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Greening Export Agriculture in East and Southeast Asia

STEPS TOWARD GREEN

POLICY RESPONSES TO THE ENVIRONMENTAL FOOTPRINT OF COMMODITY AGRICULTURE IN EAST AND SOUTHEAST ASIA

Sara J. Scherr, Kedar Mankad, Steven Jaffee, and Christine Negra

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with case studies by Tanja Havemann, Janjarang Kijtikhun,
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GREENING EXPORT AGRICULTURE IN EAST AND SOUTHEAST ASIA

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List of Abbreviations

ACP	World Bank Agricultural Competitiveness Program
ADB	Asian Development Bank
AFMA	Agriculture and Fisheries Modernization Act (Philippines)
AQSIQ	Administration of Quality Supervision, Inspection, and Quarantine Office (China)
ASB	Alternatives to Slash and Burn
BMP	Better Management Practices
CAS	Chinese Academy of Sciences
CCB	Coffee Coordination Board (Vietnam)
CDC	Community Development Center
CGIAR	Consultative Group on International Agricultural Research
CPO	Crude Palm Oil
CRSD	Coastal Resources for Sustainable Development Project (World Bank)
CSO	Civil Society Organization
DAE	Department of Agricultural Extension (Vietnam)
DARD	Department of Agriculture and Rural Development (Vietnam)
DONRE	Department of Nature Resources and Environment (Vietnam)
EU	European Union
ETP	Ethical Tea Partnership
FAO	Food and Agriculture Organization of the United Nations
FFB	Fresh Fruit Bunches (Oil Palm)
FLEGT	Forest Law Enforcement, Government and Trade process
FMU	Forest Management Unit
FPIC	Free and Prior Informed Consent
GAP	Good Agricultural Practices
GAqP	Good Aquaculture Practices
GCTF	Governor's Climate and Forests Task Force
GHG	Greenhouse Gas
GIAHS	Globally Important Agricultural Heritage Site
GI	Geographic Indication
GMS	Greater Mekong Subregion
HCMC	Ho Chi Minh City
HCVA	High Conservation Value Areas
ICRAF	World Agroforestry Center
ICS	Internal Control System

IDH	Sustainable Trade Initiative
IFAD	International Fund for Agricultural Development
IPSARD	Institute of Policy and Strategy for Agriculture and Rural Development (Vietnam)
ISPO	Indonesian Sustainable Palm Oil Standard
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
LULUCF	Land Use, Land Use Change and Forestry
MAM	Mangroves and Markets (IUCN/SNV Project)
MARD	Ministry of Agriculture and Development (Vietnam)
MIS	Market Information Systems
MOAC	Ministry of Agriculture and Cooperatives (Thailand)
MONRE	Ministry of Natural Resources and Environment (Vietnam)
NAEC	National Agricultural Extension Center (Vietnam)
NECTEC	National Electronics and Computer Technology Center (Vietnam)
NEDA	National Economic Development Authority (Philippines)
NSC	National Sustainability Curriculum (Vietnam)
NTFP	Non-Timber Forest Products
PES	Payments for Ecosystem Services
PPP	Public-Private Partnership
PFES	Payment for Forest Environmental Services
RA	Rainforest Alliance
REDD+	Reducing Emissions from Deforestation and Degradation
RMB	Renminbi (Chinese currency)
RSPO	Roundtable on Sustainable Palm Oil
RUPES	Rewarding Upland Poor for Environmental Services
SME	Small and Medium Sized Enterprises
SNV	SNV Netherlands Development Organization
SVLK	Indonesian Timber Legality Assurance System
TAO	Tambon Administrative Organizations
UNFCCC	United Nations Framework Convention on Climate Change
UTZ	Coffee Certification
VAT	Value Added Tax
VICOFA	Vietnam Coffee-Cocoa Association
WASI	Western Highlands Agriculture and Forestry Science Institute
WAVES	Wealth Accounting and the Valuation of Ecosystem Services

Foreword

The countries of East and Southeast Asia are experiencing many structural changes—in economic growth patterns, demographics, food consumption, labor markets and demands on natural resources, to name just a few. Many of these countries are seeking new "Green Growth" strategies to maintain or accelerate economic growth and lower the environmental footprint while at the same time striving to achieve greater poverty reduction impacts and more effective adaptation to climate change. To achieve this diverse set of aspirations, new polices and program initiatives are being put in place.

Given the importance of agriculture for livelihoods and its dependence on a stable natural resource base, managing agriculture and food-related environmental risks need to be important elements of these strategies. Drawing from the broader green growth concept, the practice of 'green agriculture' can pave the way for achieving agricultural development and food security goals, while preventing environmental degradation, reducing greenhouse gas emissions, stemming biodiversity loss, and curbing unsustainable natural resource use while contributing to ecosystem services and benefits.

This study examines a broad range of measures which can and are being taken to prevent, mitigate or respond to adverse environmental impacts from agriculture. Its particular focus is on agricultural commodities for export markets. Even with the growing opportunities afforded by changing domestic food demand, one of the most striking features of recent agricultural development in East and Southeast Asia has been the surge and prominent growth in market share of commodity exports. These expanding exports, however, have come at considerable environmental cost. Fortunately, there is growing recognition of these costs and the need for action among local, national and international buyers and consumers.

In response, policy makers throughout East and Southeast Asia have begun to deploy a range of regulatory, market-assisting, and other instruments to reduce the environmental footprint of these large commodity sub-sectors. While in some cases it is too soon to draw definitive conclusions, some early cross-cutting lessons can be drawn from these experiences. This study identifies such lessons, illustrated by concrete examples of policy implementation in six large agricultural landscapes where diverse innovative policy approaches are being implemented. The intent is not to be prescriptive but to highlight policy options in the context of particular commodities and landscapes. The study aims to inform the wider efforts of the World Bank Group and its development partners to support a greener, more productive and sustainable agriculture within environmentally healthy and resilient landscapes.

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PART ONE
POLICY LESSONS

Working together with communities, including hilltribes, in Mae Chaem, Thailand. Photo courtesy of Raks Thai.

A CHANGING AGRICULTURE SECTOR FACES ITS ENVIRONMENTAL FOOTPRINT

1

Agriculture in East and Southeast Asia is undergoing a process of structural transformation. While the share of agriculture in overall national employment and GDP has been declining as broad-based economic development has progressed, agriculture-related employment remains quite prominent in most countries of the region and the performance of agriculture remains important in achieving further poverty reduction gains (Briones and Felipe 2013; Timmer 2014).

Some of the sector's changes are driven by internal factors. Domestic dietary and food expenditure patterns are changing, with reduced prominence of rice and relatively rapid growth in the importance of other cereals and higher value fruits, vegetables, fish, animal products, and packaged convenience foods (Jamora 2014). These demand shifts have altered patterns of specialization among smallholder farmers and larger food producers, and have spurred changes in agricultural land and water uses. The region's diversifying food needs and growing urban population are now being supplied by a hybrid system that combines integrated, advanced cold chain distribution channels with marketing networks that still rely on traditional standards and distribution outlets. Some of the region's food demands cannot be competitively supplied locally, resulting in increased food, feed, and live animal imports among the region's middle income countries (Agrifood Consulting International 2014).

Another notable change in the agricultural economy is the policy-led growth to supply raw materials for international food and beverage markets and global value chains. The past quarter century brought an explosive growth of agricultural commodity[1] exports, leading East and Southeast Asia to dominate world trade in rubber, palm oil, black pepper, and cassava. Several of the region's countries also lead in the world's exports of rice, coffee, tea, cocoa, cashew nuts, and a variety of aquatic products and fruits and vegetables. While changes in Chinese agriculture have been primarily driven by changing domestic food market demand, much of the dynamics in the agricultural sectors of other middle income countries—including Indonesia, Vietnam, Malaysia, and Thailand—has been related to commodity production for external demand (Christiansen 2012; Wicke et al. 2011; Leimona et al. 2015; Nguyen et al. 2015). Lower income countries such as Cambodia and Myanmar have also been emphasizing the potential of commodities trade in their evolving agricultural strategies (Eliste and Jaffee 2014). While the region's agricultural commodities trade was traditionally oriented to high income country markets, over the past 10-15 years, a growing proportion of this trade has been directed to

1 In this study, we define "agricultural commodity" as a mass-produced, unspecialized agricultural product that enters large-scale national and international wholesale markets or industrial-scale processing, and hence require supply chains that regularly deliver large quantities of products of homogenous quality into those supply chains. We thus exclude subsistence production, as well as commercial production aimed at local, niche, or small-scale markets.

other emerging market countries including within Asia.

Such rapid commodity growth has had major negative impacts on the environment. Conversion of land, limited knowledge on applications of pesticides, and weak institutional support for sustainability standards has led to deforestation, soil erosion, water and air pollution, accelerated releases of greenhouse gases, water scarcity and the salinization of water resources (see Chapter 2, "Examining the Footprint of Commodity Production"). While the evidence of degradation and climate impacts was initially ignored by governments prioritizing economic growth, vocal international advocacy (especially around the topics of tropical deforestation and climate) and growing domestic concerns (focused on pollution and water scarcity) have prompted action to reduce the environmental footprint of commodity production.

Many of the innovations arising to address environmental issues have come from the private sector and civil society. Pressure has come from consumers, marketing channel leaders, local communities and NGOs for shifts in production and natural resource management practices, for the auditing of such practices, and for tracing and distinguishing commodities from different sources. More favorable commercial terms, such as concessional financing, improved market access, or price premiums, have become available to some suppliers of commodities designated as environmentally sustainable.

But the private sector cannot address this challenge without strong complementary public action. Government action—at local, provincial, and/or national levels—is often needed to address improper or incomplete rules, including norms, standards, regulations, and laws; shift prevailing incentives to alter the economics of action or inaction by players in agricultural commodity supply chains; and/or improve the quality and availability of pertinent information, including technical knowledge and capacity building that enhances the ability of stakeholders to understand the nature and consequences of adverse environmental impacts and to apply technical, managerial, or other solutions. Crafting effective policy requires strategic decisions about the priority roles of government, as well as thoughtful selection and design of appropriate policy instruments.

National and local governments in the region have put many different policies and policy instruments in place to reduce the environmental footprint of commodity agriculture, and have begun to promote climate-smart agriculture. However, to date, there has been little well-structured guidance available for policymakers seeking to select and implement policy instruments that address environmental risks and impacts in agricultural commodity landscapes. Policymakers need much more information if they are to collaborate effectively with the private sector and civil society. A review of the literature and consultation with key actors and experts in the region raised numerous questions about targeting policy measures (see Box 1.1), the appropriate roles for government, policy sequencing, and the knowledge and institutional capacities needed to effectively implement various approaches. The literature features many studies focused on particular approaches (i.e. standards; payments for environmental services) or particular commodities, yet systematic comparative assessments are rare.

1.1 STUDY OBJECTIVES AND METHODOLOGY

This study seeks to inform the strategies and incremental actions of governments in East and Southeast Asia, and highlight challenges and emerging lessons from the current application of these instruments

Box 1.1 Questions for targeting policy measures

Scale of environmental risks: Where risks are highly localized, are they best addressed through regulations or incentives targeting individual farmers or communities? Where risks affect a broad (landscape, regional, or cross-border) area, how can policy instruments incorporate an explicit spatial dimension and target multiple actors beyond the specific commodity producers?

Specific commodity: Where a commodity is associated with multiple end uses that are 'invisible' to consumers, what are the prospects of leveraging market pressures/opportunities to induce improved practices? How can government interventions align environmental and public health concerns from commodity production?

Geographically dispersed production systems: Where primary production is highly fragmented and geographically dispersed, transaction costs associated with regulatory or market-based instruments may be high in the absence of strong horizontal (i.e. cooperatives) or vertical (i.e. contract farming) arrangements. Will government need to play more significant 'Advocate' and 'Funder' roles?

Concentrated production systems: In sub-sectors where production is highly concentrated, are regulatory approaches effective in improving practices? What other factors influence effectiveness (e.g., the regulated industry has 'captured' the state; accurate, timely data on environmental risks and industry practices is poorly available)?

Fragmented supply chains: Where a commodity supply chain has a highly fragmented system of intermediaries, processors, and traders (i.e., multiple outlets for non-complying commodities/raw materials; difficulties in effectively tracing and separating compliant from non-compliant supplies), are regulatory or market-based incentives for improved practices likely to be more effective?

within six agricultural commodity landscapes. It was not designed to provide detailed technical and institutional solutions for any specific circumstance or case. Those solutions need to be identified through much more detailed assessments and intensive stakeholder consultation processes.

The study was undertaken as part of a broader research program, coordinated by the World Bank, which has examined the policy and other measures available to governments to mitigate the environmental risks associated with commodity agriculture and the lessons being learned about their application, efficacy, and limitations. There were three complementary modules in this research program. One module took a national perspective, covering green agriculture strategies, policies, programs, and evidence of progress on the ground. This work was done in Indonesia, the Philippines, and Vietnam (Leimona et al. 2015; Nguyen et al. 2015; Tiongco et al. 2015). A second module compiled practitioner-written mini-case studies, pertaining to sustainable agriculture initiatives across a spectrum from very poor to very wealthy countries (Sewadeh and Jaffee 2015).

The third module, implemented by EcoAgriculture Partners and presented in this study, focuses on the development and implementation of policies that reduce environmental risks in six agricultural commodity landscapes within China, Indonesia, the Philippines, Thailand, and Vietnam. The objectives of this study were:

- To identify the range of policy and programmatic instruments available for policymakers to contribute to a reduced environmental footprint from commodity agriculture; and

- To identify the conditions under which these policy and programmatic instruments are likely to be suitable and effective.

The results were synthesized to bring out more generalizable trends, patterns, and policy implications.

Drawing upon literature and selected experience, a comprehensive conceptual framework was first developed. This defined a range of environmental risks associated with East and Southeast Asia's agricultural commodity systems, and identified a typology of policy instruments and roles of government that can foster more environmentally sustainable production and natural resource management practices. The framework was, in part, also utilized in the other two research modules.

Following development of the conceptual framework, a broad scoping exercise was conducted in areas of commodity production in East and Southeast Asia where meaningful efforts are underway to improve environmental performance. The main criteria for case study selection were a diversity of commodities, ecosystem types, and countries. A central premise was that the suitability and effectiveness of different policy instruments will vary with the types of environmental risks, the characteristics of local agro-ecosystems, and the organizational and market context for different agricultural commodities.

Some 22 possible case study landscapes were identified through literature review and consultations with in-region contacts. Preliminary information was gathered to determine (i) the state of available information and data, (ii) the representativeness of the case in terms of environmental risks, industry structures, and policy instrument applications, and (iii) whether the main actors in the landscape would be readily accessible in person or through various means of communication. After further consultations with World Bank staff and other practitioners, six cases were selected that reflect the diverse array of environmental risks and socio-economic circumstances in the region.

The cases represent different ecosystems (e.g., lowlands, coastal areas, uplands), various environmental risks (e.g. land degradation, water resource depletion, deforestation, accelerating greenhouse gas emissions), and areas with different mixes of large- and small-scale farming operations. Different combinations of policy instruments have been employed over time in these settings. The case studies are based on desktop analysis, key informant interviews, and field visits. They document the application of specific policy instruments and their potential for improvement, from the perspectives of policymakers (local and national), non-governmental organizations, relevant private sector representatives, and other stakeholders.

The six case study landscapes and associated principal commodities were: oil palm in Central and West Kalimantan, Indonesia; coffee in Dak Lak, Vietnam; shrimp aquaculture in Ca Mau, Vietnam; tea production in Yunnan, China; maize in a multi-commodity landscape in the Mae Chaem watershed, Thailand; and bananas in Mindanao, Philippines. Given the importance of rice as a commodity crop in the region (Dawe, Jaffee, and Santos 2014), this study also incorporates examples of initiatives that are addressing the environmental footprint of rice (see Box 2.1 for example). Notably, however, during the scoping phase for this study, no cases were identified where major policy efforts have been made to promote eco-friendly rice on a landscape scale that met the selection criteria.

Addressing the environmental dimensions of food production systems for subsistence and for local markets is also critically important in East and Southeast Asia. However, this study focuses on policy issues

and opportunities for commodity agriculture, which is of growing importance (both positive and negative) in livelihood strategies and poverty reduction. The work was designed to complement a growing body of applied research and other documentation which has focused on the application of 'voluntary' environmental standards and other measures being taken or led by the private sector to manage environmental risks in agriculture and the associated operational and/or reputational risks (e.g., Milder, Gross, and Class 2012; Kissinger, Brasser, and Gross 2013).

1.2 REASONS FOR A LANDSCAPE FOCUS

Most agricultural policies and policy instruments, including for environmental objectives, formulate their objectives and strategies mainly at the farm level or in relation to product or input supply chains. However, a growing body of research has concluded that environmental issues for agriculture need to be analyzed and addressed at a larger spatial scale. 'Islands' of sustainability (e.g. a few farms complying with environment-friendly production standards), in a 'sea' of bad practices, cannot significantly mitigate environmental problems in commodity-dominated landscapes.[2]

In many cases, achieving healthy ecosystem functions requires not only spatially targeting interventions, but coordinating actions on farm and non-farm lands (e.g., for restoration of riparian zones or reducing water pollution in rivers and lakes). Where agricultural productivity is being

2 The term 'landscape' refers to a socio-ecological system that consists of a mosaic of natural and/or human-modified ecosystems, with a characteristic configuration of topography, vegetation, land use, and settlements that is influenced by the ecological, historical, economic and cultural processes and activities of the area.

Deforestation for agricultural development in Thailand. Photo courtesy of Raks Thai.

threatened by declining water tables, salinization, climate-induced droughts or flooding or pollinator decline, action on farms must be supplemented by larger actions at landscape scale, such as large-scale water harvesting, restoration of mangroves or pollinator habitat (Scherr and McNeely 2007). In the case of land-based climate change, emission reductions in part of the landscape can be offset completely by accelerating emissions in other parts of the landscape, so that it often makes sense to think of 'climate-smart landscapes' rather than just 'climate-smart agriculture' (Scherr, Shames, and Friedman 2012; Louman et al. 2014; Minang, ed. 2014).

The diversity of stakeholders affecting land and resource management within these landscapes calls for long-term collaboration focused on understanding and accommodating the goals of each group related to production, ecosystem service provision, livelihoods, human health and cultural values, among others (Scherr, Shames, and Friedman 2013).

An emergent response to this reality is the development of integrated landscape initiatives, under a wide range of names, depending on the entry point that prompted initial collaborative action (e.g., watershed, territorial, corridor, and many others). These platforms facilitate collaborative management of whole landscapes, taking into consideration the socio-ecological complexity of the landscape when planning changes in management. Where such collaborative initiatives are effective, there is potential to better realize synergies and manage tradeoffs inherent in any landscape where there are diverse stakeholders with competing claims on land and resources (Scherr 2012). A recently completed review in South and Southeast Asia by the Landscapes for People, Food and Nature Initiative documented 165 integrated landscape initiatives, including 46 in the five countries included in this study (Zanzanaini et al. 2015).

While active multi-stakeholder landscape initiatives are present in only two of the case study landscapes (Ca Mau, Vietnam and Mae Chaem, Thailand), important steps have been taken to advance them in several others, while in all of the study areas policymakers and other key private sector and civil society entities have begun to use a more comprehensive landscape lens to plan and evaluate their efforts to achieve sustainable, climate-smart development.

1.3 HOW THE BOOK IS ORGANIZED

Steps Toward Green is organized as follows: Chapter Two provides an overview of environmental challenges of agricultural commodity production in the region, and potentials to improve practices. Chapter Three describes the range of potential policy instruments and roles of government to address these challenges. Chapter Four provides a synthesis of the experiences in the six case study commodity landscapes, noting the patterns of policy interventions, their apparent drivers and constraints, and available evidence regarding policy efficacy. Where policy measures have only recently been adopted, this chapter highlights some relevant strengths and potential limitations rather than drawing premature conclusions about effectiveness. Given the defensive, reactive approaches observed in many of the case studies, Chapter Five highlights elements of what would be a more strategic, anticipatory, and participatory approach to mitigating environmental risks in East and Southeast Asian commercial agriculture.

Chapters Six through Eleven present the six case studies. Chapter Six, which examines both West and Central Kalimantan, Indonesia, highlights the challenges and opportunities of applying land use regulations and 'voluntary' standards to address

the multiple environmental (and social) risks associated with oil palm production. Chapter Seven on Dak Lak, Vietnam showcases a trend toward 'incremental environmentalism' in the public and private efforts to support intensive coffee production. Chapter Eight is focused on Ca Mau, Vietnam and reviews the growing range of technical, regulatory, and spatial planning measures to counter water pollution, biodiversity degradation, and mangrove loss related to shrimp aquaculture.

Chapter Nine on Yunnan, China highlights innovations in several tea-producing landscapes where a combination of environmental, product safety, and cultural heritage factors spurred effective action to improve the environmental footprint of production practices. Chapter Ten on the Mae Chaem watershed of Thailand describes a multi-commodity landscape where stakeholders are seeking to reduce the negative impacts of practices of upland maize producers on lowland rice producers and rural residents. Chapter Eleven assesses diverse local initiatives in the island of Mindanao, Philippines to improve the banana sector's impacts on soil, water, air, biodiversity, and smallholder farmers' rights.

1.4 MAIN MESSAGES

The study generated five main messages for policymakers in East and Southeast Asia: to be proactive rather than reactive; to better align agricultural promotion and environmental protection policies; to choose government roles more strategically; to combine value chain and spatial approaches, engaging all stakeholders; and to strengthen green agricultural organizational capacities, data and knowledge systems.

Be proactive rather than reactive

A majority of East and Southeast Asian agro-environmental policy continues to be reactive to outside pressure from buyers, consumers or external regulators; and rehabilitative, with measures taken only after serious environmental consequences have manifested. The policy response most commonly involves efforts to clean up physical damage, as well as the damage to the reputation of the product or producing region or country. Such reactive strategies reflect a poor understanding of the underlying risks and have often been very costly—for people, nature, and business. Proactive strategies, that aim to prevent degradation from occurring, reflect more realistic assessments of potential operational and environment risks, and growing recognition of the economic opportunities that can arise from innovations that save costs, improve work or living conditions, effectively adapt to climate change, or differentiate products in the market. Such proactive approaches are beginning to emerge in the region and should be encouraged at all levels.

Align agricultural promotion and environmental protection policies

At present, most countries of the region have conflicting policies for agriculture, the environment, and development. For example, measures to control water pollution in rural areas commonly co-exist with fertilizer subsidy policies and the promotion of intensive, concentrated livestock production. High public expenditures on input subsidies may crowd out, fiscally, programs of government environmental management oversight or programs to facilitate better practices. Efforts to conserve fisheries and promote fishery resource (co-)management occur in the same locations where fuel and/or boat-building subsidies are offered to expand local fish processing capacity. Efforts to restrict farmers from cutting trees and cultivating steep slopes are being undermined by the promotion of new investments in

nearby ethanol plants with large feedstock requirements. Government waivers and subsidies for water and irrigation service fees increase farmer incomes, but contribute to improper water management, often in ways that increase GHG emissions. Alignment of policy actions, both horizontally (across ministries and sectors) and vertically (across national, provincial and local governments) increases the effectiveness and efficiency of any particular policy. The next generation of agriculture, environment and development policies need to explicitly align sector and sub-sector policies and programs, promote diversified land use and market development; target policy instruments spatially, and work with local governments to devise alternative revenue strategies that do not depend on the over-exploitation of resources.

Choose government roles more strategically and adopt a learning approach

The appropriate roles for government—whether as Definer, Regulator, Enabler, Funder or Advocate (see Table 3.1)—depend upon the context, available resources, and commodity and market characteristics. Policy instruments can provide 'carrot' and 'stick' for different groups of actors. Policymakers need to be proactive and develop a hierarchy of action across different policy roles; draw on a complementary mix of policy instruments; and clarify the respective roles of national and local governments. Policymakers are also advised to take a learning approach to policy development, regularly assessing their own progress and shifting course as needed. Important questions remain. Context-specific analysis, nationally and regionally, are especially needed to identify strategies for better integration, define improved data and information systems, assess the sequence and economic viability of policy responses, determine how policy makers can more effectively leverage the capacities of key actors; scan for game-changing strategies that can alter fundamental policy barriers; translate green accounting methodologies to agricultural landscapes; and develop design criteria for policy instruments.

Combine value chain and spatial approaches, engaging all stakeholders

Over the past two decades, the most important instrument for promoting environmental standards in export agriculture commodities has been eco-certification, which typically has a value-chain orientation. These programs extend from international roundtable-based standards like RSPO to independent standards such as Rainforest Alliance and Fair Trade certification. While originally conceived as an approach led by the private sector, it has become clear that government policy has important roles to play. A more cohesive policy is needed that reconceives certification as a tool within a broader multi-instrument strategy for integrated landscape management to deliver the full range of products and ecosystem services needed.

Shifting agricultural practices and systems and reversing degradation can rarely be done through action by a single stakeholder group. Moreover, for policy actions to be powerful, they must have broad-based support. Thus, in developing strategies and instruments, policymakers should actively engage all critical stakeholders and build coalitions to advance and support them; partner with the private sector around shared risks; and build on the technical and policy innovations piloted by civil society.

Strengthen green agriculture organizational capacity, data and knowledge systems

Effective policy implementation requires adequate 'green' agriculture capabilities,

including data, knowledge, skills, financial resources, management systems, physical assets, and relationships. These must be present among supply chain actors (e.g. farmers, farmer organizations, agro-enterprises), national-level ministries and agencies, sub-national and local governments, research/training institutions, civil society organizations, and the media. The extent to which individuals and institutions have these competencies influences (and limits) what policy instruments are employed and the efficacy of their implementation. Priority areas for action are to improve agro-environment diagnostics and measurement, including the socioeconomic impacts of degradation and restoration, and then share information widely among stakeholders. Institutional capacities to administer and implement agro-environment policies and programs must be built throughout the system—in government, among supply chain actors and in civil society—governments need to assess areas of strength and weakness in pertinent institutional capacities, prioritize capacity building needs, and devise programs to invest in capacity strengthening. Investments will generally need to combine 'hard infrastructure' (i.e. testing laboratories), 'hard competencies' (i.e. technical and analytical skills), and 'soft competences' (i.e. leadership, relationship building, facilitative skills).

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EXAMINING THE FOOTPRINT OF COMMODITY PRODUCTION

2

This chapter presents an overview of the specific environmental impacts of agricultural commodity production in East and Southeast Asia, the economic costs of degradation, and the technical potentials to shift production systems to mitigate or reverse negative environment impacts.

2.1 ENUMERATING THE IMPACTS

The environmental problems often associated with commodity agriculture in East and Southeast Asia affect livelihood opportunities and security, human health, and broader economic development. The expansion or intensification of commodity agriculture may pose threats to biodiversity and to other economic interests (e.g. through competition for water supplies) and has been an important contributor to climate change. The major adverse impacts of commodity agriculture in East and Southeast Asia are summarized below, in relation to soil degradation, pollution, water scarcity and salinization, biodiversity loss and greenhouse gas (GHG) emissions.

Soil degradation

Continuous monoculture cropping, cultivation on unsuitable lands, and lack of conservation measures are diminishing soil quality in East and Southeast Asia through water and wind erosion; waterlogging and salinization; and chemical, physical and biological degradation (FAO 1999). Large tea, coffee, palm oil, and other plantations, over time, tend to lose soil nutrients and accumulate agrochemicals where poor management practices are followed, resulting in loss of soil fertility and soil biodiversity. Cultivation on steep hills or mountainsides increases the potential for landslides and can markedly decrease water quality with up to four-fold increases in sediment loads in streams (Edwards et al. 2014).

Pollution of water and air

Commodity production (and the associated land clearing) in East and Southeast Asia is an important source of water and air pollution. Several major commodities in the region are associated with excessive and inappropriate use of fertilizers and pesticides (both synthetic and organic). Soil fertility is difficult to maintain in high-output monoculture conditions without application of fertilizers, and several governments in the region subsidize its use. In China, for example, excessive fertilizer use in agriculture is the leading

> *"We know that simply extracting resources and generating great wealth from that, is not sustainable because we are now at the point where there is a real risk of resource depletion. Related to this is the fact that we, human beings, have also collectively polluted the air, the water, the ground, and the sea at unprecedented levels over the last two centuries. So, this attitude that we can get a free ride by simply extracting and polluting and not have to account for externalities is one key reason why business-as-usual is not viable."*
>
> **Dr. Vivian Balakrishnan, Singaporean Minister for the Environment and Water Resources, at the Singapore Sustainability Symposium, 8 January 2014**

cause of nitrogen pollution in groundwater (FAO 2013). Under monoculture systems without crop rotations, low plant diversity and overuse of pesticides can reduce overall biological diversity, disrupt the ecological balance of predator-prey species, and increase pest risks. In rice-growing regions of Asia, evidence shows that farmers compensate for these negative effects by applying excessive amounts of non-specific pesticides that can kill natural predators (Heong, Wong, and De los Reyes 2013). High rates of pesticide use and inappropriate timing of applications can increase pesticide residues on end products and pollute ground and surface waters, leading to negative impacts on ecosystem and human health. Excrement from livestock and aquaculture can be a major source of water pollution in locations of concentrated production (e.g. concentrated animal feeding operations). The field burning of rice husks and burning of brush cleared for oil palm production have been major contributors to air pollution and even trans-boundary haze.

Water scarcity and salinization

Poor water management is also prevalent in East and Southeast Asia. The risk of water scarcity is amplified where crop production expands onto marginal lands or is unsuitable to local climatic conditions. Poor water infrastructure, poor data systems on surface and ground water hydrology, and policy incentives to over-use water compound risks arising from poor management practices. Agriculture is the region's largest water user (Hoekstra and Mekonnen 2012). About 45 percent of total water withdrawal in the region is for rice production, with nearly half of this not being effectively utilized (Bhandari and Mohanty 2014). Competition for this water is increasing, especially from industry and urban household consumption. Overexploitation of aquifers and subsequent lowering of water tables, combined with sea level rise, can result in groundwater salinization (e.g. in Vietnam's Mekong Delta where rice cultivation is dominant, FAO 2012). As climate change advances and alters water regimes in agricultural landscapes, projections indicate that some parts of East and Southeast Asia will have potential for increasing irrigation (requiring infrastructure investments), while other parts will become more water constrained (Elliott et al. 2013).

Biodiversity, deforestation and habitat loss

East and Southeast Asia is home to a great diversity of ecosystems and cultures. For example, the Lower Mekong Basin, which consists of parts of Thailand, Vietnam, China, Laos, and Cambodia, contains many of the World Wildlife Fund's Global 200 ecoregions, which are critical landscapes of international biological importance (ICEM 2013; Salehin 2011). The Lower Mekong Basin region houses over 20,000 plant species, 430 mammals, 1,200 birds, abundant reptile and amphibian species, and is considered the largest freshwater fishery in the world (ICEM 2013; Johnston et al. 2009). This abundant biodiversity often overlaps with areas that are suitable for agricultural production, ratcheting up risks of species and habitat loss.

Between 29 and 42 percent of overall tropical deforestation from 2000 to 2012 was related to commodity agriculture and timber export, with 32 percent of the total affected area being in Asia (Lawson 2014). Forest clearing for food or tree crop production is associated with loss of food security for local communities, loss of pollination services, loss of biodiversity of local and global significance, loss of carbon stores, and reduced flood retention capacity in riparian and coastal areas (Wertz-Kanounnikoff and Kongphan-Apirak 2008). Where expanding agriculture (especially

shrimp farming) encroaches on mangrove systems, coastal and inland communities face increased vulnerability to soil erosion, salinization of inland water supplies, storm surges and tsunamis, and other climate-related risks (Barbier 2006). Plant species diversity and soil microbiota are also at risk when poor agricultural management practices are in place.

Greenhouse gas emissions

Agriculture generates GHG emissions from multiple sources. Carbon dioxide (CO_2) emissions come from forest clearing and forest degradation that result in the loss of above ground carbon stocks, increased rate of soil organic matter decomposition and soil erosion, and from poor agricultural management practices. Methane (CH_4), an especially potential greenhouse gas, is released from excessive nitrogen fertilizer use and flooded rice and from ruminant livestock production systems. The IPCC estimates that between 2000 and 2010 Asia had the second highest average annual growth rates for GHG emissions from ruminants via enteric fermentation (2.0 percent/year) and manure (2.3 percent/year), and the highest growth rates for emissions from synthetic fertilizer (5.3 percent/year) (Smith et al. 2014).

Tropical peatlands, which are extensive in East and Southeast Asia, are major storehouses for carbon and biodiversity. They have been under threat from logging, fire, and land conversion for agriculture. Draining and subsequent burning of peatland areas emits large amounts of GHGs, destroys local biodiversity, including threatened species, and alters local hydrology commonly leading to land subsidence (Posa, Wijedasa, and Corlett 2011).

Environmental risks by commodity in East and Southeast Asia

The nature and relative importance of environmental risks vary for different commodities. Table 2.1 on page 14 shows that while rice and sugar cane pose a wide range of environmental risks, the risks from coffee production are greatest for soil degradation and water scarcity. The production of rubber carries the highest risk factor for biodiversity loss. It is important to note that the actual impacts depend on production practices used on farm, on patterns of land use in landscapes, and local environmental conditions, and can be significantly mitigated or even reversed through good management at field, farm, and landscape scales (see Table 2.1).

2.2 COSTS OF ENVIRONMENTAL DEGRADATION

Adverse environmental impacts of commodity production—economic, human health and ecological—are experienced at farm and local community levels and increasingly at larger landscape levels. In the case of shrimp aquaculture, poor water and waste management contribute to increased shrimp disease incidence. The results are lower yields for producers and adverse human health impacts. At the community level, exposures to chemical, bacteria, viruses, and parasites can lead to serious respiratory diseases, cancers, birth defects, and reproductive and neurological disorders (EJF 2003; Sapkota et al. 2008). Expansion of production area may result in loss of coastal habitats and interference with ecosystem hydrology. Carbon dioxide damages, in terms of air pollution alone, are worth over 1 percent of GNI in Vietnam and China.

National economic losses associated with environmental degradation are significant across East and Southeast Asian countries. Natural resources depletion, measured in terms of resource rents, ranges from 2 percent of Gross National Income (GNI) in the Philippines to 12 percent of GNI in Laos. These figures, however, do not include economic costs of ecosystem service losses that are associated with

resource extraction. For example, while forest depletion accounts for 1 percent of GNI, on average, across East and Southeast Asian countries, this figure does not include degradation of water quality, soil retention, damage to coastal zones (via nutrient pollution and sediment damage to coral reefs) thereby impacting fisheries, and other ecosystem service reductions associated with forest losses.[1] GHG emissions-related damages in these countries are also substantial.

1 Natural resource depletion is the sum of net forest depletion, energy depletion, and mineral depletion. Net forest depletion is unit resource rents times the excess of roundwood harvest over natural growth. Carbon dioxide damage is estimated to be $20 per ton of carbon (the unit damage in 1995 U.S. dollars) times the number of tons of carbon emitted.

Table 2.1 Principal environmental risks from production of commodities in East and Southeast Asia
Dark green signifies high risk, light green signifies medium risk, and gray signifies low risk.

Commodity	Geographic area	Soil degradation	Pollution	Water scarcity/ salinization	Biodiversity and habitat loss (incl. forest clearing)	Greenhouse gas emissions (from land uses and land clearing)
Coffee	Tropical uplands					
Cocoa	Tropical uplands					
Rubber	Tropical uplands					
Bananas	Tropical uplands					
Palm oil	Lowlands/ Midlands					
Tea	Tropical uplands					
Maize	Varied					
Rice	Varied					
Sugarcane	Lowlands					
Pork (Intensive Production)	Varied					
Shrimp (Intensive)	Coastal lowlands					

Sources: Synthesized by the authors from: Clay 2004, IFC Global Map of Environmental and Social Risks in Agro-Commodity Production (GMAP), and case study informants.

At a landscape level, environmental damage from agricultural production can be costly. For example, one study estimated the economic benefit of shrimp aquaculture in Thailand to be USD 10,949 per hectare (in 2000 US dollars), or USD 1,349 per hectare when accounting for subsidies (Barbier and Cox 2004). The economic cost, however, is an estimated USD 21,456 per hectare due to loss of breeding habitat, coastal protection, and carbon storage resulting from conversion of intact mangrove forests. Shrimp farmers converted half of Thailand's coastal mangroves to shrimp farms between 1975 and 1993, resulting in net losses of over USD 4 billion (Barbier 2013; Sathirathai and Barbier 2001).

Air pollution from agriculture, including carbon emissions and haze, affects multiple sectors of the economy. Indonesia's massive wildfires in 1997 and 1998 led to damages from smoke and haze pollution equivalent to USD 700-800 million (Tacconi 2003). Health effects in Indonesia include an estimated 15,600 'missing children' due to prenatal exposure to air pollution and a 2 percent increase in regional adult cardiovascular mortality (Javachandran 2009; Marlier et al. 2012). In neighboring Malaysia, the health system costs of trans-boundary smoke haze are estimated at USD 91,000 annually (Othman et al. 2014). Particulate matter can also be damaging to plants; in 2010, black carbon emissions and ozone pollution were associated with approximately USD 5 billion worth of reduced wheat production in India (Burney and Ramanathan 2014). There is also evidence that haze from landscape fires in Indonesia negatively affects oil palm yields (Casson 1999).

In the Dak Lak region of Vietnam, where coffee irrigation accounts for over 90 percent of groundwater extraction, current irrigation practices are likely to lead to water shortages in the event of drying conditions (see Figure 2.1). Vietnam's cost advantage in coffee production would improve by an estimated USD 0.10 per pound if sustainable farming practices were broadly adopted (TechnoServe 2013). Considering the country produces over 1.2 million tons of coffee per year, the economic gain of coffee production would rise significantly to total $2.6 million annually.

Table 2.2 Costs associated with environmental degradation, as a percentage of Gross National Income (2012 data)

Country	Natural resources depletion	Net forest depletion	Carbon dioxide damage
Lao PDR	12.33	2.95	0.24
Vietnam	7.85	0.74	1.24
Indonesia	4.63	0.23	0.61
Thailand	4.05	0.85	0.94
China	3.96	0.05	1.13
Cambodia	2.62	2.62	0.39
Philippines	2.21	0.21	0.31

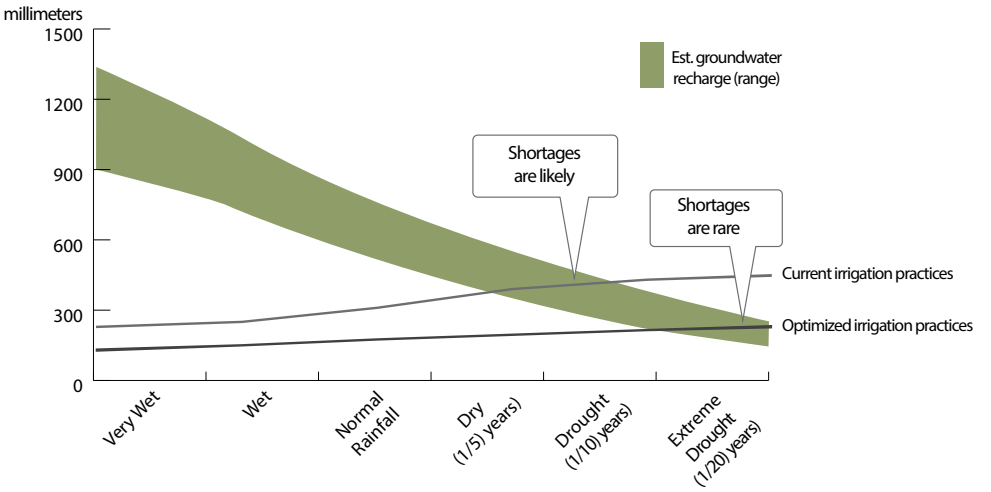

Figure 2.1 Estimates of annual groundwater recharge and extraction rates under different rainfall scenarios in Dak Lak, Vietnam
Adapted from Techhnoserve 2013

Assessing trade-offs and synergies

For policymakers, it is important to recognize that environmental degradation may be associated with benefits as well as costs, and that different types of land uses and management systems have different sets of benefits. The Alternatives to Slash and Burn research program, for example, demonstrated the types of tradeoffs of environmental, social and economic benefits across different land use options; Table 2.3 on page 20 demonstrates these for Sumatra, Indonesia.

2.3 PRACTICES TO MITIGATE ENVIRONMENTAL RISKS

Serious trade-offs are not inevitable. Modifications in production systems, resource management, and spatial patterns of land use can both substantially reduce these trade-offs, and generate synergies between environmental, economic and social benefits (Buck et al. 2007; Scherr and McNeely 2008; Milder et al. 2012).

Even without major system changes, numerous land and water management practices, at farm, community, and landscape scales, can prevent or mitigate environmental impacts. Some common examples include (WOCAT 2007; McNeely and Scherr 2003):

- Agricultural soil restoration and rehabilitation: Soil organic matter enrichment, crop rotation, appropriate tillage and management practices;
- Soil conservation: Plot-level soil management, appropriate siting of crop production within the farm or landscape, vegetative cover on farmed and non-farmed land, vegetative and earth barriers to soil movement;
- Improved management of surface or groundwater: On-site water and soil management, re-vegetation, investment in water harvesting structures;
- Improved management of irrigation and stream flow: Well-designed drainage systems, flood control structures, strategic siting of infrastructure, controlled diversion of water for irrigation and industrial/urban use;
- Improved agrochemical input management: Best practices in agrochemical application, vegetative and structural barriers;
- Permanent vegetative cover: Using cover crops, retaining areas of natural

perennial grasses, trees or palms, intercropping or retaining productive trees and shrubs in cropland;

- Native habitat restoration: Farm and community habitat networks and habitat set-asides, protected area establishment and restoration, connectivity between communities and protected areas;
- Wildlife protection in and around production areas: Maintaining wildlife access to uncontaminated water and food sources, enable mobility across farm fields, hunting and gathering at sustainable levels, using integrated pest management systems;
- Diversification of land cover: multi-cropping, using multiple crop varieties or cultivars; farm diversification; community or landscape diversification.

For greenhouse gas balances, Asia has the highest total technical mitigation potential in the world, via carbon sequestration through enhanced cropland and grazing land management, restoring organic soils and degraded lands, better practices in rice management, and reduced deforestation and degradation (see Figure 2.2; Smith et al. 2014).

Box 2.1 describes some of the environmental mitigation strategies for rice. Environmentally sustainable commodity production systems typically incorporate many of the practices in the bullets above, which represent some of the major building blocks for sustainable production standards. The spatial patterns of commodity production in agricultural landscapes, in relation to other land uses, influence these impacts, and coordinated action at a landscape scale may be needed to resolve trade-offs and realize synergies for reducing environmental risks.

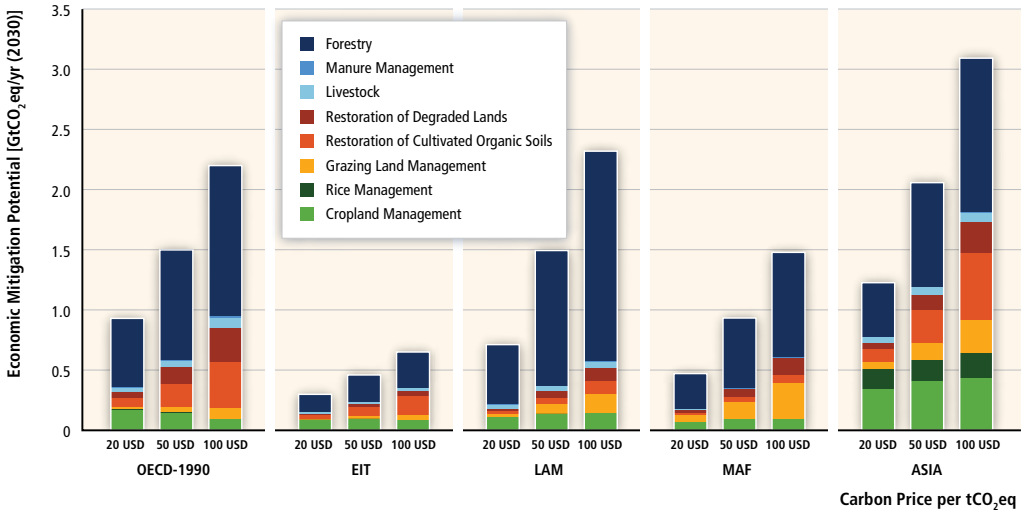

Figure 2.2 Carbon mitigation potential of agricultural practices
OECD (Organization for Economic Co-operation and Development); EIT (Economies in Transition); LAM (Latin America and Caribbean); MAF (Middle East and Africa). Source: Smith, et al. 2014.

Box 2.1 Mitigating the environmental footprint of rice

Depending upon the location, the environmental impacts of rice in East and Southeast Asia have included: groundwater depletion; reduced stream flows; waterlogging and salinization; biodiversity loss; soil health deterioration; agrochemical pollution (of water and landscapes); agrochemical damage (to soil microorganisms, beneficial insects and human health); air pollution from straw burning, and greenhouse gas emissions. These types of impacts degrade natural resources, reduce ecosystem services, impose heavy costs on human health, and potentially jeopardize long-term food security (Bhandari and Mohanty 2014).

Improved management practices. There is also a broad array of production, natural resource, and farm management techniques to reduce or eliminate these adverse environmental impacts. Some of these systems involve better water management, more judicious use of fertilizer, and the replacement of heavy pesticide use with alternative methods to protect plant health. Techniques include conservation tillage, alternative wet dry irrigation, site specific nutrient management, soil testing and precise fertilizer application, and integrated pest management (Bhandari and Mohanty 2014).

Farmers, NGOs, governments, and private sector actors have spearheaded a range of initiatives across the region to improve the sustainability of rice production. The Sustainable Rice Platform (SRP) brings many of these stakeholders together to develop guidelines and strategies that will be broadly applicable. At present, the SRP's guiding environmental principles encompass: efficient use of soil, water, nutrients, and energy; environmental protection for on-farm biodiversity, water, air, and soil quality; waste management; restricting land conversion; and climate change mitigation and adaptation.

Input use efficiency. Initiatives promoting input use efficiency have had major benefits for farmers. In 1986, the president of Indonesia abolished subsidies for pesticide use in rice production and established an Integrated Pest Management (IPM) program. These changes led to fewer pest outbreaks, higher rice yields, less money spent by farmers on pesticides, and more than USD 1 billion saved by the Indonesian government over ten years. In China, field experiments demonstrate that integrated soil-crop management practices can increase yields from 7.2 Mt/ha to 8.5 Mt/ha without any increases in nitrogen fertilizer application. These results suggest that a country with comparatively high rice yields can increase production even further, and reduce greenhouse gas emissions in the process, by managing reactive nitrogen losses and employing ecological farming techniques that carefully manage crop varieties, sowing dates, planting densities, and nutrient management practices (Chen et al. 2014).

System of Rice Intensification (SRI). The System of Rice Intensification (SRI), introduced in the 1980s, is another agro-ecological methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients. Over the last 30 years, SRI has evolved into a suite of flexible cropping principles, including reducing plant population, improving soil conditions and irrigation methods, and improving plant establishment methods, that are adaptable to local conditions. It is estimated that some 4 to 5 million farmers in over 50 countries around the world use SRI in whole or in part, with demonstrated benefits including yield increases, reductions in required seed, and significant water savings (SRI-Rice n.d.). SRI management leads to larger, more effective root structures and an increased abundance and diversity of soil biota (Uphoff 2012). Crops with these improved root structures and soil life are more resilient to droughts, storms, and other climatic shocks, leading SRI practices to be applied to other crops as well (Abraham et al. 2014).

continued on next page

Box 2.1 continued

Across Asia, SRI is gaining ground particularly as a way to increase food security. Governments have implemented SRI programs in each of the four countries producing two-thirds of the world's rice: China, India, Indonesia, and Vietnam (Uphoff 2012). In China, SRI is becoming the main rice cultivation system in much of the southern part of the country. These SRI production areas are using less water and fertilizer and are simultaneously boosting production beyond the national average of 6.6 tonnes to achieve 8 to 11 tonnes per hectare (IRIN 2012). In Vietnam, over one million farmers were reportedly using SRI by 2011, representing 10 percent of all rice growers in the country, after initial studies in the country demonstrated healthier rice fields and plants, reduced production costs, reduced water consumption, and increased profit. (Dzung 2012). The country is also using SRI and other forms of lower input rice production to meet its goal of reducing greenhouse gas emissions in wet rice production by 15 to 20 percent by 2020 (VietNamNet Bridge 2015).

Landscape initiatives. Landscape-scale rice initiatives are less common. In one Cambodian example, farmers living on or adjacent to protected areas received higher rice prices in exchange for protecting species such as the endangered Giant Ibis. Farmers who agreed to limit their hunting and forest clearing practices were able to sell their output through the Wildlife Friendly™ brand. The project succeeded in decreasing habitat clearing by 50% among participating farmers (Nielsen, Ashish, and Clements 2015). In the Philippines, small-scale communal irrigation schemes created better-paying jobs that reduced incentives to clear forest and extract products in upland areas. Annual forest clearing by upland households adjacent to the lowland irrigated area declined by 48 percent (McNeely and Scherr 2003).

In Vietnam's Mekong Delta region, efforts to reduce greenhouse gas emissions associated with rice are being scaled up through landscape-scale initiatives that also increase input use efficiency. Thus, collaboration among stakeholders such as farmers, conservationists or governments, and private companies can certainly lead to greener, more productive rice systems.

Table 2.3 ASB summary matrix: forest margins of Sumatra, Indonesia

	Global Environment		Agronomic sustainability	National policy-makers' concerns		Adoptability by small-holders
	Carbon sequestration	Biodiversity	Plot-level production sustainability	Potential profitability (at social prices)	Employment	Production Incentives (at private prices)
Land Use	Above ground, time averaged (metric tons per hectare)	Above ground plant species per standard plot	Overall rating	Returns to land (US$ per hectare)	Average (days per hectare per year)	Return labor input to labor (US$/day)
Natural forest	306	120	1	0	0	0
Community-based forest management	136	100	1	11	0.2	4.77
Commercial logging	93	90	0.5	1,080	31	0.78
Rubber agroforest	89	90	0.5	506	111	2.86
Oil palm monoculture	54	25	0.5	1,653	108	4.74
Upland ricebush fallow rotation	7	45	0.5	(117)	25	1.23
Continuous cassava degrading to imperata	2	15	0	28	98	1.78

Note: Natural forest and land-use systems are scored against criteria (global environmental benefits, agronomic sustainability, profitability, labor, and incentives) that are import for a diverse range of stakeholders in the landscape. Adapted from Tomich and others 1998.

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CONCEPTUALIZING POLICY OPTIONS TO REDUCE THE FOOTPRINT

3

Current systems of agricultural commodity production in East and Southeast Asia have generated widespread environmental damage and accelerated climate change. The economic and non-economic costs are substantial, including threats to sustained growth in commodity sub-sectors. How should policymakers approach this challenge in formulating national and local responses? This chapter considers a wide range of policy options. It first discusses the barriers and disincentives that keep producers, land managers and agribusinesses from adopting the many available practices that mitigate environment risk, and reviews the many measures that can be taken by private and civil society sectors actors to address those challenges. It then systematically reviews the wide range of potential roles and policy instruments that can be deployed by governments, both national and sub-national. Conditioning factors that influence the suitability of a given policy instrument to achieve environmental and other objectives are discussed. This framework for considering policy options will be used in Chapters 4 and 5 to evaluate policy experience to date and inform ideas for future directions.

3.1 BARRIERS AND DISINCENTIVES

Many factors constrain, inhibit, or pose barriers to agricultural producers for adopting risk mitigating practices or undertaking associated investments. In some cases, producers may be unaware of the environmental consequences of their actions or potential mitigation measures. Their economic situation may make capital investment costs or opportunity costs of shifting practices too high in the short term. In other cases, prevailing policies or market conditions may discourage more environmentally sustainable practices or even facilitate environmentally degrading practices. In addition, stakeholders may be unable to effectively perform key functions or to undertake collective action due to coordination or operational barriers at community, landscape, or commodity value chain levels (Kissinger, Brasser, and Gross 2013; Mankad, Negra, and Gross 2014; Shames, Hill Clarvis, and Kissinger 2014).

Economic incentives for resource degradation

For some producers, and in some commodity landscapes, environmentally-degrading practices generate net economic benefits in terms of yield, cost or income. The financial incentives for agricultural expansion into natural areas can be quite strong in lowland rainforests and other ecosystems, despite their value globally as carbon stores and habitat for biodiversity (Fisher et al. 2011). The opportunity cost of leaving land in natural habitats may be high in terms of profits derived from land clearing, timber harvesting, and commodity production. In Vietnam, for example, the profits from clearing mangroves, with subsequent expansion of shrimp aquaculture production, are particularly high. Similarly, there may be high short-term financial gains from over-use of agrochemicals in production, while the costs of water pollution are born by others. Sometimes policies in other sectors unintentionally

result in financial incentives for degradation, as in the case of some biofuel energy subsidies.

Weak market demand for sustainably produced products

In some cases, investment in environmentally friendly production will not make economic sense without enhanced market demand. Yet, with the exception of Arabica coffee and cocoa, for most East and Southeast Asian commodities there is not sufficient international market demand for sustainably produced goods to bring about a voluntary shift in practices at scale, as illustrated by the fact that the majority of the product from certified farms is sold as conventional produce (Harvey et al. 2013). In most domestic markets, growing concern about food safety (in particular pesticide residues) has just begun to spill over into pressures for common production practices to also become more environmentally sustainable.

Data and information gaps

Lack of data, knowledge and information is a barrier to adoption of risk-mitigating practices on farms and supportive policies at the national level. Severely deficient monitoring and evaluation (M&E) and data systems in the public sector serious limit the ability of policymakers to design policies and incentives to deliver desired results. Relevant information and local facilitators are often needed to initiate discussions and raise awareness among stakeholders. Other than China, most countries in the region have not conducted systematic assessments of non-point sources of water pollution and therefore lack the necessary knowledge base for targeting policy instruments toward commodities that are the most significant sources (FAO 2013). Information gaps are exacerbated by the decline of extension services, weak incorporation of local knowledge into research programs, and absence of real-time data for planning that affect countries in the region (Harvey et al. 2013). Bridging these data and communication gaps is critical for the training and capacity building that is needed to assist land users and managers in shifting to more sustainable practices.

Regulatory gaps

Regulations play an important role in: creating, limiting, and constraining rights and obligations; mandating, limiting or prohibiting certain activities and practices or the uses of certain technologies; protecting various stakeholders (i.e., farmers, community members, consumers) from potential harm; controlling against undesirable externalities; ensuring adequate information; and influencing incentives. Yet in most East and Southeast Asian countries, the enabling regulatory environment is not in place to make the "business case" for sustainable production. Historically, major barriers to improving commodity production have included weak or absent mandates for environmental impact assessments and for free and prior informed consent processes (resulting in few restrictions on livestock farming, poor protection of water supply catchments, etc.) and lack of enforcement for restrictions on agrochemicals, national or local standards, and landscape-scale land and water use zoning.

Weak administrative coordination

Coordination across ministries, administrative units, and scales of government is important to facilitate effective environmental risk mitigation. Government agencies in East and Southeast Asia, especially with the devolution of authority in Indonesia, Vietnam and elsewhere, tend to have divided responsibilities (Harvey et al. 2013; FAO 2013; Newton, Agrawal, and Wollenberg 2013). This 'siloing' amplifies many of the barriers described above,

including by inhibiting effective spatial planning processes that could improve how agricultural concessions are granted.

Weak technical coordination

Historically, when compensation and technical assistance programs have been put in place, they are often uncoordinated or ad hoc and may lead to conflicting programs in the same geographic region (ADB 2012; Salehin 2011). For example, extension messages to farmers may conflict for different crops or between production, conservation, and climate adaptation programs.

3.2 RESPONSES BY THE PRIVATE SECTOR AND CIVIL SOCIETY

There are numerous ways in which private businesses and civil society organizations can take action, either on their own volition or through partnerships with government, to overcome these barriers to adopting more sustainable practices or mitigating environmental risks and impacts. Examples include:

Voluntary mitigation measures

- Company internal policies, including those pertaining to own production practices, input use and management of waste.
- Donor-funded programs that directly support farmer organizations and local companies to catalyze/facilitate action.
- Voluntary environmental offsets (e.g. for carbon, biodiversity, or water) or other measureable actions to compensate for environmentally degrading practices.

Collective action

- Producer organizations or groups of companies join forces to address problems through voluntary action (pre-competitive).
- Development and application of industry or sub-sector production process standards or codes of practice.
- Multi-stakeholder platforms led by civil society to negotiate agreed action plans that address landscape-scale problems and opportunities.

Citizen advocacy

- Consumer boycotts or other actions against individual companies or sub-sectors.
- Local citizen protest movements against individual companies or sub-sectors.
- Civil society campaigns to modify norms or awareness of producers and buyers.
- Civil lawsuits for environmental damage to property, health, etc.

Promoting technological change

- Technical innovations that reduce costs or increase production or revenues while also improving environmental performance.
- Civil society-led technical assistance programs for producers.
- NGO support for producer learning hubs.

Establishing financial incentives for good environmental management

- Product certification and labeling schemes.
- Private payments for ecosystem services (e.g., biodiversity conservation, watershed protection).
- Insurance policies that advantage business using environmentally responsible practices.
- Private financial institution screening for environmental performance.
- Retail company policies to procure from environmentally sustainable sources.
- Concessional financing by private banks to promote better practices.

These measures vary greatly in scale and scope. Some are led by civil society and others by private companies, coalitions, or associations. While there is limited evidence in East and Southeast Asia of success

in reversing environmental degradation at significant scale through use of voluntary standards, certifications, and labels, these mechanisms are gaining traction. This is primarily due to demand from international buyers attempting to demonstrate effective environmental action that is increasingly mandated by regulations in developed countries or by voluntary corporate standards, such as the Consumer Goods Forum commitment to deforestation-free supply chains (Giovannucci and Purcell 2008; Mankad, Negra, and Gross 2014; The Consumer Goods Forum 2013). It is notable that certification is evolving from an instrument primarily of the private sector to one that is increasingly government-led. Private agribusiness has also begun to invest directly, and collaborate in landscape partnerships, to mitigate risks of climate change, water scarcity and community relationships, in order to secure supply in key sourcing regions (Kissinger, Brasser, and Gross 2013).

3.3 GOVERNMENT POLICY

While very important, these individual and collective private actions to spur effective environmental stewardship in commodity agriculture often have significant limitations of scale and scope. Government action—at local, provincial, and/or national levels—is often needed to address improper or incomplete **rules**, including norms, standards, regulations, and laws; shift prevailing **incentives** to alter the economics of action or inaction by players in agricultural commodity supply chains; and/or improve the quality and availability of pertinent **information**, including technical knowledge and capacity building that enhances the ability of stakeholders to understand the nature and consequences of adverse environmental impacts and to apply technical, managerial, or other solutions. Crafting effective policy requires strategic decisions about the priority roles of government, as well as thoughtful selection and design of appropriate policy instruments.

Roles of government

For simplicity, five types of roles that governments may play in this sphere are posited here: Definer, Regulator, Enabler, Funder, and Advocate. While globally the role of "Regulator" has been the most widely used in environmental policy in agriculture, the other roles can be just as powerful, or may need to be in place before regulation can be effective.

'Definer': Government sets goals, norms, and milestones for a pathway or vision for environmental performance in commodity landscapes. This vision may be embedded in national green growth strategies, progressive agricultural sector strategies, regional development strategies, and/or strategies for improving the competitiveness of particular sub-sectors.

'Enabler': Government encourages and facilitates processes for voluntary action through a mix of information and incentives. Government actively supports better production through procurement, national research and development (R&D), agricultural extension, and/or support for national and international certifiers.

'Funder': Government provides financing directly or indirectly for investments to reduce environmental impacts. Public revenues of national, sub-national, or local governments are allocated to direct investments by public agencies (e.g., to undertake public works to restore land or improve irrigation systems to avoid salinization or increase water use efficiency) or to finance practices implemented by private land managers (e.g. to share the costs with landowners for restoring riparian areas).

'Regulator': Government establishes and enforces the 'rules of the game' for sustainable production and resource management. Perverse incentives are reversed

Table 3.1 Government roles and instruments in environmental mitigation

Role	Instrument
Definer	• High-level political endorsement and advocacy for Agriculture Green Growth strategy and specific goals • Mechanisms for ministerial coordination across agriculture, environment, and related sectors • Designation of decision-making authority across national, state, and local government levels • Institutional support for multi-stakeholder landscape dialogue, planning, and coordination
Enabler	• Promotion of supply chain eco-standards, eco-certification, pre-competitive action • Institutional frameworks for private payments for ecosystem services • Public procurement of sustainably sourced commodities • Public investment in infrastructure to mitigate environmental risks • Technical assistance for land managers and businesses • Research for technology innovation and adaptation • Information systems (e.g., land and soil maps; climate risks) • Packaging environmental action within large, multi-sector green growth initiatives
Funder	• Producer subsidies to reduce cost of investments or transitioning to improved practices • Organizational subsidies to reduce cost of collective action/investment • Public payments to landowners/land managers for ecosystem services • Bonds and deposit refund systems (i.e. environmental performance, land reclamation, waste delivery, and environmental accident bonds) • Preferential access to bank finance for environmentally friendly producers/processors • Improved practices adopted in state-owned enterprises
Regulator	*Land use regulation* • Establish norms for human and ecosystem health • Direct regulation of private land use or management practices • Direct regulation of processing industry • Zoning and land use planning, including generating spatial information at granular scale • Tenure and access rules for land and resources (including concession policy, appropriation of production lands for nature protection) • Monitoring of environmental management and ecosystem health *Financial and market regulation* • Market and trade rules • Framework for private standards • Regulation through creation of cap and trade/floor and trade markets (e.g., nutrient trading, carbon offset trading) • Taxation of environmentally harmful practices or products • Environmental screening or review of agricultural investments • Liability systems (i.e. legal liability, enforcement incentives, damage liability) • Regulatory relief for environmentally friendly companies
Advocate	• Raising awareness of resource managers or users • Public media campaigns to educate citizens/consumers/buyers/investors • Public dissemination of monitoring data and evidence • Mobilizing and supporting allies and advocates

through coordinated, complimentary regulation at the national, provincial, and local scales. Where necessary, direct regulation prevents environmentally harmful practices and incentives to promote better practices are established.

'Advocate': Government mobilizes public support for the 'vision' and implementation of private and civil society actions and investments to achieve sustainable production and green outcomes. Government agencies at any level may raise public awareness through information campaigns, invite citizen and business action, and actively convene multi-stakeholder dialogue or initiatives.

Policy instruments

For each of these roles, there is a wide range of specific policy instruments that can be deployed. Examples are presented in Table 3.1.

3.4 FACTORS CONDITIONING THE CHOICE OF POLICY INSTRUMENT

Numerous factors influence the appropriateness or likely effectiveness of a particular policy instrument in relation to particular locations, environmental risks, and commodities. Figure 3.1 illustrates the exogenous and endogenous (i.e., industry-specific) factors that, in combination with the capabilities of key actors, shape the outcomes of policy selection and implementation. Some of these factors are static or slow to change. Other factors may be more dynamic such as when commercial decisions shift the nature or demands of external markets or market segments. Such shifts may be accompanied by changes in environmental safeguards required by international buyers and specified methods to ensure compliance with these requirements. There may also be step-wise shifts in local capacities such as with the completion of a credible database covering one or many environmental indicators, the commissioning and certification of a new laboratory, etc.

Exogenous factors can include:

- Agro-ecological conditions: Mosaic landscapes with many land managers vs. contiguous monocultures; hydrological features;

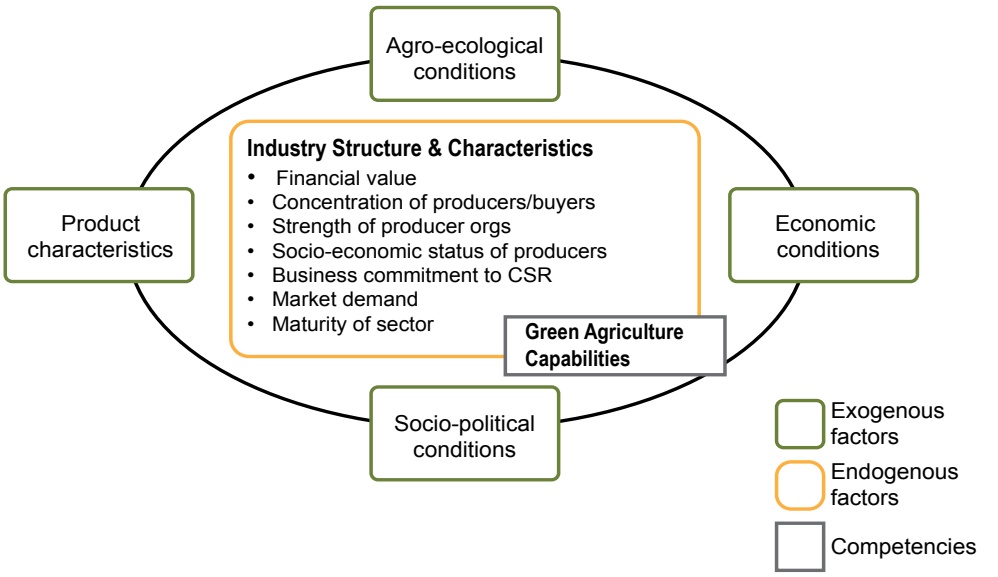

Figure 3.1 Factors conditioning the relevance and effectiveness of policies to improve environmental performance of commodity agriculture

- Economic factors: The financial value of the commodity relative to environmental values; the capacity of ecosystem service beneficiaries to pay; the sophistication of financial services; the role of the crop/commodity in livelihood strategies; distance to markets;
- Socio-political factors: The relative political power and legal rights of land managers vs. ecosystem beneficiaries; citizen awareness and environmental values and norms; demographic pressure; level of corruption; the strength of national vs. decentralized government units; and
- Product characteristics: Perishability, sensitivity to management; visibility to buyers or consumers; target market (quality).

Industry structure and characteristics affecting policy choice include:

- Production system: concentrated vs fragmented;
- Commodity industry: Agro-industry concentration/leadership; degree of vertical coordination; financial value of the commodity;
- Producers: Strength of producer organizations; socio-economic status of commodity producers;
- Business commitment to social responsibility and sustainable supply chain management;
- Market demand for sustainably-produced commodities; business competition; and
- Stage of industry development (incipient, growth, mature).

Green agriculture capabilities of farmers, firms, NGOs and government entities also matter. These relate to:

- Requisite knowledge and skills: R&D/technology transfer systems; information and monitoring systems;
- Infrastructure: including testing laboratories;
- Data quality: data on environmental hazards; data regarding cause-effect of best practices on environment; and
- Planning: Existence of platforms and norms for stakeholder dialogue, negotiation, and planning for agriculture and environment; readiness for change.

Importantly, there can be a path-dependent aspect of policy selection, which may inhibit experimentation with alternative policy approaches. Once a disruption, such as a significant environmental crisis, opens the door to policy action, an initial response may be to apply familiar policy instruments (i.e., those policymakers have used in the past), even if these are not well-suited to the specific crisis or broader context. In a best case scenario, the application of these familiar policy measures will be a positive response and will evolve, with experience, into better-adapted instruments. Similarly, policy measures tend to extend the production orientation of previous policies. For example, targets set for hectares and tons of undifferentiated commodities are shifted to mandates for hectares and tons of more sustainably produced commodities, or subsidies for chemical inputs are replaced by subsidies for organic inputs.

In the context of East and Southeast Asia, a substantial body of evidence on these conditioning factors and path dependencies does not exist, nor is there much investigation on the relative effectiveness of different policy instruments and the interplay among them. By focusing attention on the recent history of policy action in six large landscapes with extensive areas under commodity agriculture, these factors can be better understood and the relative value of different policy roles and instruments considered.

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4

PROGRESS AND CONSTRAINTS: INSIGHTS FROM SIX LANDSCAPES

The realities of environmental degradation associated with commodity production, described in Chapter 2, have resulted in significant policy responses over the past two decades in all of the countries of East and Southeast Asia. In this chapter, we describe the overall state of national policy in the region, then present a summary of the six case study landscapes (which are presented in detail in Chapters 6-11) that illustrate different facets of that experience. We assess and compare those experiences in relation to each of the government roles as Definer, Regulator, Enabler, Funder and Advocate, and suggest some next steps to advance policy in each of those landscapes. We then reflect on what those experiences can teach us in terms of the drivers for policy action, trajectories of policy response, triggers for more transformative policy action, and factors still constraining policy action.

4.1 STATE OF NATIONAL POLICY IN EAST AND SOUTHEAST ASIA

This section briefly describes the national policy context within which to evaluate the experience of the six case study landscapes.

The national context of environmental policy in relation to agricultural commodities

To some extent, all the governments in the region have approached environmental policy through all the roles described in Chapter 2: as a Definer of goals, a Regulator, an Enabler of voluntary action, a Funder and an Advocate. Most of the countries now have a vision for green or sustainable agriculture, typically embedded in national green growth strategies, yet more fleshed out within recent agricultural strategies or 'modernization' or 'restructuring' plans. Whereas agricultural strategies formerly devoted nearly all attention to goals related to productivity, food security, and farmer welfare, the more recent renditions also more clearly draw the two-way connections between agriculture and the environment plus include specific programs to realize climate change adaptation and mitigation goals. Nevertheless, sustainable agriculture strategies generally retain a two-tier hierarchy of objectives with the top tier being socio-economic (growth/income/trade/value addition) or food security goals and the second tier addressing environmental sustainability challenges. These are reflected in continued patterns of public expenditure in agriculture and the relative prominence of different programs.[1]

The current state of agro-environmental policy in the region reflects several phases of public action over the past quarter century. The period from the mid-1980s through the 1990s saw many countries in the region signing on to an array of international environmental conventions and putting in place multi-sectoral legislation and regulations pertaining to environmental management. These included measures related to clean air, water, solid waste or other dimensions of pollution control,

1 For example, in 2012 Indonesia spent USD 1.5 billion on fertilizer subsidies. This was 20 times its public expenditures on agricultural education that year and 25 times the expenditures for agricultural health and food safety inspection programs.

regulations requiring environmental impact assessments for major investments, restrictions on the use of permitted chemicals and other substances, the creation of protected areas, and regulations governing multiple classifications of land use and how land could be converted to other uses.

Since 2000, much of the earlier legislation has been amended to be more specific and to incorporate international best practice. Enforcement has now become a responsibility for both national agencies and local government units. A growing number of other approaches beyond direct regulation are being applied. Taxes, subsidies or other incentives have been introduced to induce better environmental practice in agriculture. For more than a decade, many systems of payments for ecosystem services have been piloted around the region, involving government, local NGOs, research institutes and development agencies. Most have focused on forest stewardship, reforestation and establishment of agroforestry systems, but there are also pilots to pay for improved agricultural practices that generate climate, water or biodiversity benefits.

Many schemes—led either by government or the private sector—are promoting 'good agriculture practices' and associated standards, and 'eco-certification' for particular commodities, especially for tree crops and aquaculture. An array of public-private partnership schemes are seeking to implement 'roadmaps for sustainable commodity X'. Action plans for climate change adaptation and mitigation in agriculture have been adopted by many countries.

Also, greater attention is now being given to the science and the diagnostics of 'green' agriculture, although this is still incipient with many gaps in knowledge and in the cause-effects of the applications of good environmental practice in agriculture. National awareness of agriculture's environmental footprint and the scope for changing this is increasing. This has been the result of increased research, education, and media coverage.

Achievements and limitations of current policy

While the specifics vary from country to country, throughout the region we observe, and recent country analyses have documented, the following achievements and limitations of current policy. This subsection was informed by a set of country case studies based on reviews of national policy documents, commodity sub-sector plans and reporting documents, key informant interviews, and round-table expert discussions. These investigations were commissioned by the World Bank to cover: Indonesia, researched by Leimona et al. 2015; Philippines, from the findings of Tiongco et al. 2015; and Vietnam from the research of Nguyen et al. 2015.

Fewer regulatory gaps yet sustained challenges for enforcement and implementation. Steady gains are being made in modernizing agro-environmental regulations, drawing upon better knowledge and global good practice. Yet, enforcement remains problematic. At the national level, multiple entities—ministries of agriculture, environment, and agrarian reform—have overlapping functions and often are working with different versions of land use or water resource maps. With the pursuit of decentralization policies over the past two decades, an array of powers and authority for the implementation of land use plans, enforcement of environmental regulations, and oversight for agriculture and resource conservation programs have been delegated to provincial, district or other local level government units. Varying capacities, together with potential conflicts between conservation goals and local revenue raising imperatives, has led to very inconsistent patterns and progress in different

locales. In areas where agricultural potential is high and where provincial or local entities have the incentives or requirements to raise local revenues to perform government functions, there have been tendencies toward over-development/over-expansion of commodity production, often to the detriment to the environment. The lack of reliable data (e.g., hydrological models; fish resource stocks) hinders effective enforcement in some areas. While satellite imagery is increasingly used to monitor land use changes, this technology has thus far been primarily used for research and not extensively for regulatory enforcement purposes. A common result is wide divergence between land use plans and the situation on the ground.

Continued predominance of "reactive-rehabilitative" strategies. A majority of East and Southeast Asian agro-environmental policy continues to be *reactive* to outside pressure from buyers, consumers or external regulators; and *rehabilitative*, with measures taken only after serious environmental consequences have been manifested. The policy response most commonly involves efforts to clean up physical damage, as well as the damage to the reputation of the product or producing region or country. Such reactive strategies reflect a poor understanding of the underlying risks and have often been very costly—for people, nature, and business. It is less common to see *proactive* strategies aiming to prevent degradation from occurring, though these are beginning to emerge as a result of more realistic assessments of potential operational and environment risks, and growing recognition of the economic opportunities that can arise from innovations that save costs, improve work or living conditions, or differentiate products in the market.

Some convergence is occurring but many agricultural promotion policies and programs still conflict with environmental policies. For example, measures to control water pollution in rural areas commonly co-exist with fertilizer subsidy policies and the promotion of intensive, concentrated livestock production. High public expenditures on input subsidies may fiscally crowd out programs of government environmental management oversight or programs to facilitate better practices. Efforts to conserve fisheries and promote fishery resource (co-) management occur in the same locations where fuel and/or boat-building subsidies are provided to fishers and incentives are offered that expand the fish processing capacity of local companies. Efforts to restrict farmers from cutting trees and cultivating steep slopes are being undermined by the promotion of new investments in nearby ethanol plants with large feedstock requirements. Many governments have waived or subsidized water and irrigation service fees to increase farmer incomes, yet this has contributed to improper water management, often in ways that also generate increased GHG emissions. Countries pursuing policies to realize self-sufficiency in food and feed grains have posed restrictions on lowland/irrigated land uses and supported varietal and infrastructure development to increase the frequency of crops grown on the land within a year. This can and has contributed to soil degradation, water pollution, and higher pest and disease incidence (raising the use of pesticides). In an effort to support the expansion of industrial crop production, land concessions have sometimes been granted in and around forested areas, including areas of High Conservation Value. This has made environmental mitigation quite challenging as the concession holder needs to clear the land in order to develop it. And, in some cases, the concessions have resulted in the displacement of communities, often to more marginal areas where the production and environmental risks are high.

Despite widespread innovation, environment-friendly commodity production has not been achieved at any scale. There has been a rich body of policy and program innovations in environmental management of commodity agriculture in East and Southeast Asia over the last two decades, as will be evident from the case study landscapes described below. However, today most export commodity production areas in the region are still facing serious environmental problems. It is unusual for more than 15 to 20 percent of the production of any of the focal commodities to be certified under one or another standard, and the fragmented spatial pattern of certification has limited aggregate environmental benefits. It has been challenging to involve large numbers of smallholder farmers in these schemes, when farmer organizations are not strong. Scaling up PES pilots into national programs has been difficult. Public investments in 'greening' agriculture probably represent less than five percent of the value of investments in increasing export production and marketing capacity. Thus, this is a good moment to take stock of experience in some of the most innovative commodity-dominated landscapes across the region, and begin to draw lessons for scaling up effective policy and practice.

4.2 OVERVIEW OF CASE STUDY LANDSCAPES

To understand the application of diverse policy instruments to improve environmental performance in East and Southeast Asia, this study drew on six case studies of commodity production landscapes. These cases were selected to reflect a range of commodities, institutions, policy instruments, and types of environmental risks and business risks for commodity producers. Selection also accounted for the interest and commitment of key informants to assist with the case study, who included: local officials; national policymakers (in agriculture, environment and finance ministries) whose portfolios are relevant to in-landscape issues; private agribusiness companies for which the landscape represents a key operational or sourcing region; farmer representatives; and researchers with expertise in evaluating policy measures. A standard interview guide was used and adapted for different sub-regions.

Palm Oil in West and Central Kalimantan: land use planning and establishing policy frameworks to enable sustainable production

Context.[2] Indonesia is the world's third largest producer, consumer, and exporter of palm oil. Palm oil exports, at over $12 billion per year, represent Indonesia's third largest export earner, after crude oil and natural gas. The Indonesia palm oil sector has experienced continued rapid growth with a 17 percent average annual increase in production between 1985 and 2009. The industry, whose structure combines large plantations and many smallholder producers, provides the main livelihood or source of employment for nearly 5 million people. The West and Central Kalimantan region accounts for some 14 percent of national palm oil production, and the island as a whole (including Malaysian Borneo) has the fastest growth rate in palm oil production in Indonesia with total cultivation area increasing by 1.4 million hectares from 2007-2011 (USDA FAS 2013).

Environmental risks and impacts. As elsewhere in Indonesia, Kalimantan's expanding palm oil industry has had a very large environmental footprint with adverse impacts felt locally, regionally, and even globally. Rapid expansion has contributed to significant deforestation (from intentional land clearing and unintentional

2 See Chapter 6, "Palm Oil in West and Central Kalimantan, Indonesia"

fires) posing threats to many areas of High Conservation Value (HCV), to biodiversity of both local and global importance, and to regional air quality. Some palm oil expansion has occurred, and continues to occur, on carbon-rich drained peatlands. Poor management practices, including overuse of fertilizers and chemical pesticides and degradation of riparian areas, have led to river siltation, soil erosion, water pollution, subsidence (of peat areas), and flooding. A 2010 report suggests that 85 percent of Indonesia's greenhouse gas emissions stem from land-use activities, with 37 percent due to deforestation and 27 percent due to peat fires. Even in non-drought years emissions from peatland fires can be significant (Gaveau et al.2014).

Incentives for mitigation of environmental impacts. These manifold environmental risks and impacts have given rise to domestic and international pressures to shift production practices and the growth trajectory of the palm oil industry. Domestic civil society organizations have sought to protect land and other resource use rights of communities in areas experiencing palm oil growth. National and international pressure is being applied to reduce greenhouse gas emissions associated with draining and burning of peat swamps and to protect endangered animal species. Agro-industrial companies are facing reputational risks and pressures from selected overseas buyers to adopt more sustainable practices. However, demand (and the willingness to pay) for 'sustainable palm oil' is still low as it is an invisible ingredient in large numbers of consumer products and as global demand increasingly shifts to emerging country markets. Nonetheless, some 17 percent of Indonesian palm oil is certified by the standards of the Roundtable for Sustainable Palm Oil, RSPO (IISD 2014).

State of policy action. In Kalimantan, the main government role has been as Regulator and more recently Definer. Natural resource management has benefited in some areas from decentralization of decision making power to local regulators in the context of Central Kalimantan. The Governor of Central Kalimantan has, in response to the threats posed by oil palm cultivation, implemented regulations to support communities' resource rights, opened up the province to pilot testing with the UN Reducing Emissions from Deforestation and Degradation (REDD), and required companies to monitor and report on social and environmental impacts. The Governor did so through a decree and provincial regulation that provides increased recognition of indigenous land rights and ensures a collaborative mapping process between civil society, local government, and the Ministry of Agriculture. The mapping process and online database are intended to provide greater clarity of land ownership and allocation of licenses for production.

Coffee in Dak Lak, Vietnam: from growth to sustainability

Context.[3] In the wake of a land reform and program to encourage migration in the country's Central Highlands region, Vietnam experienced an unprecedented expansion—by some 400,000 hectares--in coffee plantings during the 1990s. Subsequent additional plantings plus yield improvements have led Vietnam to become the world's largest producer and exporter of Robusta coffee. Vietnam now accounts for 60 percent of global Robusta trade, features the highest yields in the world and the lowest unit costs. The industry provides a livelihood for about half a million smallholder households and a supplemental income for half a million seasonal workers. Production is concentrated in a few provinces with Dak Lak accounting for nearly one-third of the total.

3 See Chapter 7, "Coffee in Dak Lak, Vietnam"

Environmental risks and impacts. The rapid expansion of the coffee sector in the 1990s and early 2000s was associated with high levels of deforestation, biodiversity loss, and land degradation. More than 20 percent of the coffee planted in Dak Lak has been in areas considered unsuitable for coffee due to soil, topography, water availability or other factors. Production has tended to feature heavy, if not excessive, rates of fertilizer use and heavy water extraction, including from groundwater sources, to ensure high yields. The result has been soil acidification and periodic water shortages in the growing region. A lack of hydrological survey data inhibits a good understanding of the problem. Thus far, regulatory measures, including licensing of groundwater extraction, and fining for excessive water use, have been little applied.

Incentives for mitigation of environmental impacts. Coffee accounts for nearly half of the GDP of Dak Lak Province and sustainable livelihoods associated with coffee are critical to the economy of this and several neighboring provinces. At the same time, there is emerging competition between coffee, other tree crops, and non-agricultural sectors (i.e. hydropower; ecotourism) for land and water. Patterns of climatic change have become evident and are likely to pose greater risks in the future. Many farmers are currently making a long-term investment by uprooting and replanting coffee with the help of local government initiatives. Significant investment by the public and private sector is seeking to use a spatially coordinated approach to increase the long-term viability of the sector.

State of policy action. In Dak Lak, the main government role at national level has been as Definer, and at sub-national level as Regulator. Dak Lak and the Central Highlands generally have mostly been exposed to policies promoting production. However, there is a trend toward incremental environmentalism as the consequences of uncontrolled growth become more evident. Recent pilots and applied research demonstrate the technical feasibility and the economic and environmental benefits of certain changes in land use, agronomic and water use practices. The dissemination of this information, and associated farmer training, has contributed to an increase in the share of production (to more than 20 percent) taking place under certified or certifiable sustainable practices. Complementary efforts, including effective regulatory measures, are needed, however, as the primary standard being used does not have stringent requirements for either water resource management or biodiversity protection. The creation of a new public-private industry coordination body offers the potential for improved coordination of sustainability initiatives and improved sector governance overall.

The current need by many farmers to access long-term loans in order to finance coffee replanting offers an opportunity to leverage such financing by requiring borrowers to undertake a range of measures (i.e. soil testing; planting of shade trees; applying water saving technologies) to reduce their environmental footprint. New programs are being put in place to do this. However, the sustainability of coffee production cannot only be pursued farm by farm. In Dak Lak coffee accounts for 70 percent of the water used. It is necessary to eliminate excessive nitrogen and especially phosphorus flows from the land to the rivers and coastal zones; this requires land management interventions and hydrological assessments from the top to the bottom of the landscape. The relationship between coffee production and other land uses and livelihood strategies in local communities and watersheds needs to be better understood and the available resources better managed by different stakeholders.

Efforts to pilot some spatial approaches to natural resources management are just taking shape.

Shrimp aquaculture in Ca Mau, Vietnam: dynamic drivers and public and private sector interventions

Context.[4] Vietnam ranks third in the world in seafood exports, with the industry totaling close to USD 7 billion in annual export receipts. The shrimp sector, in particular, has seen exponential growth, with an increase in value of exports from USD 662 million to USD 3 billion from 2000 to 2013 (FAO FishStat 2014). Ca Mau, a lowland coastal peninsula at the southernmost point of Vietnam, accounted for 21 percent of national shrimp production in 2009 (Phung Ha et al. 2014). With over 250 km of coastline and an extensive network of rivers and canals, this unique landscape has allowed Ca Mau to support a strong fishing industry and aquaculture sector for decades. Much of the former rice-growing land in this province has been converted over to aquaculture or rice-aquaculture rotations dominated by extensive (low stocking density) shrimp production.

Environmental risks. There are two central environmental risks with respect to shrimp aquaculture in Ca Mau. First, the rapid expansion of farming areas, initially for rice fields and later for shrimp ponds, led to massive destruction of the dense mangrove forests that historically characterized the landscape. Between the 1970s and 2010, the estimated area under mangroves fell from 200,000 hectares to 64,500 hectares. Second, the rapid area expansion of shrimp production has contributed to water pollution. Silt deposits together with shrimp waste are often released into the rivers and canal systems without proper treatment, contaminating soil, water, and coastal habitats.

Incentives for mitigation of environmental impacts. Vietnam's shrimp aquaculture has faced challenges in controlling diseases affecting productivity and morbidity. Chemicals and antibiotics have been widely applied. Although water pollution from chemical contamination is currently less problematic in Ca Mau due to its extensive production systems, poor management of human and agricultural waste and water from ponds where there have been disease outbreaks, continue to pose risks to the environment and to human health. Additionally, as it has become increasingly difficult to expand production areas, farmers and the government have needed to consider alternative means of maintaining Ca Mau's comparative advantage in shrimp production. Local policy is required to effectively create the enabling environment for voluntary action in Ca Mau. International and civil society pressure, specifically around health and food safety and reforestation has helped in pushing mitigation measures further.

State of policy action. In Ca Mau, the main government roles have been as Definer, at both national and sub-national levels, Regulator at sub-national level and more recently as Enabler at national level. National and local governments, after largely promoting expansion of shrimp aquaculture have recently begun to recognize the environmental impacts and challenges of quality demands from the global market. Ca Mau, due to its unique ecological position, has continued to try and exploit the niche of extensive shrimp/mangrove aquaculture. One approach taken has been the application of zoning regulations, dividing areas among those where mangroves need to be fully protected, areas featuring mixed mangroves/farming and those where shrimp aquaculture and other agricultural activities can predominate. However, regulatory solutions have been challenging where production

4 See Chapter 8, "Shrimp Aquaculture in Ca Mau, Vietnam"

involves hundreds of thousands of producers. Ca Mau, therefore, has also leaned on technical assistance and collaboration with NGOs and the private sector.

The Ca Mau Department of Agriculture and Rural Development has focused on promoting the adoption of a set of Good Aquaculture Practices through pilot projects, such as the adoption of Natureland standards as part of the Mangroves and Markets project with SNV, IUCN and the private sector. This public-private partnership has allowed the government to support the development of systems to manage traceability, ensure product quality and protect the environment through collaboration between farmers, collectors, processors and forestry companies. The Coastal Resources for Sustainable Development project supported by the World Bank also includes measures to promote sustainable practices, yet also includes components on integrated spatial planning within and between shrimp-growing provinces. The local government has outlined plans to promote an 'organic coast' for Ca Mau, applying an integrated landscape management approach.

Tea in Yunnan Province, China: policy and market responses to sustain product quality and cultural heritage

Context.[5] China is the world's largest producer of tea, in particular of non-black tea varieties, and most of this tea is consumed domestically. Tea is recognized by the Chinese authorities as an important product, and is specifically referred to in the Government's Five Year Plans. Chinese tea production continues to grow, along with demand, averaging 8 percent per annum between 2001 and 2010. Within China, Yunnan Province is one of China's leading tea growing areas and is among the most progressive in terms of quality management, environmental management, and the application of geographical product identification.

Environmental risks and impacts. The expansion of monoculture tea, rubber, and sugarcane plantations in Yunnan province has, over the years, contributed to significant environmental problems. The forest clearance of sloped land during the 1980s and 1990s is thought to have contributed to the devastating Yangtze River floods in 1998, prompting the government to initiate forest conservation and reforestation programs. Specifically in relation to tea, the main environmental risks have been associated with the overuse of agro-chemicals (contributing to threats to local biodiversity and to downstream water pollution), and erosion from land clearing (contributing to local soil degradation and the flooding of downstream communities). Heavy agro-chemical use has adversely affected human health, both among producers and consumers. And concerns about high levels of pesticide use have deterred some consumers, both abroad and at home from purchasing tea from many Chinese sources.

Incentives for mitigation of environmental impacts. While the downstream flooding catalyzed various forestry programs in the higher altitude areas where Yunnan tea thrives, multiple recent interventions have been spurred by perceived threats to the reputation (and associated cultural heritage) of Yunnan (and more localized) tea. Maintaining the region's traditional "tea agro-forests" and continuing to realize significant price premiums for 'ecologically produced tea' have been major objectives of growers, the industry and local government entities. This has represented a convergence of economic and environmental interest.

State of policy action. In Yunnan, especially Pu'er, the government had strong

5 See Chapter 9, "Tea Landscapes in Yunnan, China"

roles as Definer, Enabler and Funder at both national and sub-national levels. The national and local policy framework on tea production has evolved from recognition of the need to simply maintain forest cover (i.e. 'green growth') to a more nuanced understanding of environmental management which has led to the most recent emphasis (i.e. 'higher quality growth'). There are now dozens of certifications and labels for Chinese tea, internationally (Global GAP, Rainforest Alliance), nationally (hazard-free, green, Chinese GAP), and regionally (geographic indication). This proliferation of labels, together with the challenges of traceability, and the occurrence of periodic health scares related to tea and pesticides, has weakened consumer confidence, and led at least some buyers and consumers to focus on particular brands or origins of tea which they can trust.

Perhaps the most advanced efforts to build consumer confidence and marry environmental and economic goals have occurred in the vicinity of Yunnan's Pu'er City—a locality which has long promoted its rich environmental and cultural history. Some 35 percent of the local income comes from tea and Pu'er is widely promoting the science and application of 'ecological' tea production in the local ecosystem. Successful efforts—involving a combination of training and subsidies—have been made to reduce the density of tea trees on farms, reduce agro-chemical use, better integrate tea with mixed agro-forestry, and improve biodiversity on managed areas. Comprehensive quality standards are applied on tea which is allowed to carry the Pu'er name. A well-equipped local tea-testing laboratory helps to ensure a quality and safe product from Pu'er City farms and plantations. Pu'er City has applied for its 187,000 hectare Tea Garden and Tea Culture area to be recognized as a "Globally Important Agricultural Heritage Site."

Maize in a multi-commodity landscape in Northwestern Thailand: upstream action to protect downstream farm systems

Context.[6] Thailand is Southeast Asia's leading producer of maize, with this crop being exported and used as an input into animal feed and processed food. Prior to the avian influenza outbreak of 2004, Thailand was the fourth largest exporter of poultry worldwide, with annual receipts exceeding $2 billion. Thailand's production of maize took off in the 1990s, mostly through contract farming arrangements, and was introduced to Northwestern Thailand as an alternative cash crop to opium.

Environmental risks and impacts. The government and development partners sought to enable communities in Mae Chaem to shift to alternative cash crops. Several programs have sought to promote increased production of maize and a variety of vegetables and improved linkages between area farmers and traders who, in turn, deal with larger agro-processors. With increased demographic pressures, farmers have spread cultivation, making use of (environmentally fragile) areas deemed to be 'underutilized' and putting pressures on forests. This land 'extensification' has thus contributed to deforestation, soil erosion and degradation. Overuse of agrochemicals has contributed to water pollution while limited coordination in water use has affected the hydrology in the landscape. Changes in water flows has affected hydropower and contributed to downstream flooding.

Incentives for mitigation of environmental impacts. Northwestern Thailand serves as the catchment area for a number of Thailand's most important rivers, including the Chao Phraya which supports

6 See Chapter 10, "Multiple Commodities in the Mae Chaem Watershed, Thailand"

the country's most productive agricultural land, its supply of electricity, and the overall economic and residential life in Bangkok. Changes in upstream hydrology, siltation from soil erosion, and pollution from heavy chemical and fertilizer use in the uplands areas thus pose high costs for the country. However, if the livelihoods of upstream farmers were disrupted, this could lead to major social problems, a reduction in the national output of maize, and renewed opium production.

State of policy action. In Mae Chem, the national government played active roles as Definer, Regulator, Enabler and Funder, while the sub-national government was mostly involved as Regulator and Funder. Civil society engagement with national and local government has led to promotion of better management of lands through generating innovative watershed planning and management organizations. These Tambon Administrative Organizations (over 8,000 in total), have been given freedom to raise local revenues, issue local regulations, formulate and carry out development planning, and implementation of plans. Two NGOs, Raks Thai and the Royal Project Foundation, have played key roles in helping build the capacity of these and others. Raks Thai helped develop and implement strategies for reducing deforestation through raising awareness of land rights and localizing some of the national regulations linked to watershed management. Data gathering, modeling and open discussion at the local level, combined with decentralized control of defined micro-watersheds has helped improve the general environment in the region. Raks Thai and CARE have helped in the development of three-dimensional watershed maps which have been used to facilitate agreement on land boundaries and assign areas of responsibility to community groups and members in different parts of the watershed. Advanced methods are now available (Thanapakawin 2006).

While the Royal Projects Foundation has developed and sought to promote a comprehensive organic system for horticultural production, the commercial success of this has been uneven over time. In relation to maize, there has been no comprehensive program introduced to promote more sustainable land use and production practices. The fragmentation of the maize value chain and the very limited direct interaction between Mae Chaem farmers and the larger downstream animal feed and food processing companies has prevented a market-driven catalyst for more environmentally sustainable practices form taking root.

Bananas in Mindanao Island, Philippines: potential for environmental mitigation using a landscape approach

Context.[7] Banana production is extremely important to Mindanao and the Philippines as a whole, bringing in over USD 646 million in 2012 (second only to coconut oil in terms of export receipts from agriculture). With 75 percent of total production located on Mindanao, negative environmental effects of banana production are particularly important to the long-term sustainability of the banana sector in the Philippines.

Environmental risks and impacts. The multiple risks from banana production are beginning to be noticed by national policymakers (Guilford 2014). Water extraction for banana plantations has led to conflicts with downstream users over reduced water availability. Water and air pollution from improper use of fertilizers and aerial spraying of pesticides poses a significant risk to human health and also to terrestrial and aquatic biodiversity. Soil erosion and

7 See Chapter 11, "Banana Production in Mindanao, Philippines"

degradation from land clearing and poor management practices negatively affect productivity.

Incentives for mitigation of environmental impacts. Public health has been a rallying cry for changing production practices in the Philippines. However, greater collaboration among policymakers across regions and levels of government is needed for Natural Capital Accounting (NCA) to truly take root. Payments for ecosystem services (PES) have been piloted by the World Agroforestry Centre for some years, and sub-national public programs have been set up. The government has tested using water permits to promote better practices and enforcing penalties for "environmental endangerment" as described in the local Government Code of 1991.

State of policy action. Most national government action is as Definer and Regulator, while some sub-national governments have been active as Enablers and Funders. Only 2.1 percent of the Philippine banana market is currently organic or Rainforest Alliance certified (IISD 2013). Civil society and local governments have supported development projects that attempt to account for natural capital and ensure smallholders' access to land and markets. There are innovative landscape management platforms in some areas that link improvements in productivity with landscape restoration. Sub-national PES programs are also in place. There is general policy momentum towards improving practices in the industry, supported by some regulations that encourage these interventions.

4.3 ASSESSMENT OF POLICIES USED IN THE SIX LANDSCAPES

Across the six case study landscapes, there are commonalities and differences in the types of roles taken on by units of government and in the specific policy instruments applied. In most cases, application of the listed policy instruments is nascent so, in general, the observations presented below reflect early experience rather than definitive conclusions based on impacts measured over an extended period. This section highlights particular successes and remaining gaps.

Definer of policy objectives and processes

There is a gradual shift underway in national Indonesian, Vietnamese, and Chinese policies from establishing targets for increased production to developing long-term action plans for sustainable production. The policy mechanisms most commonly used to define a pathway toward sustainable agriculture are, in general, not directly related to the agricultural sector (e.g., REDD+, low-carbon green growth, climate change responses, reforestation plans).

Effective measures. National-level government agencies have had some success in endorsing and establishing environmental policy goals such as the "higher quality growth" component of China's 12th Five Year Plan, the public-private model for sector transformation under Vietnam's coffee coordination board, and Indonesia's green growth strategy. Regional and local governments have provided political support for green growth including the 'organic coast' strategy embraced by the Ca Mau provincial government and the bio-industry and low-carbon development programs in Yunnan. Thailand and Indonesia have designated clearer decision-making authority across government units. Institutional support for multi-stakeholder planning was provided by the integrated water resource management program of the Thai government, which, in the late 1990s, created local Tambon Administrative Organizations (TAOs) in the Mae Chaem watershed and endowed them with designated regulation and planning

authority. In Indonesia, devolution has ceded considerable autonomy to local governments and a 2007 spatial planning law encourages 'bottom up' land use planning and allocation.

Remaining gaps. Governments have fallen short in coordination both horizontally across ministries and vertically among levels of government as well as in engaging multiple stakeholders from the landscapes they seek to influence. In almost all cases, informants cited uncoordinated efforts as a major hindrance to realizing policy objectives. Vietnam's CCB was created to improve coordination in 2013; it has not been in place long enough to assess its effectiveness. Negative consequences of low stakeholder engagement are illustrated by conflicts related to resource rights in Kalimantan, over-extraction of water in Dak Lak, and expansion of maize production in Mae Chaem.

Regulator of land, water and natural resource management

Many of the important regulations mentioned by key informants have been put in place in the past 5 to 10 years, a short time span in terms of shifting practices in agricultural commodities (Mankad et al. 2014). Regulations have been put in place at the national, provincial, and local levels of government. Land use regulations related to forest and mangrove protection have become common, while regulation of chemical inputs has not. In several of the cases studied, tenure rights remain a contentious issue.

Effective measures. Direct regulation, zoning, and land use planning have all been areas of emphasis for policymakers. Spatial planning has also been important as illustrated by land use planning in Indonesia, water and land use zoning in Thailand, and partnerships between the Chinese Academy of Sciences and local government in China. In place since the mid-1980s, the Thai land use zoning system, which established criteria for land use within watersheds, has since been revised to transfer responsibility to local administrative organizations. Chinese Five Year Plans are accompanied by Land Use Master Plans, which must now consider critical ecosystem services based on government delineated 'Ecological Function Conservation Areas.' In Central Kalimantan, the governor has implemented a decree and a provincial regulation that provides increased recognition of indigenous land rights and ensures a collaborative mapping process between civil society and local government. The mandatory Indonesia Sustainable Palm Oil Standard (ISPO) is being promoted by the national government to encourage environmental sustainability.

Examples from some of the cases suggest that local civil society engagement can enhance the enforcement and implementation of environmental regulations. For example, Raks Thai has helped to raise awareness of land rights by convening dialogues and a three-dimensional mapping process with communities. Subsequently, facilitated engagement with local and regional authorities has helped to 'localize' some of the national land and water regulations.

Remaining gaps. Weak capacity for implementation and enforcement of these and earlier regulations (i.e. laws are 'on the books', but lack credibility) is often exacerbated by jurisdictional complications among national, provincial, and local government units. This was a challenge for many years in Vietnam until the government took steps to improve coordination by launching a legal framework enabling local People's Committees to take a bigger role in enforcing and implementing national environmental policies. The Philippines' Government Code of 1991 allows local governments to penalize companies for endangering the environment.

Indonesia has mandatory environmental and social impact assessments for all plantations over 3,000 ha. These regulations can be better tailored and enforced.

Overall, monitoring of environmental management and ecosystem health is inadequate, due to the low level of data collection by all units of government. However, this is an arena that is rapidly changing. Indonesia's OneMap Initiative and Vietnam's (VietGap-related) plan to cover 100 percent of production area with spatial analysis and to broaden soil and water testing illustrate the types of programs that will enable better monitoring of compliance with environmental regulations.

Enabler of voluntary market and institutional innovation

Governments have played an Enabler role by generating and promoting national eco-standards for agricultural commodities; by promoting uptake of international certifications as a method for environmental mitigation; through public 'green' procurement; and by assisting in R&D through partnerships with research institutions.

Effective measures. Technical assistance has been a commonly used instrument. While assistance has generally been directed toward promoting agricultural intensification, there are also examples where more sustainable practices have been promoted. The 2009 'SMART Farm' program in Thailand was a major investment by the government in technology-based extension. In Ca Mau, extension programs are supporting shrimp producers to improve water management and disease control methods. In the Philiippines, some Districts are supporting effective Landcare programs organized by local communities.

Several case study landscapes are benefiting from innovative R&D programs. For example, in China, the government invested in tea-specific research implemented through the Tea Research Institute of the Chinese Academy of Sciences (CAS). In Thailand, the Alternatives to Slash and Burn program of the World Agroforestry Centre studied improved land use management practices to develop decision-making tools for policy makers. In Vietnam, a public-private partnership has been monitoring the economic and environmental benefits of improved practices in several pilot locations.

Since 2008, the 'Green Procurement' policy in China has required all levels of government to prioritize purchasing tea labeled as environmentally-friendly. Despite this and other tea-labeling measures, pesticide residues on tea leaves have consistently been found above the 'maximum' level.

Remaining gaps. Though governments have shown support for both international and domestic standards for agricultural commodities (e.g., RSPO/ISPO in Indonesia, geographical indicators/hazard-free foods in China, GAqPs in aquaculture in Vietnam), the effects of these certification strategies are poorly understood, in part due to the absence of quantitative baselines or 'control groups'. Unclear land classifications in Indonesia, weak consumer understanding of the origins of undifferentiated commodities, complex value chains, a lack of trained auditors, and farmer perceptions that adjustment costs will exceed benefits have all inhibited more widespread adoption of sustainability standards.

Though investments in R&D are increasing, information systems (e.g. land and soil maps; climate risk projections) are not always harmonized or shared across government units. In some cases, such information systems simply do not exist. In Dak Lak, Vietnam, the lack of high-quality information on soil and underground water resources makes it difficult to develop effective mitigation strategies. Additional support for R&D should be paired with

concerted efforts to expand and increase the effectiveness of rural advisory services. In China, the National Agro-Tech Extension and Service Center has been mobilized to develop green pest management systems since 2000, however informants noted low capacity of extension workers.

Funder of environmental practices and investments

In the case study landscapes, governments have employed various means to finance environmental mitigation. In addition to traditional producer subsidies for forest and land conservation, governments have provided credit, concessional financing, and organizational subsidies to facilitate collective action and better practices among commodity producers.

Effective measures. PES schemes have been implemented by policymakers in China and Vietnam—where larger-scale, government-led schemes have been directed to the forestry sector—as well as in the Philippines and by NGOs and other actors at smaller scales. Chinese eco-compensation programs include the Conversion of Cropland to Forests and Grassland Program (i.e. Grain for Green), Forest Ecosystem Compensation Fund, Four Wastelands policy, and other local innovations. These are among the largest eco-compensation programs in the world and resulting changes in production practices have contributed to significant reforestation, which has also been driven by limits in land available for agriculture (Scherr, et al. 2006; Scherr and Bennett 2011). Targeting mountainous regions, the expansive objectives of the Vietnamese PES scheme include: conserving biodiversity; preventing and limiting natural disasters, pollution, and GHG emissions; increasing carbon storage; and increasing resilience to climate change. In the Philippines, the World Agroforestry Center, through the Rewarding Upland Poor for Environmental Services Program, piloted PES schemes in multiple watersheds involving hydropower companies, municipalities, and local land users.

Producer and organizational subsidies and preferential credit to promote improved practices have been used by the governments of Vietnam and China. In Dak Lak, government support has taken the form of preferential credit for on-farm diversification, credit for purchase of organic fertilizers, and cost coverage for spatial analysis and soil and water testing. In China, the local government of Pu'er City has provided support for replanting, purchase of seedlings, and training and awareness for 'ecological renovation' of modern tea estates covering over 60,000 hectares. Farmers receive close to USD 4,500 per hectare for the first three years of the transformation period.

There are some examples of direct public investment in land and forest restoration, however these are mainly 'land sparing' projects which indirectly serve to limit land for agricultural production. Vietnam's Five Million Hectares Reforestation Program, Ca Mau's direct support for mangrove restoration, and Chinese Grain for Green and Sloping Farmland Conversion programs could also be considered investment in restoration.

Remaining gaps. Funding and credit to encourage coordination and adoption of sustainable practices are still insufficient in many cases for generating large-scale change in practices. In Thailand, the local administrative organizations (TAOs) that have been given authority to formulate and implement development planning (as well as issue local regulations) have been underfunded. In Dak Lak, available commercial bank credit has generally only covered a fraction of coffee farmer needs, leading many of them to borrow from local input suppliers. However, a new government-backed program will be providing

long-term financing for coffee replanting, linked to farmer adoption of improved soil and water resource management practices.

Advocate for action

Although governments have taken some measures to use communications and awareness-raising among producers and the public to promote action in the Chinese tea and Indonesia palm oil sectors, and recently in Vietnam for climate-smart agriculture, there has otherwise been limited government action as Advocate.

Effective measures. Chinese promotion of FAO's Globally Important Agricultural Heritage Site (GIAHS) status for Pu'er tea agroforests is one mechanism by which the government sought to conserve traditional, environmentally-sensitive agriculture by appealing to cultural heritage. A public-private partnership has sought to demonstrate the benefits for Vietnamese coffee farmers of adopting an international sustainability standard. Technical and financial incentives have been offered for Vietnamese shrimp farmers to apply national or international GAP systems.

Given underfunding of promotional activities by national-level government units, in many circumstances, civil society and the private sector have added value and played the dual role of advocate for policy change and Advocate of existing instruments to promote environmental stewardship. Local governments have been most effective when partnering with civil society on pilot projects and locally-adapted measures.

Remaining gaps. Public dissemination of monitoring data and evidence regarding environmental risks of agricultural commodity production is uncommon; these types of data are not widely available. Though national, provincial, and local government units have been developing action plans and growth strategies, engagement with resource managers and users is only just beginning. Civil society has played a stronger role in this regard; in Mae Chaem, the Raks Thai and the Royal Project Foundation have provided maps and helped stakeholders to understand their land rights.

Stakeholders mistrust government information and policy initiatives, especially where there is a long history of controversial policy interventions, such as in Central Kalimantan where the Mega Rice/One Million Hectare Peatland project led to major environmental degradation and displacement of thousands of local people. With the exception of a regular TV program on agricultural issues conducted by WASI in Dak Lak, Vietnam, the case study landscapes have not seen particularly strong public media campaigns on environmental issues used by policymakers.

4.4 RECOMMENDED NEXT STEPS IN THE CASE STUDY LANDSCAPES

In light of the above experience, local, provincial, and national policymakers can take action to improve the environmental performance of agricultural commodities in these landscapes. Chapters 6-11 provide more detailed discussion of priority actions, but the following are a few highlights:

West and Central Kalimantan, Indonesia

- Increase engagement of the private sector in palm oil sustainability and beyond through concessional financing, empowering internal champions and frontrunner companies, or other incentives to promote better practices for producers selling to non-European markets.
- For district and provincial government, revise land permitting and release procedures so companies must prove usage of better practices to maintain land access.

- Establish fast-track court procedures and support to representation of local groups to address natural resource conflicts, e.g. fast-tracked judicial and dispute resolution processes to tackle environmental issues ('green benches') to promote rapid enforcement or to pilot out-of-court settlements to mediate between parties.
- For national government, ensure robust budget allocations for 'green growth' or 'natural capital preservation' and establish policies to incentivize local financial institutions to apply screens for better practices when making agribusiness loans.

Dak Lak, Vietnam

- Increase focus on spatial/landscape approaches for improving environmental performance in the coffee sector through empowerment of the Coffee Coordination Board.
- Promote voluntary standard adoption in combination with government regulations and a new framework for extension, infrastructure, credit and resource use.
- Dedicate further resources towards collection of independently verified data on soils and underground water resources including building labs in-region, commissioning independent hydrological surveys, and supporting ongoing initiatives.

Ca Mau, Vietnam

- Complement voluntary standards for environmental performance in the shrimp aquaculture sector with targeted regulations, financial incentives, and capacity building for farmers.
- Develop and improve utilization of scientific evidence to increase the credibility of environmental policies, such as the 60:40 mangrove to shrimp ratio, among producers and other organizations trying to promote better practices. Regularly evaluate policy efficacy and implement modifications as appropriate.
- Effectively communicate the scientific (and economic) basis for environmental regulations to improve compliance by connecting environmental risks to local concerns for health and livelihoods.

Yunnan, China

- For local government, continue to work collaboratively with landscape stakeholders to improve uptake of plans for 'higher-quality growth'. Adjust policy in response to stakeholder needs and capacities.
- At all levels of government, ensure that standards and labels are credible—a difficult task given the proliferation of national and international labels—and that domestic standards are aligned with international standards, while providing capacity-building to support compliance.
- Spatially target eco-compensation to areas of high potential mitigation impact to achieve better use of national resources.

Mae Chaem, Thailand

- Work with poultry companies and grain purchasers to increase traceability and transparency in the maize value chain. Potential pathways include maize purchasing centers or increased contract farming programs to ensure better practices can be established and monitored.
- Increase support to local TAOs so that they can effectively support sustainable land management and national objectives through their local, multi-stakeholder governance structure.

Mindanao, Philippines

- Establish and strengthen national data collection systems to develop baseline measurements and monitoring

frameworks for sustainable land use and banana production.

- Continue to support natural capital accounting initiatives such as WAVES, working with banana multinationals to incentivize better management practices.

4.5 DRIVERS, TRIGGERS, TRAJECTORIES AND CONSTRAINTS FOR TAKING POLICY ACTION

The six case studies provide useful insights into the policy processes involved in advancing environmental management in commodity production—what factors drive policy, what trajectories are followed, what triggers more transformative policy action, and common problems that complicate these efforts.

Drivers for policy action

Motivations for policy action towards environmentally sustainable agriculture and land use vary across countries and landscapes. Drivers include external market demands for sustainability (themselves sometimes driven by major threats to productivity and secure supply), policy advocacy by international civil society for environmental and social issues; advocacy by local communities or consumers affected by environmental problems, and by newly empowered local governments prioritizing local concerns.

External political and market demand has been a dominant factor for policy action. In Indonesia, demands from the European Union, from global donors concerned about climate change, from international advocacy groups concerned about biodiversity, and from local stakeholders concerned about resource rights have generated pressure to shift production practices in the palm oil sector. Similarly, in the Vietnamese aquaculture sector, external demand for sustainability-certified products has contributed to shifts in management practices, although this has largely been related to food safety concerns. Both Thailand and China have national organic policies on the books in recognition of external and domestic demand.

Importantly, growing demand for sustainably produced commodities has not been paired with an increased willingness to pay, especially for commodities that are derivatives or minor ingredients in end products such as maize and palm oil. Unless consumer recognition of environmental costs increases substantially, the initial capital and recurring costs for transitioning to more environmentally sustainable production of commodities like palm oil, tea, and Robusta coffee will need to be generated outside of pricing structures. There are also innovations with other value chain actors, like financial institutions who are using certification through multi-stakeholder initiatives and international certification (e.g. RSPO, FSC, PEFC) as screening criteria for receiving financing.

At the same time, some external market factors are dampening the drive for policy action. For many commodities, external pressure for environmentally sustainable production is dampening as the importance of US and EU markets declines relative to consumer markets in India and China that prioritize price, and to expanding domestic markets. Together, Chinese and Indian consumers now account for 47 percent of total global tea consumption, 41 percent of global palm oil consumption, and a rising share of Robusta coffee consumption (Majmudar et al. 2012; WWF-India and KPMG 2013). Since these new buyers are not requiring specific standards (and certification), some governments are recognizing the need for other policy approaches.

Local demands for environmental quality and food safety are emerging drivers. Especially in a time of increasing economic development and devolution of political power, domestic constituencies are pressing policymakers for change. Civil

society is often an instigator of changes in practice, especially where local environmental or social issues (e.g. public health, resource rights) are acute.

Food safety and public health concerns have brought about significant pressure for environmental mitigation in Yunnan, Ca Mau, Mae Chaem, Mindanao, and other landscapes. Agrochemicals are commonly at issue whether they are residual in end products (i.e. Yunnan tea) or in downstream runoff (i.e. Thailand). Policy action has been catalyzed by local conflict and activism stemming from environmental degradation and threats to public health such as water pollution downstream from Mae Chaem and aerial pollution from spraying of banana plantations in Mindanao. Another entry point for policy action arises from concerns about stability of commodity supply and resulting effects on exports and market position, as seen in the Vietnamese coffee case study.

In China, there has long been both demand and willingness to pay higher prices for tea from more environmentally friendly agroforests. This is mainly due to the perception of higher quality and also better safety due to lower agrochemical inputs. However at present, the supply chain structure empowers middlemen with dedicated purchasers in urban areas, rather than farmers, so much of the commodity's value is captured 'downstream.' This may reduce farmers' willingness to convert tea terraces to more ecologically friendly agroforests. National, regional, and local governments have tried to use certifications, labeling, and geographic indicators, but poor coordination has led to consumer confusion over the meaning of labels. This confusion has been compounded by continued scandals surrounding pesticide residues on tea, leading to low confidence in the authenticity of the domestically certified tea at market.

In Indonesia, active civil society involvement has pressured local governments to reverse course on palm oil concessions in environmentally sensitive areas. In one example, local civil society organizations (CSOs) in Kalimantan found deficiencies in a concession's environmental and social impact assessment, met with local government, and staged protests that culminated in consultations with government at the regional and national levels. It is important to note that resource rights may have been the central motivation, rather than environmental issues linked to the production of palm oil.

Innovative policies are starting to emerge from empowering local governments. In several of the case study landscapes, more progressive regional and local governments have tried to adapt national laws to local contexts. The Ca Mau provincial government has outlined its aspiration to establish an "organic coast" in this unique landscape of traditionally extensive shrimp production. Through its 'Scientific Pu'er' program, Pu'er city has incentivized conversion to tea agroforests using farmer subsidies for the transition period, paired with training and technical assistance.

In Central Kalimantan, a pioneering mapping initiative is underway to enable greater recognition of customary land ownership and allocation of palm oil licenses. Mapping will be carried out through collaboration between civil society and local government. A specific decree will increase recognition of indigenous land rights. The results are not yet evident, but this is an example of local government taking measures to enable environmental stewardship and to recognize resource rights of local communities.

Misaligned incentives and a lack of funding for local administration continue to inhibit constructive local governance. Given that agribusinesses are a significant source of employment and revenue, local

governments recognize the importance of keeping companies in their jurisdictions. Local enforcement of national environmental policies may be seen as risking the loss of agribusiness operations to less environmentally progressive jurisdictions. Local administrative units in Thailand contend that a lack of funding is hampering their ability to manage and enforce regulations. Though some enlightened provincial leaders may try to use environmental and social safeguards to differentiate commodities produced in their region, they require adequate funding for enforcement (and support in accessing markets). Neighboring provinces may not be as scrupulous or have the capacity to enforce regulations.

With the right level of resources and capacity, local government can be the linchpin for ensuring that internationally-led projects have a long-lasting impact, particularly for projects run by international organizations with short funding cycles.

Triggers for transformative policy action

There appear to be a few general triggers for transformative policy action: a disruptive event, evident landscape-scale impacts, impacts experienced by politically powerful interests (including human health), and the political need for policymakers to demonstrate responsiveness.

While inertia, risk aversion, or other factors prevent or slow policy action, political 'equilibrium' can be shifted by a disruptive event that expands the range of what is politically possible. All governments operate under complex sets of pressures and constraints (e.g. economic development, food security), which commonly converge toward a 'production at all costs' paradigm until disrupted either by conflict, major environmental catastrophe or increased effects from climate change, or escalated international pressure or market demands. Disruptions can be small or slow to emerge and produce modest response, as is the case with groundwater shortages in the Vietnamese Central Highlands, or they can be large or sudden and lead to more substantial policy action as was the case with floods and subsequent reforestation efforts in China in the 1990s. In some circumstances, environmental crisis has been used as an opportunity to shift policies in the agricultural sector. In Thailand, social conflict around water availability led to policy instruments promoting integrated watershed management.

More substantive policy responses tend to emerge when an aggregation of farm-level issues result in pronounced landscape-scale environmental impacts. In Indonesia, when draining of peat and resultant fires occurred at smaller scales, haze was more localized. With greatly increased demand for palm oil, peatland clearing expanded dramatically. The accumulated effect was a multitude of fires and major trans-boundary haze problems, which prompted swift action from policymakers. Deforestation in China was not considered to be a significant concern until the devastating floods of the 1990s that were traced back to land clearing, which led to major policies promoting reforestation and protection of sloping lands.

Where threats to water quantity or quality are the key environmental risks, a spatially coordinated approach is commonly required given the inter-connections between upstream and downstream stakeholders, the shared nature of groundwater resources, and the difficulty of monitoring non-point sources of water pollution and extraction. In the Central Highlands of Vietnam, attempts to price ground or irrigated water, license groundwater extraction, and establish water user associations have yet to have a significant impact on water extraction rates because of the difficulty of enforcement, lack of farmer

training on the marginal economic value of water, and gaps in hydrology data (Bennet and Cheesman 2009. High transaction costs (i.e., monitoring) and ease of well construction have made continued farm-level approaches unworkable. Understanding the risks facing coffee production systems, many private sector actors have identified and begun to implement measures at a landscape scale, working with local communities, governments, and other stakeholders to mitigate shared watershed risks (Kissinger et al. 2013).

Serious policy action is prompted when degradation affects politically powerful interests, or when environmental issues overlap with major human health concerns. Policy response, as well as the efficacy of interventions, is strongly influenced by who is being affected by environmental risks. When environmental impacts 'spill over' from commodity production areas and affect other powerful interest groups, demand for policy action may escalate. In the Mindanao banana sector, when siltation of rivers began to affect hydropower production and pesticide exposures were linked to health problems, pressure from the energy sector and from the public prompted policy response. In the case of Chinese tea, when evidence of widespread contamination affected the entire industry, there was an unambiguous policy response. Where commodity agriculture is linked to a trans-boundary health issue, as with haze generated by Indonesian palm oil production, governments may be forced into action to avoid conflict with neighboring countries. In addition to providing an opportunity for establishing incentives to mitigate environmentally unsound practices, trans-boundary or regional agreements send clear signals about intended compliance with environmental targets. The Mindanao, Yunnan, and Kalimantan case studies illustrate the types of circumstances that require more broadly framed policy strategies (i.e., larger than farm or commodity scale) that involve landscape stakeholders beyond the agricultural sector.

Where environmental degradation creates operational risks for agribusinesses, both voluntary action and policy measures to secure continued commodity sourcing are likely to emerge. Larger, well-connected supply chain actors can help drive and influence the design of policy instruments, while small and unorganized players tend to have little voice. As immediate and longer-term operational risks are recognized, this can lead to better rates of compliance with existing environmental safeguards.

Policymakers tend to choose highly visible policy instruments to signal a serious response to external pressure from consumers or importing country regulations. In Indonesia, the moratorium on palm oil expansion and mandatory application of RSPO standards in Central Kalimantan were meant to signal to both international and domestic audiences that national and local governments were serious about curtailing environmental and social risks. In Ca Mau, pressure from international and domestic actors for policy action on food safety and mangrove loss prompted aspirations for an 'organic coast.' In the case of Yunnan tea, the penchant of high-end domestic buyers for tea from agroforests was one of the variables that prompted the city of Pu'er to move towards acquiring special indication (i.e. FAO GIAHS) status as a way to differentiate local tea.

Trajectories of policy response

Each case study in this volume represents a 'snapshot' or a point along a trajectory of environmental risk, impact, and policy response. In order to contextualize current actions and policies, it is important to look at the varied history and patterns of agricultural production, accumulated environmental degradation, and policy

responses in the case study countries and landscapes.

In West and Central Kalimantan, Indonesia, increasing demand and favorable growing conditions led to rapid expansion of palm oil production and plantations. Incremental measures have been put into place over time to improve practices, however in the absence of price premiums or sufficient demand for sustainably produced palm oil, these measures have yet to produce substantial improvements. Recent measures by national, provincial and local governments are promising, but initiatives are still too young to declare success or failure.

In the Central Highlands of Dak Lak, Vietnam there is a clear storyline of modest, incremental mitigation efforts, which have led to the current policy environment. Initially, coffee policy focused on production targets without regard to environmental damage. Complications from rampant deforestation and water supply shortages spurred policymakers to recognize environmental risks, which resulted in incentives for better on-farm production. Multiple schemes emerged to provide training for farmers in more sustainable practices including programs designed to certify a subset of coffee farmers under a relevant sustainability standard. Importantly, these standards did not address relevant local environmental issues such as water extraction. As the limitations of a farm-centered approach for resolving environmental risks and impacts of coffee production have become apparent, policymakers are now beginning to consider a broader spatial approach to landscape-scale management of commodity production.

In the Dak Lak case, the incentives to mitigate are not obvious to many farmers since their water use is not monitored, excessive use is not penalized, and farmers can still get 'sustainably certified' without much change in their irrigation practices. In the absence of any regulatory intervention, the biggest incentive for farmers is to reduce loss of fertilizer (their highest cost item) from run-off due to over-watering. Under an upcoming program, positive incentives will be offered in the form of matching grants for the adoption of drip and other water saving technologies.

In Ca Mau, Vietnam, shrimp production is dominated by low-input, extensive, smallholder aquaculture systems within segmented supply chains. Rapid growth in the shrimp export sector, which has been actively promoted by the national government through official permits, financing, and improved transportation, has spurred massive mangrove loss as well as disease and food safety crises linked to water pollution and antibiotics use. Historically, policies in Vietnam have emphasized increased production over quality control or environmental protection. In recent years, the economic implications of shrimp disease (estimated at more than USD 1 billion annually) and rejection of high-residue shrimp by international markets has demonstrated the need to effectively address environmental challenges both to protect local stakeholders as well as to preserve the shrimp industry's position internationally.

Vietnam was one of the first four countries to design a national set of Good Aquaculture Practices, under the FAO Code of Conduct for Responsible Fisheries, and the government has supported adoption of various private certification standards, however farmer compliance beyond 'high performers' is inhibited by weak incentives (i.e. price premiums), high costs, and low enforcement capacity. (In contrast, Box 4.1 describes the progressive adoption of certified practices in the Thai Shrimp sub-sector.) The effects of a 2011 nationally decreed Payment for Forest Environmental Services program are not yet quantified.

At the provincial level, Ca Mau authorities have expressed an interest in promoting an "organic coast" of shrimp production and a Forest Management Board is tasked with overseeing regulations specifying a 60:40 ratio of mangrove and aquaculture in coastal areas. An integrated and cross-sectoral spatial planning initiative, supported by the World Bank, is targeting all coastal areas in eight provinces, including Ca Mau. While recent data from IUCN suggests that mangrove deforestation is being more effectively controlled and possibly reversed, mangrove protection and effective management of Ca Mau's integrated canal and river systems will depend on coordination among provincial governments and the local shrimp sector.

In the case of tea production in Yunnan, China, robust policies (i.e. subsidies and compensation) were introduced to promote reforestation and protection of sloped lands. However, it became evident over time that maintaining forest cover was not adequately addressing the risks from tea production. In response to proliferation of monoculture production systems and public health problems related to unsustainable practices leading, local government applied more tailored policy measures: targeting larger reforestation subsidy programs to localized areas where they would be most effective; raising revenue through taxes on chemical inputs; and enabling voluntary standards (i.e., seeking certification of food quality, geographical indication, appealing to cultural heritage).

In the multi-commodity landscape of Mae Chem, Thailand, maize production is negatively affecting forest cover, and soil, water, and air quality, leading to degraded agricultural conditions upstream, adverse effects on the lowlands rice export industry, siltation of hydropower facilities, and more frequent flooding In Bangkok. Expansion of maize production has been fostered by weak land tenure, policy incentives (e.g. government-run maize purchasing centers), and a complex maize value chain in which there has been little pressure from maize buyers for sustainable land management practices. To encourage ethnic farming communities to adhere to the 1980s ban on opium production, the Thai government introduced local and regional 'push and pull' factors, including support to grow alternative cash crops and establishment of a local captive market for premium local produce.

The government and local organizations have attempted to tackle environmental problems and social conflicts through collaborative planning and zoning. A watershed classification and land zoning system of the 1980s was decentralized in the 1990s, giving more local responsibility (and fiscal opportunity) for development planning. A framework is being created to better integrate local watershed management units into national planning. Also, beginning with a logging ban in 1989 and a Forestry Master Plan in 1992, Thai policies to increase forest cover are now included in the government's National Economic and Social Development Plan for 2012-2016. To build on these policies and the effective public-private partnerships the Thai government has initiated, next stage investments could include improved systems for supply chain traceability, environmental monitoring, and policy enforcement.

Three-quarters of bananas in the Philippines are produced in the Mindanao region, primarily by small-scale farmers, organized into cooperatives, which sell bananas to large multinational companies through several different contract arrangements. The water-intensive banana sector in Mindanao is facing challenges in meeting water supply needs of banana production, agri-chemical pollution, soil erosion and degradation, displacement of smallholders, conflicts with downstream water users, and biodiversity impacts.

National agricultural policy has generally focused on economic growth and competitiveness although, since 2004, the Philippines Agriculture and Fisheries Modernization Act has been complemented by the Philippine Agriculture 2020 strategy, which more strongly supports improved production practices. Landcare programs in Mindanao have promoted improved land management capacity among upland banana producers however there seems to be little pressure from within the local and global banana industry for supporting improved local practices through value chains, and certification standards have not been widely adopted in the Philippines banana sector.

There have been examples of civil society and local government action to block expansion of banana plantations and water

Box 4.1 Progressive adoption of certified sustainable practices in the Thai shrimp sub-sector

While its industry dates to the 1960s, over the past two decades Thailand has been successful in progressively introducing and adopting a range of food safety, environmental, and other 'good practice' standards in its shrimp aquaculture industry—at the farm level as well as among hatcheries and processors. This came after an era of 'boom and bust' in the late-80s and early-to-mid 90s which featured significant environmental damage (i.e. mangrove depletion, water pollution, salinization of soil) and periodic trade disputes and consignment rejections due to antibiotic residues and other food safety concerns.

Industry consultative meetings led to the adoption of an industry code of practice and subsequent interventions by the Thai government, leading commercial firms, and development assistance agencies to accelerate the adoption and enforcement of a range of 'good' aquaculture and related practices. Accompanying and, to a certain extent, facilitating this upgrading process was an industry shift from black tiger to whiteleg shrimp production and a major consolidation in the structure of production (from around 38,000 to 12,000 producers).

Measures taken over the past decade have enabled Thailand to achieve high levels of compliance for shrimp exports in international markets, raising its reputation as a reliable source of quality and safe shrimp. The industry has been very proactive in the implementation of both public and private certification programs. The main success factors underpinning this upgrading process have included:

- A sustained commitment of the government to lead a participatory process to develop standards and associated certification programs in alignment with internationally recognized principles. There has been clarity and cohesion among government agencies to work toward clear objectives and adjust roles as the need arose.
- Public investments in capacity development to support compliance, through implementation of programs for monitoring and surveillance and investments in required laboratory infrastructure.
- Industry re-structuring since the early 2000s has facilitated linkages between producers and farmers and, therefore, the adoption of improved practices. The shift to whiteleg shrimp production reduced the pressure on antibiotic use, facilitating compliance with market requirements. Lead firms have been pushing for improved management practices and have been playing a key role in innovation and knowledge-sharing. The implementation of farmer clubs has facilitated dissemination of knowledge and innovations.

Source: Diaz Rios and Jaffee 2013.

permits have also been used to promote better practices among banana companies in the Philippines (e.g. requiring compensation for adverse impacts on shared water supplies). There may be legal room for local regulatory approaches to improve environmental performance in the banana sector. For example, the Local Government Code of 1991 gives local authorities the ability to penalize dangerous activities and the Fertilizer and Pesticide Policy requires companies to ensure safety of employees. Voluntary and government action toward more sustainable banana production systems in Mindanao could draw on other national experiences. For example, a number of PES initiatives have been piloted in different parts of the Philippines (e.g. RUPES) and the Philippines WAVES partnership is promoting natural capital accounting as a policy planning tool.

Common problems that complicate policy action

The cases highlight a number of common problems that complicate policy action—conflicting sectoral policies, the difficulties of addressing spatially disperse problems, reaching unorganized smallholder farmers, incentivizing action in low-value commodities, and the lack of 'green' capacities across all stakeholder groups.

Environmental policies can be undermined by other sectoral policies. The efficacy of policy instruments designed to mitigate environmental risk is linked to the larger policy context. Given that Indonesian plantation concessions can be excised and resold if not put under production, companies have strong incentive to plant right away, not for setting aside HCV areas. As a result, local agricultural regulations in Kalimantan that require companies to operate under RSPO principles are not effective in achieving biodiversity conservation and other objectives. Policy distortions of this kind commonly go unnoticed due to poor coordination across ministries and levels of government or uncorrected where environmental mitigation has lower political importance relative to other policy goals (e.g., production targets).

Non-point source pollution and other spatially extensive problems pose significant transaction costs. Policymakers commonly struggle to address non-point sources of environmental risk. Unless agribusinesses see direct threats to commodity production, it can be quite difficult to foster voluntary private sector action without complementary enforcement and collective action. High transaction costs and historical mistrust of farmer aggregation schemes (e.g., compensation to incentivize reduced water use) have inhibited progress toward more appropriate water extraction patterns in the Central Highlands of Vietnam, leading to pilot tests of alternative strategies such as spatial/landscape approaches. Similarly, farmer aggregation has proven challenging in the extensive shrimp production systems of Ca Mau where regulatory approaches will likely be necessary for mangrove protection and rejuvenation.

It can be difficult and expensive to reach independent, unorganized smallholder commodity producers through public programs. Where production systems are highly fragmented – across many small-scale producers and over wide geographical areas – mobilizing collective action is critical for enforcing rules, providing effective incentives, and disseminating information. With the exception of Indonesian palm oil, smallholders account for a large majority of production volume in the case studies. In Vietnam, progress in promoting the adoption of (certified) sustainability standards has been mostly confined to a set of somewhat larger and geographically clustered smallholders. In Kalimantan, sustainable practices have made greater headway among a segment

of large-scale palm oil farms and plantations as well as smallholder outgrowers. Although they dominate production volume in some environmentally-stressed landscapes, much lower adoption of improved practices by 'independent' smallholders (i.e., those not under contract with larger firms) has not yet drawn the attention of palm oil industry critics or of potential funders of improved environmental performance, though the RSPO does have a Smallholders Working Group aimed at supporting smallholders in becoming RSPO certified.

The case study landscapes offer examples of alternative strategies for supporting small-scale producers through local NGOs and buyers, although bringing these to scale is challenging. In Mae Chaem, Raks Thai provided education and training on producers' rights. In Kalimantan, a local CSO (Epagar) established a 'School of Democracy' to convene stakeholders. The Yunnan government provides technical assistance for developing ecological tea plantations.

Voluntary market action is difficult to mobilize with undifferentiated or low-value commodities. Until there is an imminent major operational risk, weak market demand and high potential to substitute supply from another production region inhibits voluntary mitigation action with undifferentiated or low value commodities (e.g. palm oil, maize, Robusta coffee). Therefore, mitigating environmental effects through the offer of higher prices is not an option and alternative strategies must be pursued. For example, price premiums are not feasible for sustainably produced Indonesian palm oil or Thai maize, which can be readily substituted by other oils or grains and not traceable in food and feed end products. Specific regulatory and market measures will be utilized depending on the political context and the comfort level (experientially and ideologically) among policy makers with these approaches in contrast with other forms of government intervention.

Complex supply chains make policy action more difficult. The length and complexity of an agricultural supply chain influences the potential for environmental risk mitigation. Where supply chains are more complex (e.g. end products are derivatives such as palm oil or filter through many intermediary steps of traders such as for maize and coffee), achieving mitigation through regulation or voluntary market action by agribusinesses becomes more difficult. Commodities are more difficult to trace and supply chain players are more difficult to reward or penalize. Various intermediaries may have different levels of commitment to a specific product and different approaches to sourcing and trading the commodity. Enforcing a set of common standards is very difficult in this context.

'Green' agriculture capabilities of farmers, companies, NGOs, and governments require investment to achieve effective policy implementation. To bridge the gap between policy direction and actual implementation, effective technical assistance is necessary, but faces many roadblocks ranging from high resource costs to difficulty in reaching geographically distributed and unregistered smallholder operations. Vietnam's Law on Water Resources calls for holistic management and reasonable exploitation of water, basin planning, and efficient usage, however there has been little study of how best to apply these principles to achieve sustainable and equitable water allocations (Bennet et al 2009). Policy instruments are unlikely to result in meaningful change where there is little capacity to implement or enforce them, insufficient data to measure them, and/or only weak monitoring plans in place to evaluate them.

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TOWARDS A MORE STRATEGIC APPROACH TO AGRO-ENVIRONMENTAL POLICYMAKING

5

The governments of East and Southeast Asia can be ambitious in setting their policy goals. The same energy, vision and resources that resulted in the dramatic commodity production growth in the last few decades can now be channeled into advancing agricultural green growth.

In this chapter, we draw from the lessons and insights learned from the six case study landscapes in East and Southeast Asia, and their broader context, to suggest a more strategic approach to selecting and designing policy instruments to improve environmental performance of commodity agriculture. The main recommendations arising from this analysis are to: be proactive rather than reactive; align agricultural promotion and environmental protection policies; choose government roles more strategically, and take a learning approach; combine value chain and spatial approaches, engaging all critical stakeholders; and strengthen organizational capacity, data and knowledge systems to inform integrated agriculture and environment policy (see Table 5.1). These recommendations are elaborated below.

5.1 BE PROACTIVE RATHER THAN REACTIVE

There are as yet few major 'success stories' where growth in commodity agriculture in the region has become associated with measurably improved environmental conditions and net reductions in greenhouse gas emissions at a landscape scale. However, there has been notable progress in shifting the policy paradigm from a reactive to a proactive policy mode (see Figure 5.1), from ad hoc to integrated strategies; and from policies intended mainly to 'signal' attention to environmental concerns to policies designed and implemented to achieve real impact.

5.2 ALIGN AGRICULTURAL PROMOTION AND ENVIRONMENTAL PROTECTION POLICIES

Alignment of policy actions, both horizontally (across ministries and sectors) and vertically (across national, provincial and local governments) greatly increases the effectiveness and efficiency of any particular policy. There were few examples of such alignment in the case studies, notably where high-profile health problems had emerged and governments coordinated their response (e.g., pesticide residues on tea in China; downstream agricultural pollution in the Philippines and Thailand). Indeed, inconsistent or conflicting policies were identified as a barrier to effective action in all the case studies. The main recommendations are to undertake a harmonization process for policies and programs; to promote more diversified land use and market development; to target and coordinate policy instruments spatially; and to promote and assist local governments to devise revenue strategies that do not rely on over-exploitation of resources.

Harmonize sector and sub-sector policies and programs

Historically, different aspects of agriculture, land and resource use, environment, rural development and more recently climate change, have been the responsibility of separate government ministries and

Table 5.1 Elements of a proactive policy for agricultural green growth

Be proactive rather than reactive	Align agricultural promotion and environmental protection policies	Choose government roles more strategically and take a learning approach	Combine value chain and spatial approaches, engaging all stakeholders	Strengthen organizational capacity, data and knowledge systems
	• Align sector and sub-sector policies and programs • Promote diversified land use and market development • Target and coordinate policy instruments spatially • Devise alternative revenue strategies for local government	• Develop a hierarchy of action across policy roles • Draw on a complementary mix of policy instruments • Use different tools for large growers and smallholder producers • Clarify the respective roles of local and national policy • Take a learning approach	• Reconceive certification as a tool, not a strategy • Build local, regional and national coalitions • Promote integrated landscape initiatives • Partner with the private sector around shared risks • Build on technical and policy innovations piloted by civil society	• Develop robust public sector agro-environment data systems for effective and objective assessments of status and cross sector impacts in meaningful geospatial domains • Share information widely among stakeholders • Improve capacity to administer and implement agro-environment policies and programs

departments. For example, in Vietnam, natural resources management tends to fall within the domain of the environmental ministry while the use of water, agricultural land, fisheries and forests is generally overseen by the agricultural ministry. All the case studies indicated that the lack of consistency across the policy mix was a major roadblock to pushing forward what works. With the increasing spatial overlay of activities and impacts, this structure requires targeted energy and processes for harmonization to avoid conflict and realize synergies.

To date, 'green growth' visions have largely focused on the energy sector. Aspirations in agriculture and environment still largely relate to impacts on agricultural production, rather than environmental benefits from agriculture. With the exception of China, integrated policy instruments are relatively new. Though there is clearly much longer histories of policy work in agricultural commodities, both Vietnam and Indonesia are paying much more policy attention than ever to environmental management in agricultural regions.

The shift from a farm-scale to landscape approach now being considered in the Vietnamese shrimp industry, the integration of issues in the Chinese tea sector, and the progressive approach of the Kalimantan government are more recent,

and also interestingly driven by local government. In the case of the Chinese tea sector, adaptation of national regulations and funding mechanisms to local agro-ecological contexts, whether through Yunnan's adaptation of the 'Natural forest protection program' or Pu'er city's adoption of a national subsidy program for reforestation have proven effective ways to integrate broader national strategies.

Moving from divided to shared government responsibilities, both across ministries and between sub-national and national levels, can break policy inertia, especially where there is concern about sustaining the competitiveness of agriculture (McCarthy and Zen 2010). For example in Dak Lak, where coordination and enforcement of water management is split between different departments, a new legal framework is enabling local government (People's Committees) to take a proactive role in implementing national environmental policies. Even if government units and ministries can gather and share information in order to recognize where there are overlapping interests, this alone would be a major step forward in alignment of policy priorities.

Promote more diversified land use and market development

Agricultural landscapes must increasingly provide the full range of important products (food, feed, energy, building materials, medicines, etc.) and ecosystem services (watershed services, biodiversity, pollination, pest and disease control, climate regulation, etc.) needed by local people, and others who depend upon them. To achieve this generally requires diversified land use on farms and across the landscape. Diversification can also increase economic and social resilience, and is increasingly an essential strategy for adaptation to climate change (Scherr, Shames and Friedman 2012). Diversification has been challenging to promote in areas where large plantation monocultures are long-established, such as in oil palm or tea plantations. But as described in several of the case studies, there can be considerable financial benefits of intercropping and diversifying land use with tree crops such as coffee and bananas, and shrimp aquaculture. Policies to promote diversifiation should be based on objective diagnostics of projected land use, hydrology and impacts of climate change.

For example, local policymakers in Ca Mau province saw both the environmental and marketing benefits of a diversified land use strategy, through their conception of an 'organic coast' that maintains the less input-intensive shrimp-mangrove aquaculture. The CCB in Vietnam is promoting diversified farm livelihoods through intercropping in coffee plantations. In the case of Yunnan tea, local policymakers have recently promoted intercropping within monoculture tea estates due to recent droughts where tea agroforests were shown to be more resilient. Larger companies have followed suit. These strategies are being used alongside more established policies surrounding protection of natural forests, terracing, and other land sparing to promote a more diverse natural resource base in agricultural production areas.

Target policy instruments spatially

The type and intensity of environmental impacts from agricultural production depend not only on production practices in a particular field, but also on the location of that field within the landscape, its proximity to critical watershed features or habitats, its proximity to other farmers using those same practices, and the broader pattern of land use. Thus an isolated farm using highly-polluting practices at some distance from a major waterway may have much less impact on overall pollution than

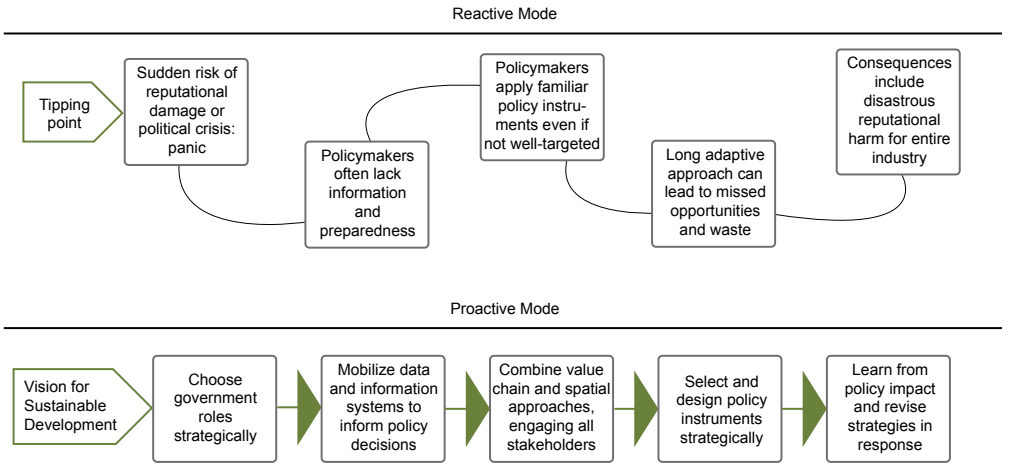

Figure 5.1 Reactive versus proactive policy approaches to environmental challenges of commodity agriculture

a moderately-polluting farm located adjacent to that waterway. Similarly, a highly-polluting farm located above a strip of forest that can filter pollutants before they reach the river, may have much lower impact than a lower-polluting farm surrounded only by annual cropland.

Thus, spatial targeting is essential for many environmental policy instruments for commodity agriculture. Data used to inform policy must be spatially disaggregated. Spatial considerations may determine priorities for regulatory enforcement or for public funding. Policy instruments, such as public payments for ecosystem services, should be implemented where they will be most effective.

The case studies demonstrate some examples. Yunnan initially planned to focus compensation for conservation set-asides on areas with more economically marginal production as a lower-cost policy option for reforestation. However, the areas offering the highest biodiversity gains happen to be those with higher profits and productivity, therefore reducing environmental impacts will require a different strategy (Yi et al. 2013). Another example of spatial targeting can be found in the decentralized system in Indonesia, where there are ongoing efforts to make land use planning more 'bottom up'. In Central Kalimantan, a collaborative mapping initiative between civil society and local government is underway to enable greater recognition of customary land ownership and allocation of licenses.

Devise alternative revenue-raising strategies for local government

Recent initiatives have sought to give local governments greater responsibilities for implementing national environmental as well as agricultural development policies. But local governments need to raise revenue and create jobs in order to maintain their development trajectories, and therefore may face difficult choices when trying to improve the environmental performance of commodities within their jurisdiction. The fear of 'chasing away' industry or losing public revenues from selling or taxing natural resources can be an impediment to enforcing stricter environmental and social safeguards. National governments must find ways to help local government entities devise alternative revenue-raising options that do not conflict with green growth strategies. In

China, national cash transfers and the ability of local governments to tax chemical inputs were used as alternative means to generate revenue so local governments could adapt national strategies. Indonesia and Vietnam are looking to link commodities into their REDD+ plans, though new sources of finance have been slow to materialize.

5.3 CHOOSE GOVERNMENT ROLES MORE STRATEGICALLY

The appropriate roles for government—whether as Definer, Regulator, Enabler, Funder or Advocate—depends upon the context, available resources and commodity and market characteristics. Policy instruments can provide both 'carrot' and 'stick' and influence different groups of actors. In moving towards a more proactive policy, policymakers need to develop a hierarchy of action across different policy roles; draw on a complementary mix of policy instruments; and clarify the respective roles of national and policy governments.

Develop a hierarchy of action across policy roles

The first priority for national, provincial and local government units is to establish high-level and cross-sectoral political support for an Agricultural Green Growth strategy, and establishing clear norms to protect human and ecosystem health and resource access. Environmental issues cannot be easily addressed if the dominant agricultural policy is not designed to ensure environmental outcomes in core programs and policies. The second priority is to strengthen government's enabling role, promoting stakeholder consultation and supporting private sector and civil society initiatives. The third priority is to advocate and provide critical technical and market information to ensure that private and public actors are moving towards the same measurable goals.

Once those policies are in place, regulatory roles are likely to be much more effective, and can be structured with graduated enforcement that reflects the state of knowledge and accommodates private profitability of adopting good practices. Promoting voluntary action may require a portfolio of both carrots and sticks. Strategies for public sector finance can then be developed to achieve impact at scale, building on the other policies in place.

Draw on a complementary mix of policy instruments

The case studies demonstrate the importance of complementarity among policy instruments and finding the right policy mix. It is difficult to have successful regulation with weak enforcement, to promote voluntary action without proper legal frameworks, or to create domestic standards without effective awareness-raising. Multiple policy instrument (reflecting different governmental roles) will usually be needed to achieve environmental goals.

For example, the Yunnan tea case is an example of government acting as definer (through national and regional and local green growth initiatives), regulator (through land use planning/zoning laws), Enabler (through training/extension), funder (through subsidies for reforestation), and Advocate (through appeals to producers adopt the process of geographic indication). Though the various instruments were created at different times and by different government units, the mix has created some progress in the tea sector through trial and error, and adaptation of national instruments to local contexts. To link and sequence multiple instruments strategically will require some experimentation, but risks can be mitigated by gathering and sharing data, and engaging with

stakeholders in the process of creating policies.

Use different tools for large growers and smallholder producers

The structure of commodity production will necessarily influence the selection of policy instruments. Where production is heavily concentrated among relatively few large production units, the most effective action will often be to implement regulatory measures or promote use of production standards. For example, in the largeholder-dominated Indonesian palm oil sector, emphasis is being placed on voluntary international (RSPO) and mandatory national standards (ISPO). Often the administrative costs of monitoring standards compliance is lower when largeholders prevail yet governments may not be willing or able to enforce standards amongst such players. It is not uncommon for large agricultural interests to co-opt governments/government agencies with there being some mutual dependence.

Where production is highly fragmented among smallholders, equal or greater attention will be needed to enabling, funding and promoting functions. A regulatory approach has proven elusive in altering practices amongst Vietnam's more than 500,000 smallholder coffee producers, yet an array of awareness-raising, training and concessional financing schemes are now being applied with some success. Fragmented Vietnamese shrimp production is being aided by public investments in water treatment and technical support for clusters of farmers, while the increasingly concentrated catfish aquaculture sub-sector is moving toward mandatory adoption of good aquaculture practice standards. In the Yunnan, China case, efforts to establish standards and certifications had difficulty in reaching smallholders as the public subsidies and government-sponsored programs favored larger enterprises due to the lower transaction costs and their greater participation in the policy development process.

Clarify the respective roles of local and national policy

Clear roles for different levels of government are important in ensuring the success of environmental mitigation. Several of the case studies provide evidence that national governments often act as a definer, but leaves implementation to the local level without the proper support or information needed for the nationally defined policy to succeed. For example in the Mekong Delta, while master plans that lay out pathways for sustainable development are abundant, implementation at the local level is minimal, and siloed policies have further blocked sustainable development. Furthermore, without participation of local governments in large-scale defining processes their buy-in is difficult to acquire. Local authorities are likely more in step with the needs of producers in their jurisdiction, and national policies do not often reflect this. The Yunnan tea case shows the benefit of strong central policies combined with material financial support; however, without refinement by government units over time these policies could not be fully effective.

There is also a need to make sure that policy incentives and roles are aligned so that actors are incentivized to make mutually supportive decisions. If local government officials fear that enforcing a national law will create an incentive for production to shift out of their jurisdiction, they have a good reason not to comply with these laws. For example, if the Governor of Central Kalimantan requires all companies who request concessions to produce palm oil on degraded land and follow RSPO principles, only to have a neighboring province 'outcompete' it by having weaker (or no) rules, there is little

possibility for sustainable management of natural resources. National government must step in to ensure that basic standards of environmental performance are met broadly.

Take a learning approach to policy development

The region's policymakers are still in a learning phase about the design and implementation of effective and affordable policies to mitigate—and even reverse—the environmental risks and impacts of commodity production, while also meeting production, economic and social development goals. The case studies presented in this study illuminated the importance of selecting clear policy goals, selecting policy tools that reinforce one another, strategic timing in implementation, stakeholder engagement, spatial targeting and new institutional models. Policymakers can take a learning approach to policy development, regularly assessing their own progress and shifting course as needed. Important questions remain. Context-specific analysis, nationally and regionally, are especially needed in the following areas: integration strategy, design

Box 5.1 Areas for context-specific analysis for policy development

- Identifying strategies for **better integration** across units and levels of government to improve policy response (e.g. faster response or better targeting) and associated environmental risk mitigation and determining appropriate mechanisms for intergovernmental coordination (e.g. inter-ministerial committees) and cross-sectoral engagement.
- More precisely defining which **data and information systems**, decision support tools and training are most important to enable policy makers to identify priority environmental risks within their jurisdictions and to realistically evaluate policy options (accounting for sectoral constituencies, historical experience with policy mechanisms, etc.)
- Clarifying how policy makers better can manage the **sequence and economic viability** of policy responses by identifying feasible (i.e. lower cost, moderately effective) near-term interventions, such as pilot programs or environmental impact reporting requirements, that can provide the foundation for subsequent policy actions that involve higher (economic and political) costs, but yield more transformative outcomes (e.g. revising subsidies and other financial incentives).
- Examining how policy makers can more effectively **leverage the capacities** of value chain actors, civil society groups, and bilateral donors using the five roles of government (e.g. commissioning risk assessments that clarify shared risks and motivate cooperation action).
- Scanning for **game-changing strategies** that can alter fundamental policy barriers to effective environmental mitigation (e.g. corruption, weak market demand for sustainable products) and improving accountability for environmental outcomes.
- Translating natural or **green accounting** methodologies that make environmental costs and benefits more explicit to agricultural landscapes in the region. These should recognize climate change, which will be a game changer for many landscapes and component land use and commodity systems over the next 2-5 decades.
- Determining **design criteria** for policy instruments that account for the regional context (e.g. centralized vs decentralized authority) and allow for 'policy pairing' (e.g. simultaneous establishment of environmental rules with 'green procurement' and supportive research programs).

of data and information systems; sequencing of policy action; leveraging opportunities, game-changing strategies; green accounting and design criteria (see Box 5.1).

5.4 COMBINE VALUE CHAIN AND SPATIAL APPROACHES, ENGAGING ALL STAKEHOLDERS

Shifting agricultural practices and systems and reversing existing degradation can rarely be done through action by a single stakeholder group. Moreover, for policy actions to be powerful, they must have broad-based support. Thus, in developing strategies and instruments, policymaker should actively engage all critical stakeholders and build coalitions to advance and support them; partner with the private sector around shared risks; and build on the technical and policy innovations piloted by civil society.

Reconceive certification as a tool rather than a strategy

Over the past two decades, the most important instrument for promoting environmental standards in export agriculture commodities has been eco-certification, from international Roundtable-based standards of RSPO, to independent standards such as Rainforest Alliance and Fair Trade certification. Experience in the region broadly, as well as in these six cases, shows that environmental standards for certification of agricultural products can be a highly useful tool. Certification standards move well beyond improved seed and input efficiency to encourage a wide range of sustainable management practices. While originally certification was seen as a mechanism to generate income premiums for producers, as larger areas become certified, premiums are declining. Rather, certification is being valued as a mechanism to reduce production costs, improve productivity and secure market share, as well as generating environmental and social benefits on and off-farm. Incorporating social standards is also becoming more important to buyers and policymakers.

Coffee beans after processing at a facility in Dak Lak. Photo by Tanja Havemann.

Over time, national, regional and local government units have emulated these standards, in whole or in part. Domestic standards focusing on external demand such as the Indonesian ISPO and Vietnamese shrimp certification, need to maintain alignment with international standards in order to remain competitive and maintain assurances that auditing practices and requirements are fully in place. Standards catering to domestic demand need better promotion and information sharing in order to maintain consumer confidence in the authenticity and meaning of eco-labels. A major issue identified in the Yunnan case was a proliferation of labels without adequate consumer awareness-raising, leading to confusion and lowered uptake.

While originally conceived as an approach led by the private sector, it has become clear that government policy has important roles to play. More cohesive policies are needed that reconceive certification as a tool within a broader multi-instrument strategy. Indeed, certification is generally insufficient by itself to achieve environmental objectives. Voluntary standards' effect on promoting diversified land cover depends on the particular standard, and the relative robustness of the legal framework in which they operate. For example, the RSPO standards provide guidelines for maintenance of high conservation value areas, however the legal framework for land classifications in Indonesia makes keeping these areas out of production difficult. Standards tend to focus on farm-level practices, not all the land uses and production in a landscape, and therefore their effect on promoting diversification beyond the farm scale is generally lower. Thus, other complementary tools, such as extension, land use planning or institutions for integrated landscape management are also needed to ensure that sufficient agricultural land areas are under certification, and in the right locations, to influence ecosystem processes.

Build local, regional and national multi-stakeholder coalitions to support policy objectives

Policies devised in capital cities by politicians and a few actors with privileged access to the process, can be difficult to implement successfully, particularly when they require changes in the perceptions and common practices of stakeholders. Proactive efforts are needed to generate a shared vision for agriculture green growth and produce more constructive, cooperative relationships between agricultural producers, other industry actors, environmental advocates and local constituencies in producing regions. This calls for knowledge exchange, and engagement of all stakeholders who can contribute to an agreed vision and to its implementation through their own actions.

In the best circumstances, local governments, administrative units and communities will feel a sense of ownership. They can be empowered through involvement in agricultural and land use planning, the clarification of tenure and access rights, and the provision of adequate resources to maintain compliance with environmental performance standards. The experience of local, multi-stakeholder administrative organizations (TAOs) for watershed management in Thailand offers one possible model for moving forward. Building up the capacities of these types of institutions is needed for cost-effective monitoring, evaluation and enforcement of environmental and social safeguards. In their role as Advocate, government units can use their convening power to ensure that policy instruments reflect inputs from, and are accepted—even championed—by all key stakeholders in the landscapes they are targeting.

Promote integrated landscape initiatives

The challenge of achieving numerous agricultural, environmental and social objectives on a fixed land and resource base, and the importance of stakeholder engagement, has prompted wide-ranging innovation in partnerships and negotiating platforms for integrated landscape management (ILM) (Kozar, et al 2014). Such initiatives have been set up to seek synergies and manage tradeoffs where diverse stakeholders have competing, legitimate claims on land and resources. Collaborative action strategies are developed that ideally respect diverse stakeholder perspectives and values, and are informed by objective analyses of tradeoffs and synergies based on good data.

National and local policymakers in the region increasingly appreciate how such ILM platforms can facilitate collaborative management of whole landscapes, in the context of socio-ecological complexity. Of the 165 integrated landscape initiatives surveyed in the Southeast Asia Continental Review, 98 percent involved one or more governmental entities (often from different ministries and different government levels) in the implementation, though many other stakeholder groups were also actively involved. Leadership roles are variously played by government or inter-government agencies, public-private partnerships, civil society organizations, producer organizations, agribusiness or indigenous peoples' organizations (Zanzanaini, et al 2015).

In our case studies, emergent landscape initiatives are represented by the Coastal Resources for Sustainable Development Program for shrimp in Vietnam and the Tambon Administrative Organizations in Thailand. The Dutch Sustainable Trade Initiative (IDH) recently created the Sustainable Land and Water Program, which has begun investing in integrated landscape initiatives where private agribusiness is a key actor, including a coffee landscape in Vietnam and an oil palm landscape in Indonesia (IDH 2014).

Partner with the private sector around shared risks

Government can rarely solve environmental problems without active engagement of agricultural businesses. In some landscapes, demand for environmental stewardship may come primarily from local community or other stakeholders not involved in commodity production or trade. But in many landscapes, companies themselves are facing operational and market risks due to environmental degradation and are open to collaboration in mitigation initiatives. Policy response should seek and encourage such collaboration.

For example, in the Indonesian palm oil case, frontrunner private sector companies have been leading on compliance with RSPO. They largely welcome government efforts to make the case for lagging companies to move towards greater environmental sustainability, through creation of ISPO standards, removal of perverse incentives, increased research and development, and training of auditors to monitor environmental effects of production. Another example is the establishment of the CCB in Vietnam to manage public and private sector agendas in order to harmonize research and investment for a sustainable coffee sector. Voluntary mitigation measures by the private sector, used to exploit a differentiated market, has in some cases spurred and informed government action (e.g. RSPO as a precursor to ISPO, GlobalGAP to VietGAP). The earlier referenced Thai shrimp case is another example.

Build on technical and policy innovations piloted by civil society

The importance (and inevitability) of local and domestic civil society engagement will increasingly be recognized by national policy makers. In Thailand, the Royal Projects Foundation and Raks Thai served as critically important stakeholders for moving the policy agenda forward. In Indonesia, an increasingly vibrant civil society and NGO sector is lobbying for resource rights. In the Philippines, civil society is rallying around public health issues from agricultural production. Rather than viewing these as a threat, national policy makers can use engagement strategies to leverage change where interests overlap and create opportunities for discussion where tradeoffs need to be made.

Indeed, civil society has been playing many constructive roles apart from political activism. Research and pilot projects organized by civil society have developed new production methods and natural resource management practices that overcome actual or perceived trade-offs between yield/production and environmental protection. In the Mae Chaem, Thailand case study, bilateral development assistance, along with support from the Royal Project Foundation led early work in the late 1960s to reduce opium production, support livelihoods, and focus on soil and water conservation. International and domestic NGOs such as CARE, ICRAF and the Alternatives to Slash and Burn initiative spent significant time conducting pilot studies of PES, promotion of agroforestry and organic production practices, and other programs that were taken up by governments in the landscapes as well. In Ca Mau, Vietnam, NGOs and other civil society organizations were among the first to champion and pilot mangrove restoration.

These projects provided a wealth of experience for governments to use in assessing the design and efficacy of interventions. Civil society has also played a valuable role in mobilizing public support for responsive policy action.

5.5 STRENGTHEN ORGANIZATIONAL CAPACITY, DATA AND KNOWLEDGE SYSTEMS

Effective implementation of all the policies discussed above requires adequate 'green' agriculture capabilities, including data, knowledge, skills, financial resources, management systems, physical assets, and relationships. These must be present among supply chain actors (e.g. farmers, farmer organizations, agro-enterprises, national ministries and agencies, sub-national and local governments, research/training institutions, civil society organizations, and the media. The presence of such competencies influences (and limits) the appropriateness of policy instruments, their implementation and efficacy. Priority areas for action are to improve agro-environment diagnostics and measurement, share information widely among stakeholders; and improve capacities to administer and implement agro-environment policies and programs.

Develop robust public sector agro-environment data systems

It is essential to develop robust public sector agro-environment data systems, to enable effective and objective assessments of status and cross sector impacts in meaningful geospatial domains. Such data and information are critical for determining present conditions, setting objectives, relating potential costs and benefits, setting appropriate norms and rules and monitoring their compliance. The lack of reliable data was observed in some of our case studies, including the absence of hydrological models in the Dak Lak watersheds, the unclear ratio between shrimp and mangroves in Ca Mau and the state

of soil conditions in Yunnan. On the other hand, the OneMap initiative in Indonesia and Central Kalimantan's collaborate mapping efforts are signs of progress.

Skills and resources are needed to collect and interpret baseline environmental data, conduct environmental assessments of proposed large-scale agricultural investments, apply green accounting methods to agricultural systems for value chains, simulate and/or measure cause-effects in the application of good (or bad) environmental practices in agriculture, monitor changes in land use, and monitor/measure water quality/groundwater levels, greenhouse gas emissions, etc.

Key information includes baseline assessment data and follow up monitoring and assessment of key environmental indicators (e.g. groundwater levels in Dak Lak; soil conditions in Yunnan; the ratio between mangroves and shrimp cultivation areas in Ca Mau). Data needs to be gathered on not just the environmental risks to agriculture, but also on the impacts stemming from agriculture. National and local government units are beginning to make strides in this area: VietGap covers 100 percent of the cost for spatial analysis and soil/water testing, the One Map initiative in Indonesia and Central Kalimantan's collaborative mapping efforts are a few examples.

Share information widely among stakeholders

The information collected above needs to be made available to all stakeholders, to enable voluntary action by private and civil society sectors, encourage and enable regulatory compliance and mobilize support for implementation. Contextualizing these risks and the policy instruments put in place to address them is critical. Local governments and producers at times are unfamiliar with the evidence that is motivating policy action, or have little clarity about how to implement national plans ad policies stemming from green growth strategies. On the other end of the spectrum, local knowledge and understanding of complex ecological systems is not always translated to show its importance to national level government, and therefore not always incorporated into broader visions and long-term strategies.

Information can be shared through increased resources and better coordination on extension services, and better horizontal and vertical knowledge sharing. Facilitators and intermediaries that have the trust of stakeholders can play a major role in making the environmental risks and mitigation opportunities relevant to local, regional and national level government units. In Mae Chaem, Thailand, Raks Thai played the role of facilitator, by providing local stakeholders with critical information and awareness raising on land rights.

Improve capacity to administer and implement agro-environment policies and programs

Effective implementation of agro-environment policies and programs requires well-trained staff at all levels of government, with suitable skills, knowledge and relationships. Skills are needed particularly to incorporate environmental risk into agricultural land use planning; design and oversee the implementation of appropriate regulations, to harmonize international environmental standards into national norms; to assess and minimize conflicts between agricultural and environmental policies; to accredit certifying entities; to promote inter-ministerial coordination on natural resource management policies; and to collaborate in landscape-level natural resource management initiatives. These capacities by local and regional government officials to implement some of these more complex policies were lacking in most of the case studies

lacked, and the studies did not identify major initiatives to enhance capacities.

Public officials also need better skills and training to raise stakeholder awareness about pertinent environmental risks and mitigating solutions; deliver training/technical assistance to farmers and other supply chain players; educate and manage relationships with stakeholders; facilitate the creation and credibility of industry code/labelling systems; convene fora for debate and discussion on agro-environmental issues; and communicate with the media. New partnerships are attempting to leverage the expertise of the private sector in delivering training and technical assistance with the access and convening power provided by the public sector to work towards solutions—the Coffee Coordination Board in Dak Lak, and the SNV Mangroves and Markets program in Ca Mau are just two examples.

To build the necessary institutional capacity throughout the system—in government, among supply chain actors and in civil society—governments need to assess areas of strength and weakness in pertinent institutional capacities, prioritize capacity building needs and devise programs to invest in capacity strengthening. Investments will generally need to combine 'hard infrastructure' (i.e. testing laboratories), 'hard competencies' (i.e. technical and analytical skills), and 'soft competences' (i.e. leadership, relationship building, facilitative skills). This investment can and should take a myriad of forms, whether direct support as in Vietnam and China, devolution of decision-making authority as in Indonesia and Thailand, and capacity-building through extension and data gathering as is beginning to gain momentum throughout the region.

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PART TWO
CASE STUDIES

Extensive shrimp farming system in Ca Mau, Vietnam. Photo by Samiksha Nair.

PALM OIL IN WEST AND CENTRAL KALIMANTAN, INDONESIA

6

Tanja Havemann and Uray Endang Kusumajaya

This case study examines the impact of large-scale oil palm expansion in West and Central Kalimantan, a lowland forest area in Indonesian Borneo. Rapid expansion of oil palm plantations in Indonesia has been driven by favorable economic production conditions and has resulted in significant local and international social and environmental externalities. Local groups are primarily concerned about the effect of these plantations on livelihoods and on the rights of local peoples. International groups have largely been concerned about the implications of large-scale oil palm production for global greenhouse gas emissions and biodiversity, particularly when it catalyzes loss of habitat for orangutans and other charismatic mega fauna.

Measures have been put in place to try to improve practices within the industry. However, it has been challenging to find a sustainable way to find incentives for better production practices given that palm oil is a product that is largely invisible to consumers and that most consumers are not willing or able to pay certification premiums for labeled 'sustainable' palm oil. International trade measures have sought to restrict imports of unsustainable palm oil, and to provide some financial incentives through payments for ecosystem services. National measures have included creation of a mandatory local standard, however this is still in its infancy and the likelihood of a substantial positive impact is uncertain. Provincial and district governments have also implemented various measures to try to encourage improved practices, but many of these are only beginning to take shape and long-term commitment by local government and private sector is unclear.

West and Central Kalimantan, Indonesia

6.1 COMMODITY PALM OIL IN INDONESIA

Palm oil is widely used in the food and beverage, cosmetics, pharmaceutical, and chemical industries, and increasingly for energy. Palm oil ingredients and by-products are estimated to be used in over 50 percent of packaged supermarket products (Riant, Mochtar, and Sasmito 2011). Importantly, oil palm is, by far, the highest yielding oil-bearing crop, and thus economic drivers for continued and expanded production are strong (Johnston et al. 2009).

Though native to West Africa, oil palm grows well plus or minus 3 degrees from the equator, and has been particularly successful in Indonesia and Malaysia. Indonesian palm oil production conditions are favorable due to the relatively flat topography, low-lying areas, and high rainfall (1,700 – 3,000 millimeters per year). Oil palm was initially grown on mineral

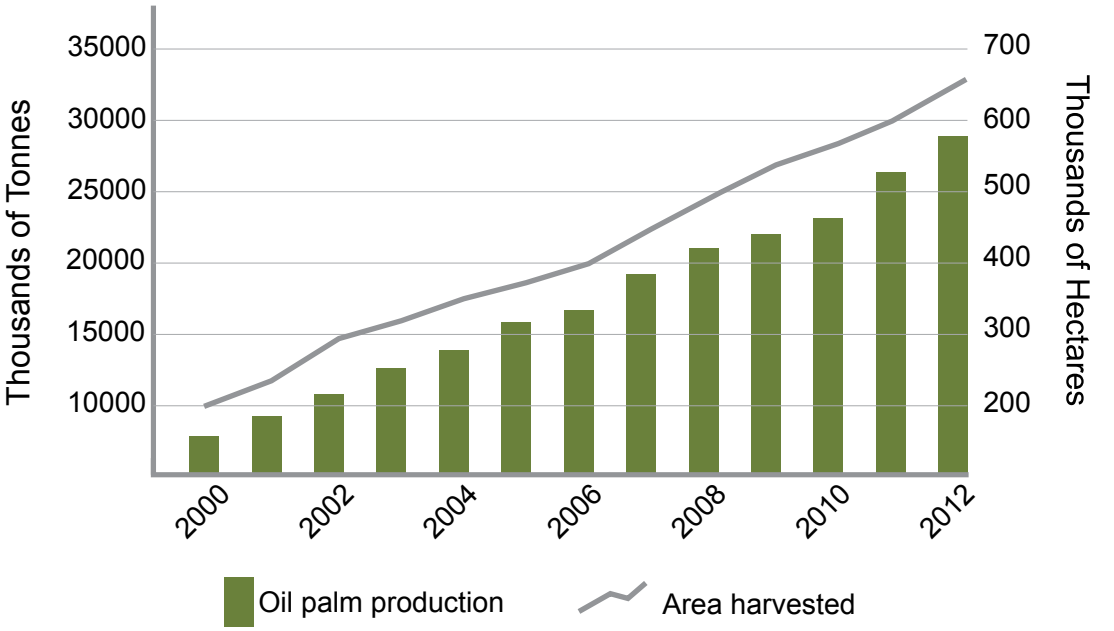

Figure 6.1 Production and area harvested of oil palm, Indonesia 2000-2012
Source: FAO 2014

soils, yet is increasingly grown on peat soils[1] as they are considered to offer better drought-resistance. Clearance of natural forests on peat soils is a major contributor to global greenhouse gas emissions (GHGs), and has greater adverse environmental impacts compared to production on mineral soils. Oil palm typically also requires chemical inputs, in particular calcium, magnesium, and potassium, and application of micronutrients when grown on peat soils. Small-scale farmers are usually less able to afford fertilizers, and are often not aware of the best application techniques. As a result there is reported to be a yield gap of around 30 percent between independent farmers and estates, as well as significant differences in fresh fruit bunch (FFB) quality. The oil palm takes nearly three years to mature, and farmers can inter-crop with maize, pineapple, or other crops.

Indonesia is the world's largest grower of oil palm, primarily for export to China, India, and the Eurozone. Palm oil exports are Indonesia's third largest export earner, after crude oil and natural gas, and the sector is directly responsible for the employment of nearly 5 million people. In 2014, Indonesia produced 33.5 million tonnes of palm oil and exported 20 million tonnes abroad (Indonesia Investments n.d.). With yields at approximately 3.8 tonnes of Crude Palm Oil (CPO) per hectare, Indonesian palm oil yields have increased significantly in the past two decades and are now among the highest in the world (Wiyono and Slette 2013). In addition to persisting in the promotion of oil palm exports, the Indonesian government is encouraging greater domestic value addition and consumption for both cooking and for use as an energy source (biodiesel) (Taylor 2014). Indonesia is expected to further raise biofuel blending rates in 2015, from 10 percent

1 Peat soils refer to the bed of a water-logged area of land with a mass of decaying plant and organic matter. Moors, bogs, swamp forests are all characterized by peat soils and are collectively referred to as peatlands.

to 15 percent, and subsequently to 20 percent (Listiyorini and Suhana, 2015).

Relevant market trends for the palm oil industry include:

- Market demand: There is significant and increasing global and local demand for products from oil palm, both from the consumer goods and energy sector. For example, burgeoning demand from China and India and other locations where 'environmental sustainability' issues are not prioritized, and the introduction of biofuel policies including the European Biofuel Policies[2] have contributed to high demand for palm oil. The top five palm oil importers are India, China, the European Union (EU), Pakistan, and the United States. Demand from India and China has grown in comparison to the EU and the United States (Agriculture Corner 2012). Indonesia itself is the third largest user of palm oil.
- Usage characteristics: Palm oil is an invisible product in that it is not frequently incorporated as the main ingredient in end use products. For example, palm oil is commonly used in chocolate as a cost effective emulsifier or humectant, but the consumer tends to be concerned about the quality and source of the cocoa rather than the palm oil. There is little differentiation of the final product based on quality of the palm oil. Moreover, with more than 30 derivatives of palm oil, the names of which often do not include the signifier "palm," it is difficult for the common consumer to make informed choices, with limits the potential for consumer activism.
- Production economics: The oil palm is the highest yielding terrestrial oil-producing crop in existence, with potential for producing the largest volumes of oil per hectare. During the early period of oil palm development, plantation owners sold high-value timber species from forest clearing, effectively subsidizing plantation costs. Once planted, oil palm is a comparatively easy crop to manage with relatively low labor costs.
- National policy incentives: Various Indonesian fiscal incentives support large-scale agricultural and infrastructure investment and development, including the oil palm sector, e.g. there is no Value Added Tax (VAT) on oil palm Fresh Fruit Bunches (FFBs). The Government is also taking an increasingly proactive approach to promote domestic palm oil processing and value addition (BKPM 2013). This is supported by other policies such as biodiesel blending policies (Rusmana and Listiyorini 2014).[3]

The environmental impact of this commodity is significant. Conversion of forests and peat fires, in part due to expansion of oil palm plantations, has been the biggest single source of Indonesian GHG emissions (Dewi et al. 2010). For example, estimates indicate that the oil palm sector was the single largest driver of Indonesian deforestation between 2009 and 2011, resulting in approximately 3,000 square kilometers of forest loss, including 75 percent of the deforestation in West Kalimantan and 38 percent of the deforestation in Central Kalimantan (Greenpeace 2013). Oil palm expansion in Indonesia is of particular concern when it takes place on peatlands (Schrier-Uijl et al. 2013). As they are cleared, peat soils release significant quantities of GHGs, and may result in a chain reaction

2 The European Union (EU) Renewable Energy Directive 2009/28/EC sets a 10 percent target by 2020 on biofuel blending. This is to be met by: (a) 8.5 percent first generation biofuels (food/feed crops & vegetable oils), (b) 1 percent renewable electricity (Diop et al. 2013).

3 In September 2013 the government increased the amount of palm oil/renewable oil to be blended with fuel to 10 percent from 7.5 percent and power plants have to blend 20 percent from January 2014 (Rusmana and Listiyorini 2014).

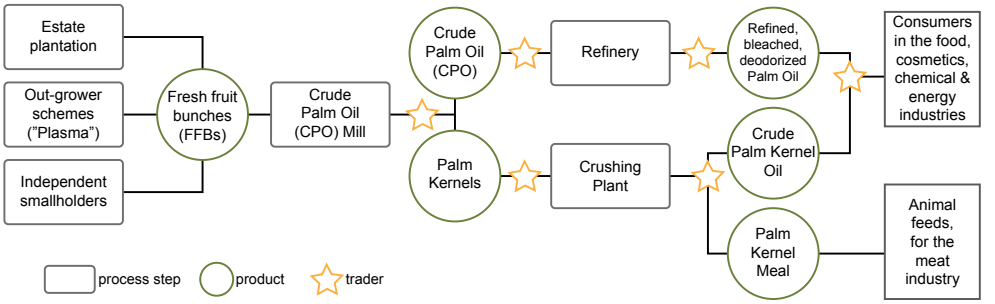

Figure 6.2 Simplified oil palm products value chain

of negative environmental impacts including increasing vulnerability to fire and changing local hydrology. Additional environmental impacts associated with large-scale oil palm plantation expansion include soil subsidence, increased risk of flooding, salt-water intrusion, chemical pollution from plantation runoff, biodiversity loss, and haze, which, in turn, may also reduce the overall productivity of plants in the region by diminishing photosynthetically-active radiation (Schrier-Uijl, et al. 2013).

Oil palm expansion has also contributed significantly to social conflict. In 2013 alone, more than 8,000 land disputes were registered with the Indonesian National Land Use and Planning Agency, most of which have yet to be addressed (MacLean 2014). In 2012, the Indonesian government recorded 250 cases of conflicts in Central Kalimantan and 77 cases in West Kalimantan (Hadinaryanto 2014). Many local communities are angered by the expansion of oil palm plantations and concerned that they are being forced off their lands. In West Kalimantan, for example, villagers filed lawsuits against oil palm plantation companies holding concessions on 110 square kilometers (MacLean 2014).

The value chain

The Indonesian palm oil production sector is dominated by private enterprises. However, contributions by small-scale farmers account for almost 40 percent of total palm oil production and are important to consider in discussions on palm oil (Rianto et al. 2011). Figure 6.2 illustrates a typical supply chain. Small-scale farmers operate either independently or as part of out-grower contract farming schemes (often called plasma schemes in Indonesia). Independent growers tend to have little or no bargaining power regarding FFB sales and usually have to sell to the closest mill, ultimately pitting farmers against a monopsony or—at best—an oligopsony (Masliani et al. 2014).

6.2 THE LANDSCAPE OF WEST AND CENTRAL KALIMANTAN

The primary focus of this case study is West Kalimantan, where several local stakeholder interviews were conducted. However, reference to Central Kalimantan is included as this region has been the focus of significant policy interventions. The 'landscape' in this context is therefore the lowland, mostly peat forests.

West Kalimantan

West Kalimantan ('Kalimantan Barat', or 'Kalbas') is a predominantly lowland province covering an area of roughly 147,000 square kilometers, with an estimated population of 4.4 million in 2012. West Kalimantan has been significantly affected by the palm oil boom, likely in part due to the availability of infrastructure, such as roads and ports, that supports the sale

of agricultural products in far removed markets. Additionally, the proximity to Malaysia provided an experienced force of laborers and entrepreneurs ready to launch the expansion of the palm oil industry in West Kalimantan, an area largely comprised of flatland, making it an area that is highly suited for the development of large-scale oil palm plantations.

According to the Governors' Climate & Forests Task Force (GCF), of which the administration of the province of West Kalimantan is a member, the national forest estate in the province covers an area of approximately 90,000 square kilometers, of which half is zoned as permanent production forest. Of this zoned production forest area, only about 5,000 square kilometers remain under natural forest due to the rapid expansion of estate crops (mostly oil palm). Some 23,000 square kilometers are zoned for protection and a further 14,500 square kilometers for conservation. Approximately 63 percent of West Kalimantan is classified as peat forest (GCF 2015).

Agriculture and forestry form the backbone of the West Kalimantan economy, with mining contributing a significant portion of the region's GDP. Primary agricultural products include corn, pineapple, banana, sweet potato, cassava, oil palm, rubber, coconut, pepper, cocoa, coffee, and cloves. A 2003 study revealed that within the agribusiness of oil palm, production was split equally between areas managed by private companies and smallholders operating under the auspices of out-grower schemes.

The push to establish oil palm plantations and enterprises of other industrial crops drove private industries to usurp forestlands and its associated communities. 529 companies representing the oil palm, logging, and mining industries have taken root in West Kalimantan, occupying approximately 70 percent of the total area. With a total of 100,000 square kilometers of

Peat swamp in West Kalimantan. Photo by Lee Gross, EcoAgriculture Partners.

the land consumed by private interests, local people, the majority of them belonging to indigenous groups, are left to get by on the remaining 44,000 square kilometers, much of which cannot be developed due to forest protections (Hadinaryanto 2014).

Central Kalimantan

Indonesia's third largest province, with an area of more than 153,000 square kilometers, is split into 13 districts and one city with a population of approximately 2.2 million dispersed across the region (GCF 2015). From 1996 to 1999, Central Kalimantan was the location of the infamous "Mega Rice Project" (also called the "One Million Hectare Peatland Development Project" or PLG). This project covered an area of 10,000 square kilometers of peat swamp and led to massive environmental degradation and displaced many tens of thousands of local peoples.

With respect to environmental issues, Central Kalimantan ('Kalimantan Tengah' or 'Kansah') is considered as one of the most progressive provinces. Due to its high rate of deforestation, starting in 1995 the province welcomed international cooperation in research and conservation projects on peatlands. Restoration of the damaged peat ecosystem became a high priority for the provincial government supported by a Presidential Instruction.[4] With the creation of a provincial research center and symposiums on peat forests spurred a shift in provincial policy to formally address environmental issues affecting the region. This "green" policy framework institutionalized land protections and conservation standards, as well as partnerships with international organizations to initiate REDD+ projects (GCF n.d). By 2010, Central Kalimantan successfully preserved 126,000 square kilometers in its national forest estates and 28,000 square kilometers under other land use categories (GCF 2015). These caught the attention of GCF, which proclaims the province a champion in environmental issues, and warranted Central Kalimantan as the pilot province for REDD+ projects established by an agreement between Indonesia and Norway. The provincial government is

4 Instruction by President Susilo Bambang Yudhoyono issued in 2007 requiring the rehabilitation and conservation of the Ex Mega Rice Project area and subsequent development of a comprehensive Master Plan in 2008.

Box 6.1 Local consultation area

Stakeholder interviews were conducted in three regencies in West Kalimantan:

- Sanggau Regency, an area of circa 12,900 km2, with a population of 408,000 in 2010.
- Sambas Regency, an area of circa 6,400 km2, with a population of 496,000 in 2010.
- North Kayong Regency, an area of circa 4,600 km2, with a population of 95,605 in 2010, divided into 43 villages and 5 sub districts.

The industry of these three regencies is largely driven by palm oil. Alongside livestock, other prominent agricultural products are: coconut, coffee, cassava, pepper, corn, soybean, and sweet potato (BKPM n.d.). According to interviewees, farmers may also cultivate horticultural products for local markets.

The populations in these three areas are primarily of the Dayak and Malay ethnic groups. As their livelihoods hinge on the availability of forest goods and services, their cultures emphasize a strong link to the forest. A government-sponsored resettlement program ('Transmigrasi') launched in 1960's stirred conflict when large-scale forest concessions were granted to logging and rubber operations. The oil palm boom of the 1990s inspired the consolidation of communal lands into plantations, often without the awareness or consent of the impacted communities (Charras 2001).

currently tackling zoning issues to facilitate better land management.

Indigenous Dayak form the largest ethnic groups in both West and Central Kalimantan. The Dayak historically relied on the forests for their livelihoods, but have increasingly entered the wage economy. There has been significant migration to Central Kalimantan as a result of government-promoted agricultural expansion programs (GCF n.d.). The main economic activities in Central Kalimantan are palm oil (contributing approximately 25 percent of provincial GDP), and mining (around

Table 6.1 Key environmental risks associated with large-scale oil palm expansion

Risks	Drivers	Impacts
Greenhouse gas emissions	Forest clearing, particularly peatlands, and emission of methane; use of fire for clearing; improper agricultural practices or water table management; lack of methane capture from palm oil mill effluent (POME) treatment/improper CH_4 management.	Increase in global climate change; local- and trans-boundary air pollution (i.e. haze); local meteorological changes, in certain cases, due to reduction of humidity level.
Loss of biodiversity	Forest/high conservation value (hcv) areas clearing for monoculture plantations; failure of landscape planning to enable wildlife corridors, which undermines efforts to protect HCV areas.	Diminished biodiversity-dependent livelihood; loss of habitat and human/wildlife conflicts; increased susceptibility to plant diseases; negative impacts on land available for food security.
River siltation and soil erosion	Forest clearing; poor plantation planning and management practices.	Changes to local hydrology; flooding; compaction and subsidence of soils.
Riparian zone loss and damage	Illegal or improper planting in riparian zones; failure of landscape planning to prevent planting on river banks.	Loss of wild animal feeding areas; loss of sediment and movement of pollutants into streams.
Adverse impacts on surface and underground water	Water abstraction for irrigation and mill processes; incorrect application of chemicals and fertilizers; mismanagement of effluent (POME).	Contaminated surface and underground water; reduced soil quality (e.g. pH) and fertility; soil exhaustion; nitrogen losses in the form of volatilization of ammonia; public and environmental health impacts, especially downstream communities; possible spread of waterborne disease.

Land Clearing

Environmental impacts

- Clearing of peatlands increases fire risk (haze)
- Clearing of natural habitat (forests), impacting biodiversity
- Increases soil vulnerability (siltation)
- Release of GHGs

Social impacts

- Displacement of local people: Conflict
- Loss of livelihoods
- Secondary impacts, e.g. siltation reducing access through river networks, vulnerability to flooding

Plantation Establishment

Environmental impacts

- Soil compaction & subsidence (erosion)
- Drainage system and soil compaction affecting local hydrology
- Run-offs from chemical inputs
- Monoculture reduces wildlife habitat (biodiversity)

Social impacts

- Tensions from increase of migrant workers
- Change in local production dynamics, e.g. displacement of food crops and monopsony
- Secondary impacts e.g. agricultural run-offs

Palm Oil Mill

Environmental impacts

- Palm Oil Mill Effluent discharges (water pollution)
- GHG emissions from improper waste management (organic matter decomposition)

Social impacts

- Health impacts from pollution

Figure 6.3 Potential environmental and social impacts in oil palm value chain
Note: Further processing and refining steps have been removed, as this does not take place in production landscapes. Palm Oil Mill photograph courtesy of Mirufish, via Flickr.

nine percent of GDP). Other relevant products include timber, rice, and rattan.

6.3 LANDSCAPE RISKS

Environmental risks resulting from large-scale expansion of oil palm production in Indonesia, the drivers of these risks, and the typical impacts, as determined by stakeholder interviews and review of relevant literature, are summarized in Table 6.1. Note that the summary table excludes important macro causes such as global demand for (unsustainable) oil palm products.

While the environmental risks of oil palm production are manifold, community groups in West Kalimantan are most concerned about the loss of local livelihoods, resource rights, and marginalization. Intuitively these issues would be categorized as social and governance issues but upon closer examination through an environmental lens it can be argued land degradation and loss of forest productivity poses the largest threat to the livelihoods of local peoples. A myriad of negative environmental consequences can be traced back to the depreciated capacity of local communities to manage forest lands. Specific community concerns include:

- *The forcible removal of farmers in West Kalimantan from their communal lands:* The land was transferred to a company for oil palm plantation development by the local government provoking conflict when some community members accepted the transfer without full agreement from the whole group.
- *The degree of control of local value chains for agricultural products*

(including FFBs) and revenue sharing with local communities:
Some farmers have been persuaded to sell FFBs directly to the plantations. However, because local millers effectively have complete control of local value chains, independent farmers have little or no bargaining power. This was exemplified by a case in Sepandak village where independent farmers were effectively forced to sell their FFBs to the local miller at a very low price, putting them out of business. The plantation company subsequently took over the independent farmers' lands. However, research institutions and companies lament that the quality of FFBs sold by independent farmers is often of very poor quality, and thereby usually warrants a lower price.

Such marginalization of local communities may spur environmental degradation in that local communities are forced onto new lands (land clearing) including more marginal lands. In general, large-scale monocultural production of a non-staple crop such as oil palm may undermine local food security.

Based on stakeholder interviews, local communities and governments are most concerned about environmental issues around water, e.g. pollution through run-off of chemicals and localized flooding and siltation. In addition to water, local governments have environmental concerns about land degradation and biodiversity loss. International organizations, including non-governmental organizations (NGOs), and central government bodies often express concern about environmental issues such as biodiversity loss, GHGs, and air pollution (smog and haze) caused by peatland fires.

6.4 POLICY INTERVENTIONS

The Indonesian government is keenly aware of the need to enact policies to tackle risks associated with the boom in oil palm plantations. However, various strategies focused on economic and agricultural development (see Box 6.2), spatial planning, bio-energy, forestry, and conservation and are not always well-aligned. A partial summary of potential and existing policy interventions is provided in Table 6.2. In the following sections, more detailed descriptions of policy interventions, at both national and local levels, are provided for spatial planning and land permitting and certification schemes.

Box 6.2 Indonesia's agricultural and oil palm development strategies

The government has developed a long-term strategy to promote the revitalization of Indonesian agricultural and fisheries sectors: Revitalisasi Pertanian, Perikanan, dan Kehutanan/RPPK 2005-2025. The primary focus of this strategy is on food security (emphasizing rice), agricultural diversification, value addition, and export development. Within these objectives, there are specific sub-strategies such as agricultural finance, utilization of agricultural lands, and product development. There are specific targets for the oil palm industry, notably to: (a) improve productivity through rejuvenation, seed industry development, seed quality improvement, farmer development, etc; (b) promote development of the downstream (processing) industry, research, and biodiesel market development, and (c) increase available financing. The overall strategic goals, summarized as 'upstream empowerment, downstream strengthening,' include raising productivity to 20 tons of FFB per hectare, increasing farmers' incomes by 80 percent to around $2,500 per year, and establishing a specific fund for oil palm development.

Spatial planning and land permitting procedures

Indonesia has a decentralized policy framework in which provincial and district governments have significant influence on policy, including management decisions on land use. Strategies for land use formulated by the provinces are laid out in Long-term Development Plans (RPJP) and Medium-Term Development Plans (RPJM) that dictate the activities of district governments. There are on-going efforts to make the land use planning and allocation more 'bottom-up,' as suggested by the 2007 Spatial Planning Law. Land use is zoned according to provincial plans and controlled by the Ministry of Forestry, the National Land Agency, and local government. Spatial planning and the resultant land use classifications and land permitting processes have been a source of concern for local and international groups. Weaknesses have been identified in spatial planning and land permitting procedures. Various stakeholder groups are testing different collaborative approaches to tackle these issues, some of which are described below.

Consistency in classification of land between central and local government administrations: Land classification has historically been done at the national level and then passed down to provinces and districts, resulting in mismatches. This came to the fore during implementation of the 2007 planning law, which highlighted tensions between the land controlled centrally by the Ministry of Forestry and local governments, particularly in areas with a high proportion of land classified as forests (e.g. Central Kalimantan). In 2013, the Indonesian Constitutional Court ruled to invalidate the Ministry of Forestry's claim to millions of hectares of customary forestland. However, it will likely take many years to untangle resource claims, especially since some areas have already been granted to companies for concessions. Gynch and Wells (2014) noted a ruling in 2012 that required the Ministry of Forestry to "formally gazette land as part of the Forest Zone before exercising management control over lands." This case was brought to court by government representatives from Central Kalimantan who accused the Ministry of blocking regional economic development (Gynch and Wells 2014).

A pioneering mapping initiative is also underway in Central Kalimantan to enable greater recognition of customary land ownership and allocation of licenses. The governor has implemented a decree and a provincial regulation that provides increased recognition to indigenous land rights. Mapping is carried out collaboratively between civil society organizations and local government. This specific approach means that the license is immediately recognized under a governor's decree (introduced in 2009), as soon as it is made public by the local chief. Various NGOs and donors are supporting this initiative, but clear results are yet to be seen. Progress has, for example, been delayed due to an on-going dispute with the Ministry of Forestry, which has resulted in an area of approximately 35,000-45,000 square kilometers being put into a 'Holding Zone' (Gynch and Wells 2014).

Consistency between the actual status of land and its classification: For example, forested High Conservation Value Areas (HCVAs) exist within lands controlled by the Ministry of Agriculture and degraded and agricultural lands exist within the forest estate. Classification of peat soils is also not consistent across all government maps. Several international and local groups are working with the government to promote greater consistency in land use classification. The Forest News reported that "these efforts contribute to the "One

Box 6.3 Progress in natural resource management in Central Kalimantan

Central Kalimantan is known for being particularly progressive: In 2009, the Governor issued provincial regulations on 'Indigenous Lands and Peoples Rights to Land,' and 'Provincial Regulation on Sustainable Palm Oil' to support communities' resource rights. The area was also chosen as the pilot province for REDD+ implementation in 2010 under the agreement between Norway and Indonesia formalized by the execution of an agreement between the Chairman of the National REDD+ Task Force and the Governor of Central Kalimantan. In 2011, Central Kalimantan drafted a low-carbon development plan, mandated development of a Regional REDD+ Strategy, and formed a Regional REDD+ Commission. In 2011, the Government also passed a provincial regulation on 'Sustainable Management of Plantation Business,' requiring that oil palm plantation companies monitor and report on social and environmental issues including conflict resolution, investment in smallholder farmers, and protection of ecologically sensitive areas. This included a requirement that licenses be prioritized for degraded, low-carbon lands, that agricultural practices be designed to achieve high yields, and that a provincial-level independent monitoring institution be established.

Source: Gnych, S. and P. Wells. 2014. *Land Use in Central Kalimantan: Combining Development and Sustainability Goals for Land Optimization*. Bogor, Indonesia: Center for International Forestry Research.

Map Initiative" which aims to develop a single all-encompassing map of Indonesia with all relevant information linked to licensing and land use claims" (Tahilramani 2013). In West Kalimantan, the local spatial planning agency is proposing new local regulations on protection of peat soils, based on local information.

Land swaps, land release criteria and conversion of land use designations: Several groups have tried to enact land swaps in which an HCVA on peat is swapped for an area of degraded land for oil palm plantation expansion. Land swaps between HCVAs and degraded areas have been difficult to implement due to issues of land zoning and permitting as well as spatial planning procedures. It has reportedly been particularly difficult to swap lands when different government departments control the parcels. It is likely that land swaps will be more feasible to pursue at the district rather than provincial or national level. Organizations are working with local parliamentarians to try to modify local regulations to help facilitate such swaps and to recognize set-asides (e.g. as part of corporate Roundtable on Sustainable Palm Oil, RSPO, certifications). Many organizations that attempted to facilitate land swaps reported significant costs of financial resources, e.g. in the form of legal bills. Other groups are working with policy makers to revise land release criteria and modify the land status conversion process. One local ministry of spatial planning, Bappeda, in West Kalimantan indicated that they are trying to conduct 'bottom-up' spatial planning in collaboration with local NGOs such as Gemawan, Swandiri Institute, and Yayasan Palung. Bappeda is also being supported by a donor-sponsored program, Indonesia Forest and Climate Support (IFACS) to improve land use assessment, planning, and stakeholder engagement.

Availability of consistent and up to date maps: This includes maps of granted concessions and areas belonging to local indigenous groups. Several groups have been working on improved maps and mapping tools. For example, World Resources Institute (WRI) developed a 'suitability mapper' to indicate areas appropriate for

Box 6.4 Learning from the conflict between the Sambas community and PT Wilmar

In 2005, PT Wilmar was given a concession by the regent for 187 km2 in the sub-districts of Galing, Sejangkung and Sajingan Besar. The permit was found to not have been accompanied by a proper feasibility study on environmental impact (known as an AMDAL in Indonesia). Workers from the oil palm company also cut down trees belonging to the local villagers (rubber trees and a sacred forest area). Civil Society Organizations (CSOs) had an audience with the parliament and Head District and organized a demonstration to protest against Wilmar's presence in the area. These culminated in consultations with, and review by, the National Land Use Agency, Forestry Agency, Parliamentarians, and the Compliance Advisor Ombudsman (agency auditors) to map out the disputed area and to discuss possible solutions. At the local level, CSOs assisted villagers and local communities to investigate and compile their complaint; to provide paralegal training to local villagers; to lobby the Regional House of Representatives (DPRD), the head of the Environmental Impact Management Agency, and regional environmental impact management agency (BAPEDALDA) to consider their complaint; to facilitate a local lawsuit; and to campaign at the central government and international levels. This included sending an official letter of complaint to the Roundtable on Sustainable Palm Oil (RSPO). Although a resolution was reached, this degree of conflict could have been prevented had there been a more consultative permitting and land release process. Local interviewees generally felt that land use planning and allocation should be done in a more transparent and collaborative manner. One representative from local government stated that because of commitment from the local bupati (regent), the time for release of land for plantations had slowed down since the impact on local communities and environment had become clearer.

Source: Saragih 2010

sustainable oil palm production and to map traditional boundaries. Local governments are also developing 'bottom-up' approaches to mapping. These types of activities are pertinent given the 2013 Indonesian Constitutional Court ruling, which paves the way for indigenous communities to reclaim ownership over their lands (France-Presse 2013). Interviewees noted that some villages do not even exist on government maps and expressed hope that the "One Map Initiative," being developed as part of the REDD+ program, will promote better coordination and community engagement in spatial planning.

The GCF and the WWF Heart of Borneo initiative have been active in the landscape to develop accurate provincial maps of soil fertility (in particular suitability for palm oil), erosion, and important animal and plant species. It seems that these surveys have positively influenced local government plans. For example landscape level spatial analyses of land suitability probably contributed to the government's decision to reduce the planned 1.8 million hectare Kalimantan Border Oil Palm Mega Project to 10 percent of its original size (Potter 2006).

Certification schemes

Many of the existing policy interventions have been driven by external (i.e. international) concerns for loss of biodiversity (in particular orangutan habitat) and GHGs. Such concern has led to strong lobbying by international NGOs on international companies and European governments to promote supply chain transparency and certification and to support Indonesia in moving toward a low-carbon growth trajectory.

Though considered an important first step, existing certification schemes

have been criticized for not going far enough. For example, the Roundtable on Sustainable Palm Oil (RSPO) rules allows forests with high carbon stocks, but lower value for biodiversity conservation, to be cleared and still be certified. This is a particular issue for lower-conservation value peatland forests. Clearing of peat forest significantly increases vulnerability to fire risk. The impact of certification on the palm oil supply chain is constrained by low traceability of this 'invisible product', both within the industry globally as well as within Indonesia specifically, making it difficult to identify and segregate oil palm products from 'good' versus 'bad' suppliers (Greenpeace 2013). However, the principles of these certification schemes have trickled down into local laws and practices, and have probably had a positive influence at the landscape level by encouraging local politicians to enact local regulations, for example as the local governor in Central Kalimantan has done. There is an opportunity to learn from the success of the Soy Moratorium in significantly reducing deforestation in Brazil and the Mars Inc. commitments to source beef, pulp and paper, soy and palm in ways that reduce deforestation and carbon footprint, while protecting human rights (Tyrrell 2015; EL 2015).

Roundtable on Sustainable Palm Oil (RSPO)

International pressure on consumer goods companies led to the establishment of the RSPO in 2004. The RSPO has developed a set of principles and criteria (Roundtable on Sustainable Palm Oil 2013) against which companies must be independently audited in order to attain certification. Certified oil can be converted into 'GreenPalm certificates' and traded on the Greenpalm market (RSPO 2014). Although the RSPO standard is being integrated into biofuel policies in Europe, and hence can be seen as influencing demand-side policies, it remains a voluntary, private sector-led measure with associated constraints on its effectiveness. (The Indonesian government has developed a mandatory local standard, the Indonesian Sustainable Palm Oil (ISPO) standard, which is discussed below). A number of other issues have limited the success of the RSPO in landscapes such as West Kalimantan:

Lack of demand for sustainably grown palm oil: The margin between sustainable and non-sustainable oil is negligible. Certified Palm Oil certificates sold for just US $2.76 in 2013, representing a premium of just 0.3 percent (Butler 2014). Sales of palm oil products under a completely segregated ('Identity Preserved', or IP) route are minor (WWF-Indonesia 2013). This may reflect the fact that the majority of Indonesian palm oil is destined for markets where sustainability is not a particular consideration in sourcing decisions, or there may be a lag in response.

Palm oil plantation managers and industry experts generally feel that there is downward pressure on RSPO-certified palm oil prices as sustainability-focused consumers are less willing to pay a premium for sustainable products and prefer to demand it as an industry norm. At the same time, consumers in China and India have little interest in bearing the cost of RSPO certification. Larger palm oil companies, particularly those with a significant presence in Europe, reportedly follow best practice and support RSPO certification primarily as a way to mitigate risk rather than achieving higher prices.

Conflicts with Indonesian law, in particular with regard to set-aside of HCVAs within concessions: RSPO-certified companies are required to maintain HCVAs in plantation areas. However regulations state if an area of the concession is not used it may be classified as abandoned ('tanah terlantar'). This opens the door for land re-allocation by the local government.

Table 6.2 Existing and related potential policy interventions related to Indonesian palm oil

Existing policy interventions
Roundtable on Sustainable Palm Oil (RSPO) Voluntary certification, and EU policies on traceability of biofuels
Indonesian Sustainable Palm Oil (ISPO) certification system (Agriculture Ministry Regulation No. 19) Formation of local government institutions, e.g.: Technical Implementation Units (UPTs) on forest inventory & mapping, forest and fire control, river basin management, forest resource conservation office, regional office of forestry planning agency, production forest product monitoring agency, and center for forestry information Environmental Impact regulations exist, managed by the Ministry of Environment; plantations over 3,000 Ha are required to have an EIA and are not allowed to use fire to clear lands
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EU requirement that CPO imports comply with sustainability criteria (European Commission n.d.)
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UNFCCC and associated policies, however carbon price not applicable Various Ministry of Forestry regulations enabling REDD+ National action plan on GHG mitigation (RAN-GRK) Provincial Governor Regulation No. 103 of 2009 on Procedure for Mobilization of Controls for Land and Forest Fires in West Kalimantan Province REDD+ & LEDS taskforce Low-carbon and green growth strategies
National Program for Community Empowerment (PNPM); note that this is purported not to be successful due to high transaction costs, lack of capacity, and low market demand
ASEAN Agreement on Trans boundary Haze Pollution (ASEAN 2002)
Ministry of Agriculture prohibiting companies from developing plantations on land where more than 70 percent of the land is on peat over 3m deep Government of Indonesia legislation: Article 41 paragraph 1 of Law No. 23 Year 1997 on Environmental Management, Article 78 paragraph 3 of Law No. 41 Year 1999 on Forestry, Article 48 paragraph 1 of Law Number 18 Year 2004 on Plantation, Article 187 of the Criminal Code
Spatial planning agency and Ministry of Agriculture and other relevant ministries reviewing and revising land use classification and regulations Provincial review of spatial plans to identify differences between central and provincial land use classifications (Soetarto et al. 2001), i.e. between the Forest Land Use Consensus (Ministry of Forestry & Estate Crops), the Provincial Spatial Plan, and the District Spatial Plan
Government has a moratorium on new logging concessions however this does not tackle the issue of existing concessions and forest areas that are not currently classified as forests Regulations by the Central Kalimantan governor requiring abidance by RSPO principles

	Potential policy interventions	Policy drivers
	Improve supply chain traceability	International pressure on consumer goods companies to become "deforestation free."
	Ensure compliance with local rules and regulations	Protection of local environment, maintenance of ecosystem goods and services
	Revise international trade incentives, e.g. include certified palm oil on WTO & APEC list of Environmental and Green Goods	Improve margins for certified products: This is being promoted by several large oil palm plantation companies
	Revise import duties and biofuel policies	Advocacy by international NGOs
	Revise national policies on biofuels, requiring these are from certified sources	N/A
	Promote corporate disclosure and transparency	Advocacy by international NGOs, institutional investor pressure, stock exchange commissions
	Promote internalization of carbon price	Engagement by the global community, in particular Letter of Intent (LoI) with the Government of Norway.
	Policies to promote Payments for Ecosystem Services	Internalization of environmental impacts into value chain
	International agreement on transboundary haze pollution	Complaints from neighboring states
	National laws to prevent clearing of deep peats & fires	Complaints from neighboring states about haze pollution; engagement by the global community, in particular Letter of Intent (LoI) with the Government of Norway
	Revise local land classification	International pressure (e.g. LoI with Norway); complaints from companies, civil society regarding inconsistencies
	Revise local land permitting and allocation procedures	N/A

Table 6.2 continued

Existing policy interventions
Various support schemes and provincial and central level to support farmer groups and Government, for example: • PisAgro • Indonesian Climate Change Trust Fund • Regulations by the Governor of Central Kalimantan
Government (Ministry of Agriculture and BAPPENAS) developing new strategies and policies to promote greening of Indonesia's agricultural sector, including the Agricultural Master Strategy 2013-2045
Domestic SVLK standard on timber legality, which came into force in January 2013 and forms part of the FLEGT voluntary agreement with the EU
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Note: International and national policies to reduce demand for vegetable oils or biofuels are not included, e.g. energy efficiency, non-biofuel renewable energy, grid-upgrades.

This can be avoided by involvement of the head of district regulation ('peraturan bupati') or district parliament regulation ('peraturan daerah'). However, stakeholders who have engaged in this process noted that it takes significant time and resources to get land classified and that the process is usually not successful. The local government is trying to improve the process in Ketapang (West Kalimantan) by drafting a local law ('PERDA Konservasi') allowing District Heads to legalize HCVA protection, preventing HCVA set-asides from being classified as abandoned (Nugroho et al. 2012).

RSPO is voluntary: This means that progress toward sustainable palm oil production tends to move at the pace of the slowest and most conservative members of the industry. As a result of its voluntary nature, it is also difficult for the Indonesian government to enact fiscal or trade incentives linked to RSPO. The governor of Central Kalimantan has, however, indicated strong support for RSPO principles and has incorporated them into local regulations under PERDA.

Complaints about the quality of audits: Some locally-based groups have expressed worries about the quality of RSPO monitoring and certification. This includes concerns that independent RSPO auditors have a general lack of capacity and that the RSPO initiative is more process-based than outcome-based. There have also been no credible independent studies comparing management and environmental impact of certified versus non-certified palm oil plantation areas. However, it is likely that a review of the quality of RSPO audits will soon be conducted and a process to strengthen the complaints procedure, audit scheme, and dispute settlement process will be developed.

	Potential policy interventions	Policy drivers
	Policies to support ecological intensification	Could support improved use of inputs, more diverse farming systems; there have been initiatives to support this (e.g. by CIRAD) and these have potential to be up-scaled by cooperatives and companies
	Greening agricultural production	Food security, livelihood vulnerability.
	Promote transparency within forestry (timber) industry	Demand for certified timber from EU
	Revise fiscal incentive framework for local corporate and institutional investors	N/A – could be linked to revision of export taxes on raw CPO Bank Nasional Indonesia (BNI) apparently has a contract with Google to monitor the oil palm plantation companies they lend to ensure they comply with regulations, e.g. not to plant on slopes
	Revise government budget allocation framework	N/A

Indonesian Sustainable Palm Oil (ISPO) certification

Recognizing the need for promoting sustainability within the oil palm sector, the Indonesian government launched ISPO in 2011. All palm oil produced in Indonesia will be required by law to be ISPO certified. ISPO is complementary to the RSPO in that it requires compliance with relevant existing Indonesian laws and regulations. ISPO has the potential to have a significant impact, although, due to the relatively early stage of its implementation, it is not clear what the impact will be on the palm oil market.

According to available information, 153 companies have already been certified under the ISPO. The process is reported to take between 3-6 months and is based on adherence to existing rules and regulations mandated by the Government of Indonesia. However, concerns have been raised regarding the following issues:

Implementation cost, in particular overlap with the RSPO: There are some overlaps with the RSPO and the program may significantly increase auditing costs, for example, certification costs may be almost doubled to get both ISPO and RSPO certification. This issue is being addressed and the RSPO and ISPO signed a collaboration agreement in November 2013 ("Unifying Palm Oil" 2013).

Inadequate consideration for social issues: A number of stakeholders are concerned about the lack of focus on social issues, in particular the lack of explicit inclusion of the principle of Free and Prior Informed Consent (FPIC) and an effective complaints system.

Accessibility: There is concern among various stakeholder groups about potential difficulties for small-scale producers to become certified (note that RSPO has a fund to support smallholder certification). This may be a particular concern for independent smallholders who are not part of a 'plasma' scheme. ISPO certification is also likely to be a major problem for smallholder farmers who do not or cannot have land titles because they are operating

inside designated forest areas, leading to significant loss of livelihood for groups who are already disadvantaged.

International acceptance of ISPO as a credible standard: It remains unclear if the international markets will accept the standard as credible, e.g. access to the EU markets.

6.5 CONCLUSIONS AND LESSONS FOR POLICY MAKERS

Environmental policies to tackle the impact of oil palm plantation expansion seem to have been largely driven by external (i.e. international) forces, in particular concern about loss of forest and orangutan habitat and concern about Indonesian greenhouse emissions. The government has been proactive in tackling some of these issues, in particular in partnership with other concerned governments, such as the Government of Norway, as part of its REDD+ commitment, and at the provincial level, in collaboration with the Governors' Climate and Forests Task Force (GCF).

However, despite some very positive steps, many of the policy drivers are only starting to be addressed. Most of the local policy interventions have focused on creating supplies of certified or more environmentally-friendly palm oil, rather than on ensuring that there is more demand for certified product. Pressure to create demand has largely come from international NGOs and has been most successful in Europe. The structure of the international market for food oils favors large-scale production, with limited attention to environmental and social issues. However, as local communities become more empowered, both through changes recognizing their rights as well as availability of affordable technology and information, they stand to have a greater voice influencing local policies, which would provide greater opportunities for speeding up policy change.

There are opportunities for increasing engagement of the private sector, such as allowing access to concessional financing or providing other incentives for producers to be more responsible. Although the government has put in place regulations, there have been few real incentives for Indonesian palm oil producers selling to non-European markets to adopt better practices. The GCF is, however, working in collaboration with the local Chambers of Commerce (Kadin) to try to find champions within the Indonesian palm oil industry. Kadin is also seeking to work closely with private sector members and the unit to establish palm oil estate and community conflict mediation units.

Despite the many efforts to address the negative impacts of palm oil production in these landscapes, several fundamental questions remain:

- Will the Indonesian, Central, and West Kalimantan governments remain committed to green and low-carbon growth if there is no clear compensation mechanism under the UNFCCC or similar mechanisms, or if there is a lessening of material external support?
- What is the interest of local governments in upholding laws in the context of rising international demand for palm oil, including from countries with no requirements to demonstrate sustainability within biofuel mandates?
- How can on-going interest of local leaders (bupati) be ensured during leadership transitions?

From this initial review of policies, there seems to be additional policy intervention opportunities, at the central, provincial, and district levels, specifically:

At the local level (district and province)

- Revising land permitting and release procedures so that companies' continued access to land is tied to good stewardship practices: Badan Penanaman

Modal dan Pelayanan Perizinan Terpadu (BPMPPT), a unit under the Bupati for integrating investment and permitting is the lead body in integrating permits for large-scale plantations and this unit should be required to act in accordance with FPIC and environmental governance principles.

- Establishment of fast-track court procedures and support to representation of local groups to address natural resource conflicts, e.g. fast-tracked judicial and dispute resolution processes to tackle environmental issues ('green benches') to promote rapid enforcement or to pilot out-of-court settlements to mediate between parties. For example, a case was mentioned whereby a group of local farmers were angry about their land being allocated and a protest of about 5,000 farmers encouraged local bupati to withdraw the permit, but the farmers subsequently lost the formal court hearing. Legal processes in Indonesia can be notoriously drawn-out and expensive, favoring those with deeper pockets.
- Local governments could consider establishing an independent commission at the district level to review permitting, that considers both environmental and social issues (note, this currently exists, but only at the provincial level).
- Increasing local peoples' awareness of their rights, including the obligations of the companies to engage with them prior to initiating operations: For example, a local CSO (Elpagar) has established a 'School of Democracy', which links together different stakeholders to address social and environmental issues.
- Greater integration of environmental concerns within infrastructure planning, e.g. the West Kalimantan government project with the Asian Development Bank, that is building new infrastructure that will support palm oil processing and export. The extent to which this will influence expansion of land for oil palm is unknown. Plantation economics depend largely on infrastructure.
- Greater consideration of economic resilience of the landscape, rather than focusing on just one crop: Several local NGOs are helping farmers to diversify production systems by integrating crops such as horticultural crops and rubber and helping to create supply chains for these products. However, it is unclear how much this would help increase land use efficiency, rather than promote even greater deforestation and land degradation.
- Revising both central and local tax and accounting regulations, e.g. to favor plantation establishment on degraded lands.

At the central level

- Collaborating with or putting in place policies to incentivize local financial institutions: It has been mentioned that Bank Nasional Indonesia (BNI) has a contract with Google, whereby they monitor the behavior of the oil palm companies they lend to (e.g. if the palm oil companies stick to the regulations in terms of planting on slopes and near rivers). This could be interesting not only in the context of the 'large' companies, but also the medium-sized companies who have not been as engaged so far.
- Incentives for 'green growth' or 'natural capital preservation' through the central budget allocation process.

6.6 SUMMARY OF LESSONS LEARNED

Although the policies are relatively new, and have probably not yet had a significant impact, interviewees were asked for their views on the main lessons learned from the Indonesian experience, particularly those relevant for policy makers in other countries.

Input on 'lessons learned' from stakeholders are summarized below:

Local commitment and buy-in is critical, both from local government and local communities. Local civil society in Indonesia is becoming more vibrant and is increasingly an important driver of change. However, local people primarily view environmental issues as a matter of resource rights: environmental issues can only be properly addressed by respecting the rights of local communities, and by engaging them in decision-making and implementation.

Local communities may not always be aware of their rights, or opportunities for them to voice their concerns, and increasing their ability to participate in decision-making is important, e.g. in land allocation.

It is important to have clear, trusted, and impartial maps, available to all stakeholders, to serve as a basis for discussion about how the landscape should be managed. These can be coupled with robust but low cost remote sensing approaches, such as local monitoring using drones. Additionally, have a legal document or a Memorandum of Understanding in writing between all the groups so that the commitment and understanding is clear on all sides. It may be necessary to contextualize and localize environmental issues in terms of why is it important for local stakeholders (e.g. climate change may be a very esoteric issue).

Private sector groups, in particular consumer-facing and highly brand-sensitive companies, in regions where consumers are more concerned about environmental issues or able to pay premiums for certification, or listed companies may be more willing to engage. However, the local rules and regulations (policy framework) must enable and support this, and steps must also be taken to ensure that small producers and smaller companies in the supply chain (in particular growers and millers) are incentivized.

Government policies should be reviewed for consistency, both between different government departments and between central and local levels. Additionally, they also need to be considered from the perspective of alignment of incentives.

International pressure, both positive and negative, can have an influence. The issue of deforestation in Indonesia initially came to the fore as a result of international concerns linked to regional haze and impact on orangutan populations. Later, international pressure and support, e.g. from the Government of Norway and the GCF, for West Kalimantan specifically, in the context of GHGs also played important roles.

Although the ethos behind certification is positive, capacity to implement, dispute settlement processes, and monitoring needs to be considered from the start and carefully assessed over time in order to ensure that these are relevant and actually address local problems rather than create additional cost and bureaucracy. In particular, they should be considered in the context of cost and reward for certification and participation by smallholders or smaller independent producers.

It is encouraging that Indonesia is developing ISPO, but this must be aligned with global standards and frameworks in order for the country and local companies to be able to compete on an international stage. Most commodities are exported and traded on international markets, and so local and global standards need to be aligned and complementary.

Ensure the economic drivers are in place to promote good environmental stewardship. At the moment, the incentives for certification are relatively weak, particularly for smaller companies selling domestically or exporting to non-EU countries, but some consumers are demanding more sustainable sourcing.

Developed nation governments and organizations see a strong need for Indonesia to enact sustainable land management practices, in particular to curb GHGs and biodiversity losses from oil palm plantation expansion. Regional neighbors, including Singapore, are urging Indonesia to tackle issues within the oil palm sector to counteract regional haze. However, sustained action to promote better practices might be more likely to emerge at the grassroots level in response to human rights and access to resource issues, combined with commitment by local leaders and national enforcement of existing laws and policies (e.g. ISPO). Voluntary industry guidance has been helpful in catalyzing some commitments by large industry players. In light of the growth in domestic and regional demand and the little interest of consumers to pay premiums on certified palm oil, it might be more useful to focus on the basic human rights issues, as well as supporting indigenous people's resource rights and sustainable resource management.

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7

COFFEE IN DAK LAK, VIETNAM

Tanja Havemann, Samiksha Nair, Emilie Cassou, and Steven Jaffee

This case study examines the significant environmental footprint associated with the expansion and intensification of Robusta coffee production in Vietnam and the emerging efforts to put the industry on a more sustainable path. Particular attention is given to developments in Dak Lak, a province in Vietnam's Central Highlands which accounts for some 40 percent of national production, and which faces an especially significant long-term sustainability challenge as productivity has been tied to heavy extraction of groundwater resources for irrigation. While coffee production in Vietnam dates to the end of the 19th century, a sizeable coffee industry emerged during the 1980s and 1990s in the context of a wide set of economic reforms which, among other things, contributed to accelerated agricultural growth. Between the mid-1980s and 2000, Vietnam's harvested coffee area expanded from 15,000 to nearly 500,000 hectares, with the country becoming the world's second largest coffee exporter, after Brazil.

The expansion of coffee production in the Central Highlands occurred with government support, although more of this was indirect (i.e., support for internal migration from more land-constrained regions; investments in rural infrastructure) rather than direct (i.e., access to finance and seedlings for tree crop planting; advisory services). The best land in Dak Lak was converted over to coffee production and the subsequent expansion was associated with considerable deforestation and biodiversity loss (and the displacement of some indigenous ethnic minority communities).

Dak Lak Province, Vietnam

Farmers freely tapped the region's seemingly abundant surface and groundwater resources. Exploiting the region's natural resources would provide the basis for accelerated economic growth, with only intermittent attention to the associated environmental costs and risks.

Over the past decade, coffee expansion has continued, albeit at a somewhat slower pace. Part of this expansion has occurred on land unsuitable for coffee, due to its steep slope or other reasons. Water withdrawals for irrigation have reached unsustainable levels. Widespread mono-cropping and very intensive fertilizer use have resulted in problems of soil fertility and pest infestation, and seem to have led to an accelerated ageing of the tree stock. Half

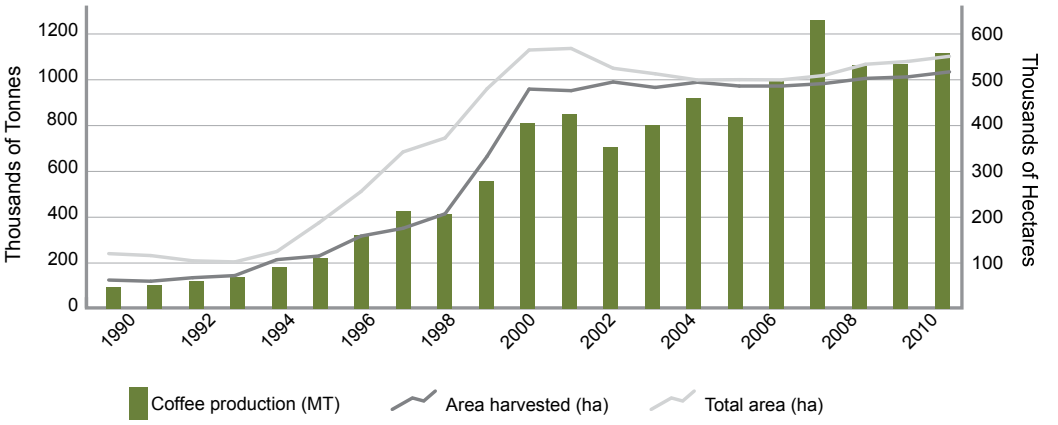

Figure 7.1 Production and area harvested of coffee in Vietnam, 1990-2010
Sources: FAO 2014 and IPSARD 2010.

million smallholder farmers seem to have engaged in collective brinkmanship with the physical environment on which their livelihood depends. Until now they have prevailed, although the ageing tree stock, rising labor costs, climate change, and increased competition for available resources may tip the balance against them.

Vietnam's $3 billion coffee industry currently produces over 1.2 million tons of green beans and accounts for 60 percent of world trade in Robusta coffee. Its supplies dominate the segment of the market which provides low cost bulk material for blending in order to produce instant coffee on a large scale. Despite its large size, global market importance, and the country in which it is set, this industry has emerged and operated under a very weak governance structure involving an amorphous combination of government and civil society organizations, technical institutions, state-owned enterprises and banks, investors, and functionally limited associations. Pertinent policies and regulations emerged from multiple ministries and provincial governments, with overlaps or gaps in responsibilities. As a result, everyone and no one was responsible and accountable for product quality, addressing technical problems, and mitigating the industry's environmental footprint.

Over an extended period, the environmental costs from Vietnam's coffee industry have grown due to a combination of regulatory and market failures. With regard to the former, pertinent regulations relating to forest protection and water resources management either provided insufficient tools to influence the pattern of coffee industry resource utilization, or the will and capacities to enforce these measures were lacking. A regulation preventing foreign companies from sourcing directly from farmers has been counterproductive for efforts to increase farmer knowledge about and incentives to adopt better practices. With regard to market failure, though coffee farmers have much to gain from farming more ecologically (more efficient water and fertilizer use reduces costs and may boost the productivity and longevity of trees), most have done little to pursue these benefits due to misperceptions and lack of accurate information. Increased downstream interest in sustainable coffee has translated into price premiums for certain high quality Arabica coffees, yet the market (and reward) for premium Robusta has remained small.

The most common international standard now being adopted in Vietnam has weak compliance requirements in relation to water resources management, an area of growing concern locally. The pressures and incentives for Vietnam's smallholder coffee farmers to adopt more sustainable practices have thus far been weak.

Things are beginning to change. During the past five years a growing array of programs have trained farmers in sustainable practices and demonstrated their benefits, both for farmer incomes and for natural resource conservation. Both technical knowledge and farmer awareness of improved practices is growing. National level green growth and climate change strategies as well as a recent (2012) medium-term master plan for the coffee industry have provided a clearer vision and commitment for sustainable agriculture and coffee farming specifically. The Coffee Coordination Board (CCB), established in 2013 with both public and private representation, offers the potential for a unified and coherent governance structure for the industry, including on matters of environmental sustainability. A perceived 'crisis' with the ageing tree stock and a need to support coffee replanting offers a major opportunity for the government to help the industry begin to mainstream improved agronomic and resource use practices. Coffee replanting is a long-term investment, with reductions in small farmer income during the early maturing period. Programs involving government financing are being developed, with the potential to leverage this money by tying lending to farmer adoption of a variety of improved practices.

This case study is instructive in a number of respects. First, it highlights the severe limitations of using voluntary market standards as the primary vehicle for inducing change in circumstances where production is highly fragmented and where product differentiation has little value. Second, it illustrates the risk of regulatory inertia where a growing, successful industry brings considerable benefits while its environmental costs are not highly visible, incremental, and not perceived to be clearly threatening to other stakeholders or goals. Third, it brings out some of the challenges and benefits associated with developing multi-stakeholder initiatives. Finally, it identifies a sustainability issue which is rarely addressed—how to deal with a potentially large number of (economically and environmentally) marginal coffee growers who will need to exit the industry and pursue other land uses and livelihood strategies in the coming years. While this case study focuses on Dak Lak Province, much of the discussion that follows is relevant to the Central Highlands more broadly.

7.1 INTRODUCTION TO THE COMMODITY

There are two main types of coffee produced for consumption around the world: Coffea Arabica (Arabica) and Coffea canephora (Robusta). Arabica beans represent the majority of the world's production, are usually grown in relatively dry climates in high altitudes, and have a milder aromatic flavor and approximately half the caffeine content of Robusta. Robusta tends to be easier to grow, produces higher yields, and is more resilient. It tends to have a harsher flavor and is usually sold for instant coffees or blended with Arabica. Robusta is generally traded at a discount to Arabica, and market incentives for certified Robusta (e.g., single origin beans) are weaker overall for Robusta growers. Recently, high Arabica prices have boosted demand for Robusta as a substitute in coffee blends (Agrimoney 2014).[1]

1 There are lower qualities of Arabic and higher qualities of Robusta; and there are breeding programs underway that aim to improve the

Vietnam primarily produces Robusta beans (95 percent) (MARD in Ipsos 2013). Arabica and minor varieties such as Excelsa also grow in Vietnam, but are much less common; once dominant, Arabica gave way to Robusta in the mid-20th century on account of Robusta's disease-resistant qualities (Doutriaux et al. 2008). Over the past two decades, Vietnam's production of Robusta has increased tenfold (Figure 1), and recent satellite imagery analysis suggests that national statistics underestimate the area under production by roughly 10 percent (NIAPP 2014). Around 90 percent of Vietnam's coffee comes from the Central Highlands, and 40 percent of national production comes specifically from Dak Lak Province within that region.

With over 635,000 hectares of coffee plantings, and more than 1.5 million tons of annual production, Vietnam is today a key player in the global coffee market. It is the second largest exporter of coffee worldwide after Brazil, in volume terms—a position it gained in the late 1990s. In 2014, Vietnam's coffee exports were valued at over $2.7 billion, placing it in third place behind Brazil and Colombia. Vietnam produces around 40 percent of all Robusta coffee worldwide and accounts for nearly 60 percent of global Robusta exports (Amarasinghe et al. 2015). Nationally, coffee is the second most important agricultural commodity after rice; it contributed to roughly 3 percent of GDP in 2012.

The vast majority of Vietnam's coffee exports are in raw green form, and the United States and Germany are Vietnam's two largest markets. A small trade in instant, roasted, and ground coffees is conducted with Russia, Hong Kong, and South Korea (Diaz Rios 2012; AFP 2014). Domestic consumption also represents a moderate slice of the market (around 6 percent), even though it has risen rapidly from a relatively low base over the past decades (Ipsos 2013, Diaz Rios 2012). International demand for coffee is growing, especially among developing countries. The commercial outlook for Vietnam's coffee industry is strong, given its current market position and comparatively low production and other costs.

These low costs stem from highly favorable agro-ecological conditions, the absence of payments for irrigation water, relatively low (but now rising) labor costs, and comparatively low levels of taxation. Among leading suppliers, Vietnam has, by far, the highest average yields for Robusta coffee. These average between 2.3 and 2.5 tons per hectare, compared with 1.6 tons/ha for Brazil and less than 1 ton/ha in Colombia and Indonesia. Widespread use of irrigation and relatively high fertilizer use has contributed to Vietnam's higher yields. Vietnam's 'competitive' pricing has generally featured discounts below international benchmarks due to a variety of factors, including quality variability. Labor shortages have led farmers to harvest immature together with mature beans, leading to mixed consignments while poor drying practices have affected some coffee.

The Vietnamese coffee industry involves a large number of disparate players, including some 550,000 smallholder farmer households of diverse ethnicities, thousands of small traders, and more than one hundred exporters (often involved in light processing). It also includes a few dozen state-owned enterprises (involved in both farming and export); the world's leading multinational coffee-trading companies, and large numbers of local SMEs. These and other key sector players, including providers of inputs, financial institutions, research institutes, non-governmental organizations and others are summarized in Table 7.1 on page 108. The level of organization is low among farmers, with there being few well-functioning cooperatives.

characteristics of the genetic material of coffee, including hybrids that transfer some of the cup quality of Arabica to Robusta.

Contract farming and other forms of regularized direct business relations between farmers (groups) and processing/exporting companies are very rare. A Ministry of Trade and Industry regulation stipulates that foreign-owned companies need to buy from locally registered companies. With the minimal role of formal cooperatives, this essentially means that these companies cannot source directly from farmers but need to source through brokers, commissioned agents and other intermediaries. A stylized overview of the coffee value chain appears in Figure 7.2 on page 104.

Over 95 percent of Vietnam's coffee comes from smallholder farmers, with much of the remainder from state-owned farms. Some 90 percent of growers have less than two hectares and 75 percent have one hectare or less, sometimes dispersed among several plots. Vietnam's coffee farmers act independently, with relatively little bargaining power in the supply chain. Still, farmers typically receive in the vicinity of 90 percent of the export price. Coffee remains among the more profitable crops widely grown by Vietnamese farmers, although the small size of individual holdings limits the incomes generated. Besides the coffee-growing households themselves, another 500,000 people are engaged in seasonal work in the industry. Farmers tend to be wary of collective action for historical reasons, and ethnic diversity has no doubt complicated matters. Until recently, ethnic minorities including the Ede made up the majority of the population in Vietnam's coffee-basket, the Central Highlands Region. While this is no longer the case, the region remains ethnically diverse to this day, and both the majority and minority ethnic groups play a role in coffee production.

Much of the existing coffee growing area was planted during the 1990s or early 2000s. While well-managed plantations

Coffee growing landscape in Dak Lak. Photo by Tanja Havemann.

can continue to obtain high yields with trees beyond 25 years, with the agronomic practices common in the Central Highlands, many farmers are said to be experiencing declining productivity after just 15 years, although strong empirical evidence for this is lacking. In 2010, nearly 10 percent of coffee area was more than 20 years old and another 24 percent was between 15 and 20 years ago. At the time, it was estimated that about 100,000 hectares needed to be replanted, while nearly half of the coffee growing area would need to be replanted by 2020 in order to prevent a significant reduction in productivity and overall national production (World Bank, 2011).

An expansion of coffee plantings has continued in recent years, with some of the newer plantings occurring on land deemed to be unsuitable for coffee, due to soil type, land slope, climatic conditions and/or availability of water. Recent (2014) satellite imagery has shown that the actual area planted in the Central Highlands (635,000 hectares) is more than 25 percent larger than what official statistics showed in 2010 (493,000 hectares). This reflects a combination of area expansion and inadequate monitoring of production. The recent 'growth or discovery' of coffee plantings is illustrated in Figure 7.3 on page 106 for the four largest producing provinces. Also shown is the proportion of planted area in 2014 deemed to be on land that is either unsuitable or marginally suitable for coffee. For Dak Lak, this share is 19 percent—i.e. 41,500 out of 221,000 hectares.

The exports segment of the value chain is the most concentrated one, and may continue evolving in this direction. In 2009-2010, the ten largest exporters accounted for 70 percent of all exports. The three largest exporters were all joint-stock companies and accounted for 44 percent of exports. Foreign-linked companies accounted for around 26 percent of exports. Approximately 150 Vietnamese companies exported some coffee, but about half of them shipped less than 1,000 tons (Diaz Rios 2012). Since then, several JSC have faced difficulties and many SME coffee traders have exited the business—either due to financial problems or because of their inability to meet a 2012 regulation stipulating the minimum size and infrastructure capacities for licensed exporters. Multi-national companies now account for the majority of exports.

The Government of Vietnam has played an active role in promoting the development of the coffee industry and coffee production in particular, through the development of improved varieties, the provision of seedlings, research to deal with problems of pests and diseases, the issuance

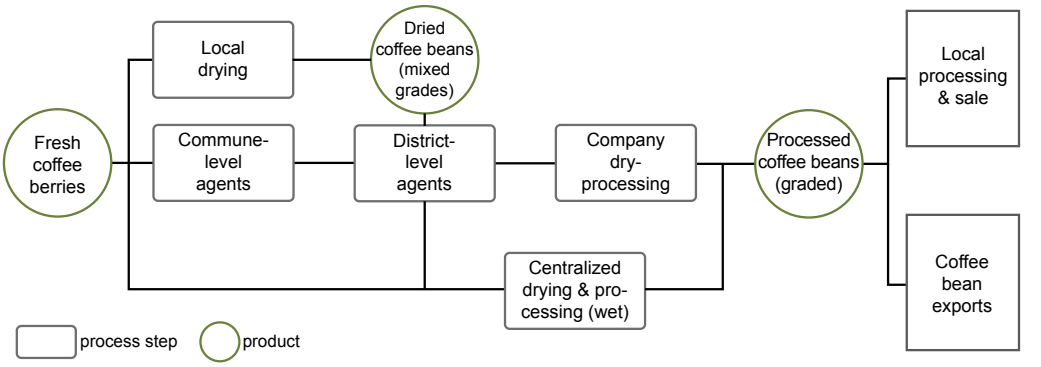

Figure 7.2 Simplified overview of the coffee value chain

of land use rights certificates to farming households, and a variety fiscal incentives and concessional finance schemes. State-owned banks have extended various forms of concessional finance to the sector, including preferential credit for agricultural inputs and for exports (Tran 2014). The industry has also benefited from fiscal incentives, ranging from value added tax refunds on coffee exports to tax exemptions tied to agricultural land use. The state will fund up to half the cost of advertising and promoting Vietnamese export commodities including coffee (Tran 2014). Importantly, also, the government has kept irrigation water free. The government has helped to open up international markets by have Vietnam become a member of the World Trade Organization and the ASEAN-China Free Trade Area, and be a signatory of various international agreements such as the Vietnam-Japan Economic Partnership Agreement, the Vietnam-EU Free Trade Agreement, and the Trade and Investment Framework Agreement (TIFA) with the United States.

7.2 THE LANDSCAPE

Located in the southern half of Vietnam, the Central Highlands Region is a relatively flat plateau that extends over approximately 51,800 square kilometers. The predominantly rural landscape features rugged mountain peaks, extensive forests, and rich soil. The region's agricultural landscape is dominated by the intensive monoculture of tree crops including coffee, rubber pepper, and increasingly cocoa (though coffee and pepper are sometimes grown together).

In fact, under pressure from the expansion of commodity agriculture, the Central Highlands Region has experienced widespread deforestation since the mid-twentieth century, and the phenomenon is ongoing. From 1945 to 1980, nearly half of Vietnam's forests were cleared, primarily for agricultural purposes; and whereas the forest cover has since stabilized in North-Central Vietnam, deforestation continues to dominate land-use change in the Central Highlands (UN REDD Program 2010). In the 1980s and 1990s, Dak Lak lost around 200 square kilometers of forests per year to both public and private coffee plantations and gardens (ICAD and Oxfam 2002).

The Central Highlands' agro-ecological conditions are well-suited for coffee production.

- **Altitude and temperature:** The area is 500-700 meters above sea level and the temperature range is ideal for production.
- **Soil profiles:** The Central Highlands Region is dominated by rhodic-humic ferralsols with low bulk densities and good water retention suitable for shallow-rooted perennials like Robusta coffee.
- **Water:** While overall rainfall is generally sufficient, its uneven distribution over the year (typically 80-85 percent of total rainfall occurs in the wet season) means that irrigation is necessary during certain periods (especially at flowering) (World Bank 2011). Water resources used for irrigation comprise man-made ponds and reservoirs (20.8 percent), natural sources (28.5 percent), and ground water (56.6 percent). Groundwater is extracted from private wells. And underground water stores are replenished by monsoon rains. Over 70 percent of the local water resource capacity is estimated to be exploited, largely for agricultural production.

Climate change, however, may have unfavorable effects on growing conditions going forward by contributing to water scarcity and temperature rise. Most probably, Vietnam's coffee production has already suffered from the adverse effects of climate change. Between 1958 and

2007, the average annual temperature in Vietnam increased by 0.5 - 0.7 degrees Celsius (MONRE 2009 in World Bank 2010). And in recent years, both the rainy and dry seasons have become more extreme, leading to increased floods and periods of water scarcity. In the Central Highlands, the 2012-2013 dry season started early and extended longer than usual, displaying a pattern that may become more frequent and extreme in years ahead (SDC/Nestle/IWMI 2013). While climate-model predictions for the rest of the century are scenario-dependent, changes that could impact coffee production in the Central Highlands include a sharp increase in the number of hot days in a year (above 25°C), an increase in total rainfall linked with extreme weather from June to October, and a sharp decrease in rainfall during the rest of the year. In particular, by increasing rates of evapotranspiration, higher temperatures could double or triple water requirements by late century (Haggar and Schepp 2012).

7.3 LANDSCAPE RISKS

This section summarizes the ways in which coffee has grown at the expense of the environment in Vietnam's Central Highlands and some of the market and governance failures which have contributed to this.

Coffee production has grown at the expense of the environment

Coffee production in Dak Lak and other parts of the Central Highlands has grown through a combination of extensification—often at the expense of natural forest—and intensification. The harvested area grew from 114,000 hectares in 1995 to over 600,000 hectares in recent years. High yields have been achieved through heavy use of fertilizer—often exceeding 1 ton of NPK (nitrogen, phosphorus, potassium)

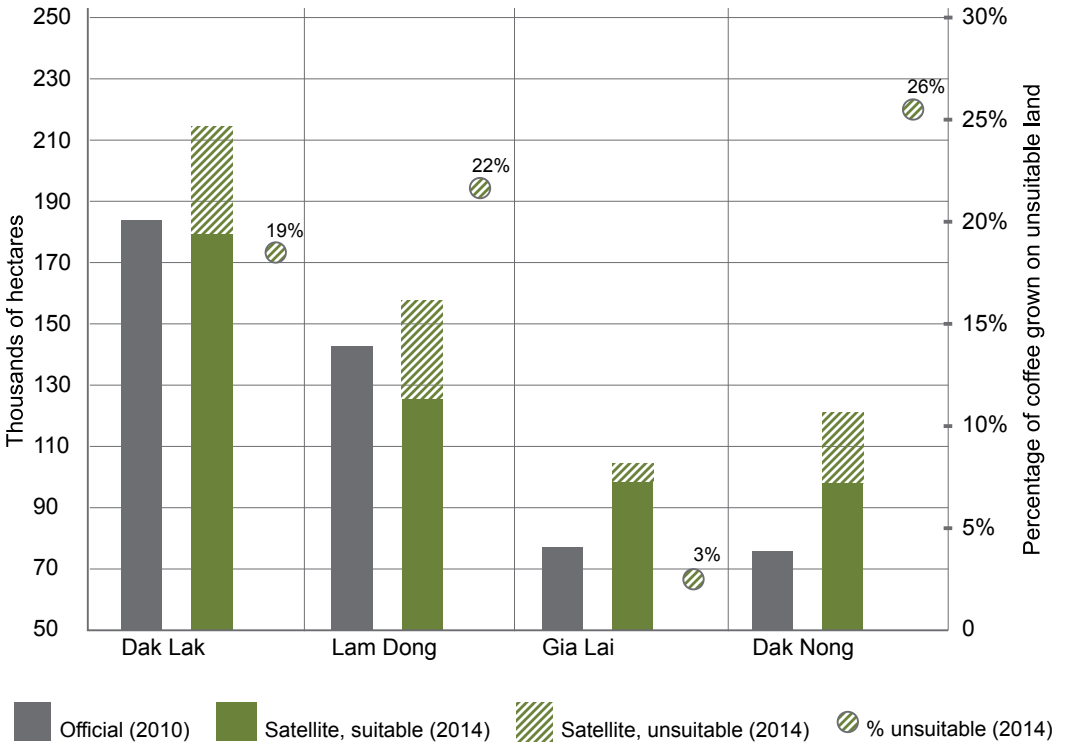

Figure 7.3 Suitability of planted area for coffee in selected provinces of Vietnam
Source: Based on data provided by NIAPP

and upwards of 3-5 tons of manure per hectare. As will be noted below, water use for irrigation has often been far in excess of the needed or optimal amount. The result is that coffee is contributing to deforestation and land degradation, biodiversity loss, the decline in water tables, water pollution, and greenhouse gas emissions.

There are signs that common practices are taking a significant toll on the industry itself. For example, high density mono-crop cultivation, together with high application of fertilizers, have resulted in growing nutrition and soil imbalances leading to infestation particularly by nematodes that cause root rot, followed by leaf drop and finally tree death. The presence of nematodes may now considerably raise the costs of replacing old coffee trees with new seedlings since nematodes prey upon newly planted seedlings that have a shallow root system.

Land-use: forest encroachment and mono-cropping

In recent years, coffee has remained on an expansion course in Dak Lak, moving into forested, sloping, and degraded lands which offer suboptimal growing conditions. Recent satellite imagery of the Central Highlands reveals that the area under coffee plantation in 2013-2014, for example, exceeded the area that is suitable for coffee by almost 117,000 hectares; and this may be an underestimate to the extent that it does not detect coffee planted on unsuitable lands under forest cover (authors' calculations based on NIAPP 2014). In Dak Lak Province, the data show that the practice of planting of coffee on unsuitable land is widespread among farmers.[2]

Deforestation, degradation, and farming on marginal lands are directly contributing to greenhouse gas emissions[3], soil erosion, water pollution through siltation, land instability and landslides, and biodiversity loss[4]. Moreover, the use of land that is unsuitable for coffee production is exacerbating farmers' already excessive and inefficient use of agro-chemicals and fresh water resources, discussed below.

Coffee can grow well in agroforestry systems and recommended management practices include intercropping with other perennials and annuals including cocoa, durian, and black pepper. However, many farmers perceive that they can maximize their earnings via coffee monocultures, without shade trees. Mono-cropping is associated with higher rates of evapotranspiration and water demand, a loss of biodiversity, and lower farm income diversification.

Farming practices: excessive fertilizer and water use

One of the industry's greatest sustainability challenges is its excessive use of fertilizer and fresh water. While this pattern of overuse today corresponds to a risk management strategy employed by farmers, it represents a key risk to the industry's sustainability over the longer term. The expansion of coffee onto unsuitable land has led farmers to make even heavier use of agro-chemicals to compensate for poor growing conditions.

2 While it is accurate to say that Vietnam provides favorable agro-ecological conditions for coffee, this situation varies considerably within the Central Highlands. For example, more than half (53 percent) of Dak Lak's total land area of 877,000 hectares is unsuitable for cover and only 22 percent is considered as (highly) suitable.

3 At the national level, land use, land use change and forestry accounted for 10 percent of national emissions in 2000; agriculture accounted for 43 percent and over 20 percent of agricultural emissions were from soils (N_2O) (Viet Nam's Second National Communication to the United Nations Framework Convention on Climate Change 2010).

4 Approximately 15 percent of Vietnam's species are considered endangered and much of Vietnam's biodiversity loss is linked to the loss of natural forest cover.

Table 7.1 Overview of major coffee-related landscape stakeholders

Category	Organization
Government agencies	Ministry of Agriculture and Rural Development (MARD) and the local MARD offices (DARD), Ministry of Labor, Invalids and Social Affairs, Ministry of Natural Resources and Environment (MONRE) and local MONRE office (DONRE), Provincial People's Committee, Ministry of Trade and Investment, National Agricultural Extension Center (NAEC), State Bank of Vietnam and Ministry of Finance (which supervise VBARD)
Research agencies	Western Highlands Agriculture and Forestry Science Institute (WASI), Institute of Policy and Strategy for Agriculture and Rural Development, Tay Nguyen University, National Agriculture Centre
Other local stakeholder groups	Coffee Coordination Board (CCB), Vietnam Farmers Union, Vietnam Coffee and Cocoa Association (VICOFA), Water User Associations, irrigation management entities and organizations
Local banks	Vietnamese Bank of Agriculture and Rural Development (VBARD), Vietnam Bank for Social Policy; Private commercial banks
Local coffee companies	VINACAFE, Trung Nguyen Coffee Company, Hung Phat Company, Tam Chau Tea and Coffee Company, Viet Pacific
International exporters & buyers	ECOM, Nestlé, Mondelez, Tchibo, Olam, Dakman, DE Master Blenders, Mars, Cargill
Input and technology suppliers	Syngenta, Yara, Netafim, EAKMAN (a part of WASI that sells seedlings), domestic input stockists
NGOs & other partners	Community Development Center, IDH, SNV Netherlands Development Agency, Solidaridad, EDE Consulting, Technoserve, Rabobank Development, Rabobank Foundation, World Bank Group, Denmark International Development Agency (DANIDA), Swiss State Secretariat for Economic Affairs, World Wildlife Fund, International Union for Conservation of Nature
Standards-related entities	4C Association, Rainforest Alliance, UTZ Certified, Fair Trade International

The excessive application of nitrogen-based fertilizer (e.g., urea and generic NPK fertilizer), over time, leads to soil acidification, which in turn interferes with the bioavailability of nutrients to crops and favors certain crop diseases.[5] Moreover, fertilizer that is not absorbed by crops is washed away, polluting surface water. This is exacerbated by excessive irrigation, as well as a lack of synchronization in the scheduling of water and fertilizer applications. Data from 2008 suggest that coffee plants take up less than 50 percent of chemical fertilizer applications. In addition, both the production of and the heavy use of fertilizer use contribute to greenhouse gas emissions (CO_2 and N_2O).

The success of a coffee harvest is intrinsically tied to the abundant availability of water. Irrigation is necessary for coffee

5 This can also interfere with the success of replanting efforts.

trees to remain productive in spite of an extended dry season (rainfall only provides 25 percent of water requirements) (Amarasinghe et al. 2015).[6] However, the over-extraction of groundwater has also become a serious issue in Dak Lak province, which often experiences longer and more intense dry seasons than other parts of the Central Highlands. Although farmers do not monitor their water extraction (as noted, most farmers dig their own wells), it is estimated that they use over double the amount of water they require on average (D'haeze 2008 in Amarasinghe et al. 2015; Technoserve 2013).

Province-level authorities reportedly find it difficult to manage farm-based water extractions, and local authorities do not enforce licensing regulations on the number and depth of wells (Corsin 2014, interviews). No province-wide monitoring system is in place to ensure that groundwater is adequately being replenished during the rainy season and that withdrawals are sustainable—or equitable for that matter. There are no fees applied to pumped groundwater and there is no legal framework for fining farmers who mismanage water or over-extract. Farmers are attracted to the option of pumping groundwater due to its affordability as a defense against increasingly intense and unpredictable droughts; one interviewed farmer explained that he constructed his own well, a venture that only cost him a small investment of 3 million VND ($140) and did not require a permit.

This current pattern of water use is causing water table levels to decline in the region's upper unconfined and lower confined aquifers (D'haeze et al. 2003 in Amarasinghe et al. 2015), and in Dak Lak, high extraction rates are reported to have exhausted a number of water sources already (ICARD and Oxfam 2002). It has been estimated that, province-wide, agriculture is exploiting over half of the water flow, which is in explicit violation of the 30 percent extraction rate mandated by law (Nhan 2014); and at the regional level, over 90 percent of the demand for water is used to irrigate coffee (Technoserve 2013).

The consequences of these unsustainable water withdrawals will be particularly felt in times of drought, as they have been in the past. In 2005-2006, for example, water shortages limited farmers' ability to irrigate sufficiently and national production declined by 20 percent. Meanwhile, yield losses varied substantially across farms depending on their ability to access water. It is worth noting that water scarcity in drought years is compounded by the fact that demand for irrigation water increases precisely when water tables are not being replenished; farmers tend to irrigate four to five times during a dry year but only twice during a wet one. Going forward, if current irrigation levels are maintained, the sector could experience mild shortages every five years, and acute shortages every ten years (Technoserve 2013). More judicious use of groundwater resources would significantly mitigate this risk. Table 7.2 summarizes the main environmental problems associated with coffee production in the Central Highlands.

Recent assessments by the International Finance Corporation have examined the social and environmental risks associated with coffee and other commodity sub-sectors in a range of low- and middle-income countries. Figure 4 below summarizes the 2013 risk assessment done in relation to environmental criteria, for coffee production in several countries including Vietnam. Consistent with the discussion here, Vietnamese production is seen as involving (relatively) high risk in relation to pressures on water resources, greenhouse gas emissions, soil degradation,

6 Crop phenology requires a period of water stress, after which irrigation is crucial for achieving high yields (Amarasinghe et al. 2015).

Table 7.2 Environmental risks associated with coffee expansion and intensification

Risks	Drivers	Impacts
Forest encroachment, production on unsuitable lands	Demand for land for the production of coffee linked to policy and market incentives Limited suitability of land for coffee planting in Dak Lak Province	Land instability and heightened risk of flooding and landslides Habitat loss; loss of (flora and fauna) biodiversity Soil erosion, leading to siltation of waterways Greenhouse gas emissions from the reversal of carbon stocks linked to reduced vegetative cover and soil degradation
Excessive fertilizer and agro-chemical use	Lack of awareness of soil testing benefits and limited soil testing infrastructure Risk aversion and perception of fertilizer as risk insurance Lack of farmer understanding of the fertilizer dose-response function Improper timing of irrigation washes away agro-chemicals and reduces plant use efficiency	Soil acidification Increased soil hospitality to nematodes and plant diseases (affecting productivity and fertility) Increased reliance on agro-chemicals Accelerated ageing of trees Surface water pollution (nutrients, pesticides) with impacts on biodiversity, water quality and costs of water filtration/treatment Greenhouse gas emissions from production and consumption of fertilizer Lower margins on coffee
Excessive irrigation/ Overexploitation of groundwater	Water neither monitored nor priced Province-level limits on water usage not enforced Farmer risk aversion resulting in over-irrigation	Groundwater drawn down faster than it is replenished Acute water shortages in (or following) drought years Soil salinization Accelerated ageing of trees

and biodiversity loss (plus organic waste disposal).

Market, collective action, and regulatory failures

The industry's current lack of sustainability is the reflection of market, collective action, and regulatory failures. Neither the public sector nor markets have provided a compelling framework for environmental stewardship in Dak Lak Province and Vietnam's coffee sector more broadly. This lack of environmental stewardship in the Vietnamese coffee industry can be explained by a failure of markets as well as a shortcoming of governance.

Failure of markets: the business case has not swayed farmers

Cost- and productivity-related incentives. Farmers stand to reap private economic benefits from adopting more sustainable practices, mostly in the form of cost-savings. Technoserve (2013) estimates that farmers' incomes could increase by around 30 percent (from a base of USD 1,500 per year, at 2013 coffee prices) as a result of lower pumping and fertilizer

expenditures, and higher yields. However, these have been insufficient or underestimated by farmers—or perhaps too long-term—to inspire change.

In the short-run, the main way in which farmers stand to privately benefit from changing their ways is by cutting their fertilizer and water pumping costs. Studies have shown that fertilizer and water applications can be cut significantly without this negatively impacting yields (SDC/Nestle/IWMI 2013). In fact, optimizing the application of fertilizer and water has the potential to increase yields in the short-run. Reductions in fertilizer use alone could improve yields by an estimated 10 percent and revenues by 30 percent according to a Technoserve study (2013). Amarasinghe et al. 2015 find that yields of 4 tons per hectare are possible in the region with improved management practices (e.g., improved timing of irrigation and fertilizer applications). Nitrogen-based fertilizer represents coffee farmers' biggest cash cost (Technoserve 2013), at some 25-33 percent of the total.

It is estimated that farmers apply twice as much water as their crops need, a practice that incurs fuel or electricity expenses (the water itself is free). Irrigation costs are estimated to represent 15-20 percent of production costs in terms of labor, energy, and equipment (D'haeze 2008 in Amarasinghe et al. 2015). A 2012 survey of Dak Lak farmers trained in improved water management practices reported using 470 liters of water per plant, three times in the season, under average rainfall conditions. Untrained farmers were reportedly using up to 1,391 liters per plant per round of watering (SDC/Nestle/IWMI).

In the longer run, farmers would also benefit by preventing their yields from declining over time as a result of soil acidification and exhaustion, accelerated tree fatigue, and groundwater water depletion (a particular problem in times of drought). Under current management practices,

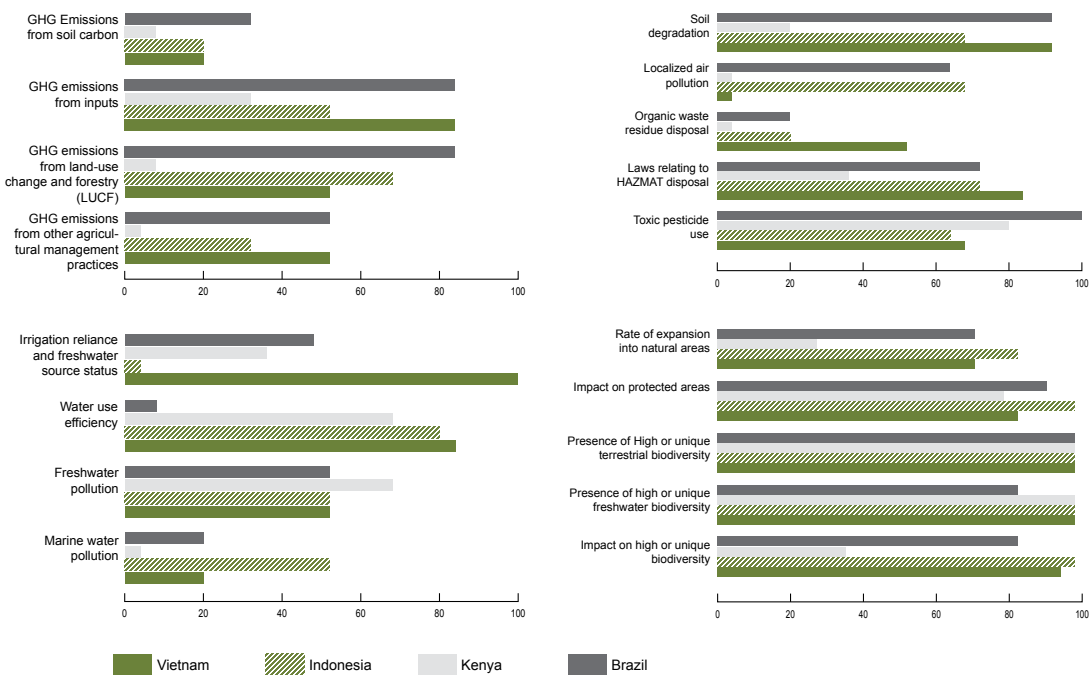

Figure 7.4 Environmental risk indicators in the coffee sector for selected countries
Source: GMAP 2013.

soil exhaustion could cause yields to plateau and start dropping starting in 2020 (Technoserve 2013). However, farmers tend to heavily discount long-term benefits, and non-economic factors may contribute to farmers leaving potential savings on the table. Soil testing is rare as is farmer record keeping. Farmers are largely informed by their own experiences. And, undertaking significant investments is inhibited by the access to or cost of credit.

Certification-related incentives. Although markets do reward growers for meeting environmental standards (exporters pay roasters a small premium for certified coffee), the premiums at play do not provide farmers strong incentives to become better stewards of the environment. Vietnam's specialization in the production of low-cost, low-quality coffee—a strategy that has favored volume over quality—largely explains why producers in Dak Lak and elsewhere have sought only to meet minimal standards to secure market access. Another limiting factor in using standards to change existing incentives is that multinational corporations are barred from procuring green coffee beans directly from growers. Their inability to contract directly with farmers has presumably made it less attractive for these large players to use their market power to demand and invest in better farming practices, as some have in other countries to protect their brand's reputation. Given the absence of influential value chain organizations, Vietnam's larger exporters might have otherwise occupied a relatively strong position to press for changes throughout the value chain, including ones aiming at mitigating environmental impact. Instead, the industry has invested little in monitoring and traceability systems, and only a relative small portion of coffee growers have benefitted from training on more sustainable practices.

While sustainability standards have made significant inroads into Vietnam since the mid-2000s, the predominant standard, the Common Code for the Coffee Community (4C), places relatively weak demands on farmers with respect to water management, managing soils, reducing GHG emissions, or preventing biodiversity loss.[7] The 4C standard is sometimes described as a stepping stone for producers to move incrementally toward meeting the more stringent demands of standards systems. Some 25 percent of Vietnamese coffee is estimated to be certified the 4C standard, compared with 41 percent in Brazil and 60 percent in Colombia (IISD 2014). Even if this share expands in Vietnam, as expected, in the coming years, this process alone is unlikely to effectively stimulate the changes needed to address the industry's most pressing environmental challenges.

Shortcoming of governance: collective action and oversight have been weak

Considering the size and strategic importance of the coffee industry for Vietnam, the sector is characterized by relatively weak governance structures, be they public or private. This can be seen in both the lack of collective action which has characterized the industry, as well as the limited amount of regulatory oversight that applies to a number of sector activities.

Collective action. Given that the industry is first and foremost harming itself by not taking precautions to safeguard its natural resource base, one might expect the industry to be organizing a stronger

7 A field study carried out in 2011-2012 by the DE Foundation similarly found that certification does not properly tackle the main local environmental problems such as excess irrigation and fertilization (the study is documented in Kuit et al. 2013). According to that study, while certification does improve farmers' access to training and promotes uptake of good management practices, it is not economically attractive for farm with lower levels of productivity.

response of its own device. However, Vietnam's coffee industry is generally characterized by a low level of collective action (i.e., not just in the context of environmental issues). This is in contrast to the strongly organized coffee sectors of Brazil and Colombia, for example. Possible reasons for the low level of collective action in Vietnam include the sector's lack of cohesiveness—with SOEs, MNCs, and local SMEs having only limited shared interests-- and farmers' memories of involuntary collective action in the past. Vietnam's industry is loosely organized under the Vietnam Coffee-Cocoa Association (VICOFA), which has limited regulatory power or disciplinary power and is not particularly proactive. Membership is not mandated and the organization is de facto mostly an association of exporters with little farmer or trader representation.

Regulatory oversight. Until recently, Vietnam's government has generally prioritized sector growth over sustainability. Perhaps this is why, even as the state has actively supported the sector (as described above), it has also stepped out of the way—keeping both taxation and regulatory oversight quite low. Illustrative manifestations of this include the imperfect monitoring and control (by government or other actors) of the extent of land under coffee production (or under natural forest cover); limited monitoring or control of water withdrawals and uses; limited data collection on available water and soil resources; a lack of soil testing infrastructure; and the previously noted lack of obligation for value chain actors to join or work through an industry association. A dearth of good information on soils and underground water resources makes it difficult to develop and implement feasible management plans in Dak Lak. The government is developing various maps and indicator frameworks to address this, but more support is needed. There are few soil and leaf analysis laboratories and service providers in the region that are able to provide farmers with more tailored production guidance. The Western Highlands Agriculture and Forestry Science Institute (WASI) has one laboratory for soil and leaf testing, but it is relatively far from Dak Lak and is generally under-resourced.

With the Ministry of Environment and Natural Resources being responsible for water resources management and with the Ministry of Agriculture and Rural Development promoting increased access to irrigation, inconsistencies in policies have emerged. This has notably detracted from effective water management in the Central Highlands. Weak coordination between central and local authorities has possibly prevented fiscal resources from flowing back to production areas. Another challenge in Dak Lak specifically has been the government's general weak capacity to implement and enforce national policies and programs.[8] As discussed in the following section, however, sector governance may be on the cusp of significant changes with the potential to reorient the coffee sector toward greater sustainability.

7.4 TOWARD MOVE EFFECTIVE POLICY INTERVENTIONS

Vietnam faces a unique opportunity to take its coffee industry in a more environmentally sustainable direction. This opportunity corresponds to the convergence of several developments and circumstances within and surrounding the industry. These include the accumulation of a critical mass of local knowledge on sustainable practices and their benefits; the strengthened institutional basis for governance and industry coordination

8 The local People's Committees have, however, recently shown an interest in more proactively implementing and enforcing national environmental policies under a 2004 policy designed for this purpose

tied to the recent establishment of the Coffee Coordination Board (CCB); and the ageing of the current tree stock which has motivated the government to mobilize financial and program resources to support coffee replanting. If the availability of these resources can be linked to better land use and agronomic practices, then the incentives for 'sustainable coffee' can be increased considerably.

Political will

First, both the public and private sectors have demonstrated increasing concern for the environmental impacts of coffee, and a willingness, over the past five to ten years, to take measures in support of more sustainable landscape management in Dak Lak and the rest of the Central Highlands. This, for example, is reflected in the government's 2012 Master Coffee Plan, as its long-term vision for the industry (through 2030) involves putting a halt to the spatial expansion of coffee (this, however, has proved a challenge to date, Ipsos 2013, NIAPP 2014). The province-level government has also made efforts to incorporate sustainability considerations into planning. And while it is not its core focus, sustainability is among the priorities of the CCB, which was created in 2013 by government decree as discussed below.

More generally—that is, looking beyond the coffee sector—the Government of Vietnam has since the 2000s been developing a policy, legal and regulatory framework to support green and low-emission growth. These include high level, multi-year strategies, as well as specific laws and regulations, including ones on water and payments for ecosystem services (see Box 7.1). The latter establish formal mechanisms that could be of direct relevance to and ultimately enable more sustainable coffee production going forward.

Knowledge base

Since the mid-to-late 2000s, there have a been a growing number of initiatives which have sought to train coffee farmers in sustainable practices and/or demonstration the technical and financial feasibility of various technologies whose adoption would reduce coffee's environmental footprint. For example, beginning in 2005, Nestle, the Neumann Kaffee Gruppe, GTZ, and a consortium of Vietnamese public agencies implemented a pilot project that involved training Dak Lak famers in efficient irrigation techniques. (ITC 2009). More recently, a number of institutions participated in trials and demonstrations of using drip irrigation systems in coffee production, identifying both opportunities and constraints, with the latter including cost, the need for good farm management skills, and the risk of equipment theft.

Under the World Bank-supported Agriculture Competitiveness Program with MARD (2009-14), a cluster of farmer group–agribusiness 'partnerships' were supported, typically with emphasis placed on promoting more ecological farming practices. Support for technology demonstration schemes including one aiming to spread the practice of composting coffee husks for use as a soil amendment in Dak Lak Province. The Vietnam Public Private Task Force on Sustainable Agriculture (now subsumed into the CCB) undertook some 75 pilots (involving 3000 farmers) between 2010 and 2013 demonstrating the technical and financial dimensions of production methods involving lower water and fertilizer use, and of various approaches to rejuvenating ageing plantations.

Institutional foundations for sector governance

As noted above, Vietnam's coffee sector is an international outlier in having risen to a position of global dominance without having developed strong institutions

Box 7.1 Emerging policy, legal, and program framework for environmental action

National strategies:

- Several national strategies have been developed to address climate change. These include the National Target Program to Respond to Climate Change, the Action Plan Framework for Adaptation to Climate Change in the Agriculture and Rural Development Sector Period 2008-2020, the Action Plan to Respond to Climate Change of the Agriculture and Rural Development 2011-2015 (MARD), and Vision to 2150.
- Strategies addressing threats to natural landscapes and biodiversity include the Biodiversity Action Plan (1994), the National Strategy for Environmental Protection (2001-2010), and the Five Million Hectares Reforestation Program support forest and biodiversity protection and enhancement.
- The Ministry of Natural Resources and Environment (MONRE) recently finalized a set of national environmental indicators, which will be used in strategy development and planning, although these have not yet been applied at the local level.

Law and regulations:

- The recent Law on Water Resources includes a requirement for MONRE and People's Committees to conduct surveys of water resources and to oversee the management of those resources including educating local stakeholders about water issues. This law also requires permitting for exploitation of underground water in particular in areas of declining water levels (Nguyen 2013).
- A decree was issued in 2010 making provisions for programs involving payments for forest environmental services. These would be aimed to conserve biodiversity, prevent and limit adverse impacts of natural disasters as they relate to flood, drought, soil erosion, desertification, air pollution, and climate change. The main target groups would be people living in mountainous regions. (Smyle and Cooke 2010).
- The revision of Vietnams' land regulation, effective from July 2014, increased farmer tenure certainty including for perennial crop production (Tran 2014). The revised land law increases tenure length and the land area that each farmer can have (up to 50 years, between 10 and 30 hectares of perennial crops).

Incentive programs:

- A Payment for Forest Environmental Services (PFES) program promotes maintenance of natural forest cover. A pilot program in the Central Highlands' Lam Dong Province levied fees on local hydropower generation, fresh water consumption, and tourism, and channeled these funds to the Forest Protection and Development Fund. The funds are used to pay farming households to preserve natural forest cover.
- Through implementation of VietGAP, the government supports 100 percent of the cost of baseline surveys, topographical surveys, soil analysis, water samples, and air samples (Tran 2014). This instrument can be applied to coffee growing regions.
- The Western Highlands Agriculture and Forestry Science Institute (WASI) regularly delivers a popular television program on agricultural issues, which has helped to spread good farming practices in the region.

dedicated to the sector's oversight and promotion. In other countries' tree crop sectors, it has been the norm for (public or private) industry organizations to engage in a range of functions and, for example, monitor, collect data on, and regulate industry activities; invest in research; manage innovation; facilitate finance; coordinate levels of production; develop areas of specialization; negotiate in the marketplace; brand national or regional products; develop or enforce standards;

coordinate the use of resources such as land and water; and protect the sector's natural resource base.

In 2013, Vietnam took a step in this institutional direction through the creation of the CCB. The CCB's 16 seats are reserved for an equal number of public and private sector representatives, and the latter must include at least two foreign and two Vietnamese representatives. The Ministerial Decision that created the CCB also requires the Dak Lak People's Committees to participate. The CCB has four sub-committees, respectively devoted to processing, trade and credit, sustainability, and policy and production. The Dutch Sustainable Trade Initiative (IDH) is currently leading the coordinated implementation of field-based programming. The CCB meets twice per year to set priorities for the coffee sector and to coordinate activities. Formally, the functions of the CCB are to:

1. Carry out research and make suggestions to the Minister about strategy, policy, planning, and scheduling of the Vietnamese coffee industry in the context of competitive ability, food safety standards, value addition, efficiency, and sustainability;
2. Assist the Minister in guiding and directing the facilitation of policy, strategy, and programming for Vietnam's coffee industry;
3. Advise the Minister about coordination of operations and resources of different stakeholders regarding the producing, processing, trading, and consumption of coffee; and
4. Participate in the International Coffee Organization.

The CCB has made environmental sustainability one of the four pillars of its founding strategy, alongside quality, yield, and farmer income. Created by governmental decision (MARD), and vested with public and private sector as well as foreign and domestic legitimacy, the CCB faces an unprecedented opportunity to take sustainable practices to scale, drawing on the knowledge and experience acquired to date. So far, the CCB's actions have shown promise. For example, it is taking measures not only to improve the coordination and quality of extension services, but also to develop a national curriculum that will leverage existing extension services (namely the NAEC) to promote more ecological practices. The National Sustainable Curriculum that it is in the process of developing will include modules on water, waste, rejuvenation, farming, and production cycles. The CCB is also focusing on the promotion of farm-level diversification. The CCB has also taken first steps to promote collaboration across private and public entities in the coffee value chain, including the local government agencies.

Mobilization around tree replanting

Against the political and institutional backdrop described above, the looming 'crisis' linked to the ageing of Vietnam's tree stock represents a unique opportunity to send the industry down a more environmentally sustainable path. Some estimates have suggested that in the absence of replanting, Vietnam's coffee production could fall by some 30 to 40 percent by the mid-2020s (World Bank 2011). The need to rejuvenate Vietnam's tree stock has given the public sector a reason to intervene, and the private sector a reason to make long-term investments in the industry.

The payback period for investments in tree replanting is several years long as trees are not immediately productive (they can take 3 years to generate a yield, and another 3-4 to yield fully), and are costlier to care for in initial years. For this reason, it is common among countries for the public sector to support tree replanting programs in order to prevent a significant

decline in tree crop productivity. These programs generally help farmers manage and finance tree planting, helping them to do what is in their long-term economic interest. In Vietnam, nematode infestations in soil may require leaving land fallow for one or more years (or planting annual crops) before replanting coffee, thus extending the period over which current coffee farmers might face reduced incomes. Some replanting efforts in recent years have failed, with this being attributed to nematode activity.

In Vietnam, both industry and government have become aware that much of the tree stock has reached a peak and taken a downward turn in terms of productivity—and that there is a pressing need to address this challenge. In fact, the government is already in the process of developing a program to address this need. That said, while the government's mobilization around this issue holds promise, rejuvenation efforts will not automatically lead to the embrace of more sustainable farming practices. It is in the hands of government—and private sector leaders (including multinational players)—to systematically link support for tree replanting to sustainability. This could involve tying lending to farmer adoption of certain practices, related to soil management, use of shade trees, reduced water use, etc. Large numbers of small-scale growers are unlikely to change their ways if the government does not make sustainability funding and policy priorities, and see these through to the field.

While the need to support coffee replanting is recognized, the coffee Master Plan anticipates an overall reduction in coffee area plantings—to 500,000 hectares—reflecting both land suitability considerations and the expectation that new plantings will involve planting material enabling higher yields in the future. For Dak Lak, current plans envision a reduction in the coffee planted area from 221,000 hectares to 170,000. How this will be achieved is not yet clear, including what measures the government might take to facilitate land use and livelihood changes. This will need to involve positive measures and not simply the denial of farmers in the more marginal coffee growing areas from accessing finance.

7.5 CONCLUSIONS AND LESSONS FOR POLICY MAKERS

Vietnam's coffee industry has turned the corner toward a more sustainable path. A unique opportunity now exists to bring synergies between a range of training and technology demonstration initiatives on the one hand, and the government's efforts to promote increased investment in agriculture through various credit programs. For the coming years, weaving sustainability objectives and approaches into coffee replanting support programs represents an opportunity for the public sector at both the national and provincial levels to demonstrate its commitment to reducing agriculture's environmental footprint. Longer term financing for replanting can be systematically tied to (monitored) changes in farmer practices.

Looking beyond the tree replanting opportunity, the environmental policy and regulatory framework that the Government of Vietnam has put in place over the past years offers a range of possibilities for developing economic and structural incentives to green the coffee industry. The government could make use of several mechanisms that existing laws have already put in place. For example, the law on water provides a framework within which the government could develop a water monitoring system, and potentially impose usage constraints—enforced through fines, possibly in combination with peer-based monitoring. The policy on payments for forest environmental services also establishes a mechanism that could be used

to help finance cash payments to farmers or other, more collective efforts, to slow coffee's encroachment into natural forest land. Funds raised could also potentially be used to encourage or facilitate the adoption of farming practices that result in less non-point water pollution (depending on how broadly the law is applicable to different ecosystem services).

In light of some of the non-financial explanations for current practices (including structural and behavioral ones), changing behavior at the farm level is bound to require more than directing cash payments or other financial incentives to farmers (including negative ones such as fines). It is probably critical that financial incentives be used with care to not crowd out social and ethical motivators that can be essential to the spread and longevity of new behaviors. Examples of indirect ways of supporting more sustainable practices (i.e., not involving cash payments to farmers, which in any case may pale in comparison to perceived profit opportunities) could involve using available funds to train farmers or leaders, to develop soil testing facilities and capacity, to build the private sector's capacity to improve its fertilizer offerings (e.g., to supply quality, custom blends), to monitor water use at the well and watershed levels, and to design peer-based water monitoring systems at the community level.

Over the longer term, mitigating the environmental footprint of coffee production in Dak Lak and other parts of the Central Highlands Region calls for a landscape approach. Indeed, the challenges and opportunities at hand point to the need for broad stakeholder involvement in the formulation and implementation of solutions, as well as the need for spatially cohesive strategies that treat the coffee growing landscape and its interacting parts—including its disparate players, and its water, soil, nutrient, biodiversity, ecosystem, and topographical resources—as a whole. Currently, farmers are relatively insulated from ecosystem system feedbacks, meaning that they are not directly feeling the consequences—at least not with immediacy—of their choices (e.g., their impacts on land cover, soil, and fresh water), even though these will harm them in the long run. In addition, water resources, though farmers treat them as though they were private, are shared, and the problem of water management is very much a collective one.

In all likelihood, deep and long-lasting improvements in the sector will be realized through a combination of horizontal and vertical, multi-scale interventions, i.e., both among farmers and among different stakeholders in the value chain. On one level, coordination among farmers is necessary to address the environmental issues discussed in this case study, if only to minimize the problem of free-ridership. In addition, greener growing cannot be embraced by smallholders working in isolation. Rather, it will take the involvement of different actors involved namely in input provision, finance, marketing, and export; in applied research and its diffusion; and rule-making, monitoring and enforcement.

The road to greater environmental sustainability will inevitably involve a portion of Dak Lak's coffee farmers, and many others in region, exiting the sector. Some 23 percent of the existing coffee growing area falls outside of the coffee Master Plan's projection of 500,000 hectares remaining under production. The potential to both accelerate and mitigate the adverse consequences of this are causes for the government to intervene. Exit from the sector will first and foremost affect the most disenfranchised farmers that have sought opportunity—lured by attractive coffee prices—on marginal lands. Thus, a well-executed strategy could both benefit

these farmers and improve the industry's sustainability. Alternative livelihood and land use opportunities will need to be examined, although this is likely to include the possibilities of introducing mixed agro-forestry or even, programs of afforestation. Supporting these and other approaches would be consistent with a strategy of greening the landscapes in the Central Highlands where coffee production plays a major role.

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SHRIMP AQUACULTURE IN CA MAU, VIETNAM

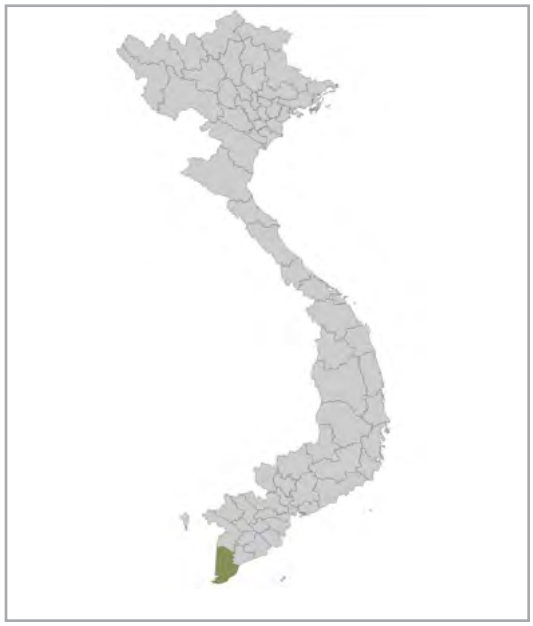
8

Samiksha Nair

This case study examines the expansion of shrimp aquaculture in the Ca Mau Province of Vietnam, its associated impacts, and the primary interventions undertaken by government bodies and other actors. Ca Mau is a lowland coastal peninsula in the southernmost point of Vietnam with over 250 kilometers of coastline and an extensive network of rivers and canals. This unique landscape has allowed Ca Mau to support a strong fishing industry and agricultural sector for decades. It accounts for nearly half of Vietnam's remaining mangrove forest area, and 70 percent of that within the Mekong Delta (Thi et al. 2013).

Vietnam's shrimp sector uses both extensive and intensive systems. However, unlike many other production areas in Vietnam, more traditional, extensive aquaculture systems dominate the landscape in Ca Mau and integrated mangrove shrimp farming is relatively common. While a deliberate shift towards more intensive systems has occurred in other Vietnamese provinces, Ca Mau remains largely an exception to this trend by relying on the comparative advantage of its ecological landscape.

There are two central environmental risks with respect to shrimp aquaculture in Ca Mau. First, the rapid expansion of farming areas, initially for rice fields and later for shrimp ponds, led to massive destruction of the dense mangrove forests that historically characterized the landscape. While recent analysis indicates that mangrove deforestation is being more effectively controlled and possibly reversed, protection and rejuvenation of the mangroves continues to be one of the primary environmental concerns associated with shrimp production in the province. Furthermore, while the quantity of mangrove trees may be stabilizing or increasing, the quality of the forests and the benefits they bring to the ecosystem must still improve. Second, the rapid areal expansion of shrimp production has also increased the risks of disease and poor water quality. The flow of water through the integrated canals and rivers that make up the landscape requires effective and coordinated management.



Ca Mau, Vietnam

The case study of this landscape was developed through a review of existing literature, as well as interviews with government officials, local farmers, local university researchers and local and

international NGOs with projects in Ca Mau, and businesses operating in Ca Mau.

8.1 INTRODUCTION TO THE COMMODITY

Over the past two decades, Vietnam has emerged as a major supplier of seafood to international markets. In 2013, Vietnam ranked third in the world with seafood exports of USD 6.72 billion. Exports are derived from near and offshore fishing as well as coastal and inland aquaculture. Growth in the sector has been especially impressive in shrimp aquaculture. In 2000, Vietnam's shrimp exports totaled only USD 662 million, yet by 2013 exports exceeded 3 billion (General Statistics Office of Vietnam 2015). This trade has been directed to some 46 countries, although the leading markets for Vietnamese shrimp are the United States, the European Union and Japan (Viet Nam News 2013).

The Mekong Delta has a variety of attributes that are ideal for aquaculture. A network of rivers is interspersed between fertile plains that drain into diverse mangrove forests, providing ideal habitats for large communities of fish. The Delta currently accounts for three quarters of Vietnam's total aquaculture area producing approximately 1.7 million tons of fish and 370,000 tons of shrimp. According to the Vietnam General Office of Statistics, of the 337,614 households engaged in shrimp farming nationally, 86 percent are located in the Mekong Delta. There are three main types of shrimp farming: intensive, semi-intensive, and extensive.

- Intensive and semi-intensive systems have higher seed stocking densities and involve the use of feed, veterinary drugs, chemicals, and pesticides.
- Extensive systems do not generally use artificial seed and generally have lower input investments, following essentially organic or natural farming practices.

While shrimp aquaculture has been practiced in Vietnam for decades, the boost in commercial production began in the 1990s and then accelerated in the 2000s. At the national level, the area dedicated to shrimp aquaculture grew from 1,000 square kilometers in 1991 to 4,780 square kilometers in 2001 and reached more than 6,600 square kilometers in 2013 (Viet Nam News 2013). While shrimp production exists in several areas within Vietnam, it is concentrated in the Mekong Delta region, particularly in Ca Mau, Bac Lieu, and Soc Trang Provinces. In 2013, these three provinces accounted for 4,360 square kilometers (66 percent) of the national shrimp aquaculture area with Ca Mau alone accounting for 2,670 square kilometers (40 percent) (GSO 2015). Within the Mekong Delta, and dominated by these three provinces, shrimp aquaculture, together with shrimp collection and processing, is a high-value, export-oriented agri-food commodity and a leading source of livelihoods for the local population. Shrimp-related activities account for an estimated 26 percent of the provincial GDP for Ca Mau (approximately USD 1.04 billion) (GSO 2015).

Recognizing the potential for shrimp production to reduce poverty and to drive economic growth, the Vietnamese government played a central role in developing the sector through deliberate efforts to boost shrimp production, expand exports, and gain international market share.

International market for shrimp

Despite slow economic and income growth in recent years in Europe and Japan, international demand for shrimp has remained robust. The value of shrimp exports from Vietnam has increased from approximately USD 330 million in 2001 to over USD 1.9 billion in 2010, with current exports split fairly evenly between the EU (27 percent), US (14 percent), Japan (27 percent), and others (van Duijn et al.

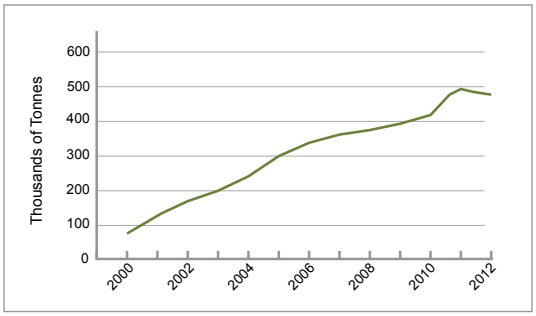


Figure 8.1 Production of shrimp in Vietnam, 2000–2012
Source: FAO 2014

2012). Production growth in Vietnam has occurred through a combination of area expansion and, in some areas, to a shift to more intensive production systems. Generally, farmers in Soc Trang and Bac Lieu followed suit of their counterparts in Thailand and shifted towards intensification of existing farms while Ca Mau expanded the area of extensive systems to draw on the traditional comparative advantages of the landscape.

Vietnam supplies both fresh-water shrimp and brackish-water shrimp to the market, with the latter accounting for 97 percent of total production. While Vietnam has traditionally produced mostly black-tiger shrimp (Penaeus monodon), smaller, whiteleg shrimp (Penaeus vannamei) have recently been raised in intensive production systems. While larger, black-tiger shrimp usually fetch higher prices on the international market, demand for this expensive shrimp is also more elastic, and thus vulnerable to fluctuations in the global economy. Whiteleg shrimp, on the other hand, grow more quickly and exhibit a higher yield, but can cause extreme pollution if its production is poorly managed. These characteristics lead to greater risks for disease and can be harmful to other species that cohabitate the area. The Vietnamese government first permitted whiteleg shrimp to be raised in the Mekong Delta in 2008 and despite the environmental risks, may continue to incentivize its production because of its popularity in key export markets such as the EU (Lan 2013).

The value chain

In Vietnam, the value chain for shrimp production can be viewed in four stages: (1) input and service supplies; (2) production; (3) shrimp collection; and (4) shrimp processing and export (Nhuong, Bailey, and Wilson 2011). Traditionally, each stage involved different actors operating separately. Despite several touch points for government regulation, the market remains fairly segmented since shrimp production is predominantly the domain of small-scale, family farmers. While shrimp farmers are considered wealthy relative to many other types of farmers, they generally remain far removed from the market and thus are vulnerable to price volatility at various stages of the value chain.

Infrastructure gaps have affected shrimp aquaculture, however transport between the Mekong Delta and Ho Chi Minh City has recently been much improved due to investments in several highways and bridges, which provide an alternative to barge transport. Furthermore, a long-term government project is underway to build a road and bridges that will connect the southern most areas of Ca Mau to the region's main transport arteries. This type of large-scale infrastructure may change the way shrimp is collected and processed and could potentially simplify the value chain.

Global demand for shrimp continues to rise in high-income countries as well as in middle-income countries in Asia and elsewhere. Vietnamese producers will find ample demand for their shrimp and, potentially, market incentives to expand their growing areas and/or intensify production. The possibility to expand production area is limited by competition for land. and other resources. Increased demands on land can strain the ecosystem in the long term, however the alternative of intensive

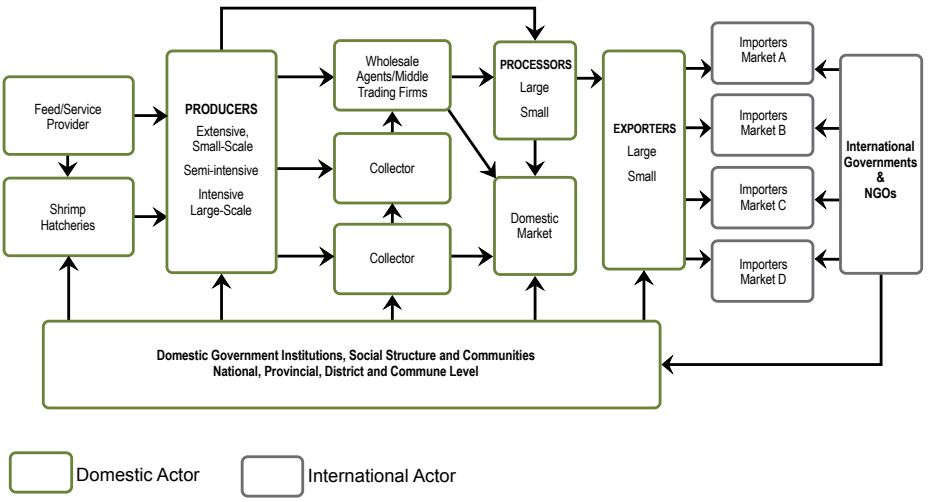


Figure 8.2 Simplified value chain of Vietnamese shrimp in global market

systems involves chemicals that can cause pollution and jeopardize water quality if not managed responsibly. The interconnected nature of Ca Mau's water system makes this landscape particularly vulnerable to poor management practices, which are extremely challenging to address on a farm-by-farm basis.

Of the primary agriculture options within the Mekong Delta, shrimp aquaculture provides the highest economic returns to land, water, and labor when managed effectively. Intensive production systems can be especially profitable provided that shrimp diseases are avoided or minimized. Yet, compared to traditional extensive systems, intensive systems require approximately 40 times the capital investment per hectare per year.

Meanwhile, mangrove timber can serve as an important traded commodity. Clearing of mangrove forests allows farmers to subsidize their production costs through the sale of high-value timber, while potentially also increasing their pond areas.

Historically, Vietnamese policies have focused on responding to market signals by increasing production with less emphasis on quality control and environmental concerns. Certain policies have also supported large-scale agricultural and infrastructure development, without necessarily taking into account the changing landscapes and long-term effects. For example, there was a series of policies and infrastructure projects intended to protect rice production as a priority crop for cultural and historic reasons, despite landscape-scale ecological changes. In response to saltwater intrusion in lowland, coastal areas of Ca Mau, farmers shifted their practices without permission from the government. Policies were later changed to support shrimp production over rice when it was recognized as an important driver of economic growth. However, the long-term sustainability of the commodity and the effects of rapid expansion were not properly anticipated. In the past, policies addressing environmental concerns have largely been reactionary and responding to more serious existing or immediate risks.

For many years, engineers have sought to manipulate the natural environment of the Mekong Delta in order to maximize agricultural use. This has been done very successfully, as seen by the region's burgeoning production, first of rice, and

now also of aquaculture products, which primarily serve international markets. Yet the main drivers for regional reduction in poverty and economic growth have also been the primary drivers for environmental degradation within the region. As a result of climate change impacts (as well as developments in upstream Mekong River areas), regional environmental management challenges will become even more complex, requiring a shift in expectations and planning for how best to continue to develop and manage the landscape, its natural resources, and market signals.

Finally, the Vietnamese shrimp value chain is horizontally and vertically fragmented. This poses a challenge in conveying market signals regarding environmental and food safety requirements, in fairly distributing any premiums that the market might offer for attaining the highest standards, and in simply verifying that growers adhere to national regulations and local land use provisions.

8.2 DESCRIBING THE CA MAU LANDSCAPE

Ca Mau was traditionally a very poor and physically isolated province, yet improved infrastructure, technological innovations, effective policy, and market reforms have given rise to improved economic opportunities, especially in fisheries and aquaculture.

The agro-ecological conditions in Ca Mau Province are ideal for aquaculture, allowing farmers to produce nearly year round. The temperate climate in this region results in two distinct wet and dry seasons with variation in temperature of approximately three degrees Centigrade. The wet season lasts from May to November, with rainfall on average from 170 to 200 days/year, while the dry season lasts from November to April. Farmers generally farm shrimp during the dry season, though there is an increasing trend of stocking shrimp during the wet season as

White leg shrimp grown in an intensive cultivation system. Photo by Samiksha Nair.

well to increase yields and guard against losses resulting from disease, low-quality fry (shrimp seed), changing ecological conditions, and other risks.

The low-lying peninsula's numerous rivers and canals make flooding common, although there is a virtual absence of severe storms or sea surges. The land of Ca Mau has formed from silt and sediment accretion from the East Sea and Gulf of Thailand, which accumulated over many years resulting in relatively "young" and fertile soil.

Historically, Ca Mau featured vast mangrove forests. Estimates suggest that in the early 1970s, Ca Mau's mangroves covered approximately 2,000 square kilometers. This has been sharply reduced over the years as a result of in-migration, the expansion of rice cultivation, overexploitation of timber for construction and charcoal, and, more recently, the expansion of shrimp aquaculture, according to local sources. The most recent estimate, for 2010, is that Ca Mau still has roughly 645 square kilometers of mangrove forests, classified as production, protection, or special-use forests. Even with this huge decline, Ca Mau still accounts for almost half of Vietnam's remaining mangroves and some 70 percent of mangroves in the Mekong Delta. By comparison, between 1999 and 2008, the area of shrimp aquaculture in Ca Mau increased from just over 900 square kilometers to nearly 2,400 square kilometers, further illustrating the change in land use over a relatively short period of time (Thi et al. 2013).

Ca Mau is often regarded as the birthplace of shrimp farming in the Mekong Delta. In the 1980s, Ca Mau farmers forewent official permissions to independently allow saline water into land designated as rice fields by the Government to produce shrimp naturally. As a result, much of the shrimp production in Ca Mau began with rice-shrimp rotation farming models.

The disbursal of permits was administered in increments, with the Ca Mau Province gaining official approval from the central government in 1992 to begin to actively support shrimp cultivation. Due to the locally-specific implementation of national policies permitting shrimp farming, each province in the Mekong Delta developed its own trajectory of transformation from rice to shrimp cultivation. As pointed out by several local stakeholders, this initiated a practice that continues today, where provinces often do not adequately coordinate planning and strategies despite the crossover of landscapes and natural resources. In Ca Mau, the shift happened rapidly due to the favorable ecological conditions and economic incentives, especially when compared with rice cultivation.[1] For example, for the Ca Nuoc district, the acreage of shrimp production increased by 8.5 times from 1997 to 2002 (Lan 2013). While rice and other fruit and tree crops are still produced, aquaculture production remains a key priority for Ca Mau today.

The vast majority of farmers in Ca Mau are smallholder farmers that use extensive and semi-extensive systems. In advanced-extensive shrimp production (extensive production with higher stocking densities), the expected density of shrimp post larva is from three to five shrimp per square meter, however, in practice, with limited land area and incentives to increase yields, farmers often released shrimp fry into their ponds with much higher stocking densities than recommended for extensive systems. Meanwhile, though in the minority, some farmers with the resources to shift to intensive systems have done so.

1 Rice yields (and profitability) in Ca Mau have traditionally been much lower, on average, than those realized by farmers in provinces to the north and northwest of Ca Mau, largly due to saline water intrusion and less effective water management systems.

8.3 LANDSCAPE RISKS

Environmental risks resulting from widespread shrimp aquaculture are summarized below, together with the major drivers and the form of impacts on different stakeholders (see Table 8.1). The causes listed below do not include external factors, such as global demand for undifferentiated shrimp.

Mangrove deforestation

One of the central environmental concerns of stakeholders across government, international NGOs, research institutions, development organizations, and civil society is the conservation and rejuvenation of mangrove forests that once defined the landscape. Ca Mau's mangroves serve as natural sea dikes, offering protection against storm surges, soil erosion, and extreme weather events. While the province is not often hit by major storms since it is south of the hurricane belt, the impacts when storms do occur can be devastating for communities. Mangroves protect against natural disasters, prevent soil erosion, serve as nursing grounds for natural shrimp, and mitigate greenhouse gas emissions (McNally et al.2011). They also act as a natural filtration system, which in turn impacts disease prevention and control and improves water quality.

Replacing mangrove forests has a large carbon footprint. In a study on the release of carbon from the conversion of mangrove forests into shrimp ponds, researchers Sidik and Lovelock (2013) found:

> "[Converting] mangrove forests to aquaculture ponds contributes to greenhouse gas emissions that are comparable to peat forest conversion to other land uses in Indonesia. Higher magnitudes of CO2 emission may be released to atmosphere where ponds are constructed in newly cleared mangrove forests. This study indicates the need for incentives that can meet the target of aquaculture industry without expanding the converted mangrove areas, which will lead to increased CO2 released to atmosphere."

While the inputs associated with intensive shrimp systems allow for higher yields, the vast expansion of shrimp and other industries has certainly caused environmental impacts. After a preceding phase of clearing land for rice, the expansion of shrimp farming has been the leading cause for mangrove deforestation in Ca Mau. Consequently, many of the environmental benefits provided by mangrove forests have been weakened.

As mentioned previously, 1970-1990 was a period of rampant mangrove deforestation since the prevailing attitude viewed its conservation as unrelated to the productivity of aquaculture. Initial satellite imagery provided by the International Union for Conservation of Nature (IUCN) suggests that this trend only began to slow and reverse in 2004. Further study of the reasons for this apparent reversal is needed. Possible reasons for this change could be more effective enforcement on behalf of the government or clear incentives for protection, however there are other potential causes. For example, perhaps most of the areas that farmers can access have already been encroached upon and the remaining areas are too remote.

While many efforts to control mangrove loss due to aquaculture expansion are underway, sizeable areas of mangroves lining the coast of the province are also beginning to succumb to rising sea levels. Furthermore, replanting mangroves is an experimental venture that is expensive. Many newly planted mangrove forests lack the species diversity of the original forests, bringing into question their quality and long-term survival. Given issues regarding the quality of the new forests and the sustainability of financing rejuvenation by government and farmers, further examination of current plans is necessary.

Table 8.1 Environmental risks associated with large scale shrimp production

Risks	Drivers	Impacts
Mangrove deforestation	Land clearing for shrimp pond expansion, illegal cultivation of mangrove timber	Erosion, decline in water quality of ponds, impacts on shrimp health, habitat loss, decreased C02 sequestration
River siltation and soil erosion	Leaf litter and farm management practices	Local impact on water flows (e.g. impacting canals for irrigation), water quality, and transportation
Water pollution	River and canal pollution from ponds (dispersion of chemicals, nutrients, shrimp excretion) and mismanagement of waste	Local health impacts, fishery production losses
Changes to local hydrology (including salt-water intrusion)	Compaction and subsidence of silt due to deepening of ponds and creation of new ponds, global climate change (increased rain fall), outdates infrastructure created for rice farming (more shallow canal systems, dikes. etc.)	Flooding, river siltation, sea level rise
Shrimp disease	Higher than recommended pond density, poor shrimp fry quality, overuse of inputs (chemicals, feed, veterinary medicine)	Loss of local livelihoods, health
Loss of biodiversity	Forest clearance, loss of wetland habitats, increased production of whiteleg shrimp	Loss of local livelihoods (agriculture, aquaculture, ecotourism, etc.) depletion and biological contamination of wild fish and shrimp populations

Water pollution

Local government, industry, and farmers are most concerned that, in addition to the poor quality of shrimp fry, water pollution also contributes to shrimp (and other crop) losses and threatens export profits. The high density of shrimp fry and additional inputs (e.g. level of feed, chemicals, antibiotics, etc.) used in intensive and semi-intensive systems affect the quality of water in the ponds and requires stringent management, particularly given Ca Mau's integrated waterways. These inputs along with growing silt deposits and waste from the shrimp are often released into the rivers and canal systems without proper treatment, contaminating soil, rivers, and coastal habitats. The canal infrastructure in Ca Mau was not intended to accommodate the existing widespread shrimp aquaculture sector, placing further strains on water quality management. Low quality and polluted water is a contributing factor to the incidence of disease, which further increases the usage of antibiotics to control this risk. In the first half of 2014, Japan and the EU repeatedly warned Vietnam regarding oxytetracycline residues, a type of antibiotic used to control disease, in excess of permitted limits.

Consumers and regulators are concerned about the food safety dimensions of this antibiotic use and so when high levels of residues are detected, either warnings or trade restrictions are put in place. These concerns force a concerted response to either reduce or more prudently apply the antibiotics or to address the root causes of the disease (including water quality).

The discharge of wastewater is also a common reaction some farmers practice to respond to an outbreak of disease. Though largely extensive production systems has limited the extent of water pollution from chemical contamination in Ca Mau, the poor management of water contaminated by disease, either through contact from human and agricultural waste or water from affected ponds, continues to pose risks to the environment and to human health. Additionally as it becomes increasingly difficult to expand the total production area, farmers and government will need to consider alternative means of maintaining Ca Mau's comparative advantage in shrimp production.

The development of industry and transport infrastructure in the area is also contributing to increased pollution and changes to the ecosystem, including to water quality. This calls for more integrated planning and management of the landscape and cannot be addressed by individual farms.

Climate change

Vietnam is expected to be one of the five most vulnerable countries to climate change (InfoDev 2012). According to research conducted in 2009, Ca Mau is among the localities most likely to experience the impacts of a changing climate. That study found that land erosion at the rate of 20 to 40 meters per year has been occurring in Ca Mau.

Mekong Delta researchers note changes already evident in the timing of rainy seasons, in the total levels of rainfall, and in the variance of daily high and low temperatures.[2] Incremental sea level rise plus more extensive patterns of inland salt-water intrusion are reported by farmers as disrupting the production of recent years. The precise connection between these developments and farmer yields (and the incidence of diseases in shrimp) is not yet well understood. The perception of many local stakeholders in the farming community, as well as in government, is that recent and expected changes will not prove favorable to shrimp aquaculture. This could perhaps lead more farm operations to fail or result in increased investment in order to maintain the same yields and profitability.

Shrimp disease

Serious outbreaks of disease in shrimp have occurred periodically, with devastating short-term (and sometimes long-term) impacts on producers. In recent years, a disease causing high rates of mortality in shrimp fry has hit many shrimp operations. Farmers applying intensive production methods have been especially affected. While the extensive systems of Ca Mau are less susceptible to disease, any disease outbreak in an extensive shrimp farming area can be difficult to contain given the reliance on tidal flows and integrated water systems. Whether the recent disease outbreaks have an environmental origin is not known—for example, one theory is that the disease came from imported shrimp seed. There is, however, a general perception that its persistence and spread occurred through the environment, whether through the exchange of water or in water embedded in pond soils. There is a correlation between

2 Interviews with researchers at a local university confirmed farmers' views that shrimp productivity can be highly sensitive to high or low temperatures, a change observed with the altering climate.

higher stocking densities and shrimp disease, even in extensive systems.

The World Bank estimates that, annually, Vietnam experiences more than USD 1 billion in losses due to shrimp disease. In April 2013, Mexico stopped importing shrimp from Vietnam and other countries in the region due to the outbreak of early mortality syndrome. The economic implications of shrimp disease, often attributed to environmental pollution, poor seed quality, and weak planning, have changed the mindset of stakeholders throughout the value chain. Improved and coordinated planning is at the root of addressing this risk.

Biodiversity

The diversity of wild aquatic species native to the area has been affected by the expansion of shrimp production. While extensive shrimp farming follows natural practices that afford farmers the advantage of selling other species cohabitating in their ponds like crab, wild fish, and other wild species found in the landscape, the increased introduction of chemicals to kill other species of fish that compete with shrimp for food or kill shrimp fry have affected biodiversity in the area. In Ca Mau, the practice of virtually organic, traditional extensive farming has meant that biodiversity loss has been primarily the result of the loss of wetland habitat due to industry expansion. However, as the ecological conditions of the landscape change due to climate change, less diverse mangrove forests and changes to water quality can exacerbate this loss.

8.4 POLICY INTERVENTIONS

There are many existing and planned interventions focused on addressing the risks to sustainable shrimp production. Some of these occur at the national and regional (Mekong Delta) levels, others at the provincial or more localized levels. National and local policies have long emphasized production growth and increased investment by processors in the shrimp sub-sector. In recent years there has been mounting recognition of the environmental challenges associated with the industry and the need to effectively address these challenges, both to protect local stakeholders as well as maintain (or improve) the competitiveness of the industry internationally (Ha 2012). The current trade-off between economic benefit and environmental cost no longer looks tenable in Ca Mau and Vietnam more broadly (Diaz-Rios and Jaffee 2013).

With globalization and the increased integration of the agri-food system through trade, quality has emerged as a defining principle for gaining market share and economic advantage, in addition to price and quantity (Diaz-Rios, Luz, and Jaffee 2013). According to interviews with representatives from development organizations and international NGOs, while earlier generations of Vietnamese policy focused solely on increasing productivity and yield, a notable shift to adapt to the quality demands of the global market can be observed. Quality in this sense encapsulates not just the characteristics of the commodity, but the process by which it was produced (Ha 2012). Identifying environmental and social risks are essential to this notion.

Land-use

In the 1990s, when the Government shifted its stance on shrimp, recognizing it as a high-value export commodity, a Shrimp Aquaculture Export Promotion Program was established. The aim of this program was to increase the capacity of the industry and to speed up production for export (Decision 347-CT, signed on 14, December 1987). One of the policies within this project permitted mangrove forests in Ca Mau to be converted to shrimp ponds. A report by Tran, van Dijk, and Bush (2012) indicates that in Minh Hai, shrimp production area

expanded from 3,000 ha in 1980 to 76,036 ha in 1995. While this occurred, an equal or greater area of mangroves was subjected to illegal clearing of the forests by farmers. Decision 224/1999/QD-TTg intended to improve aquaculture development over the period of 1999 to 2010 and further facilitated expansion by allowing farmers to convert low-yielding rice fields, uncultivated areas, and saltpans for aquaculture use. Financial support was provided to farmers who lacked formal access to credit. One of the objectives of the plan was to reach over USD 2 billion in export revenues by 2010. With profits from shrimp farming 10 to 15 times that of rice production, by 2008 the black-tiger shrimp farming area in Ca Mau province alone exceeded the 2010 government target for all of Vietnam (Ha 2012).

Recognizing the consequences of widespread forest destruction, each province in the Mekong Delta set its own regulations for mangrove protection and assigned Forest Management Boards to oversee these regulations. In the case of Ca Mau, it has been stipulated that land use patterns in the coastal areas should feature 60 percent mangrove cover and 40 percent available for aquaculture. Application of this regulation in practice varies among locales. Some resources are also being made available to support mangrove forest regeneration directly. In Ca Mau, the plan is to support this on some 500-600 hectares a year, with no end date for the policy.

Ca Mau is divided into three zones with specific regulations for mangrove coverage: the full protection zone, the buffer zone of mixed mangrove/farming, and the economic zone. No agricultural activities or cutting of mangroves are permitted in the full protection zone, or Green Belt. In the protection or buffer zone behind the Green Belt, the integrated shrimp/mangrove model is permitted. In this zone, 60 percent of the land is designated for mangroves and

Extensive shrimp farm in Ca Mau. Photo by Samiksha Nair.

40 percent for shrimp aquaculture and other agricultural activities. Within this zone, 10 percent of the mangrove trees can be cultivated per year.

In practice, the actual difference between the protection area and the economic zone is unclear. In the economic zone, mangrove cultivation is permitted, but trees must be replanted within 12 months and the 60:40 ratio must be maintained. Mangrove cultivation is an attractive source of additional revenue if farmers are able to abide by these specifications. However, reaching this ratio has proved challenging. While cutting mangrove trees negatively affects the ecosystem and can impact aquaculture productivity, the vast coverage of land by mangroves also limits its productivity, particularly for smaller farms. Determining the ideal ratio for both farmer livelihood and the ecosystem requires further consideration.[3]

The arm of the provincial level government is important for facilitating protections of mangroves. However, enforcement and regulation has been loose and at times ineffective due to inadequate capacity and financial resources. Rather than signaling weak intent for enforcement, this may be a result of a mandatory policy for which enforcement is not sufficient, a problem that exists throughout Vietnam.[4]

Data from IUCN points to an increase in mangrove forest cover, a trend that could potentially be explained by more rigorous attempts to enforce existing regulations. A further analysis is needed to determine this conclusion and assess whether or not an incentive structure could prove more effective in conserving mangrove forests. Furthermore, as the ecology of the landscape continues to evolve, the precise reasoning for and scientific evidence supporting current zoning laws should be examined further.

The Ca Mau Department of Agriculture and Rural Development (DARD) is also committed to improving current results through several projects, including a strategy for mixed mangrove/shrimp farming for 2020. Successfully protecting the mangroves requires action from the provincial level government first as this is the level of government that determines budget allocation, land use planning, provincial regulations, and local incentive policies. For this reason, among others, the World Bank is working closely with the provincial governments of eight provinces, including Ca Mau, on the Coastal Resources for Sustainable Development (CRSD) Project. The project includes a component on integrated spatial planning of all coastal areas across sectors. This work will also address policy guidance through a Provincial Steering Committee for each of the eight provinces participating in the project. Collaboration across the provinces will then occur at a later stage of the project.

Better management practices and standards compliance

Vietnam was one of the first four countries to implement the FAO Code of Conduct for Responsible Fisheries, designing a national set of Good Aquaculture Practices (GAqPs) addressing food safety, environmental pollution, and disease control (Vu and Griffiths 2009). These GAqPs address both intensive and extensive production systems. However, implementing these GAqPs may involve high costs, especially for intensive shrimp farmers who need to make changes in their pond infrastructure.

Representatives from local DARD and Department of Natural Resources and

3 One representative from the development community who also owns a 30 ha farm noted that mangrove coverage reaching over 60 percent of farm area precludes high shrimp productivity, in part due to the leaf litter that the trees cause.

4 This, however, does not imply that another actor should take the lead on mangrove protection as this risk is not conducive to deregulation or market driven solutions.

Environment (DONRE) offices note that Vietnam, India, and Thailand have collectively developed a modified set of Better Management Practices (BMPs) that are "more practical and better suited to smallholder farmers" as well as zones with inadequate infrastructure. The BMPs aim to reduce environmental pollution, prevent and control disease, and ensure food safety. Various government projects, including the World Bank-supported CRSD project, aim to scale up the adoption of the BMPs in several provinces, including Ca Mau, with the support of the DARD and DONRE. While some farmers have been discouraged by the absence of price premiums associated with BMP adoption, the main benefits for farmers should be improved productivity, reduced yield risk from disease, and access to cleaner water.

The lack of reliable price premiums, together with problems in certifying compliance in a fragmented supply chain, have also inhibited local adoption of international voluntary standards for shrimp aquaculture. Many smaller scale pilot projects currently underway are focused on addressing this barrier. Over the years, government authorities have supported the adoption of different private standards through more targeted interventions. For example, to encourage the adoption of the Natureland standards in select areas of Ca Mau as part of the Mangroves and Markets (MAM) project (with SNV, IUCN, and a Vietnamese shrimp company), the government supported the development of systems needed for quality and environmental management and product traceability, as a collaboration between all of the necessary stakeholders, including

Box 8.1 PPPs in aquaculture—mangroves and markets

The current IUCN-SNV- Vietnamese shrimp company voluntary certification project aims to transition the shrimp farming sector to a more sustainable footing while increasing coastal resilience to climate change. The project involves applying the Natureland standard to the 125 square kilometer Nhung Mien Forest Management Unit (FMU), which is managed by the FMU and home to about 2,600 shrimp farmers. The project has already certified 700 farmers in the first stage and has been commended for working closely with the DARD and engaging the world's second largest (by export value) seafood processor. The processing company commits to buying all the certified organic shrimp produced by the participating farmers at a 10 percent price premium. Additionally, identifying the value of Natureland certified products, the private sector partner covers much of the cost associated with certification for the farmers (including the annual audit and the ICS that ensures chain of custody from the farm to the processor), while SNV provides trainings and other support.

This project provides direct incentives to farmers to participate in certification without placing the burden of the financial cost on them. It also addresses water management risks by incorporating toilet systems for improved waste management. The results of this and other projects are not yet conclusive given their relatively early stage of development.

While the Mangroves and Markets (MAM) project is still in its early stages, this project has successfully engaged all of the relevant stakeholders in the shrimp value chain to address many of the environmental and social risks associated with shrimp aquaculture. It has effectively incorporated lessons from previous generations of projects in the area including the inclusion of integrated spatial planning as part of the design when selecting participating farmers.

farmers, collectors, processors, and forestry companies. The Natureland standard requires relatively stringent environmental management practices and at least 50 percent mangrove forest cover assessed on an individual farm basis, setting it apart from many other international standards. Ca Mau authorities have expressed an interest in promoting an "organic coast" of shrimp production, yet obtaining commercial benefits from such practices and designation will require major improvements in market relations and production oversight within the value chain.

While there are central policies mandating compliance, enforcing these policies has been difficult. The Vietnamese government does not yet have the capacity for punitive enforcement for mandatory standards, so incentives that encourage self-regulation are key. Finally, Vietnam has an ambitious national action plan for green growth for 2014-2020 including policies that support the application of good agricultural practices to agriculture, silviculture, and aquaculture.

Even with incentives, given the flow of water through Ca Mau's integrated waterways, pursuing results through better management practices relies on adoption at the individual farmer level. Compliance will prove challenging on a larger scale for a fragmented industry comprised of many smallholder farmers. The landscape in Ca Mau may prove particularly challenging, when compared to other landscapes. Since the CRSD project also includes a component on "good practices for sustainable aquaculture including improved bio-security management, improved seed quality management, and improved environmental management," it aims to address this hurdle through a more integrated approach that, emphasizes collaboration across sectors and stakeholders and spatial planning. The project is in its very early stages and the lessons on the effectiveness of this approach will be shared in the upcoming years.

Payment for Environmental Services

As part of the revised Forest Protection and Development Law, the Government began the development of a Payment for Forest Environmental Services (PFES) program in 2004 (Box 3.3). In 2010, after two pilot projects, Decree No. 99 mandated the implementation of PFES nationwide, to take effect in January 2011. According to an IUCN report, Vietnam was the first Asian country to implement such a scheme nationwide. The goals of the program are to improve forest quality and quantity, to increase the forestry sector's contribution to the economy, to reduce the state's financial burden for forest protection and management, and to improve social well-being. Progress of the PFES program towards achieving these objectives has not yet been comprehensively reviewed or analyzed (Thu Thuy 2013).

Interviews with both government and international organization representatives indicate that the Vietnamese government is very interested in further exploring mechanisms for applying Payment for Environmental Services in Vietnam. MARD has been particularly interested since Vietnam's economic slowdown in 2010 and has specific plans for piloting for an aquaculture PES in late 2014 and 2015. There may be opportunities for "Blue Carbon" payments for protecting threatened coastal habitats (Murray et al. 2011; Lau 2013).

Species diversification

The global recession in 2008-09 had significant impact on global fisheries. The demand for black-tiger shrimp, as a relatively expensive commodity, declined with macroeconomic downturns in importing countries. The government attempted to shield Vietnam from market fluctuations. In direct response to market demands, and as an effort to counter this decline,

the government reversed an earlier decision to ban the production of whiteleg shrimp. It was only later that reports from the Vietnam Aquaculture Department indicated that whiteleg shrimp are susceptible to Taura syndrome virus (Thu Thuy 2013). Initially there was no substantial evidence of such outbreaks for whiteleg shrimp. Prior to a formal decree changing regulations, only former black tiger shrimp-intensive farms were permitted to produce whiteleg shrimp in the Mekong Delta provinces. Later there was plan to set up an area of 108 square kilometers for whiteleg shrimp. Intensive shrimp systems require shrimp seed and feed, but there is doubt that the government is able to monitor the quality of these inputs, further exacerbating water quality, food safety, and pollution concerns. Despite policies promoting whiteleg shrimp, black-tiger shrimp continue to account for the majority of area and production volume in Ca Mau specifically.

8.5 STAKEHOLDER CONCERNS

While the Government of Vietnam plays an important role in the governance of the shrimp value chain, it is only part of the equation. Nearly all stakeholders agree that governmental and non-governmental actors outside Vietnam are well-positioned to influence and support sustainable shrimp farming in Vietnam as well. Importing markets have established and enforce certain food safety and environmental standards that are becoming increasingly salient features of shrimp aquaculture. Nongovernmental actors and development organizations, both Vietnamese and international, are also more active in seafood trade issues promoting more sustainable practices through the advancement of market-based, voluntary certification standards.

While national afforestation efforts first began after unification of the country in 1975 and were expanded during the 1990s following a severe period of deforestation, success was questionable and slow at best. More recently, the government, several international organizations, NGOs, and private sector actors have also supported rehabilitation through a range of projects and interventions. IUCN research indicates that greater progress has been made since 2004 (data analysis reports are forthcoming). The results of these studies will be integral when evaluating the long-term sustainability of current land use policies in protecting the natural resources of the province, while also ensuring a sustainable and competitive shrimp aquaculture sector in Ca Mau.

The government's plans for an organic coast in Ca Mau are ambitious, but link well with the principles underpinning a landscape approach to sustainable production of shrimp within a very important province in Vietnam. Scaling up projects, particularly those that encompass mangrove protection and rejuvenation like the current IUCN-SNV MAM project, offer real, but as yet unproven potential and illustrate growing recognition that increased coordination across stakeholders is a necessary part of any solution. Communicating the outcomes of these projects will be important when implementing similar projects led by other organizations (including GIZ).

Governments, retailers, and consumers in importing markets increasingly require greater assurance over the production process, particularly for agri-food products, resulting in the establishment of a variety of voluntary certification systems, including private standards. Evaluating how producers, in this case smallholder farmers, can be engaged effectively in certification schemes is an important part of the process. Policies enabling this engagement will facilitate their successful adoption. However, the question still remains as to whether certification schemes are the best approach for a fragmented industry. Equally important will

be quantifying the demand for these types of certified products. GIZ is currently conducting a study in this regard.

While there are concerns about limited resources for the MAM and similar projects, one element of success rests on their approach. In the first stage, many certification projects work with the "cream of the crop" of producers in order to achieve results and prove the viability of the model. This implies that scaling up beyond initial high-performing farmers may be more challenging. In the MAM project, many of the farmers receiving certification have not had to make substantial changes to their current farming practices, though they have certainly benefited from the trainings, capacity building, and resources provided to them through the project. Identifying enough farmers that met the minimal requirements to participate was not, however, an easy process. Stakeholders are optimistic about scaling up these types of efforts in Ca Mau, given the prevalence of "near organic" farming practices (e.g. extensive shrimp systems) compared to other areas in the region.

The prevalence and variety of engaged stakeholders and initiatives focused on improving the sustainability of shrimp aquaculture in Ca Mau is promising, but many interventions are still in their early stages. The context and landscape of the province, combined with the motivation of government, suggest that Ca Mau is a suitable location to explore the viability of an integrated, long-term approach.

8.6 CONCLUSIONS AND LESSONS FOR POLICY MAKERS

While there has been an evolution towards more environmentally-focused policies in Vietnam, many of these policies and interventions are relatively new and will take time to have impact and provide concrete outcomes. The lessons learned thus far from the Vietnamese experience, particularly those relevant for policy makers in other countries, are listed below.

Information, monitoring, assessment, and evaluation

- Close monitoring of the various models and approaches underway is important for answering questions regarding the scope and limitations of market drivers and regulation as a means of addressing environmental risks.
- Government and researchers should take the lead in spatial planning for coastal areas, involving a range of stakeholders to identify and resolve conflicting interests, and monitor the implementation of agreed spatial plans.
- Effectively communicated and digestible research and scientific evidence to support environmental policies and regulations can support compliance with best practices. None of the interviewed stakeholders knew the basis for precise regulations related to mangrove coverage, for example: the rationale behind Ca Mau's 60:40 ratio for mangrove forests. While government and civil society trainings address the broader benefits of mangroves, there remains notable skepticism around the optimum ratio to achieve sustainability objectives for agriculture and the environment.

Vertical and horizontal government coordination

- Government policies should be reviewed for consistency, both horizontally between government departments and vertically between national, regional, and local levels. Additionally, the policy mix should be reviewed for alignment of incentives with social and environmental resilience (Ha 2012). For example, different provinces have different regulations around mangrove coverage in Vietnam, which can make harmonization difficult.

- Pockets of projects and interventions by government and other actors require greater coordination at all levels in order to effectively scale up and shift from a project approach to a landscape approach for sustainable shrimp production. The MAM and CRSD projects have adopted this lesson, but remain in the very early stages of their lifecycles.
- The Mekong Delta itself is a landscape that spans multiple countries and provinces. While at a regional level there are master plans for sustainable development of the landscape, implementation at the local level remains segmented and uncoordinated. Working with provincial government is imperative to ensure that regional plans are realized.

Standards are necessary but not sufficient

- The Ca Mau case implies that a mix of approaches will be necessary to address the environmental risks associated with shrimp production. There is likely no substitute for efficient regulation in regards to mangrove protection and rejuvenation. However, other risks such as water quality can be influenced by market drivers due to linkages to food safety and other priorities in consumer markets.
- Costs for adopting more sustainable practices or adhering to certification standards can be significant and difficult to sustain over long periods of time. Engaging stakeholders with the capacity and pre-existing incentives to absorb some of these additional costs can kick-start an initial transition.
- Although certification schemes can be positive interventions, capacity to implement and monitor them needs to be considered from the start and carefully assessed over time. Projects like MAM have successfully learned from past experiences and are keen to share lessons more broadly. Understanding these needs will minimize opting out by stakeholders who participate in certification schemes.
- Scaling up certification schemes and standards is challenging in a fragmented sector. Non-compliance by a single farmer in an area can impact the landscape, particularly in Ca Mau due to the canal infrastructure and flow of water. It is important to weigh the costs of certification with the environmental, livelihood, and health benefits of all stakeholders in the landscape.
- It is commendable that Vietnam has developed GAqP and BMP standards. Since shrimp and other aquaculture commodities are exported and traded on international markets, it will be important for local standards to be closely aligned with global standards and frameworks in order for the country and local companies to be able to compete on an international stage.

Local stakeholder support

- There is no substitute for localized, collective action to address environmental risks such as water quality and pollution. To address these risks, spatial approaches which encourage collective action among farmers, farming communities, and concerned sectors are needed, as these issues cannot be solved by individual farms. This principle will be increasingly important as Ca Mau explores the application of different standards and the possibility of an organic coast. If governments do not account for environmental costs when setting growth targets, other stakeholders will ignore environmental impacts until they affect profits. Given the nature of the risks outlined in this case, market-led approaches have a limited scope.
- Local commitment and buy-in is critical, both from government and communities. Local authorities are more closely

connected with local needs, stakeholders, and nuances. Furthermore, civil society working at the province and district levels in Vietnam has become an increasingly significant driver of change. Local people primarily view these issues in relation to improved livelihoods, thus it is important not to separate environmental and social concerns in sustainable landscape management.

The right mix of incentives

- Private sector stakeholders, in particular those further up the value chain with linkages to the international market, are willing to engage with government and development actors. However, the local rules, regulations (policy framework), structures, and capacity must more actively enable and support this engagement. This should include developing systems of payments for conserving threatened coastal ecosystems, such as "Blue Carbon."
- Identifying the right partners and incentives should be paramount. Efforts must be made to ensure that small producers and smaller companies throughout the supply chain (in particular smallholder shrimp farmers) are incentivized. The CRSD project has identified shrimp disease concerns as a driver for better environmental management.
- International pressure, both positive and negative, can have an influence. Stakeholders virtually unanimously identified international markets as having the greatest influence on domestic shrimp production, particularly related to food safety and water quality concerns. Increased regulation for shrimp began with health safety concerns from importing countries, leading to policy changes domestically. The international NGO and civil society communities also first championed mangrove reforestation as an important priority. Most recently several international standards, including the Natureland standard, have proven more ambitious than local regulations in setting environmental metrics, including mangrove coverage requirements and waste management practices.
- Interventions must ensure that the economic drivers are in place to promote good environmental stewardship. At the moment, the incentives for certification are relatively weak, especially for smaller producers, companies selling domestically, or to international markets without clearly demonstrated market demand. Having clear data quantifying the international demand for certified shrimp according to the various priorities (e.g. health, environmental, and social concerns) would support greater adoption and compliance with international standards. Vietnam has begun not only to focus on punitive regulation, but also incentive structures with PES. If the risks have not worsened and are possibly stabilizing, more information is needed as to whether this change in mindset has contributed to these results.
- There is no overarching formula for sustainable shrimp farming. The local environmental and social risks are interconnected and will require a combination of different interventions from a range of international and domestic actors including government, the private sector, civil society, NGOs, and, most importantly, farmers themselves. The good should not be sacrificed for the perfect. While some ambitious standards may be preferable in the long term, achieving these standards may require a phased approach in order to address barriers, including the cost of compliance.

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TEA LANDSCAPES IN YUNNAN, CHINA

9

Tanja Havemann

This case study examines how government policies have responded to environmental risks and impacts associated with tea production in Yunnan, a geographically diverse province in Southwestern China. This landscape is the mountainous, fertile region around Xishuangbanna, Simao, and Pu'er. This region falls within the South China-Vietnam sub-tropical evergreen forest belt. Historically covered with highly diverse forests, this landscape has experienced many environmental changes over the past few decades.

Tea in the landscape is grown both intensively, in plantations, and in tea gardens. These tea gardens have a high level of agro-ecological diversity. Tea plants grown in tea gardens also tend to be older and taller (hence the term 'tea trees'). In plantations, the tea plants are usually smaller and the agro-ecological systems much less diverse.There are two main environmental issues with respect to this landscape: loss of natural forest cover and associated impacts (e.g. on soil, water) due to expansion of commercial perennial and agricultural crops and over-use of chemical inputs leading to pollution as well as food and worker safety concerns. Although both issues will be described in this case study, the focus will be on chemical pollution and response measures taken by the government. In particular, the case illustrates how measures have been taken to promote market demand for better production and how national policies have been adapted to shift local development paradigms to more effectively internalize environmental costs.

Yunnan Province, China

Sources for the analysis in the landscape case study include published literature, and interviews with local sources including farmer organizations, local and international NGOs, international development agencies and businesses operating in the landscape.

9.1 INTRODUCTION TO TEA AS COMMODITY IN CHINA

Tea is an important global commodity, consumed all over the world, with strong ties to local culture. All tea comes from an evergreen bush Camellia Sinensis, which grows best at a relatively high altitude. After the first five years of its initial production, tea can be cultivable for over 100 years. Once the leaves are harvested, they are processed, and usually distributed through auctions and traders to blenders and consumers. The different recognized types of tea (black, green, etc.) are based largely on how the leaves are processed rather than on plant physiology. Global trends suggest that consumer demand is shifting away from black tea to green and more exotic teas as these are perceived as having health-giving benefits.

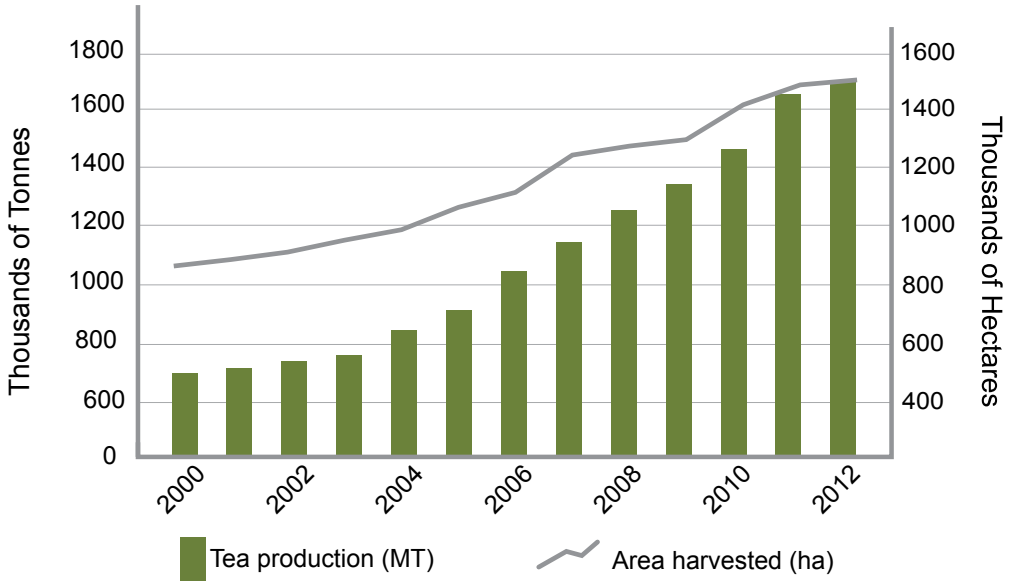

Figure 9.1 Production and area harvested of tea in China, 2000-2012
Source: FAO 2014.

The main tea-growing nations are China, India, Kenya, Sri Lanka, and Vietnam. China producies over 1.5 million tonnes per annum and is responsible for approximately 35 percent of global production (ETP 2015). China is the global leader in tea production, in particular of non-black tea varieties, but most tea is consumed domestically (IGG 2012b). The most significant tea-growing areas in China are Fujian, Yunnan, and Zhejiang. It is estimated that more than 70 percent of tea produced in Yunnan is sold outside the province each year. It is not clear what proportion of Yunnan's tea is exported from China.

Generally, environmental issues associated with tea production are loss of natural forest cover due to expansion of tea estates, demand for wood fuel for processing, and chemical pollution due to application. This is also associated with loss of biodiversity, erosion and soil degradation.

At the same time, tea production is being affected by environmental changes, including (Brouder, Billing, and Uren 2013):

- water scarcity;
- climate change;
- resource constraints, e.g. for energy and phosphorous.

Tea is recognized by the Chinese authorities as an important product, so much so that it is specifically referred to in the government's Five Year Plans. In recognition of the importance of this industry, the Chinese government has created a variety of dedicated institutions to support the industry, including state-owned import and export companies and the China Tea Marketing Association. Additionally, the Chinese Academy of Sciences (CAS) has a dedicated Tea Research Institute (TRI).

The value chain

Global tea value chains are generally vertically integrated, with a few multinational companies dominating the international trade. In China, there are three basic types of production: traditional mode (small farmers), cooperative mode, and industrialized mode (tea companies). However, tea production remains a small family business in China with tea growers

planting an average of 0.3 hectares. The market structure is such that growers tend not to have much bargaining power. Tea production is labor-intensive with relatively low labor productivity, high labor costs, and weak growing skills. Tea farmers in China are relatively poor, earning on average 25 percent less than non-tea farmers (net income of RMB 6,049 for non-tea farmers and RMB 4,821 of tea farmers, this is equivalent to approximately USD 980 and 780 respectively) (Fang et al. 2014).

The Chinese government plays several roles in managing Yunnan's tea industry. It sets the legal frameworks around rights and interests of workers, environmental issues, and product quality. It also develops standards and certification, controls the tax and subsidy frameworks, and supports research, development, and training.

The biggest international global brand owners (e.g. Unilever, Tata Tea, Twinings) are present in Yunnan and tend to buy on a sporadic, rather than a contractual, basis. These major companies have committed to embracing more responsible practices. However, the drive for sustainable value chains and voluntary certification has mostly been driven by Western and Japanese consumers, who account for a small fraction of global consumption. Similar market signals are generally lacking from the large and growing economies such as China and India. These two countries accounted for 47 percent of total global tea consumption in 2010 (IGG 2012b).

The tea value chain is illustrated below. Note that this excludes input suppliers, some of whom also function as first tier traders. Generally, the highest profit margin resides in blending and branding (Fang et al. 2014). Branded teas fetch prices approximately six times higher than crude teas, but producers are often unable to produce ready-to-use tea due to a lack of a marketing budget or expertise (Groosman 2011). In recognition to this, the government is trying to support growers to accrue a higher proportion of the value, by supporting specialized tea-growing communities, encouraging growers to develop specialized economic cooperatives, and building partnerships between leading companies and growers.

Note that in China, the top quality "single origin" teas from 'famous' tea gardens are typically sold directly to informed consumers. Chinese companies and consumers, particularly in the urban middle and higher income brackets, put high premiums on tea quality, especially 'famous' teas. It is widely believed that the best quality tea is not exported, but sold directly into urban centers, and that it is largely the medium quality tea that is exported. The lowest quality tea is widely understood as destined for domestic markets. Intermediaries know where to find the top-quality tea and pre-purchase it from specific high-quality farms, usually grown under 'ecological' conditions or in tea gardens.

Industry insiders believe that the best tea is not certified, but sourced directly, and commands a significant premium. Tea from 'famous' tea gardens tends to be produced under more environmentally-friendly conditions, and this–along with heritage preservation–explains the government's support for this type of traditional agriculture.

Although the majority of Chinese people now live in urban areas, 656 million Chinese (less than 50 percent) reside in and depend on rural areas (Bloomberg 2012). The agricultural sector employed around 34 percent of China's workforce in 2011 (Trading Economics 2014). China's average farm size is small and decreasing: the Chinese National Bureau of Statistics estimates that the national average farm size is only 0.13 ha (Dasgupta and Roy 2011). In China, tea areas under smallholder management increased by 73 percent from 2001 to 2010

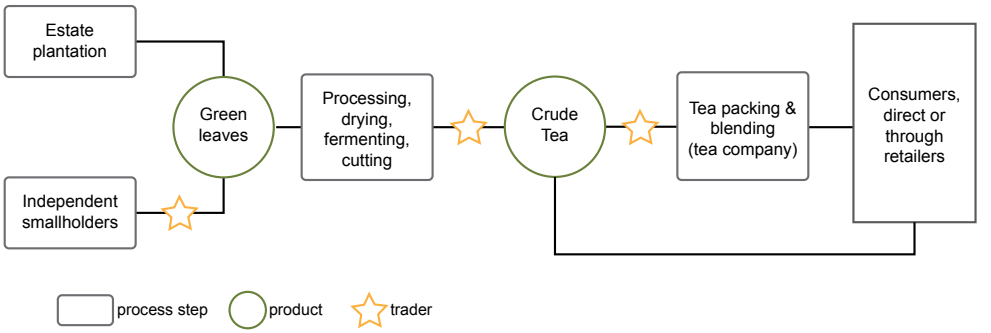

Figure 9.2 Simplified tea value chain
Note: Independent growers and cooperatives from 'famous' tea gardens are more likely to carry out their own processing and sell directly to retailers and, in some instances, consumers.

("Contribution of Smallholders" 2012). This means that although overall economic growth has been impressive, small household land allocations effectively cap production. It is noteworthy that, although there are successful cooperatives in China and in Pu'er (the specific landscape), it is reported that most farmers do not take part in cooperatives. Cooperatives have apparently suffered from not having access to professional branding and marketing expertise as well as poor management and organizational capacity. Farmers also tend not to sell on a long-term contract basis. A number of non-governmental groups operating in the landscape have focused on building organizational capacity for producers. These include the Kunming Daite Center, which helps tea farmers build cooperatives, and the Solidaridad Tea Program, which offers technical support to farmers on farm management and market access.

9.2 THE LANDSCAPE OF YUNNAN PROVINCE

Yunnan Province, in China's Southwestern corner, contains a variety of ecosystems embedded into a largely hilly and mountainous terrain, including upland temperate regions and tropical regions (Aiguo and Zhiling 2001). Yunnan's primary agriculture and forestry crops are eucalyptus, tea, tobacco, corn, sugarcane, rubber, pine resin, walnuts, and increasingly, high-quality Arabica coffee (Meyer 2014). The siting of crops is linked to altitude and topography (Lesham, Aenis, and Grötz 2010).

Yunnan province is rich in diversity, including ethnic and biological diversity, and falls within the Indo-Burma biodiversity hotspot zone. Of the reported 49 tea species in the world, 31 of these and the varieties of two of them are found in the Yunnan Province. Within this wide range of tea species grown in the province, 25 species and two varieties exist only in Yunnan. (People's Government of Pu'er City 2010). The province contains four main tea production areas: Xishuangbanna, Pu'er (Simao), Lincang, and Baoshan. Pu'er is the most well-known partly because of a certificate of geographical origin (also referred to as Geographical Indication, or GI) for a specific type of tea harvested from an ancient population of wild tea trees. Tea from 'ancient' tea gardens is recognized for having health benefits and is said to improve with age, much like fine wine. Most of the older tea trees are grown in traditional tea gardens, which are distinct from the modern terraced tea plantations, in that they are densely inter-planted with other species. Within the landscape (Xishuangbanna, Simao and Pu'er), traditional tea gardens and 'modern'

tea plantations co-exist. No data exists on the percentage of tea produced under gardens vs. estates, though tea production generally remains a small family business in China (Fang et al. 2014).

9.3 LANDSCAPE RISKS

The landscape lies within the South China-Vietnam sub-tropical evergreen forest belt. Fertile, forested, and mountainous, the region stretches around Xishuangbanna, Simao, and Pu'er. Many research studies done on this area document the value of ecosystem goods and services provided by maintaining natural forest cover. One such study by the Biodiversity Corridors Initiative of the Asian Development Bank (ADB) Greater Mekong Sub region (GMS) program identified the forests of Xishuangbanna as a regionally significant biodiversity corridor (Xi 2009). Each year, it is estimated that Yunnan's forests provide USD 1.16 billion in ecosystem services. The majority of this value comes from mitigation services (carbon storage), water quality regulation, and nutrient cycling (Asian Development Bank 2009).

Since the start of China's reform period in 1978, the expansion of commodity agriculture and forestry has led to negative environmental impacts (OECD 2011). In Yunnan province, forest clearance has come primarily from production of rubber, rice, corn, sugarcane, tea, and, increasingly, coffee (Gibson 2013). For conventionally grown estate crops, returns are highest for rubber.[1] These crops have had the greatest negative impacts where they have replaced natural forest (Fangyi and Jiading

1 Based on average net present value (NPV) of land use options in Xishuangbanna Biodiversity Conservation Corridors Initiative Pilot Site, where NPV was calculated in $/ha applying a 10 percent discount rate over 35 years (Moinuddih and Jiao Xi 2010).

Tea picker works on a plantation in Yunnan Province. Photo provided by Prof. Yuan Wei, Tea Research Institute of Yunnan Academy of Agricultural Sciences.

2013). Though forest cover as a whole has been increasing across China as well as in the Yunnan Province, there has been switching from natural forests to so-called 'economic' forests (intensive monoculture plantations of rubber, tea, and coffee). Rubber in particular has caused significant land use change in the landscape especially at altitudes of less than 1,000 meters and in hilly areas.[2] Rampant rubber expansion has arguably created a greater impact on the landscape than tea and local communities refer to these monoculture rubber landscapes as 'green deserts' (Ahlheim, Börger, and Frör 2012).

Expansion of crop monoculture is believed to have had severe impacts on soil stability and local hydrology and has likely resulted in greenhouse gas (GHG) emissions (De Blécourt et al. 2013). Farmers in the area are noticing a greater frequency and severity of drought. Yunnan suffered from a multi-year drought, starting in 2009 through to 2013, which has historically been uncommon in this area (Fangyi and Jiading 2013). Monoculture plantations of rubber are noted as having a particular impact in the area as the tree is more water-intensive than native plants and the plantation layout is not conducive to soil conservation or water retention (Mike 2014).

Both traditional and modern tea systems are present in the Yunnan landscape. In traditional systems, the tea trees are inter-planted with a variety of other plants. No chemical fertilizers or pesticides are used and management is minimal. Modern tea plantations, however, use chemical

2 Note that 'cold resistant' varieties are being developed, which will allow rubber to be grown at higher elevations.

Table 9.1 Environmental risks from expansion of monoculture tea tree production

Risks	Drivers	Impacts
Soil erosion/loss of topsoil, soil hardening	Land clearing, monocultures; soils are vulnerable to erosion due to topography & soil type	Declining productivity, landslides, silting of water storage systems, and hydro dams
Soil degradation (changes to soil chemistry)	Monocultures eroding fertility, herbicides, fertilizer, and chemical applications	Soil degradation, increased farmer spending on inputs
Water pollution	Soil and water pollution from chemical run-off and seepage	Chemical residue limits; loss of market demand, health impacts
Changes to local microclimate	Removal of large shade trees, replacing natural forests	Increased crop vulnerability to drought and pests
Changes to local hydrology	Increased run-off from loss of natural forest cover; widespread rubber plantations impacting local hydrology	Flooding, river siltation
Loss of biodiversity	Forest clearance, loss of habitat; replacing 'ecological forest' with 'economic forest'	Increase in plant pests and diseases, increased vulnerability to price bubbles (livelihood diversity)
Greenhouse gas emissions	Forest clearing	Local micro-climate and global climatic impact

Land Clearing

Environmental impacts

- Conversion of natural forests, leading to loss of habitat (biodiversity)
- Clearing on slopes leading to soil erosion
- GHG emissions from clearing
- Changes to hydrology and microclimate

Social impacts

- Changes to local hydrology impacting frequency of drought and flooding, pest outbreaks, impact on hydro-generation
- Landslides due to clearing on steep slopes

Plantation

Environmental impacts

- Monocultures have reduced ability to capture water
- Pesticide and insecticide run-off
- Soil acidification from use of inputs

Social impacts

- Health impacts from run-off: in both water ways and in other agricultural products
- Reduced crop diversity in landscapes reduces economic resilience (increases vulnerability to bubbles)

Processing

Environmental impacts

- Energy use
- Waste and pollution run-off

Social impacts

- Health impacts from pollution

Figure 9.3 Landscape impacts and risks from tea production

fertilizers and pesticides and have little or no diversity. According to tea industry representatives, the primary environmental concern is improper use of agrochemicals, resulting in soil and water pollution. This pollution is having a negative impact on tea incomes as regulatory limits on pesticide residues are exceeded and reputations tarnished due to consumer concerns about tea quality and human health impacts.

Economic valuation studies from the area indicate that local people are concerned about these environmental issues, but indicate that this concern may not yet be great enough to shift production practices without state intervention (Ahlheim, Börger, and Frör 2012). According to stakeholder interviews, concerns linked to specific farms and to the production of tea in the landscape overall seem to center on over-use of chemical inputs. This is consistent with recent government data indicating that around 16 percent of all soils and over 19 percent of farmlands nationally are dangerously polluted (Xinhua English News 2014). In terms of the Yunnan landscape, the government's environmental concerns are centered on the state of the watershed, biodiversity loss, and soil degradation. Assessments of projected impacts of climate change on tea in Yunnan are under way (e.g., Nemec-Boehm et al. 2014).

9.4 POLICY INTERVENTIONS

It is interesting to consider how the People's Republic of China's policy framework has evolved. Initial environmental concerns emphasized maintaining forest cover, in particular on steep slopes, to prevent natural disasters downstream. Strong policies were introduced to promote reforestation and protection. However, it

has since become clear that these early policy interventions were blunt instruments. This has been reflected in the 12th Five Year Plan, released in 2011, which emphasized 'higher quality growth' (KPMG 2011). Recent examples of this include efforts to promote development of a 'Green GDP' and amendments, in April 2014, to the country's Environmental Protection Law (EPL) creating a stronger legal framework for environmental management (Li and Lang 2010). This case study focuses on policy interventions directed at the Yunnan tea production landscapes.

In addition to targeted environmental policies, there are other influential sector policies. Specifically, the government is striving, through a policy called "Develop the West," to promote industries in western China that can support regional development, given that average GDP has historically been lower in this rural Western part of China. Additionally, there are policies to support small and medium enterprises (SMEs), including rural industry associations, and to spur domestic consumption (Weyerhaeuser, Wen, and Kahrl 2006). Specifically, China's 2002 Agricultural Law includes support for development of Township Village Enterprises (TVEs) and aims to shift agricultural development away from export-driven to domestic-driven growth. Although this has probably contributed to increased rural growth, TVEs have extremely varied approaches to the importance of upholding

Table 9.2 Roles of government in China's tea sector

Step	Department support activities
Growing	Ministry of Agriculture: Industrial development, cooperative-building, tea-growing skills promotion, import and export of agricultural means of production
	Tea Bureau/Office: Provision of policy information to tea companies and growers and organization of tea-related associations
Processing	Administration of Quality Supervision, Inspection and Quarantine Office (AQSIQ): Inspection of tea quality, licensing of tea manufacturing, and standardizing certification
	Ministry of Agriculture (MOA): Supervision of quality tea products and organization of certification.
Distribution	All China Federation of Supply and Manufacturing Co-operatives (ACFSMC): Development of cooperatives and administration of affiliated tea import and export companies
	State Administration for Industry and Commerce (SAIC): Examine tea quality, check for illegal business activities (counterfeit trademarks, geographical indicators, deceptive advertisement, etc.)
Market	Ministry of Commerce (MOFCOM): Drafting and management of tea production plans, supervision of tea import and export
	SAIC: Market supervision and law enforcement
	AQSIQ: Food safety certification of tea import and export

Source: Fang et al. 2014

environmental regulations (Xu 2014). The Yunnan Economic Committee is responsible for promoting SMEs. It has a support fund focused particularly on backing industries linked to agricultural processing and with high-value job creation potential (Weyerhaeuser, Wen, and Kahrl 2006).

In terms of the tea sector specifically, the government plays a number of different roles through its departments, which are summarized in Table 9.2 below. General government support policies to the tea industry have included (Fang et al. 2014):

- Tax reduction: Value Added Tax (VAT) reductions
- Subsidies: Direct subsidies and agricultural input subsidies
- Financial support to growers and companies
- Research and Development (R&D) funding, including for extension and training
- Support to cooperatives, mainly through tax reductions
- Establishment of improved Market Information Systems (MIS)

This case study considers three levels of policy engagement: National, provincial (Yunnan), and Pu'er City.

National policies

China's environmental policy landscape is complex and evolving. This case study captures some of the main interventions that have affected the landscape and commodity.

Watershed and land management policies

Economic liberalization in the 1980s led to a shifting of forest management responsibility from the central state to local communities and individuals under the 'forestry three fixes' program. A lot of the land labeled as forest was already degraded and auctioned out for reforestation in the 1990s. However, this program was not particularly successful in restoring and protecting natural forests. Much of the reforestation was carried out with commercial tree plantations in monocultures. Driven by increasing loss of forest cover and spurred by extensive flooding in the Yangtze basin in 1998, the Chinese government introduced the 'National Forest Protection Program' to halt deforestation, followed by the 'Sloping Farmland Conversion Program' to encourage reforestation on steep slopes. This program is also known as 'Grain for Green' (Xu and Ribot 2004). These programs introduced varying forms and quantities of support to farmers based on their location, including food and cash transfers in exchange for reforestation and conservation (Feng et al. 2005).

These two policy instruments were designed to shift about 150,000 square kilometers of low-yield farmland to forest and afforest a further 170,000 square kilometers of barren mountains and lands (in particular, farmland on slopes greater than 25 degrees) (Feng et al. 2005). To encourage participation and compensate farmers for economic losses, the Chinese central government provided eight years of subsidies to participating households for 'ecological forests,' five years for 'economic forests,' and two years for 'grasslands.' Benefit transfers were given to local farmers for the conversion, the equivalent of USD 0.90 for each hectare converted, 2,250 kg of grain per hectare per year for areas in the Yangtze River Basin and 1,500 kg of grain per hectare per year in the Yellow River Basin (Xu, Lebel, and Sturgeon 2009). In 2007, the Chinese State Council approved another round of subsidies under the Grain for Green program. The annual grain subsidy was revised to 750 kg of grain per hectare per year and 1,125 kg of grain per hectare per year in the Yellow River Basin and Yangtze River Basin respectively. Since 2004, this subsidy allowance has been paid in cash, with the conversion rate being 1 kg of grain to 1.4 Yuan (Min 2014). Due to

concerns about fraud and corruption, this system has moved to a 'smart card' system of payment.

The program also served to distribute wealth from urban to rural areas in recognition of the growing wealth gap and environmental services these areas provide. On paper, these two programs have been hugely successful, contributing significantly to increases in tree cover. However, the bluntness of the policy instrument has been a concern as, in some cases, the program also supported growing of unsuitable monoculture tree crops such as non-indigenous rubber and eucalyptus on vulnerable lands. Apprehensions have also been raised about the long-term economic viability of the program. According to the most recent Five Year Plan, the Chinese government intends to continue with a modified version of the program, but to place greater focus on areas of strategic importance. In this context, there is an on-going policy debate about the differentiation of 'ecological' versus 'economic' trees, and how areas should be classified for support. The continuation of this government program is also linked to the strategy of eco-compensation (see below) in which compensation is provided through mechanisms such as the Chinese government Forest Ecosystem Benefit Fund. Local Chinese governments have generally embraced the Grain for Green program as an opportunity to develop and implement long-term, sustainability-focused industries in their regions.

China's State Council has been promoting an eco-compensation policy since 2005. This was enshrined in a 2008 Decision of the Central Committee of the Communist Party of China on 'Several Significant Issues in Promoting Rural Reform and Development,' which stressed the need for an effective incentive mechanism. The Chinese eco-compensation concept is effectively a national framework for Payment for Ecosystem Services (PES) policies and programs (ADB 2009). The eco-compensation approach is enshrined in policy guidance, including the Five-Year Plan, and is integrated into the proposed national land zoning system. Eco-compensation is also considered as a way to support rural poverty alleviation and support more equitable distribution of wealth across the country (Bennett, Carroll, and Hamilton 2012).

This eco-compensation ethos is reflected in other policies such as regulations on green securities. One such measure requires polluting companies to pass additional environmental inspections when applying for public listing. To ensure adequate funds to compensate victoms, and the ethos also mandates a green insurance policy that places additional insurance costs on polluting companies (Jialin 2011).

Land use zoning

Reforms in land use zoning are also relevant to the issue of management and eco-compensation. China's Five Year Plans are accompanied by Land Use Master Plans (LUMPs), which must now consider critical ecosystem services within their designations based on identification of 'Ecological Function Conservation Areas' (EFCAs) (Kram et al. 2012). Lands are divided into four types of zones: optimized, intensive, restricted, and prohibited (banned) development zones. The designated zone determines the degree to which development is encouraged or restricted and establishes a framework for transfer of funds from zones where development is encouraged to where it is banned.

Food labeling and certification policies

Food labeling and certification is driven by three distinct motives. To help consumers identify:

- Food with higher health and safety standards, i.e. 'Hazard Free Food'

- Agricultural products that are grown in a more environmentally-friendly manner, i.e. 'Green' or 'Organic' food
- 'Famous' products from a particular geographical origin

There is reportedly confusion about what different labels mean as well as a general lack of information and monitoring both on the consumer and producer ends. It is suggested that this results from a lack of capacity and 'siloing' rather than a lack of intention or interest. Both international and local consumers may be unclear about what specific labels represent. Known premium teas are likely to be purchased directly by buyers with a significant quality premium.

Food labeling for health and safety

There have been increasing concerns about food safety among domestic and international consumers of Chinese products. This has in part been due to reported violations of Maximum Residue Levels (MRLs) in Chinese tea exports, which has led to bans on shipments of Chinese tea into the European and Japanese markets (He Tao and Xin 2012). In June 2011, China's Ministry of Agriculture released a statement titled "Aims to reduce pesticide usage by 20 percent within the period of the 12th Five Year Plan." The government also initiated a green procurement law in 2008, requiring all levels of government to prioritize the purchase of products labeled as being environmentally-friendly and prohibiting the accruement of products harmful to the environment or human health (Scherr and Bennett 2011). Since 2000, the National Agro-Tech Extension and Service Centre (NATESC) has also been mobilized to develop and promote green pest management solutions. Despite these government interventions, independent testing by Greenpeace in 2012 of 18 different medium-grade teas indicated that every single sample contained at least three different types of pesticides and that,

A tea processing facility in Yunnan Province. Photo by Angela Hu.

overall, as many as 29 different pesticides were detected in the samples. Illegal pesticides were found on 12 of the 18 samples (Greenpeace 2012).

In response to these concerns, the government's center for agricultural food quality and safety under the Ministry of Agriculture has developed the 'Hazard Free Food' indication. This label indicates that the food has "controlled and limited use of synthesized fertilizers, pesticides, growth regulators, livestock and poultry feed additives and gene engineering technologies and no use of pesticides with high toxicities and high residues" (Liu, Pieniak, and Verbeke 2013).

The Ministry of Agriculture, in collaboration with the China Green Food Development Center has also developed the 'Green Food' label, which has more stringent criteria. The China Organic Food Certification Center, the Ministry of Agriculture, the China Organic Food Development Center, and the Ministry of Environmental Protection have also developed a third national label on 'Organic Food' (Liu, Pieniak, and Verbeke 2013).

Food labeling for 'famous' products

The government has identified the development of specific products, including tea in Yunnan, as a potential tool for rural development and for the improvement of farmers' incomes in sensitive rural areas. This has included developing a policy framework for certain 'famous' products to attain a Geographical Indication (GI). Given China's rich food heritage and culture, many products have acquired strong domestic identities based on their geographical origin and a good reputation over long periods of marketing, sometimes up to 2,000 years. These products have usually not had a specific brand name, but are known based on their origin. This method of sharing the same name results in a de facto designation of origin. Before the establishment of any basic protection for designations of origin, some companies registered the common names of these traditional products as their own brand, which was prejudicial to the interests of traditional producers and consumers and upset the balance of competition.

GI indication is the responsibility of the State Administration for Industry and Commerce (SAIC) and is governed by the Trademark Law and the 'Provisions on the Protection of Geographical Indication Products and the Measures for Administration of Geographical Indications of Agricultural Products'. The Trademark Office (TMO), under the General Administration of Quality Supervision, Inspection and Quarantine Office (AQSIQ) and the Ministry of Agriculture, manages geographical indication (King and Wood 2014). The AQSIQ system was set up to provide support in identifying opportunities to increase added value and promote rural development, in collaboration with local governments (Wang and Toulose n.d.). The Ministry of Agriculture is currently improving the GI system to promote environmental protection, sustainable production and quality of agricultural outputs. Support can also be implicit, e.g. in the location of new infrastructure. Pu'er tea from Yunnan attained AQSIQ GI status in 2008, a warranted designation considering that raw Pu'er tea from the 1950s–1970s can command up to USD 20,000 per pound (Tan 2012).

Local government policies

Within China, Yunnan Province, and particularly Pu'er, is setting a benchmark for green growth. The local government was spurred into action by the severe drought in 2010, which has greatly influenced local policies and led to a stress on environmental issues within the Twelfth Provincial Five Year Plan. This was further encapsulated in the 2014 Yunnan provincial

government work plan, which focuses on 'strengthening ecological construction and environmental protection' as part of the 'Colorful Yunnan Conservation Action Plan.' The local government has generally been progressive in developing and implementing sustainable economic growth policies. This province was also the site of one of the first Payments for Ecosystem Services (PES) projects in China (in Lashihai Nature Reserve). The International Fund for Agricultural Development (IFAD), in collaboration with The World Agroforestry Center China and other partners, also piloted a PES for watershed protection scheme in Songhuaba watershed involving various producers including maize growers (ICRAF 2013).

Yunnan is also home to the country's first Rainforest Alliance (RA) certified tea farm, in Lincang, where chemical fertilizers have been banned in some areas (Rainforest Alliance 2014). The Chinese National Development and Reform Commission (NDRC) also chose Pu'er City as the location for the national green economy experiment in 2013 and a raft of policies have been developed and implemented (People's Daily Online 2013). A selection of relevant local policies is described below.

Adoption of national policies and promotion of bio-industries

At the end of 2012, China's State Council officially issued a 'Notice on the Bio-industry Development Program.' This is also linked to the Low-Carbon Development Plans of Yunnan (2011-2020). 'Bio-industry' refers to a shift to not only biotechnologies, but also improved natural resource management and green growth. Yunnan Province has developed its provincial strategy, which is also linked to the national Grain for Green program. This program promotes agricultural practices that reduce soil erosion on sloped areas. Initiatives include the planting of tree-crops like citrus fruits and rubber and subsidies (grain and grants) and interest free loans for improved land management practices (STEA n.d.). Policies have also been developed to conserve biodiversity and traditional livelihoods and to promote holistic land management. The Yunnan bio-industry provincial strategy singled out 12 'advantageous bio-industries', including tea (Zhu 2011).

Yunnan is reported to have adapted the 'Natural forest protection program' to better promote growth of its bio-industry. Some of the motions incorporated in the program are: supporting the halt of logging on forestry farms; adapting policies to develop forests as commonwealth resources; introducing strict protection of natural forests; supporting diversification of forest enterprises; supporting reduction of fallow lands through irrigation; providing support for terracing; and clearing and moving illegal settlers from state forests. Local government agencies have apparently provided more training and financial support to farmers and farming groups. This takes shape in establishing pilot farms to test new techniques and practices and providing assistance in promoting local tea brands domestically and in the region (e.g. Hong Kong).

Although policies exist, there have reportedly been challenges with fully engaging smallholders and some groups feel that companies are benefitting more from government interventions than smallholder farmers and individual producers. For example, government support tends to be in the form of tax incentives, funding to build or rehabilitate irrigation systems, and the promotion of trade, which generally favors corporations. These benefits positively influence producers largely when tea companies have more control over the value chain or manage the production areas directly. Given the structure of Chinese tea production, the impact on smallholders of these policies may be

weak. The government has taken steps to support smallholders, but it is not yet clear how successful these have been (Fang et al. 2014).

The local Yunnan Agricultural University is also becoming a leading actor in promoting sustainability within the provincial tea sector, but budget constraints mean that they are often unable to tackle issues as comprehensively as desired. International companies are also becoming more involved in Yunnan's agricultural sector and there are calls for increased efforts to bring these and other private sector groups together with government and non-governmental organizations to develop a platform for promoting sustainability within the industry (e.g. through up-scaling of activities through the Ethical Tea Partnership).

There have apparently been positive changes in some regions of Yunnan. In one area, local policy makers have reportedly promoted intercropping within historical monoculture Grain for Green program areas (e.g. supported replacing some tea trees in monoculture estates with a range of endemic species). This is also observed on some large Chinese company estates. This may have been stimulated by the outcome of a recent drought in Yunnan when pests were reportedly seen to affect monoculture estates to a much greater degree than the more biodiverse farms. There seems to be a growing recognition of the importance of maintaining biodiversity among landscape actors in the tea industry. There is also increasing interest for collaboration among stakeholder groups in the landscape, for example, between the local Ministry of Agriculture and the local Environment Protection Agency to promote biodiversity within farming systems.

Regional trademarks

The State Council and Party Central Committees recognize the importance of brand recognition for Yunnan province and have supported the Provincial Agricultural Department to formulate the 'Measures for the Administration of Famous-brand Agricultural Products Identification of Yunnan Province (trial)' based on the Ministry of Agriculture's 'Opinions on Further Advancing the Agricultural Branding Work.'

Yunnan has developed a modified set of regulations to ease brand registration and to support local businesses applying for the Yunnan GI/AQSIQ trademark (SAIC 2013). A Yunnan 'famous trademark' must "be a registered trademark that belongs to an owner of a company, institution or store in Yunnan; must have more than two years of use; the commodity that uses the trademark must be a frontrunner in its industry according to principal economic indicators such as market share; the company's after-sale services must leave nothing to be desired and have good public reputation; and the owner of the trademark implements strict trademark usage and supervisions measures." Yunnan's measures

Box 9.1 Ethical Tea Partnership and Tea Research Institute training on chemicals

The Ethical Tea Partnership has facilitated private sector led initiatives for tea that have reached Yunnan. The ETP represents different industry stakeholders from research, farmers groups, and companies, to promote best practices in the global tea sector. ETP has collaborated with the Tea Research Institute of the Chinese Academy of Sciences (TRICAAS) and cooperated with CropLife to provide training to farmers focused on reducing the risks from improper agrochemical use. When tested against the baseline, it was found that farmers have improved their practices, which has had a positive impact on their health and helped to reduce pesticide residues in tea (ETP 2015).

have a five-year validity, two-year use requirement, and three-month grace period. Yunnan has many famous trademarks (1,177 in 2011) compared to, for example, Beijing, which had 517 in 2011 (Kossof 2013). The additional monetary value that this trademark brings to local farmers is unknown.

There has apparently been increasing recognition among local policy makers of the special 'terroir' (characteristic taste and flavor) of tea produced in more diverse ecosystems. Tea produced under monoculture conditions is said to have a harsher taste and to be less palatable. In recognition of this, local policy makers and extension agents have, from 2012 onwards, promoted more ecological production methods to farmers. However, the local extension service is reportedly constrained in their ability to fully promote flavor quality both in terms of budget resources as well as access to planting material and their own training, which has historically focused on maximizing yields.

It is also reported that the Yunnan government has taken positive steps in bridging international and domestic certification by approving the RA standard for use within the province. Promotion of a 'foreign' certification is relatively new in China. However, although the local government, tea exporters, and branded tea companies are adopting RA for part of their production, this is usually only applied to exported tea. The impact of RA certification is, therefore, limited because most tea produced in the area is for domestic consumption, both by value and volume.

The local government is reportedly not too familiar with international buyers, nor are they particularly interested in exploring or promoting this direction because of the strength of the domestic market. However, domestic consumers are becoming increasingly concerned about the health and safety of Chinese food products and support for producers will be needed for them to meet higher standards and for companies to improve traceability within supply chains (IGG 2012a). Companies exporting tea, especially to high-income countries, are facing increasingly stringent pesticide residue limits, encouraging them to invest in measures to improve the traceability of supply chains. Pesticide residue standards are reportedly not rigorously enforced on tea exports to other developing countries, so these investments will rely somewhat on the demographics of demand (IGG 2012a).

The government has a strong role to play in product promotion and marketing, in particular in rural areas where few farmers have the resources or time to promote their product. Although a China Tea Marketing Association established a Sustainable Development Working Group in 2010, the impact of this is unclear (Hai 2014). Such marketing associations may be most relevant when markets are relatively shallow and demand is for very specific products. In Yunnan, the local government has reportedly had some success in promoting local high-quality products with some 'famous' teas achieving margins of 300–400 percent (Giovannucci 2005).

Some local stakeholders report that certification standards around improved practices are not well understood by local consumers and that 'foreign standards' such as RA are only nascent and generally not strongly supported in domestic markets. The price difference between certified and uncertified product is not significant, but provides farmers with a greater choice of whom they can sell to and helps improve on-farm practices (and avoided input costs). Low understanding and awareness about the differences between the domestic standards (e.g. organic) and RA/Sustainable Agriculture Network (SAN) standard has been mentioned as an issue. Also, although the Chinese government has developed the Chinese Good Agricultural

Box 9.2 Pu'er tea bubbles

Pu'er tea is well known in China for specific health benefits--reducing bad cholesterol and increasing 'good' high density lipoprotein cholesterol). This is post-fermented tea from old tea trees and health benefits are said to increase with the age of the tea plant. There have been several Pu'er tea bubbles, most recently in 2013. There are many reasons for these bubbles including heavy marketing of the value of this tea through the media, positioning as an investment similar to wine (i.e. it improves with age and that there is a limited supply of old trees), and a dearth of secure domestic investment opportunities in China. The 2007 bubble burst when it was discovered that the tea had been mixed with tea leaves that did not come from the famous tea gardens. Subsequently, scrupulous dealers started to dump stocks, bankrupting many dealers, processors, and farmers. Prices rose by more than 80 percent again in 2013. This was likely the result of a severe drought in Yunnan, compounded by increasing input costs (primarily labor) and uncertainty about the harvest (Zhu 2013).

Practices (GAP), foreign buyers only recognize Global GAP.

One cautionary lesson from this particular commodity should however also be considered: the Pu'er price bubble. In some cases, a very high value and demand for a product can result in non-optimal harvesting to maximize short-term yields. In Yunnan, the higher prices offered for teas grown in the 'famous ancient' tea gardens have in the past stimulated over-extraction as well as speculation (Giovannucci 2005).

Policies implemented by Pu'er City

Within Yunnan, Pu'er City has been very prominent at promoting itself based on its rich environment and cultural history. In Pu'er, approximately 35 percent of the local economic income comes from tea production (People's Government of Pu'er City Yunnan Province 2010). Pu'er city has made ecological tea production a priority in its 12th Five year plan for the tea industry. The plan states that the area of ecological tea plantations will be increased to 90 percent of the total tea plantation area and that this will be supported by guidance and trainings for farmers. This is being accompanied by a shift in focus from tea production and volumes to tea quality.

In 2008, Pu'er City implemented a number of specific programs linked to tea including the 'Scientific Pu'er Program.' This has resulted in the city government supporting ecological renovation for modern tea estates over a 600 square kilometer area. Support has been given for re-planting, purchase of seedlings, training, and increasing awareness with respect to improved land management practices (e.g. to reduce the density of tea trees on farms and to improve biodiversity on managed areas). During the transformation period, tea farmers received a subsidy from the local government equivalent to 300 RMB per mu each year (equivalent to approximately USD 4,500 per hectare) lasting three years (Min 2014). In addition, the Pu'er government has also published a recommended pesticide list for tea gardens and has established a well-equipped tea-testing laboratory.

There has apparently been a positive reaction to Pu'er City's subsidy to producers engaged in reforestation. This cash incentive has reportedly secured producers' buy-in more effectively than capacity building programs run by international organizations. Local government agencies such as the Bureau of Agriculture and the Tea Office of Pu'er City are playing increasingly important roles in promoting sustainable agriculture and land management. Local government has an important

role to play in creating an enabling environment to ensure a longer-lasting impact of programs (in particular programs run by international organizations, which may have shorter funding cycles).

In addition to the local government, various departments of the Chinese Academy of Sciences (CAS) have supported the local program. For example, they are conducting plant biodiversity assessments of tea production areas and helping to establish nurseries and demonstration plots with potentially valuable endemic species, including intercropping in rubber plantations. Other research groups, such as the United Nations University (UNU) together with various CAS departments, are working with the local government to assess how to better integrate ecosystem services within land use planning, in particular in relation to forest management and land rehabilitation. Local and international non-governmental organizations (NGOs), including research organizations, have also been active in the area.

Pu'er City Certification

In addition to these activities, Pu'er City applied for its Pu-er Tea Garden and Tea Culture area (1,870 square kilometers) to be recognized as a United Nations Food and Agriculture Organization (FAO) Globally Important Agricultural Heritage Site (GIAHS) pilot area in 2011. The process started in 2005, when more than 600 people were mobilized for a one-year survey of the ancient tea resources in the area, which led to the Chinese Academy of Sciences (CAS) preparing the 'Application of Pu'er City for Globally Important Agricultural Heritage System – Pu-er Tea.'

According to the FAO, selected sites are "Remarkable land use systems and landscapes which are rich in biological diversity evolving from the co-adaptation of rural community/population with its environment and its needs and aspirations for sustainable development." The GIAHS designation was supported locally by the Center for Natural and Cultural Heritage Research (CNACH) of the Institute of Geographic Sciences and Natural Resources Research (IGSNRR) of CAS and the local Department of Agriculture. The area is also undergoing consideration as a UNESCO site of Outstanding Universal Value. The program is linked to the national Chinese Nationally Important Agricultural Heritage Sites (NIAHS) program launched in March 2012

Box 9.3 Farmer returns under different management systems

One interviewee described recent prices and yields they encountered on a trip to the area. The lowest prices are around 10 RMB (USD 1.60) per kg of dried leaf. One monoculture site planted under the Grain for Green program has circa 8,000 tea plants per hectare and each plant produces 4-10 kg of tea per plant per year. Households sell 4,800 – 40,000 kg. This spread is so high because farmers do not always harvest and sell their product because there is not enough market demand for the (relatively poor) product. In contrast, tea produced in the agroforestry system can be priced up to RMB 4,500 (around USD 730) per kg of tea leaf due to its superior quality. However, in such a system, 1 ha has around 350 tea plants, as well as a few hundred other species, and production yields are around 10 kg per plant per year. The households under this system that the interviewee had visited sold an average of 3,500 kg per household per year. The gap between high-quality and low-quality tea had apparently been increasing since 2008. These descriptions are consistent with a recent TEEB study, which found that although tea production from intensive systems can be up to six times higher in terms of volumes, the total value of the product may be less (Liang, Xiang, and Takeuchi 2013).

Table 9.3 Policy responses to environmental challenges in China's tea sector

Policy Driver	Policy Intervention
Promote more mixed tree-crop and farming systems	• Development of Xishuangbanna 5-year plan for bio-industries as a joint effort between the local government, Yunnan Society of Tropical Crops, Xishuangbanna Tropical Botanical Garden, Yunnan Institute of Agricultural Engineering Research & Design (2011- 2015) • Technical Specification of Developing Ecological Tea Plantations in Pu'er City and Opinions on Implementing the Ecological Tea Plantation Project in Pu-er City
Biodiversity conservation and heritage protection	• Xishuangbanna promoted as a conservation priority area by the Ministry of Environmental Protection and noted in China's Biodiversity Conservation Strategy and Action Plan (2011-2030) • Central government Forest Ecosystem Compensation Fund (FECF) & Provincial level FECF • Natural Forest Protection Program • Forest Vegetation Restoration Fee • Improve margins for biodiversity-linked products through certification • Local regulations to protect ancient tea gardens • Bio-industries initiative • Regulations on the Protection of Ancient Tea Plantation in various landscapes (People's Government of Pu'er City Yunnan Province 2010) • Tea standards and indicators as part of the GIAHS process • Land use zoning, using identification of EFCAs
Watershed protection	• Eco-compensation policy • Water Use Rights Transfers (N.B. not practiced in Yunnan
Protect soils from erosion	• Soil erosion control fees • Soil & water conservation installation compensation payments • Yangtze River Upper Watershed Water & Soil Conservation and Key Prevention Program • Yunnan government Soil & Water Conservation Regulation & establishment of Yunnan Soil Conservation Services, i.e. the local manifestation of the 'Sloping land conversion program' • Local version of Natural Forest Protection Program
Reduce pesticide use	• National certification systems • Increase demand for certified product through procurement • National VAT Tax Exemption for Organic Fertilizer Use
Reduce forest degradation and promote better management	• Rural Biogas Development • Forest property reform
Increase demand & margins for 'good' products	'Measures of Yunnan Province on Famous Trademark Recognition and Protection' (order of Yunnan Provincial People's Government No. 79) Comprehensive Standards of Pu-er Tea (a local standard) Introduction of the national quality standard: Pu'er Tea-A Geographically Symbolic Product Tea industry development plans and strategies (2005 & 2010 regulations)

Source: Fang et al. 2014

by the Ministry of Agriculture (Wenhua 2014). The Pu'er City government envisages that this designation will stimulate greater interest in local products and promote niche markets and tourism.

Stakeholder concerns

Although interviewees were positive about the direction of government policies to support the greening of this commodity landscape overall, in particular the Pu'er City government, they raised a number of concerns including:

- **The need for greater prevalence of soil testing and more targeted guidance to farmers and land managers with respect to chemical applications:** This included suggestions for the local government to increase monitoring of local agrochemical sales and enforcement of existing chemical guidance lists.
- **Capacity of the local extension service:** It was reported that there were not enough resources (personnel) within the local extension service, and that many of the local staff have been trained in 'old techniques.' There is also reportedly little capacity with local government for recording and monitoring land management practices.
- **A lack of real incentives for land managers to change practices:** Transformation from monocultures to less intensive systems may reduce costs and impact incomes, particularly in the short term. This may not be an issue for producers of premium teas who already understand the value of diversity, but producers of low-quality product and with less diverse income strategies may be less willing to change behavior.
- **Rising labor costs and labor shortages** and the impact that this may have on the more labor-intensive systems versus diverse systems.
- **A general lack of farmer aggregation and difficulties of dealing with smallholders:** It was reported that more effort could be given to building and strengthening local cooperatives and producer associations. There are many small-scale farmers, and supervising these in a mixed and rural landscape is difficult. One result of this is that many of the public subsidies and government-sponsored programs favor larger enterprises, and small-scale farmers may be neglected in the policy development process. Small-scale farmers are also reportedly difficult to contract with and may be more inclined to break sales agreements if they feel they can get better prices elsewhere.
- **Recognition of the ability of small-scale farmers versus companies to follow standards and regulations:** Smallholders are often less able to change their practices (e.g. become certified, rejuvenate their tree-crops). According to reports, the government is helping farmers comply by providing technical extension services that is linked to microfinance.[3] The government is also working to promote more collaboration between smallholder producers and companies (People's Government of Pu'er City 2010).
- **Technology and infrastructure:** Processing machinery and technologies to improve on-farm practices could be more available. Other local stakeholders mentioned the need for investing in improved local processing infrastructure as well as labor conditions, branding, and marketing.
- **Proliferation of standards:** Numerous local stakeholders stated that standards needed to be meaningful and

3 No information on specific government sponsored programs in the landscape were found, however there have been private initiatives on microfinance in Yunnan's tea sector.

comparable, both between domestic standards and with international standards.

9.5 CONCLUSIONS AND LESSONS FOR POLICY MAKERS

Initiatives by both the central and the local government provide some interesting lessons for policy makers. Lessons can broadly be divided into two streams: 1) lessons about landscape management frameworks, and 2) about using a particular commodity to promote development. This experience should also be considered in the light of China's overall development pathway.

Lessons about landscape management

At the central government level, there was a clear reaction to an environmental disaster, leading to policies that did effectively increase national tree cover. It can be drawn is clear from this case that strong central policies, combined with direct cash transfers based on environmental indicators, can have dramatic results. However, it also points to the bluntness of many policy instruments and the need for nuance and flexibility within policies. Generally, it seems that the national government has become increasingly adept at allowing provincial and local governments to adapt national policies in a way that reflects local concerns. This case study may therefore provide some interesting lessons about how to build national policy frameworks that promote improved land management, in a fashion that enables local government innovation and is adaptable to local conditions (e.g. through combining both national cash transfers and ability for local governments to raise additional funding for environmental goods through taxes on chemical inputs) (Yi et al.2013).

Experiences from other PES schemes, including in Yunnan, as well as by the Pu'er City government indicate a need to focus cash compensation on areas where they have the highest impact and where they are most likely to be effective (Yi et al. 2013). For example, land managers with areas of marginal tree crop production will be more likely to participate in an eco-compensation scheme, although these may not be the areas that will have the highest biodiversity gains from participation. It is clear that opportunity costs of land use change will also have to be balanced by economic interests (e.g. for rubber in Yunnan, which is perhaps a much greater environmental threat in the landscape than tea).

Lessons about Yunnan tea

The case of tea in Yunnan clearly has some distinct characteristics, which influence the relevance of lessons for other agri-commodity landscapes. The tea commodity is strongly associated with local culture and heritage and it is consumed domestically as a luxury product (for example, in contrast to palm oil, corn, or low-quality coffee). Specifically, this may indicate that:

- Interest in promoting improved commodity production in a specific landscape can be effectively rallied around a 'famous' product.
- Premiums linked to improved production have to be available and meaningful, even if they are not usually formally certified. Teas from 'ecological' tea gardens are famous in China and command significant premiums.
- Marketing around a specific 'famous' commodity can help increase other revenues to the area. Pu-er City is likely promoting its tea gardens, in part, because it can attract tourism.
- Certification and labels need to be meaningful and credible to the target audience. For example, Pu'er tea is well known in China, and among international tea aficionados. Support for

maintaining these specific tea gardens would not be possible without this recognition.

- Local policy makers need to be proactive and work with different stakeholders on an on-going and open basis, in particular with different categories of land managers including small-scale farmers if they want to use this avenue for promoting local growth. This also includes seeking comparability with other local and international standards, ensuring credibility of standards and labels and providing support to strengthen value chains and marketing channels (Giovannucci 2005).

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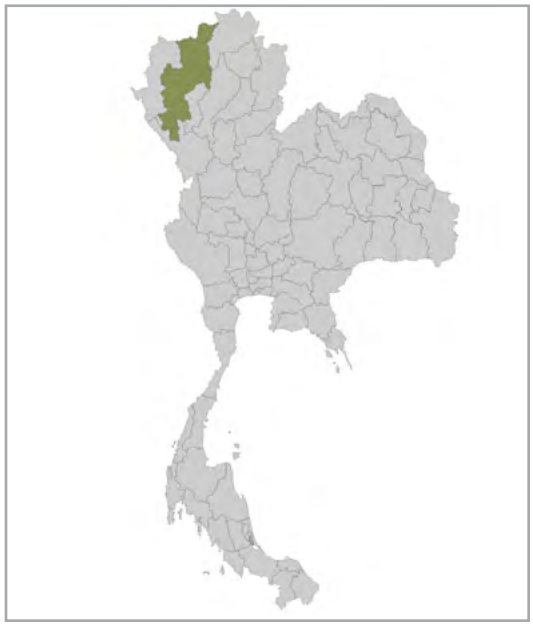
MULTIPLE COMMODITIES IN THE MAE CHAEM WATERSHED, THAILAND

10

Tanja Havemann, Naomi Rosenthal and Janjarang Kijtikhun

This case study considers a multi-commodity landscape in Thailand, specifically how an upland watershed can affect downstream users and catalyze changes to land management policy frameworks. This case study provides insights for designing landscape approaches and interventions and illustrates the need for contextualizing these within wider development contexts (e.g. difficulties of balancing socio-economic and environmental aspects of land management). It also highlights the unintended consequences of developing policies for crops that are relatively substitutable.

Northwestern Thailand was historically inhabited by ethnic communities practicing swidden (or shifting cultivation) agriculture in a form where the 'market came to them' for a relatively easy-to-grow and profitable crop (i.e. opium). The government and development partners sought to enable these communities to move out of opium production by introducing local and regional 'push and pull' factors, including support to grow alternative cash crops and establishment of a local captive market for premium local produce. At the same time, there was increasing tension between upstream and downstream communities within the Ping Basin (including the flatlands surrounding Bangkok), as downstream farmers felt that people upstream were managing the land in a way that undermined their access to reliable water quality and flow. This led to the introduction of innovative watershed planning and management organizations in Thailand, which are now becoming more institutionalized within the national policy framework.



Mae Chaem, Thailand

The Thai government and other non-governmental organizations (NGOs) have helped farmers increase on-farm income, but rapid economic growth has come at an environmental price. Regional competition for agricultural products has increased at a time of rising tensions between factions who want to heavily protect Thailand's farmers and those pushing greater liberalization. This region is encountering: (1) growing demand for a relatively low-value product, maize; (2) pressure on local horticultural products from Chinese imports and associated supply chain infrastructure issues; and (3) demographics and national policies that have contributed to increasing agricultural

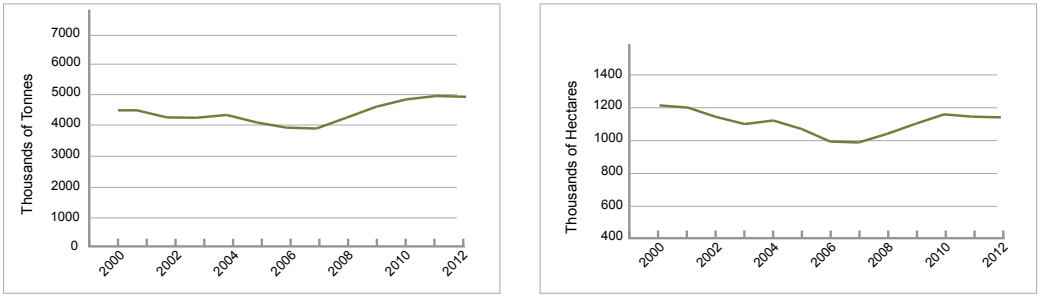


Figure 10.1 Production and area harvested of maize in Thailand, 2000-2012
Source: FAO 2014

intensification and pressure to extend the cultivated area in upland areas, which also have important watershed protection features. Degradation of upland forests for agriculture has reportedly contributed to increased flooding, siltation of hydropower facilities, and downstream water pollution. The government and local organizations are attempting to tackle these issues through collaborative planning and zoning.

Sources for this landscape case included published literature, as well as interviews with local government officials, local and international NGOs operating in the landscape, and international development agencies.

10.1 INTRODUCTION TO THE COMMODITIES OF MAE CHAEM

Thailand is the world's fourth largest food exporter (Songpaisan and Saisudthiwong 2013). Major agricultural export commodities include sugar, cassava, rubber, pineapples, poultry products, animal feed, rice, and maize.

Commodities considered in this report are summarized below. Maize is the primary focus of this case study.

- Maize: This is grown primarily for export, as an input to processed foods and animal feeds, and consumed domestically as starch and corn syrup. Maize products may be substituted for rice and tapioca or cassava in the starch and animal feed industries, and are therefore influenced by government intervention programs in these sectors (Box 1).
- Paddy rice: This is grown both for export and for domestic consumption. Where feasible, this is grown alongside maize and other cash crops.
- Fruits and vegetables: These are grown primarily for domestic markets (Chiang Mai) or sold in processed form throughout the region (e.g. under the Royal Doi Moi brand).

Maize is an important global commodity grown in diverse climates around the world. Maize is grown in more countries than any other crop, but only a limited number of countries produce enough to both satisfy domestic needs and export. The top producers are the United States, China, and Brazil, but the largest exporters are the United States, Argentina, and Brazil. Within South East Asia, Thailand and Indonesia are major maize producers. The majority of the worlds' production is used as livestock feed and the remainder processed into a range of food and industrial products, including biofuels (ethanol). Maize prices are largely set by international maize futures markets, for example as quoted on the Chicago Board of Trade and the Tokyo Grain Exchange (UNCTAD 2012).

Maize demand in Thailand has grown in the past few decades, in tandem with the animal feed and processed poultry

markets. Export demand for animal protein is supported by strong domestic demand as poultry is the cheapest source of domestic animal protein (Songpaisan and Saisudthiwong 2013). Prior to the 2004 outbreak of avian influenza, Thailand was the fourth largest exporter of poultry worldwide. Although the virus initially affected exports, the industry quickly rebounded and Thailand's production was expected to reach 1.6 million tonnes in 2014 (Indexmundi n.d.). Thailand is taking a number of actions to position itself as the global leader in poultry, exemplified by its efforts to establish a national poultry brand similar to that of Australian beef. The intersection between Thailand's animal protein and maize industry includes a wide variety of different actors including maize seed and fertilizer suppliers, maize farmers, middlemen, maize purchasing centers, and feed producers. The feed is typically used domestically for poultry hatcheries and sold directly for export. Chicken produced in Thailand is typically processed and canned before it is exported to Japan (53 percent), the EU (39 percent), and Singapore (3 percent). As feed accounts for between 70 and 80 percent of poultry costs, it is essential to the poultry industry that animal feed remain inexpensive (Indexmundi n.d.).

Generally, the environmental issues associated with maize production in the region are:

- Loss of natural forest cover due to expansion of agricultural areas. This is also associated with a loss of biodiversity, erosion, and soil degradation.
- Changes in use of water systems, impact on aquifers, water quality, and flows.
- Chemical pollution of soil and water. Heavy and improper use of pesticides, herbicides, and plant growth regulators, especially persistent herbicides. (Panuwet et al. 2012).
- Air pollution from land management. In many places, including Thailand, maize stalks and other crop residues are usually burned in the fields, resulting in localized smog and haze (Hauser n.d.).

At the same time, maize production itself is being affected by environmental changes including:

- Changes to water availability.
- Soil degradation.

Box 10.1 Thailand's grain purchasing policies

Thailand has regularly been the world's largest rice exporter, but the government's rice purchasing policy has slowed exports considerably in recent years. Under this policy, the Thai government effectively overpaid for paddy rice and ended up with significant rice stockpiles, resulting in cash liquidity problems. Official estimates suggested that the program cost Thailand USD 4 billion per year, but independent analysts estimate the true cost to be double (Lyddon 2014). In February 2014, the government abolished the policy and Thailand is expected to fully re-engage in global rice markets (Steger 2014). The rice purchasing policy has had knock-on effects on both cassava and maize markets, and subsequently, on the feed, livestock, and poultry sectors by pushing up feed costs. In addition to a rice-pledging scheme, the government also operates purchasing schemes for cassava and maize. For cassava, the prices paid by the government to farmers are estimated to be 30 to 40 percent above 'real' domestic farm gate prices (Lyddon 2014). There are on-going tensions as farmers protest for the government to increase its maize price guarantee program by extending the purchasing period and increasing the pledging volumes. The animal feed and livestock industry have urged the government to revise this policy. These purchasing policies are relevant in terms of their interrelatedness and impact on local land management dynamics.

- Spread of pests and diseases.
- Resource constraints, e.g. for energy and inputs.

The value chain

Globally, maize is grown by large farming companies as well as by smallholders. Archer Daniels Midland (ADM), Bunge, Cargill, and Louis Dreyfus are major commodity houses that dominate the international maize trade. However, only 10 percent of produced maize is actually traded, which means that it is important to consider the local use context when describing the value chain (Murphy, Burch, and Clapp 2012). Approximately two-thirds of Thailand's production is absorbed into the animal feeds sector (mainly poultry but also for swine and aquaculture) (Hauser n.d.). It is also used in cooking, for flour and oil.

Maize was introduced in Northern Thailand in the 1960s, but production took off in the 1990s, mostly through contract farming arrangements. The Thai government worked with several large Thai integrated agricultural companies to promote local maize production and helped to initiate contracts with farmers. The government also established government-run maize purchasing centers, which have strengthened the local industry.

In Mae Chaem, maize is generally harvested in September and October. Of this, approximately 10 percent is reserved for the next season's planting, fed to domestic livestock, or fermented to make local liquor (lao khao phot). Approximately 90 percent of the harvest is transported to local dealers, who run small or medium-sized collection centers, which may include storage silos. Kernels are mechanically removed and farmers are paid according to net weight and quality.

Despite government support for maize farming through purchasing schemes, many farmers struggle to obtain high prices for their output. The value chains are relatively complex and there are often

Box 10.2 Horticultural production in Mae Chaem

The Royal Project Foundation helped to develop projects focusing on high-value products and technical assistance to create financial alternatives to opium production. The Foundation developed a comprehensive organic system, including the provision of seeds and organic fertilizers, capacity building, and assistance with accessing markets. As part of this project, the Foundation developed an organic market in Chiang Mai, which experts have suggested has driven the organic movement within the region. The Foundation has also launched other initiatives to promote agriculture, including a regional chicken cluster (Khuntonthong et al. 2013). It also developed its own brand which processes and exports agriculture products ('Dhoi Kam').

Products include red onion, cabbage, lettuce, and herbs as well as fruits and flowers. Production and marketing challenges have included weeds, insects, water, price stability, storage, unofficial tenure status, transport and market access (in particular during rains), and consistency of product quality. The program bans farmers from using chemical applications such as pesticides and inorganic fertilizers, but farmers are reported using these anyways. Several institutions are working to increase capacity and knowledge about the benefits of reducing chemical fertilizer use. However, without a clear and reliable market opportunity, farmers are hesitant to engage in organic agriculture (Møllegaard et al. 2007). Despite some challenges, most experts consider the Royal Projects to be largely successful in eliminating opium production and advisors from the Royal Project Foundation have sought to support other countries including Laos and Afghanistan to do the same.

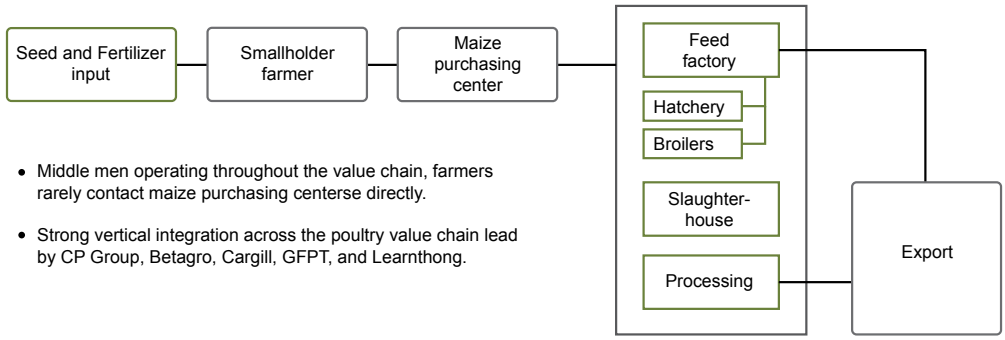


Figure 10.2 Maize value chain in Thailand

middlemen who transport the crop to purchasing centers. Agricultural companies are also said to work with local government officials and community leaders to arrange contract farming schemes, but the extent of these arrangements in the landscape and the balance of interests between farmers and buyers is unclear. Some experts report that the regular income gained through contract farming in the landscape has helped to stabilize the region and that farmers are increasingly expanding beyond their commitments to develop their own crops to sell independently. In order to obtain short-term profits, many small farmers grow maize with little regard for protecting water quality and often encroach on forest areas in order to expand their cropland. Most, if not all, large agricultural companies in Thailand (maize buyers) place little emphasis on supporting farmers in implementing sustainable land management practices.

The majority of crops grown within the Mae Chaem area are sold to large agricultural companies, primarily Charoen Pokphand Group (CP Group) and Pioneer, for animal feed. These companies have not been actively involved in any interventions to reduce the environmental impact of agricultural practices. The ability of these companies to directly influence production methods is limited because they typically do not work directly with farmers. Rather these companies purchase products through middlemen and maize purchasing centers.

In addition to maize, the Mae Chaem landscape is renowned for its horticultural products including those which fall under the Royal Project Foundation brand (see Box 10.2).

10.2 LANDSCAPE DESCRIPTION

Thailand has undergone major economic, social, and political changes in the past 30 years. There has been impressive economic development through growth within the tourism, agriculture, and industrial sectors. Thailand is pivoting from a largely agricultural economy to one with a more diversified and industrial economic base with a significant share of national Gross Domestic Product (GDP) coming from higher-value products (FAO 2014). Rural areas have experienced rapid transformation and a shift is underway from subsistence farming to more industrialized agriculture. However, over 60 percent of Thailand's population is still rural and relies on agriculture to meet livelihood needs (Papademetriou and Dent 2001). This economic shift from low-value agriculture is having a profound impact on the economy and society, as well as on the environment. This has been accompanied by political tension resulting in civil unrest as the government strives to balance the interests of rural and urban populations.

Examples of this challenging balance are reflected in the governments' agricultural policies, particularly in terms of rural populism and 'Sufficiency Economy' strategy, including the rice purchasing policy (see Box 10.1) (Lyddon 2014).

Northwestern Thailand and Mae Chaem landscape

Northwestern Thailand encompasses some of the least developed parts of the country. The region serves as the catchment area for a number of Thailand's most important rivers including the Chao Phraya, which flows to Bangkok.[1] Thailand relies heavily on the Chao Phraya Basin for agricultural production, electricity, and overall economic well-being. Upstream management of the Chao Phraya has come under increasing scrutiny, not only because of recent floods, but also because of pollution. The basin provides water for Thailand's primary agricultural production areas and influences rice and aquaculture production (ADB n.d.). According to the United Nations Development Program (UNDP), Thailand ranks lowest in Asia for per capita water availability, yet ranks 14th in the world in industrial organic water pollution (Ministry of the Interior 2010).

Mae Chaem district is located in the 'three monsoon zone,' receiving on average between 940 and 2,150 millimeters per year (Shelton and Phaikaew 2006). The region experiences large variations in seasonal and annual rainfall. These rainfall patterns result from an intricate relationship between the Pacific typhoons and the southwest monsoon. The rainy season generally lasts from May to October and average temperatures can range from 20 to 34 degrees Celsius. The regional topography gives rise to a variety of microclimates. The altitude within the Mae Chaem river basin varies between 282 meters and 2,565 meters above sea level.

The introduction of improved seeds and irrigation, immigration, and changing local food demands are a few of the many elements tied to agricultural industrialization that rapidly transformed the landscape (Badenoch and Wanitpradit 2006). The Mae Chaem is home to a diverse community of ethnic groups, biodiversity, and a mosaic of different land use types. The Chaem River flows through the center of the district and forms one of the primary tributaries to the Ping River, which, in turn, is the largest tributary of central Thailand's Chao Phraya River. The Mae Chaem sub-basin encompasses an area of around 3,853 square kilometers (Thanapakpawina et al. 2007).

The landscape can be divided into three general categories, summarized in Table 1. The upper regions of this landscape contain deciduous forests on relatively shallow soils with poor water retention capacity, in particular when natural vegetation is lost. Land and water management in this area have contributed to downstream flooding, sometimes resulting in disasters like the floods of 2012 (Sayama et al. 2012). Land management practices in upland areas are therefore a major concern for lowland communities that are vulnerable to the effects of soil degradation (erosion, siltation, and pollution), groundwater replenishment rates, and water quality (pollution) (see Box 10.2) (Badenoch and Wanitpradit 2006). Impacts on water can prove to be particularly problematic for maize and rice producers in downstream areas. To assuage these risks, about 90 percent is zoned as Class 1 and Class 2 watershed areas, which, according to land use zoning policies, theoretically restricts agricultural expansion and deforestation.

Various ethnic groups, including the Karen, Hmong H'tin, Lua, Khamu, Lahu, Liso, Yao, Akha, and Haw, originally

1 The Mae Chaem landscape is part of the Ping (Mae Ping) sub-Basin, which forms part of the greater Chao Phraya Basin. The region is bounded by three mountain ranges: the Daen Lao Range, Thanon Thong Chai Range and the Khun Tan Range.

managed this landscape and traditionally practiced different types of swidden agriculture (Kanok et al. 2002). Programs seeking to foster economic development introduced more commodity crops, pushing farmers away from traditional methods and towards commodity agriculture (Letcher et al. 2002). Beginning in the 1970s, these programs initially focused on reducing opium production by introducing alternative agricultural livelihood strategies to communities and, in parallel, attempted to establish markets for alternative cash crops (including maize). A decade later, there was a ban on opium production and the Royal Projects invested heavily in promoting alternative cash crops. Zoning to regulate land use in the watershed was implemented in the 1990s, reducing the total available commercial land use base. The zoning programs were also introduced to help reduce illegal logging.

This 4,000 square kilometer landscape has been the site of several programs, including those operated by DANIDA and CARE/Raks Thai, and was also selected as Alternatives to Slash and Burn (ASB) site by the World Agroforestry Center. The site was chosen by the ASB-Thailand program as the research location for studying improved land use management practices to develop decision making tools for policy makers in order to balance water rights, watershed protection, and forest conservation issues. Mae Chaem is also the site for a collaborative research project on 'catchment approaches to combating soil erosion in Thailand' between the Royal Forest Department (RFD), the Land Development Department (LDD), and the International Board for Soil Research and Management (IBSRAM), which started in 1999 (MSEC n.d.). Since 1994, CARE Thailand has very actively established and facilitated community-based watershed and

Maize production on unsuitable land in Mae Chaem. Photo courtesy of Raks Thai.

forest management programs in the area. Once founded, CARE's activities were transferred to CARE Thailand's affiliated organization, Raks Thai, which now works with almost 90 community organizations to establish participatory natural resource management frameworks, build community natural resource management capacity, develop sustainable livelihood opportunities, and foster collaboration between different stakeholder groups.

10.3 LANDSCAPE RISKS

Landscape risks are summarized in Table 10.2, and specific risks are briefly described below. Many of these risks are interrelated and broadly associated with agricultural expansion in upland areas, rather than specifically linked to maize production. In order to increase their incomes, many farmers are pursuing a land 'extensification' strategy in addition to increasing the intensity on their existing lands. Demand for land is exerting pressure on forests and areas perceived as under-utilized. It has been suggested that private companies (maize buyers) encourage deforestation and actively motivate contract farmers to convert land for maize production. Organizations working within the area suffer from a limited amount of resources to raise awareness of the environmental risks associated with expanding agricultural production and introduce alternative models of land use.

Water quality and flow

Water quality within tributary rivers is a major concern for communities living in central Thailand. Downstream communities are particularly worried about the impact of human activities on water flow and quality but cannot point to any correlations on the cause and effect of reduced water quality due to a lack of available research. As a result of conflicts over water between upstream and downstream communities in the area, Mae Chaem was the site of a long-running program on community-based watershed planning and Integrated Water Resource Management (IWRM) initiated by the Royal Foundation and donors, together with RAKS Thai/CARE, and has reportedly been quite successful (see Box 10.4).

Biodiversity and forest preservation

No precise data exists on natural forest cover and biodiversity loss in Northern Thailand, though it is clear that agricultural transformation has manipulated the landscape. Thailand is estimated to lose 0.15 percent of forest cover per year (Mongabay 2015).

Table 10.1 Categories of land use in the landscape

Category	Terrain	Land use
Lowlands Approx. 15 percent	Relatively flat and alluvial	Rice, onion, garlic, soybean, and maize, fruit tree crops are grown under irrigation (Badenoch and Wanitpradit 2006)
Uplands Approx. 45 percent	Hilly to undulating	Maize, tree crops, horticultural products, e.g. cabbage, shallots, tomatoes, potatoes which are grown through irrigation during dry season as well as carrots which are grown during the wet season
Highlands Approx. 40 percent	Steep slopes and valleys	Deciduous forest, tree-products, encroachment for agriculture where possible

Air pollution

After a completed harvest cycle, farmers typically burn remaining residues in their fields. This is a major cause of localized smog and haze. Several experts noted the negative effect the practice has on regional air quality. The Agricultural Extension Office is engaging with local communities to show how maize crop remainders can be combined with cow manure to produce an organic fertilizer in order to try to tackle this issue.

Soil degradation

Historically, indigenous populations in the area practiced shifting cultivation. As pressures on land have increased, the time for land to lie fallow between cultivation periods has decreased and the overall intensity of land use has increased (Ruankaew 2004). The watershed has a very varied topography and steep slopes increase vulnerability to soil erosion and loss of soil nutrients. This is being compounded by removal of natural forest cover and introduction of annual and more intensive cropping patterns (Thanapakpawina et al. 2007).

Chemical pollution

Maize farmers are often not trained on proper soil management techniques and chemical applications. Farmers may use several kilograms of chemical fertilizer for a small plot and there is little regulation on chemical inputs including harmful substances. The extensive use of fertilizer is reported to be highly problematic and economies of scale prevent effective capacity building programs. Communities may be hesitant to participate in capacity building programs which provide training on correct use of fertilizers and appropriate land management tactics until they perceive that there is a problem and they are assured that their yields will not be negatively affected. Typically, land is used until the productivity of the crop is reduced, at which time the farmers move to new areas of land, often encroaching on forest areas.

Box 10.3 Protests against upland managers

In 1997, there was conflict in the Mae Chaem watershed, when villagers living downstream protested against the management of upland areas (Bach et al. 2011). These lowland communities were concerned about the impact of upstream land conversion on their access to water and of chemical applications on water quality. Lowland communities demanded that the government overturn a series of cabinet resolutions about the rights of local communities to manage their forests because they perceived that these upland management practices were negatively affecting them. Recognizing the growing conflict, local non-governmental groups established a roundtable to facilitate open and constructive dialogue about collaborative resource management, bringing together both upstream and downstream stakeholders. This roundtable was successful and became a recurring event consisting of a watershed leader and with representation from several local ethnic groups, government officials, and Royal Project staff. This roundtable helped the upland communities better appreciate the consequences of their actions and supported them in adopting more sustainable land management practices. This and other similar conflicts in the region created awareness about the need for participatory approaches to watershed management and is likely to have influenced creation the Department of Water Resources (DWR) in 2002, which has a specific emphasis on public participation in water resource management. In 2003, the DWR subsequently developed policies for the creation of committees or working groups for each river basin in Thailand (Kanjina 2008).

Land tenure and resource access

Environmental degradation in the landscape is linked to the complex issue of land and resource access and tenure. The majority of the Mae Chaem basin is considered a protected area and some residents have settled without land rights, both legally and illegally. As a result of immigration, degrading land quality, and the expansion of contract farming, many communities continue to encroach on forestland. Lack of clear ownership is a hindrance for environmental protection as communities do not recognize their need to work collectively towards protecting the natural resources.

10.4 POLICY INTERVENTIONS

The Thai government has introduced several policies to tackle these issues, a selection of which is described below. One of the most successful interventions in the area has been the creation of watershed management units, introduced in response to conflicts between upstream and downstream communities such as in Mae Chaem. Policies to decentralize decision-making on natural resource management more generally are in place, but these have mostly been successful in the context of watershed management.

Table 10.2 Environmental risks associated with maize and other agri-commodity production

Risks	Drivers	Impacts
Deforestation, particularly in upland and lowland areas	Expansion for agricultural crops	Rural livelihoods (NTFPs), soil erosion and degradation, regulation of water flow (droughts and floods), sedimentation, biodiversity impacts
Soil erosion	Unsuited land management practices on slopes, expansion for agricultural crops	Soil degradation, siltation of downstream areas
Chemical applications	Chemical crop applications	Water pollution in downstream agricultural areas including aquaculture areas, human health
Changes to water flows	Upstream land and water management practices	Affects flows to Chao Phraya (lowland rice areas, and industrial water users), hydropower impacts
Groundwater depletion	Agricultural intensification, overuse of water in the area	Negative impact on rural production (agriculture), urban impacts including tourism
Biodiversity loss	Loss of natural habitats	Reduced rural livelihoods, tourism
Declining soil fertility	Land management practices (e.g. continuous cropping with annuals) & deforestation	Reducing yields requiring more chemical inputs, pushes agricultural expansion
Air pollution	Burning of crop residues	Smog, particulate matter, greenhouse gas emissions

Watershed management policies

Thailand has included watershed management objectives within its National Economic and Social Development Plans (NESDP) since the 1960s. Thailand first implemented a watershed classification and land zoning system in the mid-1980s, which established criteria for land use within each watershed. These were further enshrined in His Majesty the King's Guidelines for Watershed Conservation, which included regulations on land use planning, legal enforcement, and watershed community development (FAO 2009). This policy was strengthened in the early 1990s, with steps towards greater decentralization and more responsibility for local development planning allotted to the sub-district administrations. This enabled fiscal opportunities for local land and water management and resulted in a number of different programs to strengthen local decision-making capacities, mapping and community awareness programs, and developing democratic processes for allocating land. The process was reinforced through Thailand's Constitution, enacted in 1997, which explicitly gives individuals, communities, and local authorities the right to participate in the management of natural resources (Heyd and Neef 2006). The government is currently developing a new national framework to better integrate local watershed management units into national planning (GWP 2013).

Major outcomes of the shift towards decentralized participatory governance include the establishment and empowerment of more than 8,000 Tambon Administrative Organizations (TAOs). Evidence of TAOs' empowerment is seen in their freedom to raise local revenues, issue local regulations, formulate and carry out development planning, and to implement these plans. In areas where communities are directly reliant on land, forest, and water resources for their livelihoods, TAOs nominally assume responsibility alongside

Upland rice fields in Mae Chaem.

national and regional authorities to manage these resources. A key challenge for many TAOs is that they are largely under-funded and they are usually not able to collect taxes to fund local activities. In order to address this, the central government and regional governments provide support to the TAOs. However, this can leave TAOs dependent on regional government entities and may limit their ability to serve local communities.

There has been an emergence of people's organizations, referred to as prachakom, and civil society groups around issues of watershed management in northern Thailand. Ranging from government-led agricultural cooperatives to informal clan-based ethnic groups, new prachakom organizations are being created in response to a local perception that TAQs and governmental agencies are restrained by jurisdictional limitations and limited resources (Kurauchi et al. 2006). Groups such as Raks Thai and CARE have also played a facilitative role in supporting the formation of these groups and promoting dialogue, including on setting stakeholder management priorities in the landscape. They have reportedly had success in using three dimensional (3D) maps to create better understanding of the watershed among stakeholders, facilitate agreement on land boundaries, and assign areas of responsibility to community groups and members in different parts of the watershed.

Experiences from assessments of different watershed management arrangements in Northern Thailand suggest that participatory sub-basin management approaches can be successful, but require trusted local coordination and flexible policy frameworks. It is also unclear how these systems adapt to changes in commodity price signals and the changing nature of farming in Thailand.

Policies to tackle deforestation and forest degradation

Thailand has enacted numerous policies to increase forest cover. These have included a logging ban (1989), the Thai Forestry Master Plan (1992), which recognized community forestry management models, references to forest conservation in the Third Environmental Quality Management Plan (1999 – 2016), and the 11th National Economic and Social

Box 10.4 The Thai watershed management implementation experience

In the northern sub-watershed of Nam Sa, there was increasing conflict in the 1980s between midland and upland tribes due to rapid loss of forest cover and a belief by downstream communities that this was negatively impacting their livelihoods. An initiative was launched in the early 1990s to develop 'micro-watershed land committees' and 'networking resident community groups.' These groups used tools such as 3D modeling, maps, and ecological information to facilitate an open discussion about upstream-downstream linkages in the landscape. In response, the midland Karen people, with the Hmong and Lisu, began abandoning shifting cultivation on steep slopes and started to practice landscape management better suited to the area (e.g. forest protection on steep slopes and cultivation of annual crops on flatter lands). Decentralized control of defined micro-watersheds organized by local hamlets has improved the general environment. This work was facilitated by ICRAF-ASB, Raks Thai/CARE, the Royal Foundation, and the Thai government. Lessons from the intervention include the importance of a good system to document and share experiences at the local level and the need for watershed management to carefully consider the local environment and cultural situation (Bunnara et al. 2004).

Development Plan (2012–2016). Thailand is also a member of the World Bank Forest Carbon Partnership Facility (FCPF). Membership of the FCPF has facilitated establishment of a number of new institutional arrangements, including a National Committee for Integration of Systematic Land Management in 2012, and several working groups under this Committee, including district-level working groups. Thailand's REDD+ strategy is expected to address several relevant issues, including creation of sustainable alternative livelihoods, harmonization of policies, participatory delineation and demarcation of forest boundaries, enforcement of social and environmental impact assessments, and practices to ensure sustainable forestry management. The extent to which these will address maize production and other concerns in the Mae Chaem basin is not yet known, as implementation of the REDD+ strategy has only recently commenced.

At the local level, a number of actors are involved in preventing further encroachment to the forest reserve and many of the programs aim to protect forests indirectly, for example, through TAOs. Legislation on forest protection is in place, though this legislation often conflicts with communities' views on land and resource rights. In practice, the local governments' power to fully implement forest protection legislation is limited by resource constraints and community livelihood needs. Local governments' efforts have focused on supporting off-farm opportunities, introducing improved farming practices, and increasing demand for 'green' products.

Improving agricultural practices

The Thai government's primary policy framework is in the form of the National Economic and Social Development Board (NESDB); the current one (the 11th) runs from the year 2012 to 2016. This strategy refers to the following development priorities in agriculture:

- Enhance agricultural productivity and value chains.
- Promote job and income security for farmers.
- Improve agricultural management to ensure balance between food and energy production.

The primary government entity responsible for improving agricultural practices is the Ministry of Agriculture and Cooperatives (MOAC) and, within this, the Department of Agricultural Extension (DAE). This is further divided into five bureaus, seven divisions, six regional offices, 879 district offices and 48 operational centers. Provincial offices supervise extension tasks, but planning remains central (Worldwide Extension Study n.d.).

Thailand has successfully pursued development within its agricultural sector through public-private partnerships, including on contract farming and crop breeding (e.g. baby corn for export) (Richmond 2013). The government has also heavily promoted technology-based extension systems, enshrined in the 2009 'SMART Farm' program and Agriculture Information Network with the National Electronics and Computer Technology Center (NECTEC) (Kawtrakul 2012). One of the objectives of the partnership between NECTEC and the Ministry of Agriculture is to promote better farming practices that incorporate sensitive land management and more efficient chemical applications. This has led to some innovative models, but there has been relatively low use of Information Technologies (IT) by farmers (Richmond 2013).

The local MOAC and DAE have promoted commercialization of agriculture and contract farming in the region, supported by the local university in Chiang Mai and various local non-governmental organizations

Table 10.3 Development programs in Mae Chaem

Name	Highlights
Thai-German Highland Development Program (TG-HDP)	• Established in 1965, focus on soil and water conservation, as well as the shift away from opium towards other crops as a system of reducing drug abuse. • Used mapping to increase understanding of land use in an effort to stop encroachment • Used Participatory Rural Appraisal (PRA) techniques to generate, analyse and use data in rural development contexts (GIZ n.d.)
Thai-Australia Highland Agricultural and Social Development Project (TA-HASDP)	• Integrated Water Resource Management (IWRAM) Framework Project: focuses on the assessment of upland agricultural systems and uses an international, inter-disciplinary team approach to develop decision support tools that will assist the Royal Project Foundation, government and other stakeholders to identify and assess the implications of a series of 'what if' scenarios. The first phase focused on Mae Chaem river basin (Missingham 2001).
UN-SAM Mun Highland Development Project (SM-HDP)	• Interagency project from 1987 to 1994, led by Royal Forest Department in collaboration with the Office of the Narcotics Control Board, and funded by the United Nations Drug Control Program and the Ford Foundation. • Focused on strengthening the capacity of community organizations so they could be self-reliant on managing their communities, food supplies, and natural resources (soil, water and forest). Emphasized food self-sufficiency, income generation, reduced use of chemicals in agriculture, reduced swidden agriculture, increased forest protection, initiation of watershed management networks and the development of tools for local land use planning, as well social community development (access to citizenship, healthcare etc.) (Palm et al. 2005). • Project area extends beyond the Mae Chaem watershed area, however, as a pioneering and relatively successful case of improved land management within Northern Thailand it shaped much of the work in Mae Chaem. • Was considered particularly successful as a result of the strong emphasis on individual communities involvement and ownership in decision making, the United Nations maintained a role of giving recommendations and gave communities the opportunity to take a leading role in decision making.
RTG-USAID	• The first major land development project within the Mae Chaem basin, had the primary purpose of eliminating opium production and improving citizenship status of local communities. • The project ran for a total of ten years and was largely successful in reducing opium production, increasing citizenship and also developing 'interface teams' which grouped villagers from different ethnic groups with local field officers from various agencies to promote participatory land management. • The project ended in 1990 and much of the work in relation to the promotion of soybeans and maize was quickly reversed, which leads many to suggest that the project had mixed results. The concern raised towards the end of this project was critical in developing subsequent research within the watershed and directly lead to the formation of: The Royal Project Foundation, the Suan Pah Sirkit Project as well as the Care-Thailand Integrated Natural Resource Conservation Project.

Table 10.3 continued

Name	Highlights
Care-Thailand Integrated Natural Resource Conservation Project	• Aimed to conserve watersheds in northern provinces, including Mae Chaem and Mae Hong Son from illegal logging, forest fires and agricultural expansion from 1994 to 1999 (Palm et al. 2005). • Collaboration with Royal Forest Department, Ministry of Agriculture and Cooperatives, local governments. • Used agroforestry, soil and water conservation, paddy rice and fishpond development, as well as additional nonfarm income-generating activities. • Improved governance was achieved through the development of Village Forest Conservation and Watershed Management Committees, with government representatives and village leaders as members. District officials countersign land use agreements as a guarantee to determined land management practices (Puginier 2001). • Project partners included the Royal Forest Department, agencies of the ministry of agriculture and cooperatives and the local governments. The project provided valuable assistance in developing the ASB-Thailand benchmark site.
Royal Project Foundation	• Launched by the royal family in late the 1960s there are over 36 royal project sites across northern Thailand. The primary purpose of these projects was to reduce the production of opium by giving highland communities viable alternatives. Beginning with research into temperate climate vegetables, the project later provided appropriate agriculture inputs, community governance structures, developed off take programs and protected against post-harvest losses. • There are two project sites within Mae Chaem, Ithanon and Wat Chan. The project has developed a vertically integrated 'full-cycle' agriculture approach involving extension, processing, transportation, retail outlets and branding through the 'Doi Kham' brand.
Suan Pah Sirikit Project (also referred to as Queen Sirikit Forest Development Project)	• Project launched by H.M. the Queen of Thailand in 1996, and is implemented through the Royal Forest Department through 10 watershed management units (Palm et al. 2005). • Farmers developed crop rotation system for permanent upland fields in which upland rice is rotated with soybean every third year. This has provided a new source of income through sale of soybeans and the land taken out of upland rice is converted to permanent community forests. It has been suggested, however, many of these farmers later switched to maize due to the low prices obtained for soybean.

including the Royal Projects Foundation. The MOAC has reportedly started to record and register farmer cropland in order to develop targeted assistance programs, including in the event of natural disasters, and crop support mechanisms. This registration process has the potential to give communities more resource access. This program is still in early stages and some experts noted the challenge associated with the rapidly changing policy landscape. Additionally, mandates set forth by the ministry typically change on an annual basis and the lack of continuity hinders the long-term benefits associated with some of the initiatives. There is also a void in government interventions to target

the specific environmental impacts of the maize sector at the national or local levels.

Area-based development projects

Historically, much of the focus within Mae Chaem has been on moving away from opium production. The employed policy and voluntary instruments developed against that background and many have had a spatial area based focus. These historical projects are summarized in Table 10.3.

10.5 CONCLUSIONS AND LESSONS FOR POLICY MAKERS

An array of different instruments and approaches have been applied within the Mae Chaem watershed, yet the effectiveness of these measures for achieiving a more sustainable system of upland agriculture has been undermined by a combination of weak and illegal land tenure and market and policy incentives to further expand maize production. Although the Thai government has generally been good at promoting development within the agricultural sector, including through public-private partnerships and innovation, more could be done to tackle the environmental impacts of grain production in the Mae Chaem watershed and other parts of Chiang Mai province. Failure to tackle these issues may lead to continued impacts on downstream water users and have adverse consequences for economic growth.

It is clear that downstream communities are being affected by changes to land use practices in watersheds such as Mae Chaem. Additionally, farmers and middlemen who sell maize to companies such as CP Group and Pioneer may themselves suffer due to environmental changes such as soil degradation. Some notable points from this landscape are:

Maize value chains in Northern Thailand are relatively complex. Many animal feed companies do not buy directly from growers, and the value chain is not transparent, hence it is difficult to impose obligations on big maize buyers. Introducing opportunities for traceability, for example, through maize purchasing centers or increasing contract-farming programs could pave the way for introducing more sustainable practices.

Transformation and substitution are important factors. Maize is consumed directly, used as an ingredient for food and energy materials, and used as an input to the animal feed industry. There is also a high degree of substitutability between maize and other grains in some end uses, in particular in animal feeds. This increases policy complexity and likely makes it more challenging to impose mechanisms whereby buyers are expected to pay a premium for sustainably grown produce.

Opportunities await from high-value crops and improved market access. The Royal Projects helped local farmers to gain access to high-end tourist markets in Chiang Mai and also created opportunities for farmers who practiced sustainable land management techniques to receive premiums. This program has been relatively successful, but additional investment may be required to increase enforcement, increase demand, and support uptake to ensure that farmers are properly and consistently incentivized.

Strengthened market mechanisms for alternative crops should be used to create a greater diversity of agricultural products. Maize is land-intensive and several experts believe that shifting focus back onto a broader array of crops will reduce the negative environmental impacts of the maize industry.

Land tenure for communities inspires environmental action. Decentralized governance over land can work when a sense of ownership and involvement is developed through the use of maps, citizenship,

and land ownership. Tenure influences the degree to which communities feel responsible for protecting the local environment. However, communities may need to be supported in recognizing both their rights and responsibilities, and in having these officially recognized by government agencies.

Poverty, exacerbated by a lack of land tenure security, reduces availability of local resources to tackle environmental and social issues. Programs are at the mercy of central government budgets. In Thailand, a lack of steady funding has complicated TAOs ability to effectively support sustainable land management.

There is a need for clear incentives and demonstration activities to reduce the real or perceived risks facing farmers in adopting alternative crops and land management practices. Many farmers are apprehensive to move to new crop types because they are concerned about market opportunities and potential impacts on production. Farmers consider input applications carefully as a livelihood hedging strategy. Farmers may be reluctant to switch to organic fertilizers if these are more expensive or unproven.

Consistency of impact monitoring metrics across the country and good environmental data is needed to inform decision-making at local and national levels. Thailand has been relatively successful in decentralizing watershed management, but more could be done to integrate data across government departments, for example to strictly enforce conservation of natural forest cover in key watersheds to prevent severity of flooding (Thanapakpawin, et al 2007).

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BANANA PRODUCTION IN MINDANAO, PHILIPPINES

11

Tanja Havemann and Naomi Rosenthal

With economic growth of over seven percent last year and expected growth of over six percent this year, the Philippines is likely to continue as one of the fastest growing economies in East and Southeast Asia. While agriculture's contribution to Gross Domestic Product (GDP) declined from 30 percent to 11 percent in 2013, it remains an important sector as a source of employment and a driver of rural development (Cayabyab 2013). Poverty rates in the Philippines are also significantly higher in rural areas (almost 38 percent) than in urban areas (14 percent) (NAST n.d.).

The top commodities produced, by quantity and value, in the Philippines include sugar cane, paddy rice, coconuts, bananas, maize, vegetables, pineapples, and cassava. The primary export markets are the United States, Netherlands, Japan, China, and Korea. While the Philippines government has focused primarily on standard economic development indicators, it is increasingly recognizing the need to consider environmental sustainability issues within its development strategy. In particular, there has been a focus on hydrological cycles and the value these bring to communities through fisheries, recreation and tourism, agriculture, industry, and drinking water supply (Globe International n.d.). Although the Philippines Agriculture and Fisheries Modernization Act (AFMA) signed in 1997 sets the policy framework for development within the agricultural sector and includes reference to inter alia poverty alleviation and social equity, food security, rational use of resources, and

Mindanao, Philippines

sustainable development, the main policy focus has been on economic growth and competitiveness (Aquino, Ani, and Festejo 2013). The AFMA was complemented by the Philippine Agriculture 2020 (PA 2020) strategy in 2004, which sets the medium-term policy for agriculture and more strongly supports improved practices (NAST 2011).

Though there is some experience in the Philippines with landscape approaches, through Landcare and sub-national Payment for Environmental Services (PES) programs, significant challenges remain in improving practices within the banana industry. These include: prioritization of human health and rights issues over environmental issues, lack of consumer demand for sustainably produced bananas, and economic reliance on large industry players (i.e. local politicians are sometimes

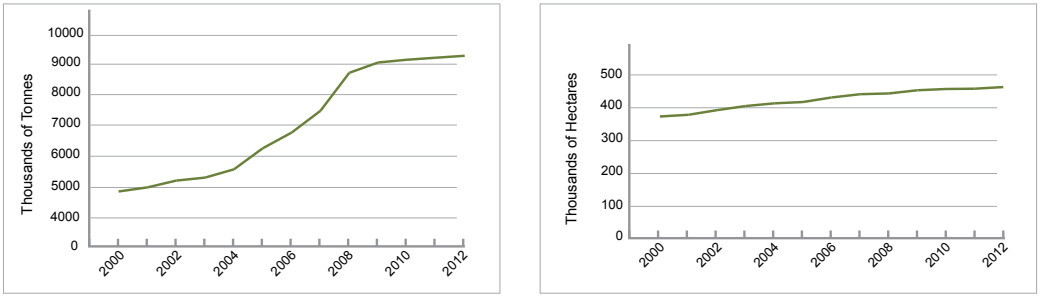

Figure 11.1 Production and area harvested of banana in Philippines, 2000-2012
Source: FAO 2014

wary of 'scaring away' big banana production companies and losing local jobs). Added to this, there has been relatively little action on sustainability issues within the international banana industry in general, in comparison to the coffee, cocoa, and oil palm sectors.

This brief case study provides an overview of the challenges and opportunities for addressing environmental impacts of large-scale banana production in Mindanao, Philippines.

11.1 INTRODUCTION TO BANANA AS COMMODITY IN MINDANAO

Banana is a non-seasonal crop that is well-suited to the Philippine soil and climate. Estimates from 2011 suggest that almost six million farm households in the Philippines depend on this crop for their livelihoods. In 2011, the Philippines ranked as the fourth largest producer of bananas and plantains worldwide (NAST 2011).

Banana production in Mindanao

Bananas are among the most important fruit crops in Mindanao and the Philippines in terms of both production volumes and export earnings, generating USD 646 million in 2012. Nearly six million farm households depend on banana crops for their livelihoods. The Davao Region of Mindanao is known as the 'Banana Capital', with the province of Davao del Norte being the top producer. A significant proportion, approximately 75 percent, or 4.3 million metric tons, of the bananas produced in the Philippines originate from Mindanao, with about 41 percent grown in Southern Mindanao. Commodity plantations made up approximately ten percent of banana production in 2006, with the other 90 percent being produced by smallholder farmers. Mindanao accounts for about 90 percent of the country's banana chips production (DCED 2012).

Davao Region's Banana Industry Cluster contributes about 75 percent of the total exports of the region. It is based upon cultivation of the Cavendish variety for fresh exports, cardava and saba variety for banana chips for exports, and lakatan for the local fresh market. These banana types are produced in different locations within Mindanao. Cluster infrastructure has been developed to support local industry and is linked to road and port infrastructure including shipping facilities for ocean-going vessels customized for banana transportation (NICCEP n.d.).

Export banana value chain

Value chains for banana exports encompass both fresh and processed banana, in the form of chips. In Mindanao, there are over twenty banana chip processor-exporters. Only three of these are Hazard Analysis and Critical Control Points (HACCP) certified. Approximately 35 percent of total production is processed into banana chips. The 'wet' banana export value chain is controlled by a few lead

companies, which undertake washing, drying, and packaging. These companies also act as intermediaries between growers and importers in foreign markets and thus maintain a strong degree of control across the value chain.

Small-scale farmers, organized into cooperatives, dominate banana production in Mindanao. These cooperatives sell the bananas to large multinational companies. In Mindanao, the main banana companies are Sumifru Philippines Corporation and Dole Philippines. There are also a few large-scale growers who have managed to retain land rights throughout the government land redistribution process. These large growers package and process wet bananas for export and deal with the importers directly.

Cooperatives and family owned plantations have a variety of contract types with the larger companies. These contract types have been categorized by De los Reyes and Pelupessy (2009) as ex-farm, ex-patio, and ex-wharf:

- Under an ex-farm contract, the growers' cooperative or plantation is responsible for growing the fruit, with the contracting firm taking over all post-harvest operations.
- Under an ex-patio contract, responsibility for growing, harvesting, and packing are all maintained by the growers' cooperative or plantation, with the contracting firm simply picking up boxes and transporting these to the seaport warehouses.
- Under an ex-wharf contract, risk is concentrated with the grower, who is responsible for growing, harvesting, packing, and transporting the crop to the seaport (De Los Reyes and Pelupessy 2009).

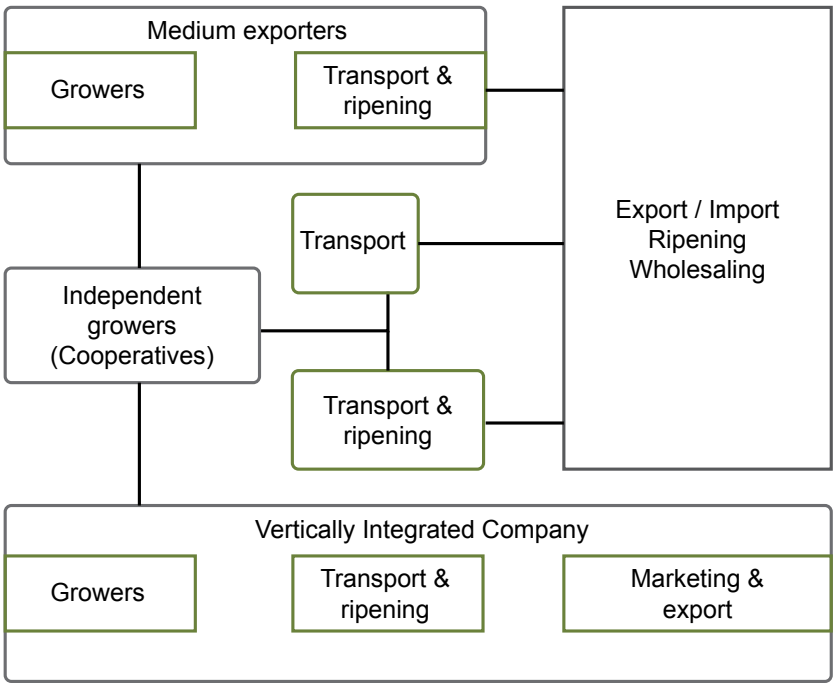

Figure 11.2 Simplifed Philippines banana export value chain

Upon reaching the seaport, bananas from Mindanao are exported to a variety of different markets including Japan (40 percent), Iran (20 percent), and Korea (13 percent). Unfortunately, there has not been much pressure by consumers in the main import markets for improved production practices (Agnote 2010).

Although environmental standards have been mainstreamed in some locations (e.g. Guatemala, Colombia, and Costa Rica) only one percent of Philippine banana production was certified organic in 2011, and 1.6 percent was Rainforest Alliance certified in 2012 (IISD 2014).

11.2 ENVIRONMENTAL AND SOCIAL CONCERNS ASSOCIATED WITH BANANA PRODUCTION

Large-scale, intensive banana production in the Philippines and in Mindanao is the focus of rising environmental unease. The primary reservations related to banana production in Mindanao include:

Reduced water quantity: Banana plantations require large volumes of water for irrigation, fertilization and pesticide application, which are draining surface water resources. This strain on water resources results in conflicts with downstream communities, who have less water for household use, irrigation, and power generation (Calderon and Rola 2003).

Reduced water and air quality: Overuse and improper use of fertilizers and pesticides can result in leaching of chemicals, including nitrates, and contamination of surface and groundwater. Nitrate pollution of water bodies can lead to eutrophication, resulting in the death of aquatic life, algal blooms, and 'blue baby' syndrome (an illness caused by excessive nitrate consumption in contaminated water). Reports have also indicated that a number of different chemicals are sprayed aerially on banana plantations in Mindanao including fungicides, herbicides, and insecticides. These chemicals have varying degrees of toxicity and are highly toxic for birds and reptiles inhabiting the plantations (Center for Trade Union and Human Rights and Nonoy Librado Development Foundation 2013). Pesticide residues in air and water also pose risks to human health (Calderon and Rola 2003).

Reduced aesthetic value of water bodies: Water bodies often have a recreational value for nearby communities. Pollution reduces the recreational value and many local communities believe that contamination causes health issues such as skin disease and irritations (Calderon and Rola 2003).

Destruction of terrestrial and aquatic biodiversity: Runoff from agricultural chemicals used in banana production around Lantapan are polluting the Manupali River, which in turn drains to the Pulangi and Rio Grande Rivers, threatening aquatic biodiversity (Calderon and Rola 2003). Numerous reports have also indicated that banana expansion has resulted in forest cover loss in Mindanao, negatively impacting terrestrial biodiversity.

Soil erosion and degradation: As a result of land clearing and land management practices, soil erosion and degradation is impacting the physical and chemical qualities of soils. Some reports have indicated that loss of topsoil is negatively impacting local soil quality (CTUHR 2013).

These environmental impacts are becoming evident in some parts of Mindanao including to civil society and local government agencies. For example, in 2012, an alliance of local government departments voiced concern about the further expansion of banana and pineapple expansion in South Cotabato. A complaint was brought by the Allah Valley Landscape Development Alliance about the environmental impact that this plantation expansion would have on the area particularly soil erosion and waterway siltation. True

to most of Mindanao, the primary banana producers in this particular province are Sumifru Philippines Corporation and Dole Philippines (Dolefil). The Alliance requested that the local Protected Area Management Board (PAMB) deny further licenses and enforce the "no clearance, no environmental compliance certificate issuance policy" (BananaLink n.d.).

Social impacts: In addition to environmental problems, local groups have also voiced concerns about land rights and resource access. For example, of the 3,152 square kilometers in Bukidnon, 795 square kilometers were allocated to pineapple plantations and 316 square kilometers for banana production, most of which was granted to large companies. The resulting perception of displacement of local, small-scale farmers by multinational companies resulted in violence. Many farmers in Mindanao do not own the land that they manage, live below the poverty line, and are operating in a contractual arrangement with large companies, warranting little or no bargaining power or capacity to assume alternative livelihood options (International Forum 2012).

11.3 EXPERIENCES WITH LANDSCAPE-SCALE INTERVENTIONS

A number of sub-national initiatives in the Philippines have explored landscape-level environmental resource management, although with only limited efforts so far to apply them at scale in banana-producing areas. Many of these initiatives have been led by international organizations in collaboration with local entities and have focused on protecting water and soil quality and biodiversity.

National Capital Accounting to mobilize policy action

Beginning in the early 1990s, programs in the Philippines evaluated how accounting measures could be developed to better

Worker in a banana plantation in Mindanao. Photo courtesy of the Asian Development Bank.

integrate environmental factors. However, many of these initiatives had difficulty in expanding beyond theory into practice due to financial constraints (Allebone-Webb et al. 2013). More recently, natural capital accounting (NCA) has advanced through collaboration among stakeholders including the National Statistical Coordination Board (NSCB), the Inter-Agency Committee on Environment and Natural Resource Statistics (IACENRS), the National Economic Development Authority (NEDA), and various government bodies that regulate agricultural production and land use including the Department of Agriculture, the Philippine Center for Postharvest Development and Mechanization and the Secretary of Agrarian Reform; Local Government Units (LGUs) are also being involved. NCA is helping to raise awareness of the environmental impacts of poorly managed commodity production, and could be applied to mobilize voluntary and government action toward more sustainable banana production systems.

The WAVES Partnership

Launched in August 2013, the Philippines WAVES partnership is laying the foundation for using NCA as a policy planning tool. The purpose of the partnership is to support the government and link it with international capacity to apply NCA assessment methods, especially in relation to fisheries, coastal and marine ecosystems, and minerals. Specific initiatives include the development of macro-level indicators for natural capital valuation and using these to evaluate Adjusted Net Savings (ANS) to help inform economic, environmental, and natural resource management decisions and policies and to increase stakeholders' capacity to apply this knowledge (WAVES 2014). The partnership, chaired by NEDA, has completed a number of training workshops with stakeholders to begin planning the use of ecosystem accounts for natural capital accounting (Allebone-Webb et al. 2013).

The WAVES partnership has identified two initial landscapes as pilot regions:

Laguna Lake region: This is a vital ecosystem and center of economic activity that is also home to an estimated 15 million people. The local communities rely on the lake for water, food, energy, recreation, and livelihoods. The ecosystem is at risk to degradation and overflow from intensifying rainfalls, the consequences of which can be observed in reduced fish catches and instances of flash flooding. The program focuses on addressing problems of siltation and pollution of the lake. The Laguna Lake Development Authority will seek to properly price the lake waters for water concessionaires who extract drinking water and pursue aquaculture and commercial fishing.

Southern Palawan landscape: This is a biodiversity-rich area, home to a number of indigenous tribes. Local biodiversity is at risk due to the increasing conversion of forestlands, activities spurred by mining claims, the destruction of watershed areas, illegal gathering of forest products, and wildlife poaching. The focus of the program will be on evaluating conflicting land uses. Resulting ecosystem accounts are expected to assist decision makers in considering the value of natural capital (WAVES 2014).

Preliminary work for these landscapes includes the development of land cover change matrixes for both areas as well as a water use and supply table for the Laguna Lake basin. The project has received support from the European Space Agency, which will help to fill data gaps (WAVES 2014).

RUPES Payments for Ecosystem Services

The World Agroforestry Centre (ICRAF) has been active in working with

governmental and non-governmental organizations to develop landscape approaches to environmental issues, including payments for ecosystem services (PES). Pilot sites have included the Bakun Watershed (developed in partnership between the local government and the ICRAF Rewarding Upland Poor for Environmental Services, RUPES, program), the Sibuyan Watershed, and the Baticulan Watersheds (Tongson and Balasinorwala 2010; Gaitán, Lasco, and Delfino 2013).

Bakun watershed: ICRAF developed a PES payment system in collaboration with local hydroelectric power plant operators. Upstream local smallholder farmers sell PES benefits brokered through the Bakun Indigenous Tribe Organization (BITO). The two hydroelectric power plants invest in local infrastructure including the construction of roads and bridges, as well as social development and livelihood assistance programs for local communities (Villamor et al. n.d.).

Sibuyan Island: WWF-Philippines in collaboration with the local government, a hydropower producer, and CARE established water funds in two adjacent watersheds in the municipality of San Fernando to support land management activities implemented by the ancestral domain title holder (the Sibuyan Mangyan Tagabukid) (Padilla, Tongson, and Lasco 2005). This area is one of several RUPES learning sites, where ICRAF has piloted a rapid assessment tool to support watershed protection (ICRAF 2011).

Baticulan Watershed: This is another RUPES learning site, where ICRAF has piloted their rapid assessment tool. ICRAF also held a Rapid Hydrological Assessment training workshop co-financed by the city mayor through the San Carlos Development Board.

The majority of these landscape interventions have addressed watershed management issues including flow, quality, and sediment challenges through partnerships between local and international organizations (Villamor and Lasco 2006).

Other Philippine sub-national PES programs

The Maasin watershed: This PES project is facilitated by a number of different entities including, the Iloilo watershed management council and the Japanese Overseas Economic Cooperation. The project is pooling funds from a variety of stakeholders to fund reforestation, agroforestry, and protective infrastructure including lookout towers, fire lines, and trails as well as selected social measures including institutional capacity building. The local water utility is required by law to pay 1 percent of its gross revenues to the Maasin local government upstream in the watershed (Porras, Grieg-Gran, and Neves 2008). Civil society groups, the provincial government, the national government, Japanese cooperators, and the Asian Development Bank (ADB) provided funding for this project. The project is developed to protect the Metro Iloilo Water District water source through improved flow regulation (Porras and Neves 2006).

The Manapuli watershed: The Bukidnon Environment and Natural Resource Office became aware of the impact of intensive banana production on water availability and water quality within the watershed. As a result, the local government developed a reward system for farmers who adopted and practiced sustainable farming systems and triggered an investment forum for watershed management. The banana industry was engaged, as they form the economic backbone for the region and provide significant employment. The two primary plantations in Bukidnon, Mount Kitanglad Agri-Ventures Inc. (MKAVI) and the Dole Banana Plantation cumulatively employ thousands of people, in a region with less than 10,000 inhabitants.

Landcare

Landcare was first used in 1996 in the northern Mindanao municipality of Claveria, Misamis Oriental, adapted from the successful Landcare programs developed in Australia for sustainable land management. Landcare brought together farmers, representatives of the Claveria Local Government Unit, and technical facilitators from the World Agroforestry Centre. This partnership helped upland farmers to tackle erosion by involving them in the development of conservation farming technologies for steep slopes by capacitating the adoption of more farmer-friendly systems such as natural vegetative strips. The project expanded with the support of ACIAR, ICRAF and others to three new Landcare sites in Mindanao at: Barangay Ned, Lake Sebu, in the province of South Cotabato; the municipality of Lantapan in the province of Bukidnon; and the province of Misamis Oriental. The project appointed specialized extension personnel called 'Landcare facilitators' at each of the three sites. The Landcare facilitators were backed by technical and extension personnel offering support in conservation farming technology, training and evaluation.

By 2004, more than 600 Landcare groups had formed, with 30 to 60 percent of the farmers at each site adopting soil conservation technologies, affecting 15–25% of their total farm area. There were also positive social and economic impacts from the farmers' improved capacity to pursue potential livelihood improvements. Farmers that previously practiced monoculture rice and maize, participants shifted to agroforestry systems of fruit, timber trees, and high-value vegetable crops. The improved availability of products also allowed farmers to implement collective marketing and purchasing schemes through the Landcare projects. More than 40 local institutions adopted the Landcare concept, a structure that enabled farmers to play a lead role in shaping the direction and implementation and demonstrated the potential for Landcare to improve local governance. The project flourished across the region—a fourth Mindanao site (in Agusan del Sur) was established, activities at the Bohol site were extended to two new municipalities, and activities at the other three sites were expanded to the provincial level. Catholic Relief Services and the National Crop Protection Center of the University of the Philippines Los Baños joined the project as partners. A second phase of the project focused on: researching the most suitable institutional or agency structure for taking Landcare forward; identifying the most appropriate ways of helping Landcare entities such as Landcare groups, municipal Landcare associations and farmer trainer groups to be self-sufficient; increasing the scale and level of uptake of the improved farming systems and diversified livelihoods; and evaluating the impacts of Landcare activities. Programs evolved in some regions to tackle sub-watershed level land management challenges (ACIAR 2009; Catacutan 2010).

Local policy instruments

Stakeholders have suggested that the Local Government Code of 1991 (RA 7160), which gives local authorities the ability to generate and apply resources independently of national legislation, and the Fertilizer and Pesticide Policy, which requires companies to ensure safety of employees when using fertilizers and pesticides, could be applied to promote better practices within the banana industry. The Local Government Code of 1991 allows local governments to penalize any actor engaging in activities that endanger the environment. The Code prohibits destructive fishing practices, illegal logging, poaching of endangered species, slash and burn

farming, and other activities that cause pollution, accelerate eutrophication of rivers and lakes, or disrupt the local ecological balance (Republic of the Philippines 1991). These regulations may create enabling frameworks for local communities to develop mandatory improved agricultural management measures for locally operating agricultural companies.

Water permits have also been used to promote better practices among agribusinesses in the Philippines. For example, Dole-Skyland, a banana company, was given a water permit under the condition that they compensate the Hilltop Lantapan farmers with whom they share the water source for any environmental damages. As a result, the company temporarily supported the farmer projects, but has since ceased to use this water source due to limited water availability. In another example, the Celebrate Life Inc. banana company received water rights under the condition that they fund a 50 km2 conservation project and support community livelihood projects (Catacutan 2009).

11.4 CHALLENGES AND OPPORTUNITIES FOR TACKLING ADVERSE IMPACTS OF BANANA PRODUCTION IN MINDANAO

The challenges associated with increasing the sustainability of banana production through landscape approaches in the Philippines include a lack of clear metrics and technical information, a lack of strong commitment by local government, and low capacity, both financially and in knowledge and skills, with small scale farmers.

Specifically, there is a lack of clear metrics for sustainable land use at the national and local levels. National guidance and local implementation experience are currently being developed, but there is as yet little consensus on formulating appropriate, scalable, and particularly industry-wide approaches for tackling these issues (WAVES 2014).

Linked to the point above, there is a lack of technical information (i.e. data) to develop baselines and monitoring frameworks, and there is a high cost of establishing such systems. National information collection systems are still in development and not yet at a level where they can effectively be used to guide policies.

A lack of strong, long-term commitment by the local government, and accompanying resources, to coordinate actions across stakeholder groups and landscape aspects undermines the movement towards sustainable banana production. A large proportion of local government revenues come from the banana industry. Central and local governments are relatively resource constrained and may be worried about 'chasing away' the economically important banana export industry.

Small-scale farmers generally have fewer resources to invest in good plantation management practices, and often are not aware of optimal farm and resource management practices. Small-scale banana farmers in the Philippines may misuse chemical inputs because they are unaware of best practices, there is increasing pest resistance, and because farmers are paid based on outputs and hedge production by over-applying inputs (PAN North America 2009).

Basic development barriers within cooperatives (e.g. managerial skills, literacy) are compounded by a lack of access to finance (in part due to resource access and tenure), equipment, and infrastructure.

Nonetheless, stakeholders can build on existing efforts and open new opportunities, through several approaches:

- Promote improved environmental management through practice codes and farmer associations, including farmer contract programs.

- Work within the emerging NCA and WAVES frameworks and major banana multinationals to incentivize improved practices throughout the value chain, e.g. export and import incentives and local tax incentives for companies linked to supporting better production in landscapes.
- Adapt Landcare models for farmer-led improvements in environmental management linked to improved local government action, that address local concerns for health, water quality and sustainability of livelihoods.
- Tie good environmental practices to access to government incentives for plantation licenses and access to credits and other farmer incentives, including shared infrastructure.
- Support farmers to diversify incomes. For example, small-scale farmers in Davao are increasingly starting to inter-crop with other crops such as cocoa to minimize their production risks.
- Develop more opportunities for selling certified produce, e.g. farmer's cooperatives selling Cavendish bananas to Japan.
- Work with brand name companies and companies with a supportive investor base to implement more sustainable practices within the local banana and pineapple industry, e.g. support the wide-spread adoption of the Sustainable Agriculture Network (SAN) principles (SAN 2009).
- Better integrate landscape indicators into Philippine Good Agricultural Practices (GAP) certification.
- Develop sustainable "agri-food clusters," linked to infrastructure access such as ripening rooms, cold storage, and ports.
- Facilitate multi-stakeholder partnerships to support small-scale farmers in a way that can also promote improved local environmental outcomes. These partnerships should assist by providing suitable financing, risk mitigation (insurance), technical assistance packages, mechanisms for cutting wastes, and by developing an independent, neutral coordinating body to promote best practices in the industry on a global level.

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While contributing to economic and income growth, commercial agriculture has sometimes contributed to the degradation of ecosystem services, including deforestation, biodiversity loss, wetlands destruction, land degradation, water pollution and depletion of aquifers. These impacts are not inevitable and there is a wide range of instruments which can and are being used to reduce agriculture's environmental footprint. *Steps Toward Green* examines what governments in East and Southeast Asia are doing and could do to accomplish just that. Using six case studies of policy action and response in large landscapes, the authors draw out best practices and approaches for policy leaders that lay out the path to sustainable agriculture.

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