment taking place. Information transparency leading to cases of exposed and prosecuted corruption is growing in Indonesia, which makes it more risky for individuals to violate rules and regulations, such as illegal logging.

Both overseas and domestic demand for organic farm products has increased in the last few years.38 Many multinational companies implement the same purchasing policy for all their market demand, therefore creating a domestic supply as well. And, there is a growing domestic market for organic as well as eco-products, noticeably not only in urban areas but also in rural communities, where many Indonesian famers use pesticides for cash crops but grow vegetables organically for their own household consumption. Market demand and consumer awareness will lead companies and farmers in Indonesia to produce more organic as well as eco-certified products.

The government at the national and subnational level potentially becomes one of the most important drivers for change. Apart from many crucial challenges discussed previously, many new initiatives, such as Indonesia's 'One Map Policy' to synchronize maps produced by different institutions, have been developed and need to be strengthened and continued. Further, various innovative policies and regulations, such as Law 32/2009 on economic instruments for environmental management and protection, have been in place, waiting for further applications in the field.

37 http://www.scientificamerican.com/article/deforestation-in-indonesia-is-double-the-government-s-official-rate/.

38 www.thejakartapost.com/news/2007/06/30/organic-farm-products-demand-not-available.html.

www.rimanews.com/read/20140420/148749/permintaan-konsumen-meningkat-distan-musirawas-perluas-areal-tanam-padi-organik.

6.2.2 Priority actions and recommendations

The recommendations below targeting specific challenges and key actions were prioritized based on expert consultations on green agriculture issues. For example, despite many problems still faced by the national government on land-use planning, the recommendation for this issue focuses on the subnational government as a matter of priority. The reason is that the sub-national government plays an important role since the decentralization process in the late 1990s produced more authority and share of revenue-sharing arrangements for natural resources and taxes. Therefore, targeting the subnational government may increase the effectiveness of environmental problem solutions at the field level. For incentive-based mechanisms, we highlight the importance of earmarking funds from environmental levies because this will become a major source for any incentive-based schemes based on public funds. For certification and standards, we concentrate on the challenges of the adoption of international standards that are relevant to a local context. For further reference on challenges faced by the government, Chapter 5 on green agriculture capacity presents many other government performances that have not been addressed.

Land-use planning at the subnational level

Direct regulations on land-use planning and zoning have existed nationally that aim at solving several large-impact environmental risks, such as deforestation, habitat loss, reduction of carbon stock, and forest fires. Although the subnational government plays an essential role in materializing this national planning in the field, it is essential to comprehensively incorporate environmental risks and impact when developing and enforcing land-use planning maps. Some districts and provinces in Indonesia may have been successful in curbing these problems; however, there is still a large degree of planning synergy among regencies, provinces, and the national level. The formulation of policy and regulation has to apply scientific-based information specifically providing alternative scenarios for subnational government to access its scenarios of development and conservation trade-offs. In addition, the government has to give high priority to setting up a comprehensive database and risk/impact monitoring system to guarantee public support for such policies.

Key actions

1. Incorporate environmental risk in agricultural/rural land-use planning;
2. Carry out natural resource mapping and planning at a watershed nested scale focusing on ecosystem functions, services, and values rather than institutionally determined land boundaries (i.e. state-forest land status, where no tree cover is left);
3. Conduct objective reviews of sound environmental assessment;
4. Provide complete monetary valorisation of environmental goods and services as part of a green accounting system (see Section 6.2.2.3);
5. Synchronize planning and zoning maps between national and subnational government agencies.

Environmental standards for agricultural commodities

Improving scope and context of environmental standards for agricultural domains

In Indonesia, a national standardization agency called *Badan Standardisasi Nasional* (BSN) has been in existence since 1997. Related to green agriculture initiatives, this agency has at least three certification systems: environmental management, eco-label, and organic. Technical regulations, such as product certification requirements, performance mandates, testing procedures, conformity assessment, and labelling standards, exist to ensure consumer safety, network reliability, or other goals. In principle, these standards for agricultural products motivate producers to internalize the cost of promoting environmental quality, such as organic farming practices. However, the current BSN standards still focus on uniform technicalities on environmentally friendly GAP at the plot level without considering real environmental problems on the site. The BSN

standards have limited market demand and do not carry a significant premium with low standard stringency. This condition may hinder solving substantial environmental problems.

Key actions

1. Provide environmental assessment at a finer scale, that is, subwatershed, using a scientific (modelling) and participatory approach;
2. Build capacity of national and subnational agricultural standardization agencies;
3. Develop subnational databases on environmental data related to agricultural practices linked to other domains, that is, forestry and urban environment;
4. Monitor and evaluate environmental performances of agricultural practices.

Adapting international sustainability standards to national context to allow higher adoption

International standards can provide common reference points for countries to follow so that developing countries can be recognized in global export markets. Lessons from the application of international standards in Indonesia showed that some of the principles and criteria of these environmental standards need adaptations when being introduced at the national level. In the case of Indonesian palm oil production, there are two types of standards: the RSPO, a voluntary international certification, and the ISPO, a mandatory national scheme. The main difference between the ISPO scheme and the RSPO certification is the legality of the scheme (Table 5). To interpret its principles and criteria for sustainable palm oil production, the RSPO developed the Indonesian National Interpretation Working Group (INA-NIWG). However, the palm oil producers raised their concerns about the restrictions regulated under the RSPO and revealed that adjustments would be needed if this certification was applied in Indonesia. The concerned articles were the prohibition of new plantation development with high-conservation-value (HCV) areas, and high transparency and recognition of customary laws proposed by the RSPO. When the governance of land boundaries and their administration is weak, the definition of HCV and rights can be contested. For example, the producers received a legal plantation permit from the government, but this did not guarantee that the legal permit would be accepted by other local stakeholders. Therefore, the Indonesian Association of Palm Oil Producers (GAPKI) initiated the ISPO that somehow has more space to negotiate such issues than the RSPO.

Key actions

1. Analytically assess international standards to review their feasibility in national conditions;
2. Interpret international standards to national ones with the option of a step-wise approach toward these stringent standards accepted in the global consumer market;
3. Actively review and promote national standards with proof of salience for global consumers' needs;
4. Provide enabling conditions (such as resolving land disputes, mapping and legalization of HCV, facilitating product quality inspection by providing independent laboratories funded by the government, and others) for producers to meet any of global consumers' needs;
5. Negotiate with foreign countries that those companies that meet international standards of green agriculture would receive import tax deductions from importing countries.

Incentive-based mechanisms for better adoption of environment-friendly agricultural practices

Earmarking funds generated from environment-related levies

Funds generated from environment-related levies have to be earmarked for paying for environmental protection and rehabilitation. For example, funds

generated from value-added taxes from timber, plantation business licenses, and waste flushing licenses that currently become a component in the country's general budget should be proportionally distributed to the sectors that need protection and rehabilitation. Consequently, sectors related to environmental protection and rehabilitation will receive enough funds proportionally to their shares for increasing the national GDP.

The way to fund environmental practices and investment under incentive-based mechanisms and voluntary approaches was an important challenge. Therefore, as an enabler, the government might enhance established incentive-based and voluntary approaches, which can include guaranteeing premium prices, incorporating economic value to GDP, and earmarking environment-related levies. Further, mastering technology, including training and extension about agricultural ecosystem service provisions, might be the top priority of interventions. These could be integrated with initiatives of nongovernment sectors, such as an NGO, in raising green awareness.

Key actions

1. Incorporate economic value of environmental assets into the calculation of national and subnational GDP;
2. Integrate environmental indicators as a measurement of subnational government performance;
3. Finalize and implement the Government Regulation (PP) on economic instruments for environmental management and protection in the near future;
4. Review and revise regulations under the Ministry of Finance to set enabling conditions for such incentive-based mechanisms;
5. Provide capacity to produce science-based ecosystem valuation and green accounting, and apply knowledge on ecosystem service principles;
6. Provide incentive systems to reward districts as ecosystem service providers;
7. Facilitate subnational entities by providing adequate technical assistance and sufficient performance-based funds for environmental protection and rehabilitation.

Green technology

Improving access to information and financial support to green agriculture technology and information for smallholders

It is important to target smallholders by improving access to formal financial institutions, green agriculture technology and information, and extension programs, particularly for plantation farmers (i.e. cacao, coffee, rubber, and oil palm). The government should have acted as an investor for smallholders to adopt green technology since now green agriculture has become relatively expensive and less profitable in the short term for farmers. Subsidies for green agriculture practices and access to formal financial institutions for smallholders are parts of the solution. As a consequence, financial institutions that consider the green agriculture concept when providing their financial services must become accessible to farmers. In fact, a price premium in many cases is not a guarantee when farmers have applied environmental (and social) standards to minimize their negative externalities from farming practices. Strengthening farmer groups is one of the first steps to enable individual smallholder farmers to become agribusiness players.

Key actions

1. Design inexpensive and profitable green agriculture practices for smallholders, preferably organized in groups;
2. Improve infrastructure for testing environmental indicators accessible to local farmers, such as for conducting soil and water tests to determine pollution level, including soil nitrogen;

3. Improve the roles of financial institutions toward green agriculture. For the initial step, promote the GA concept to financial institutions;
4. Provide access for smallholders to formal financial institutions that provide microcredit based on farmers' performance in environment-friendly agricultural practices;
5. Guarantee that premium prices and subsidies are directly received by producers. Reduce fertilizer subsidy gradually and allocate the budget for investment in other agricultural public goods (infrastructure, R&D for better technologies, extension services). These actions should be coupled with support for farmers to use organic fertilizers.

Advocacy

Improve extension systems to strengthen farmers' knowledge to carry out Good Agricultural Practices (GAP) and provide preconditions for collaborative conservation management

Agricultural extension is the first layer of empowerment from the government to smallholders; thus, the government has to make sure the availability and capability of extension workers can meet farmers' requirements. Existing agricultural extension workers have to be enabled to provide demand-driven training services in agricultural communities and cover all main commodities.

The existing collaborative management developed in recent years should be improved, particularly between the conservation/protected area and the agricultural communities in its surrounding area. The government can expand the collaboration by cooperating (co-financing) with the private sector and donor community, such as through payment for environmental services.

Key actions

1. Restate the government's commitment (national and subnational) in providing adequate funds for extension services;
2. Provide incentives for agricultural extension workers to grow in their career as a professional service provider to agricultural communities in Indonesia;
3. Incorporate local knowledge (bottom-up approach) from farmers in formulating extension programs in which the green agriculture concept will be imparted;
4. Strengthen the extension system to transfer green agriculture knowledge to farmer communities across Indonesia;
5. Strengthen collaborative management between actors, including smallholders, the private sector, and the donor community.

Raise public awareness on the green agriculture concept

Beyond the government and producers, consumers are important targets to ensure awareness and higher demand for green commodities.

Key actions

1. Provide better awareness and understanding of the green agriculture concept with simple language for public audiences;
2. Engage social media for the growing urban society in the topic of green agriculture;
3. Involve academicians and scientists to provide 'training of trainers' for the implementation of green agriculture.

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7. Annexes

Annex 1. Commodity area and productivity for smallholder and large-scale plantations.

Area, production, and productivity of coffee

Year	Production (tons)			Harvested area (ha)			Productivity (tons/ha)		
	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate
2000	29,754	514,896	9,924	38,233	830,811	17,211	0.78	0.62	0.58
2001	18,111	541,476	9,647	24,378	891,139	16,672	0.74	0.61	0.58
2002	18,128	654,281	9,610	24,398	929,460	16,396	0.74	0.70	0.59
2003	17,007	644,657	9,591	24,429	886,820	16,287	0.70	0.73	0.59
2004	17,025	618,227	12,134	24,425	930,635	17,286	0.70	0.66	0.70
2005	17,034	615,556	7,775	24,446	895,661	17,297	0.70	0.69	0.45
2006	17,017	653,261	11,880	24,253	937,743	18,126	0.70	0.70	0.66
2007	13,642	652,336	10,498	18,912	929,237	20,932	0.72	0.70	0.50
2008	17,332	669,942	10,742	20,878	918,592	20,878	0.83	0.73	0.51
2009	14,387	653,918	14,285	18,046	891,255	20,229	0.80	0.73	0.71
2010	14,065	657,909	14,947	17,864	843,946	20,540	0.79	0.78	0.73
2011	9,099	616,429	13,118	17,127	871,911	20,850	0.53	0.71	0.63
2012	9,362	634,277	13,498	17,269	872,112	20,128	0.54	0.73	0.67

Source: Directorate General of Plantation, Ministry of Agriculture - Republic of Indonesia (2013)

Area, production, and productivity of cacao

Year	Production (tons)			Harvested area (ha)			Productivity (tons/ha)		
	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate
2000	34,790	363,628	22,724	49,831	389,764	32,653	0.70	0.93	0.70
2001	33,905	476,924	25,975	49,906	476,434	34,941	0.68	1.00	0.74
2002	34,083	511,379	25,693	49,530	530,838	37,721	0.69	0.96	0.68
2003	32,075	634,877	31,864	37,961	583,128	34,975	0.84	1.09	0.91
2004	25,830	636,783	29,091	33,741	704,874	31,554	0.77	0.90	0.92
2005	25,494	693,701	29,633	33,701	747,838	31,145	0.76	0.93	0.95
2006	33,795	703,207	33,384	38,409	832,596	34,726	0.88	0.84	0.96
2007	34,643	671,370	33,993	44,014	843,331	36,624	0.79	0.80	0.93
2008	31,130	740,681	31,783	37,305	831,560	35,158	0.83	0.89	0.90
2009	34,604	741,981	32,998	36,771	914,431	33,182	0.94	0.81	0.99
2010	34,740	772,771	30,407	46,416	974,642	31,618	0.75	0.79	0.96
2011	34,373	644,688	33,170	36,400	797,411	33,953	0.94	0.81	0.98
2012	34,716	867,904	33,646	37,350	1,070,532	34,420	0.93	0.81	0.98

Source: Directorate General of Plantation, Ministry of Agriculture - Republic of Indonesia (2013)

Area, production, and productivity of rubber

Year	Production (tons)			Harvested area (ha)			Productivity (tons/ha)		
	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate
2000	203,086	1,182,396	178,842	180,520	1,882,400	151,393	1.13	0.63	1.18
2001	182,578	1,209,284	215,599	175,302	1,980,515	186,075	1.04	0.61	1.16
2002	186,535	1,226,647	217,177	175,671	1,988,500	176,268	1.06	0.62	1.23
2003	191,699	1,396,191	204,405	187,060	1,985,930	171,017	1.02	0.70	1.20
2004	196,088	1,662,016	207,713	189,226	2,099,739	173,251	1.04	0.79	1.20
2005	196,673	1,723,318	208,432	189,332	2,162,544	173,318	1.04	0.80	1.20
2006	265,813	2,062,597	204,560	204,560	2,333,874	187,424	1.30	0.88	1.09
2007	277,200	2,176,686	310,286	205,303	2,381,466	188,778	1.35	0.91	1.64
2008	276,809	2,173,616	300,861	205,499	2,374,615	188,614	1.35	0.92	1.60
2009	238,656	1,942,298	259,393	199,369	2,325,563	183,798	1.20	0.84	1.41
2010	266,326	2,179,061	289,467	203,199	2,382,295	187,329	1.31	0.91	1.55
2011	302,370	2,359,811	328,003	229,923	2,386,819	175,639	1.32	0.99	1.87
2012	325,827	2,360,997	353,552	230,795	2,405,939	177,681	1.41	0.98	1.99

Source: Directorate General of Plantation, Ministry of Agriculture - Republic of Indonesia (2013)

Area, production, and productivity of oil palm

Year	Production (tons)			Harvested area (ha)			Productivity (tons/ha)		
	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate	State large-scale estate	Small-holder estate	Private large-scale estate
2000	1,970,578	1,977,814	3,632,109	433,046	798,101	1,219,918	4.55	2.48	2.98
2001	1,606,458	2,800,744	4,690,270	446,258	1,065,894	1,477,241	3.60	2.63	3.18
2002	1,642,825	3,134,323	5,242,837	460,236	1,237,811	1,705,013	3.57	2.53	3.07
2003	1,750,651	3,517,324	5,172,859	538,221	1,278,951	1,531,478	3.25	2.75	3.38
2004	1,617,706	3,847,157	5,365,526	511,813	1,340,21	1,695,338	3.16	2.87	3.16
2005	1,449,254	4,500,769	5,911,592	438,170	1,675,186	1,941,327	3.31	2.69	3.05
2006	3,470,943	5,783,088	9,254,031	639,772	1,847,461	2,313,729	5.43	3.13	4.00
2007	2,117,035	6,358,389	9,189,301	515,501	1,983,974	2,381,860	4.11	3.20	3.86
2008	1,938,134	6,923,042	8,678,612	507,519	2,080,053	2,534,704	3.82	3.33	3.42
2009	2,005,880	7,517,716	9,800,697	530,046	2,270,593	2,740,783	3.78	3.31	3.58
2010	1,890,503	8,458,709	11,608,907	512,912	2,416,425	3,178,938	3.69	3.50	3.65
2011	2,045,562	8,797,924	12,253,055	541,570	2,674,310	3,334,920	3.78	3.29	3.67
2012	2,096,701	8,973,883	12,450,487	543,690	2,679,659	3,364,689	3.86	3.35	3.70

Source: Directorate General of Plantation, Ministry of Agriculture - Republic of Indonesia (2013)

Area, production, and productivity of rice

Year	Harvested Area (ha)	Production (tons)	Productivity (tons/ha)
1993	10,993,920	48,129,321	4.38
1994	10,717,734	46,598,380	4.35
1995	11,420,680	49,697,444	4.35
1996	11,550,045	51,048,899	4.42
1997	11,126,396	49,339,086	4.43
1998	11,730,325	49,236,692	4.20
1999	11,963,204	50,866,387	4.25
2000	11,793,475	51,898,852	4.40
2001	11,499,997	50,460,782	4.39
2002	11,521,166	51,489,694	4.47
2003	11,488,034	52,137,604	4.54
2004	11,922,974	54,088,468	4.54
2005	11,839,060	54,151,097	4.57
2006	11,786,430	54,454,937	4.62
2007	12,147,637	57,157,435	4.71
2008	12,327,425	60,325,925	4.89
2009	12,883,576	64,398,890	5.00
2010	13,253,450	66,469,394	5.02
2011	13,203,643	65,756,904	4.98
2012	13,445,524	69,056,126	5.14

Source: Central Statistics Bureau - Republic of Indonesia (2014)

Annex 2 National Workshop on Green Agriculture, April 15, 2014

On April 15, 2014, ICRAF, in cooperation with BAPPENAS, carried out a National Workshop on Green Agriculture in Pranaya Hotel, BSD, Tangerang. This workshop aimed to collect stakeholders' inputs on the implementation of green agriculture in Indonesia, ranging from regulation/policies at the national to local level to the state-of-the-art of the real situation in the field. The workshop was attended by 26 participants, ranging from government officers from the National Planning Agency (BAPPENAS) and the Ministry of Agriculture to agricultural experts from academic and research institutions, a representative from the private sector, and representatives from Agricultural and Estate Agencies from several provinces (South Sumatra, Central Kalimantan, and South Sulawesi).

The workshop opened with the presentation from Mr. Rusono, the director of Directorate of Crops and Agriculture of the National Planning Agency, on the position of green agriculture in the National Agricultural Strategy. Mr. Rusono emphasized that development planning of Indonesia is directed to achieving sustainable development through green growth. Thus, greening the agricultural sector is one of the main strategies to achieving sustainable development. The opening session continued with a presentation from Dr. Leimona regarding the

progress of the National Green Agriculture Review. Dr. Leimona highlighted the salient findings of the review and the steps to be taken from the workshop and afterward.

Several suggestions and comments on the study follow:

1. As Indonesia consists of many regions with various spatial characteristics, the study must address those various characteristics, for example, address the different impacts of farming activities in dryland and wetland.

2. The study should focus on the whole agricultural value chain, not only on the production part, to see whether a commodity can really be considered as a green commodity. For example, the environmental impact might be vicious in the processing instead of production stage.

3. How should the water footprint be explained in the study in relation to its spatial and commodity context?

Workshop in progress

The next session discussed the aspirations and applications of green agriculture in Indonesia. The participants commented and added a list of aspirations that influence the application of green agriculture. Although greening the agricultural sector has become the priority, as reflected in the draft of RPJMN 2015–2019, environmental indicators to assess the green performance of agricultural activities are not yet available. The discussion revealed that, although the government has prepared many green agriculture aspirations in terms of laws and regulations, on the application side, this will need much more improvement, mainly on the coordination part between government agencies.

After the lunch break, the workshop continued with a discussion on the gap between green agriculture applications and applications in Indonesia to implement green agriculture. During the session, the participants highlighted the existing gaps, such as the overlapping zoning regulations between the national and local government, the weak extension system to support the capacity building of smallholders, limited agricultural research and development that is reflected in the limited availability of reliable data, the lack of a monitoring and evaluation system (institutions and indicators to assess), and the high cost and scale needed to implement green agriculture initiatives.

At the end of the session, the participants were requested to assess the capacity of stakeholders to implement green agriculture. To do so, we adopted the capability indicators shared by the World Bank green agriculture team. As the workshop participants were dominated by government officers and researchers, we were asked by the participants to also add other stakeholders to have a balanced result. The survey during the workshop was followed by another survey in the private sector expert meeting to re-confirm the results. The workshop ended with closing remarks from Dr. Wibawa from National Plantation Research (PT.RPN).

Workshop participants

No.	Participant	Institution
1	Sulhadiana	Directorate General of Crops, Ministry of Agriculture
2	Dyah Mutiawati	Directorate of Crop Protetion, Ministry of Agriculture
3	Thomas Wijaya	Rubber Research and Development Center
4	Lindu Basyah	Directorate General of Crops, Ministry of Agriculture
5	Nono Rusono	Directorate of Crops and Agricultre, BAPPENAS
6	Justin Siregar	BT Cocoa
7	Gede Wibawa	RPN
8	Lugi Kater	Estate Agency of Central Kalimantan Province
9	Ifan Martino	Directorate of Crops and Agricultre, BAPPENAS
10	Anwar Sunari	Directorate of Crops and Agricultre, BAPPENAS
11	Sapar Bahri	Estate Agency of South Sumatra Province
12	Erwinsyah	Palm Oil Research and Development Center
13	Hafiza	Directorate General of Estate Crops, Minstry of Agriculture
14	Robert Sinaga	Directorate General of Estate Crops, Minstry of Agriculture
15	Retno S	Directorate General of Estate Crops, Minstry of Agriculture
16	Sylvia	Directorate General of Estate Crops, Minstry of Agriculture
17	Agus S	Directorate General of Estate Crops, Minstry of Agriculture
18	Aswan Sikong	Agriculture Agency, South Sulawesi Provinces
19	Beria Leimona	World Agroforestry Centre (ICRAF)
20	Sacha Amaruzaman	World Agroforestry Centre (ICRAF)
21	Fitria Yasmin	World Agroforestry Centre (ICRAF)
22	Bustanul Arifin	INDEF
23	Herdhata Agusta	Bogor Agricultural University
24	Fadhil Hasan	RPN
25	Bambang Dradjat	RPN
26	M Yusdipriantoro	Directorate General of Estate Crops, Minstry of Agriculture

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United Nations Avenue
PO Box 30677 – 00100, Nairobi, Kenya
Tel: +254 20 7224000, via USA + 1 650 8336645
Fax: +254 20 7224001, via USA + 1 650 8336646
Email: worldagroforestry@cgiar.org

www.worldagroforestry.org