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Assessment of governance mechanisms, livelihood outcomes and incentive instruments for green rubber in Myanmar

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Abbreviations

CFI	Community Forest Instructions
ESIA	Environmental and Social Impact Assessment
FUG	forest user group
ICRAF	World Agroforestry Centre
LMC	Myanmar Government Central Land Management Committee
LNDO	Lahu National Development Organization
MOAI	Ministry of Agriculture and Irrigation
MPCE	Myanmar Perennial Crop Enterprise
MRPPA	Myanmar Rubber Planters and Producers and Association
NGO	non-governmental organization
NTFPs	non-timber forest products
PES	Payments for ecosystem services
REDD+	Reducing Emissions from Deforestation and Forest Degradation +
SLORC	State Law and Order Restoration Council
VFW	Vacant, Fallow, and Virgin Farmland Law

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1 Introduction

Over the past decade, the cultivation of rubber trees¹ has expanded rapidly throughout the Mekong region, from more established centers of production in Thailand, China and Vietnam to new sites in Laos, Myanmar and Cambodia (Fox *et al.* 2014). Much of this expansion is due to rising demand for rubber from China and related increases in rubber prices from 1990 to 2010.² Concurrently, the governments of Laos, Myanmar and Cambodia have initiated economic, political and legal reforms that have opened up their countries to higher levels of foreign investment and trade. They have promoted the industrialization of agricultural production, particularly rubber as a primary target cash crop (Fox *et al.* 2014). Consequently, rubber has expanded rapidly and extensively throughout all three countries leading to extensive socio-environmental transformations of rural areas. Such expansion has been halted, however, due to a crash in rubber prices in 2012.

In Myanmar (Burma), rubber was first planted during the British colonial period in the early 20th century, mostly in Mon State of southern Myanmar by smallholders (Keong 1973). The country's rubber sector, however, long remained stagnant until the national economy began to open up to private trade and foreign investment and rubber prices increased in the 1990s, propelling smallholders to produce rubber more intensively and extensively throughout Mon State, Kayin State and Tanintharyi Region. Rubber plantations have also developed in the form of large-scale estates since 2006, granted as land concessions by the Myanmar government in northern Myanmar, particularly Kachin State and the northern and eastern regions of Shan State. Most of the concessions have been granted to Chinese investors and there are hardly any smallholding rubber plantations. Since 2010, concessions have also been granted in areas of the south that are dominated by smallholding production. The Myanmar government has established plan to plant 1.5 million acres of land with rubber from 2000–2030, aiming to produce 300,000 metric tons of latex per year.

The rapid expansion of rubber in Myanmar and other new sites of production in the Mekong sub-region has generated criticism and concern over the social and environmental implications of monocrop production, particularly in the form of large-scale plantations. Numerous research projects have found that, despite the promise of rubber to reduce rural poverty, the opposite effect can occur for a number of reasons; for example, if farmers do not retain control of their land or rubber trees, if contracting arrangements between investors and farmers are unfair and exploitative, or when rubber prices bottom out, among other factors (LNDO 2009; Woods 2012; Fox and Castella 2013; Global Witness 2014). In addition, rubber plantations can lead to deforestation and a loss of biodiversity and ecosystem services, especially due to poor land-zoning processes. In mountainous areas of Southeast Asia, rubber has been shown to induce drier conditions at the local level, surface erosion, loss of soil health, sedimentation and disruption of stream flows, and increase the risk of landslides (Ziegler *et al.* 2009). Additionally, carbon emissions are likely to increase when primary or secondary forests are converted to rubber (Fox *et al.* 2014; Warren-Thomas *et al.* 2015).

In response to these challenges, but also the opportunities the rubber tree crop offers, this research project, *Assessment of governance mechanisms, livelihood outcomes and incentive instruments for 'green rubber'*, has two main objectives. First, analyze the range of obstacles that prevent the emergence of 'green' rubber systems. Second, identify policy and governance mechanisms that enable rubber production to be 'greener' both environmentally and socially.

1 In this report, the term rubber only refers to the latex from rubber trees, not manufactured synthetic rubber.

2 Global and regional rubber prices have dropped since 2012, slowing the expansion of new rubber plantations in these countries.

The concept of ‘green rubber’ is not well-defined in the literature, and is largely used for the purposes of stimulating research and analysis on the potential for improving the social and environmental dimensions of rubber production. This project preliminarily defines green rubber systems as rubber production and trade that support the maintenance and potential enhancement of ecosystem services, and that contributes to intra-household empowerment of women, and poverty alleviation at both the household and community scale.

This report focuses on both governance challenges and opportunities for the emergence of green, or at least *greener* rubber systems in Myanmar. A key finding of the report is that one of the main challenges for developing green rubber in Myanmar is a lack of direct government support – in the form of policy and extension – for the types of rubber production that provide benefits for smallholders and maintain ecosystem services. Effective policy and extension approaches include private land tenure and usufruct rights for farmers, subsidized agricultural inputs, low-interest loans, and technical agricultural extension support (Fox and Castella 2013). Problematically, there is a high level of governmental support for large-scale agribusiness production of rubber, which provides fewer benefits to smallholders and the rural poor, and creates larger-scale environmental impacts. Nonetheless, there are a number of opportunities for greening rubber systems in Myanmar via state-led, community-based, and novel or emerging regulatory systems.

These findings are supported in the following sections of the report. Section two provides an overview of the analytical methodology employed in the project. Section three examines the national policy context of rubber production in Myanmar, providing an analysis of the various types of legislation and policy that promote and support rubber production, and guide different types of cultivation. Section four outlines the various types of rubber production that are actually occurring and their environmental and livelihood outcomes: smallholding production, rubber concessions, and contract farming. Section five defines three different types of governance processes that both constrain but also enable the potential for green rubber in Myanmar.

2 Analytical methodology

The green rubber research project is geographically focused on Laos and Myanmar, with this report focusing on the latter country. The methodologies used to collect and analyze data are the same for both countries, as described below. The approach for data collection is relatively straightforward – the country studies use existing literature, focusing on scholarly articles and gray literature. Online libraries searched included Google Scholar and the Online Burma/Myanmar Library.³ A number of different keywords were used in the search, such as “rubber”, “agroforestry”, “Myanmar”, “Burma”, “Thailand”, “China”, “Southeast Asia”, “land concessions”, “contract farming”, and “smallholder production”. All major sources relevant to the research focus for both countries were collected – such as literature on policy and legislation, international development support, livelihood and environmental outcomes, governance processes, etc. The sources collected are representative of current debates on policy, land and resource governance mechanisms, and development outcomes of rubber production.

In addition to a review of relevant documents and literature, consultations were held with key stakeholders working in the non-profit and academic sectors who are specialists on the development of rubber production in Myanmar. They were asked questions on the following themes: the key environmental and social challenges facing rubber development, governance challenges and opportunities for rubber, and the potential for developing green rubber in the Myanmar context.

Four main aspects of rubber production are examined in the study: (1) the policy context of rubber production in each country; (2) the range of livelihood and environmental outcomes taking place as a result of rubber production; (3) the obstacles that prevent the emergence of green rubber production; and (4) the governance possibilities for the emergence of green rubber. The analytical methodologies for each of these components is described below:

1. *National policy context of rubber production*: Based upon the literature and research available, the policies, legislation and regulations for each country that are relevant for rubber production are identified. Consensus within the literature was sought as to how the relevant policies have led to the emergence of rubber production, in particular leading to the predominance of different social and political-economic modalities, such as independent smallholder production, contract production between farmers and investors, and large-scale estate production via land concessions.
2. *Livelihood and environmental outcomes*: In this component, the analysis focuses on common livelihood and environmental outcomes, both positive and negative, resulting from the production of rubber. Specifically, positive and negative outcomes are examined for different modes of production, i.e. smallholding, contract farming and concessions. There is a wide range of perspectives concerning the social and environmental impacts of rubber production, and therefore the analysis utilizes evidence-based studies that have collected primary field data on livelihood and environmental outcomes.⁴ In cases where studies have found conflicting results, the range of outcomes reported is presented rather than focusing on one type of impact over another.
3. *Obstacles to the emergence of green rubber*: Based upon the analysis of previous studies, and our own analysis of the various factors influencing different social and environmental outcomes, the main obstacles that prevent the emergence of green rubber production systems are identified. This includes a variety of different aspects, such as biophysical and technical, socioeconomic and political-economic constraints. This section examines how these various obstacles actually prevent the emergence of green rubber, as based upon evidence found in the reviewed literature.

³ <http://www.burmalibrary.org/>

⁴ It is possible that research studies conducted may focus on the worst case scenarios, thus biasing the outcome of the literature review.

4. *Green rubber governance possibilities*: The final component of the project utilizes all of the other components to identify various possibilities for improving the governance of rubber production to move toward green rubber. Such possibilities are examined along the lines of community-based, traditional state-led regulatory and novel or emerging regulatory mechanisms. Examples of community-based mechanisms are community forestry or communal land-management approaches. Traditional state-led regulatory mechanisms, particularly the implementation of safeguards for managing social and environmental outcomes, might include land zoning and policies promoting different types of production schemes. Novel or emerging regulatory, voluntary and market-based instruments include payment for ecosystem services (PES) schemes, the imposition of ecological taxes or fines, subsidies or tax breaks for green rubber production, or preferential purchase programs. Such systems could only be effective if implemented with clear criteria and indicators for what constitutes 'green rubber'. The analysis focuses on the types of schemes that are already present in each country and that have been assessed within the literature, as these are the schemes that have been implemented thus far. Additionally, a discussion is included of additional mechanisms or approaches that have yet to be developed, but could be appropriate for the country context.

3 National policy context of rubber production in Myanmar

The Myanmar government and its military establishment have long supported rubber as a strategic export crop for the purposes of earning foreign exchange. Myanmar has a long history of rubber production in the smallholding sector of the south, but the most rapid expansion of production has occurred in the past few decades in the context of a liberalizing economy, increasingly open to market exchange, export and private investment in the agricultural sector. The expansion of rubber in Myanmar has occurred in large part due to the government’s gradual liberalization of the economy, including the agricultural sector, thus relaxing state control over agricultural production. In 1989, the State Law and Order Restoration Council (SLORC) government introduced its open door policy and partially liberalized the production and exchange of perennial crops. While the government retained control over rubber exports, local rubber producers could sell their latex on the private market to domestic buyers after fulfilling government procurement quotas. As a result, smallholders began to grow rubber again and expand production.

Increased rubber prices in the 1990s and 2000s, combined with relaxed government control over the rubber sector, have facilitated the expansion of rubber in Myanmar, including a rebirth of smallholder production. However, much of the focus of government policy has been on the promotion of large-scale estate forms of rubber production by private agribusiness. Since the establishment of the Myanmar Perennial Crop Enterprise (MPCE) in 1994, the Myanmar government has increasingly supported the development of the rubber sector, but little support has gone toward smallholding rubber producers – low-interest loans have been provided to smallholders in sectors other than rubber.⁵

The Ministry of Agriculture and Irrigation’s 30-year Master Plan for the Agriculture Sector from 2000 to 2030 prioritizes large-scale agriculture, aiming to convert 10 million acres of ‘wasteland’ – primarily swidden fields and fallows in upland areas – into industrial agricultural production, especially rubber, oil palm, paddy rice, pulses and sugarcane crops.⁶ They seek to achieve a goal of 1.5 million acres of planted rubber in the country and a production capacity of 300,000 metric tonnes per year. Data from the Ministry of Agriculture and Irrigation (MOAI) shows that in 2000–01 only 446,000 acres had been planted, which had increased to 1.34 million acres by 2011–12, of which 490,000 acres are being tapped (Myint 2013). Table 1 shows the total area of rubber planted and tapped in states and regions for the areas where more than 1000 acres have been planted.

Table 1. Area of planted and tapping rubber in top rubber-producing regions of Myanmar.

State/region	Planted area (acres)	Tapping area (acres)
Kachin	61,478	1,436
Kayin	189,747	44,595
Sagaing	8,451	23
Tanintharyi	264,106	106,419
Bago	101,121	20,349
Mon	464,477	286,502
Yangon	39,208	7,957
Rakhine	34,320	1,481
Shan (North)	68,756	16,523
Shan (East)	87,180	4,579
Ayeyarwaddy	21,884	198
Total	1,342,202	490,151

Data source: Myint 2013 (MOAI data)

5 Promotion of rubber and other perennial cash crops is now under the Perennial Crops Educational and Technical Development Division of the Department of Industrial Crops Development, MOAI (Myint 2013).

6 ‘Wastelands’ have historically been a political land category and a term discursively to gain control over lands and populations in ethnic minority areas, particularly areas of insurgency (Ferguson 2014). More recently, the concept of ‘wasteland’ has been formalized in the Vacant, Fallow and Virgin Lands Management Law of 2012 (see Oberndorf 2012).

Data from the MOAI does not disaggregate rubber plantations by smallholder versus large-scale estate, but does disaggregate by size of holdings. As can be seen in Table 2, the majority of holdings and planted areas is under 50 acres, the largest percentage between 5 and 20 acres.

There are longstanding land laws and policies in Myanmar that have enabled the government to gain control over land. The Land Acquisition Act of 1894, which is still in effect today, legally gives the government the right to expropriate any land to develop projects with a public purpose, as long as compensation is provided to the original land owners. The 1953 Land Nationalization

Act and the 1963 Tenancy Law gave legal power to the state to seize all land throughout the country and redistribute them according to socialist principles (thus effectively creating the possibility that any land could become state land). Government acquisition of rural land occurs despite the passing of the 1963 Law Safeguarding Peasant Rights, which forbids the confiscation of farmer's land (BEWG 2011). Apart from the 1894 Land Acquisition Act, however, the above laws have been rescinded with the passage of the 2012 Farmland Law.

Woods (2012) demonstrates that there is a transition in policy focus from relying upon smallholding farming to achieve national agricultural production targets, to using private companies, many of which are connected to top Myanmar officials. This has been facilitated by legislation that supports large-scale agribusiness and weakens the prospects for smallholders. Additionally, the government has increasingly provided agribusinesses with easy access to lands for rubber production. The 1991 Wasteland Instructions and the 2012 Vacant, Fallow, and Virgin Farmland (VFW) Law have provided agribusinesses with easier access to land for rubber production by permitting the leasing of land via large-scale agricultural land concessions.⁷ The Wastelands Instruction sought to encourage the development of 'wastelands', effectively defined as land without title, by granting the rights to develop such lands to state-owned economic enterprises, joint ventures, corporations or private individuals, regardless of the original land owner. The Government Central Land Management Committee (LMC) may assign blocks of land to private agribusiness of up to 5000 acres for the development of selected perennial industrial crops such as sugar cane, oil palm and rubber. If this land is developed, then more land can be granted – up to 50,000 acres for 30 years (the maximum length of leases was increased to 70 years under the Foreign Investment Law of 2012). By mid-2013, 5.2 million acres of land nationwide had been allocated for commercial agricultural land concessions (Woods 2015a).

Under the VFW Law, the Government's Central Committee for the Management of VFW, chaired by the MOAI, can allocate land used by smallholders (both upland *taungya* lands and lowlands without official title) to domestic and foreign investors (TNI 2013). Foreign companies work with Burmese companies, formally as joint-venture investments, but more commonly in informal arrangements as a domestic investment with foreign financing in the background, which makes the investment process easier and allows for greater tax breaks (Woods 2013). Additionally, the VFW Law weakens land tenure by only recognizing land to which farmers have official land title certificates – most farmers do not have certificates and are thereby classified as 'squatters', vulnerable to land expropriation for concessions (TNI 2013).

Table 2. Structure of rubber sector by size of holdings.

Category	Holdings No.	%	Planted area No.	%
<5 acres	22,423	40.2	62,778	8.6
5-20 acres	28,052	50.3	242,828	33.3
20-50 acres	3,971	6.8	109,442	15.1
50-100 acres	950	1.7	59,700	8.2
100-500 acres	419	0.8	99,872	13.7
500-1000 acres	65	0.1	52,560	7.2
>1000 acres	31	0.1	101,169	13.9
Total	55,731	100	728,329	100

Data source: Myint 2013 (MOAI data)

⁷ The law also allows allocation of up to 50 acres of land to individual farmer households or organizations.

The process of gaining permission to access land and establish large rubber plantations depends upon the size and location of the plantation. Leasing land over 5000 acres and up to 50,000 requires approval from the Myanmar Investment Commission (Noam 2010). Permission to plant rubber is either granted by regional military commanders or top regime officials in Naypyidaw, although in some cases concessions are granted by people's militias in their autonomous territories. Concessions granted by the Kachin Independence Organization and New Democratic Army-Kachin in some areas of Kachin State are generally smaller than government-authorized concessions. In Wa- and Kokang-controlled areas of Shan State, however, the size and extent of concessions is outpacing those in government-controlled areas. Nonetheless, most of the current agricultural investment is in areas controlled by the government, but MPCE figures show that 95% of the planted area is under control of private agribusinesses (Noam 2010).

The rise of rubber concessions in northern Myanmar is also heavily influenced by China's Opium Substitution Program, which began in 2006. The aim of the program is to reduce the import of opiates into China from Laos and Myanmar by providing opium farmers in those countries with alternative livelihood options and thus reduce the production of opium for export (TNI 2010). Under the crop substitution component of the program, companies participating in the scheme receive various forms of state subsidies and financial incentives, such as eased bureaucratic procedures and labor regulations, tax exemptions, subsidized investment depending on the size of the project, and difficult-to-attain permission to import crops. According to MPCE, most areas targeted for future rubber production in the north fall under the government category of 'perennial crop development substituting for opium poppies in border areas' (Noam 2010). Chinese-led investment in rubber, as well as a range of other cash crops such as maize, cassava, rice, tea, sugarcane and watermelon, has taken off under China's Opium Crop Substitution Policy. The policy is implemented by Chinese agribusinesses that receive state-backed funds to secure agricultural concession contracts in northern Myanmar. The companies sometimes work with a Burmese company that is either directly owned by or indirectly linked to a government military official, an armed ethnic group leader or another type of local elite. This helps explain why regional military commanders in both Kachin State and Shan State have aggressively supported rubber production in the past decade.

The environmental impacts of large-scale agricultural concessions in Myanmar are regulated by newly passed environmental legislation. The Environmental Conservation Law, passed in 2012, requires environmental and social impact assessments (ESIAs). There is some recognition of community forestry in Myanmar. The 1995 Community Forestry Instructions (CFI) recognizes co-management in forestry. The overall principles of the CFI are for local communities to fulfill basic livelihood needs for firewood, farm implements and small timber, as well as reforest degraded forest lands. Community forestry user groups (FUGs) collaborate with non-governmental organizations (NGOs) and the district Forest Department (within the Ministry of Environmental Conservation and Forestry) to manage the community forest. Community forestry started to be implemented in the mid-2000s, particularly in the north, in response to land tenure threats from agribusiness concessions on upland forests and *taungya* (Woods 2010). Community forestry is also a tool for reforestation, partly as an attempt to enable communities who have farmed in protected forests to be involved in the process of reforestation while maintaining livelihoods. When the community forest is recognized by the district Forest Department and other relevant agencies, the FUG's user rights to the land are more strongly protected, making it more difficult to grant the land to an outside party. Thus community forestry can be used as a strategy to enhance community land tenure, protecting access to lands. The Myanmar government has set a goal of establishing 2.27 million acres of community forestry by 2030 (Wode *et al.* 2014).

Finally, the Myanmar government is undergoing a review of a draft National Land Use Policy. Earlier drafts of the policy were largely geared toward improving the business and investment environment for land in the country, securing foreign investments in land-based projects rather than protecting the land tenure and ecologies of rural communities (TNI 2015). However, the government has opened the land policy up to extensive consultation with civil society, enabling NGOs and other civil society groups to voice their concerns and suggest changes prior to its approval. As a result, the latest iteration of the policy, the sixth draft, does much more to protect the land rights of those with access to land and provide land access and rights to those who were previously dispossessed or displaced (TNI 2015).

4 Socio-ecological dynamics of Myanmar rubber

The focus of this section is the varying social and economic forms in which rubber is produced in Myanmar, the socio-ecological dynamics of these differing forms and variations in their ‘greenness’. There are two main forms of rubber production in the country – production by smallholding farmers and estate plantations established by private agribusinesses, often on land acquired through government or military land concessions. A third, but less predominant and not well-understood, form is contract farming, whereby a joint arrangement is set up between investors and farmers, based upon a division of inputs and production revenues. For social dimensions, each type of production is reviewed based upon the degree to which it has affected household poverty, social empowerment and gender relations. For environmental dimensions, rubber production is reviewed in terms of a variety of impacts, such as deforestation, biodiversity, soil quality, pollution and impacts upon ecosystem services. The key socioeconomic and environmental dynamics of each type of rubber production are summarized in Table 3.

Table 3. Typology of rubber production arrangements and associated socioeconomic and environmental dynamics in Myanmar.

Type of production	Socio-economic dynamics	Environmental dynamics
<i>Smallholding</i>	Smallholders maintain control of land	Deforestation and loss of biodiversity, but at a smaller scale than agribusiness estates
	Smallholders gain full benefits of latex production and revenues, but must access capital and technical expertise in dependently	Loss of ecosystem services, but at a smaller scale than agribusiness estates
	Farmers are susceptible to risk of price crashes	Pollution (run-off from use of fertilizer, pesticides, and herbicides), but at a smaller scale than agribusiness estates
<i>Land concessions and agribusiness estates</i>	Dispossession of villagers’ agricultural and forest land with minimal and inconsistent cash compensation	Deforestation and loss of biodiversity
	Wage labor opportunities are available, but do not compensate for income and subsistence from expropriated lands and natural resources, and in some cases include forced labor	Loss of ecosystem services
	Villagers don not directly bear the costs of price crashes	Pollution (run-off from use of fertilizer; pesticides, and herbicides)
<i>Contract farming</i>	Benefits are unfairly divided between companies and villagers, or only go to local authorities	<i>Unknown (lack of research and data)</i>

4.1 Smallholding production

Smallholder rubber is predominant in southern Myanmar, due to the historical lineage of rubber production in that region of the country since the British colonial period. Interest in smallholding rubber production was revived after rubber prices started rising in the 1990s. Currently, smallholding rubber is occurring in Mon State, Kayin State, Tanintharyi Region, Bago Region and Ayarwaddy Region. Smallholding rubber is embedded within Chinese rubber markets, bought and traded by Chinese traders. Inputs are purchased from middlemen at competitive market prices without contracts (apart from some informal agreements whereby fertilizer inputs are paid for after harvest) (Woods 2012).

Smallholder rubber has yet to take root in northern Myanmar because most local farmers lack the investment capital and market access to take advantage of the boom. Additionally, many farmers are being forcibly displaced from their subsistence farmlands to make way for large rubber enterprises, leaving them with few livelihood options (Kramer and Woods 2012). Additionally, smallholders do not play a role in the allocation of rubber concessions as this process is controlled by the Myanmar military and people's militias.

Even for those farmers in the north who maintain control over their land, a number of significant barriers to entry remain. A high initial investment is required without any return for 7 years before the rubber trees can be tapped and it is difficult for them to receive loans because they do not have collateral if they are no longer cultivating poppy. This is in part due to the lack of government support for smallholding rubber production and any institutions that could provide access to financing. Secure land tenure could potentially increase the possibility of accessing credit. The large gap between planting and harvesting is a significant challenge. As a Wa region tribal leader put it (cited in Kramer 2009): "Rubber is only profitable after seven years. This interval time is the hardest period. We calculate it will take about seven to ten years to recover the previous crop income."

Additionally, rubber growers are dependent upon the Chinese rubber market, leaving them vulnerable to fluctuations in prices, evidenced by the crash of rubber prices since 2012. As a result, mostly well-connected Myanmar elite, in rural and urban areas, can afford to produce rubber. These small-scale rubber producers grow not only to profit, but also as a means of protecting their lands against dispossession for concessions as cultivating rubber shows that the land is being used productively.

For farmers that can afford it, independent smallholding production is the most socially advantageous form of rubber production as the farming household does not have to split cash revenue from the sale of latex with another party, as is the case with contract farming models. Farmers have the potential to increase their income, or at the very least gain access to some cash income. Additionally, labor costs for smallholders are lower than for agribusinesses as farmers labor themselves and therefore smallholding production can remain profitable when international prices are low (Delarue 2009). This is not always the case as smallholders may also hire wage laborers when household labor is not sufficient and they have enough capital to do so. The caveat is that many farmers are unable to afford independent production. Not only do they have to purchase the seeds, seedlings, fertilizer and tools, they need to have access to enough capital, land and labor to grow the rubber trees for 7 years prior to the harvest without jeopardizing household access to food. Additionally, producing rubber independently puts a level of risk upon the household greater than growing under contract with an external investor – the cost of tree failure or price crashes fall completely upon the household and thus it is important that households are able to cope with such crises. One major challenge that many rural people face if they wish to grow rubber as smallholders is a lack of access to land as there is a high rate of landlessness throughout rural Myanmar.

Environmentally, the impacts of independent smallholding production are similar to those of concessions and contract farming. The impacts, however, may in some cases be less due to the smaller scale of the plantations, as they have less capital for investment. Plantation sizes tend to be smaller and are only on lands that farmers find appropriate for tree production without significantly impacting the surrounding environment, including ecosystem services and availability of non-timber forest products (NTFPs). Nonetheless, smallholding monocrop plantations still reduce biodiversity, limit ecosystem services, and in some cases lead to pollution from use of fertilizers and agrochemicals. For example, smallholding rubber production has led to significant deforestation in Tanintharyi Region (Woods 2015).

Independent smallholding production has the highest potential to improve livelihoods through increased incomes. Farming households may also be more empowered when they retain control over their land and labor in the rubber production process. Furthermore, their independence offers the greatest opportunities for engaging in cooperative forms of production and marketing and also greener forms of production, such as agroforestry and mixed cropping. The environmental effects of smallholding rubber may be as

poor or worse than land concessions. Additionally, it is important to recognize that ‘smallholders’ are not an undifferentiated group and that there is great variation in the different types of small-scale independent farmers, including those that have quite large plots of land or clear forest and plant the land to claim control over certain areas. Thus, ‘smallholder’ should not be automatically equated with green production.

4.2 Land concessions and agribusiness estates

Land concessions for rubber estate plantations are predominantly in the north, particularly Kachin and Shan States (especially the northern and eastern portions of Shan State). More recently, however, concessions have also targeted areas where smallholder farms have historically dominated the rubber sector such as in Rakhine, Mon and Kayin States, and Tanintharyi Region. Concessions are almost exclusively granted to private Myanmar companies, but they are oftentimes financed by foreign capital, especially for rubber projects backed by Chinese companies in the north. There are few completely foreign-owned agricultural operations in the country due to high taxes and the restrictive business environment, although this is beginning to change (Woods 2015a). This may begin to change as the country continues to open its doors and economically liberalize.

Concessions can be granted for up to 50,000 acres and for periods of 30–70 years. By mid-2013, 5.2 million acres had been granted (Woods 2015a). Large agricultural concessions are mostly channeled through military-favored companies such as Yuzana, Htoo Trading, Dagon and Max Myanmar (BEWG 2011). The success of concession-based plantations is also questionable – investors have been cheated by being sold poor seeds, poor or faked budded seedlings, or offered unfair prices. Additionally, there is a lack of technical expertise and knowledge about rubber and a lack of fire control in Shan State, which has resulted in the loss of rubber trees (LNDO 2009).

The most significant negative social and ecological impacts of concessions is that they often lead to the expropriation of farmers’ agricultural and forest lands and associated resources and ecosystem services. Rubber concessions often target ‘wastelands’ in upland areas, which are typically household swidden cultivation areas and fallow lands. Such lands are also important for NTFP collection and livestock grazing, key components of local livelihoods, especially for landless rural populations. Even lands targeted under China’s Opium Substitution Program were mostly not used for opium production, but for other alternative land uses (Woods 2012). In some cases in Wa region, rubber plantations were established on farmland taken from communities and then the families were relocated and forced to work on these plantations (Kramer 2009). The dispossession of farmers’ land occurs in part due to weak land tenure for smallholders in the legal regime, the lack of recognition of collective and customary tenure rights, and the ability for the government to rescind land-use rights if certain use conditions are not met (Global Witness 2014). Most households in rural upland areas have not formally registered their lands, partly because customary land tenure used to be sufficient for protecting lands, but also because systematic land registration has not reached the uplands in most ethnic states (BEWG 2011). Additionally, there is no effective system for issuing Land Use Certificates for communally or collectively managed lands under customary tenure arrangements.

The main potential for estate plantations to alleviate poverty is through the provision of wage labor. However, wage labor provided is rarely adequate or commensurate with the resources and ecosystem services lost (Woods 2012). Additionally, farmers often have little choice but to work on plantations – in Wa region, the opium ban put in place by Wa authorities, influenced by the Chinese government, means that farmers have few other options for cash income, and also because Wa authorities have forcibly moved people to areas near to rubber plantations to supply sufficient labor, effectively forcing people to work on the plantations (Kramer 2009). According to a UN worker, local Wa authorities coerce about 10% of the village household labor force to move to the rubber plantations for 4–5 months per year, during a time in the year when farmers need to plant rice and other subsistence crops (Noam 2010). An international aid worker based in Wa territory said that “There is not a single household [in this township] that does not have to contribute work on the rubber plantation. They are forced to work, but they receive some payment.” (Kramer *et al.* 2009, 33). The forced laborers work five acres per person and receive about 5 yuan (USD 0.73) per day. Finally, many of the hired wage laborers are ethnic Burmans migrating from other parts of the country for work.

Labor rates on plantations in the Wa region on average are higher than the above case, but still low at 2500 Burmese Kyat (USD 2.50) per day, often because wages are paid through local authorities, who pocket part of the money. In other areas, such as Kachin State, farmers forced off their lands are often not hired back as laborers because concessionaires are more interested in hiring ethnic Burmans from other parts of the country who have experience of working with rubber crops (Noam 2010). This has led to the migration of Burman Burmese from the south to the north, creating conflicts with local ethnic minority farmers (TNI 2010). While wage laborers on rubber plantations do not directly bear the risks of price crashes, they would not be hired when prices are low and tapping is not occurring.

Rubber concessions often lead to significant environmental impacts, especially deforestation and loss of biodiversity. One reason for this is that rubber plantations are sometimes used as a cover for a logging operation and therefore target areas with high quality timber (Woods 2015a). Companies that gain land concessions for the timber leave after logging the forest and selling the wood on the black market (BEWG 2011). Rubber concessions can also lead to a loss of ecosystem services, which are particularly important for the rural poor.

In sum, estate rubber plantations by agribusinesses on land granted via state land concessions is far from a green form of rubber production due to the significant negative social and environmental impacts that commonly occur. Rather than alleviating household and community-level poverty, rubber concessions are more likely to increase poverty. They additionally disempower households and communities by expropriating their lands and impelling them to become dependent upon the company to make a livelihood as wage laborers. Rubber concessions tend to degrade rather than maintain ecosystems through deforestation, loss of biodiversity and ecosystem services, and damage to landscapes and pollution.

4.3 Contract farming

Rubber contract farming is not as predominant as smallholding and concessions in Myanmar, but does occur in some areas and thus is worth reviewing briefly. However, there is a lack of information on how contract farming operates, apart from a few cases, and thus this an area that necessitates more research. One area where contract arrangements are in place is in the Wa region of eastern Shan State. Contracts are signed between Chinese businessmen and Wa authorities whereby the investor receives 65% of the rubber revenue while the villagers receive 35%. The Chinese company provides technical expertise as well as seedlings, fertilizer and other capital expenditures, while the local government or people's militia authorities provide land, which is often confiscated from farmers, and labor, which is often forced. The Chinese company pays villagers wages to establish and maintain the plantations, although the labor is paid for via local authorities rather than directly to farmers, thus laborers earn only a fraction of what is paid (Kramer 2009).

Another type of informal rubber contracting arrangement reported by the Lahu National Development Organization (LNDO 2009) in Wa district is where a commander in the United Wa State Army (UWSA) provides rubber seedlings to villagers to plant on their own lands, paying them 3 Thai Baht per tree planted and orally agrees to give the villagers 30% of the profit at the time of harvest. However, forced labor is also common in the UWSA-controlled areas (Kramer 2009).

One reason that companies are increasingly engaging in contract farming is because agricultural concessions are not performing that well due to their geographical location on marginal lands and their lack of support from the government. However, the companies already have obtained agricultural commodity export quotas, so they want to take advantage of them. The company provides the inputs (loans for chemicals and seeds), while the farmer provides land and labor. The businessmen then export produce from the farmers, a way of compensating their financial losses from the concessions. In another contract farming arrangement, the farmers work on the company's concession in exchange for rent, a form of share-cropping, but this provides little benefit for the farmers (BEWG 2011).

5 Greening rubber: Opportunities and challenges

The review above has shown that the social and ecological dynamics of rubber production in Myanmar have a mixed record – while smallholding rubber production has improved livelihoods in the south, large-scale agribusiness plantations have had generally negative impacts upon household economies and environments in the north. As a result, there are a number of challenges for achieving greener rubber systems that include environmental and social protection, maintaining and enhancing ecosystems while alleviating poverty and empowering rural producers, but there are also a number of opportunities as well. This section is separated into two sub-sections. The first provides a conceptual overview for what an ideal ‘green rubber’ system might look like, while the second reviews a number of different governance strategies for achieving such a system in the Myanmar context: traditional state-led regulatory mechanisms, community-based mechanisms, and novel or emerging regulatory mechanisms.

5.1 Conceptualizing green rubber systems

As defined in the introduction, green rubber systems can be understood as rubber production and trade that supports the maintenance and/or enhancement of ecosystems, and that contributes to intra-household empowerment of women and poverty alleviation at both the household and community scale. Such a broad definition means that there are a number of different ways in which rubber systems can be more or less ‘green’. In this section, an ideal form of green rubber is described, which can be used as a point of comparison for the rubber production systems that actually exist in Myanmar and potentially as a goal for the development and evolution of rubber in the country. This ideal form of green rubber production would be smallholder-controlled production, using agroforestry or mixed cropping methods, and organized through a production or marketing cooperative, receiving technical and financial support from the state or non-government bodies. Additionally, rubber production should be spatially planned and zoned in a way that it does not replace intact, dense primary forests, but rather leads to the generation of a dynamic and diverse agroforestry landscape of mixed land and integrated land uses. Each of these various aspects of such a green rubber system are described below. These dimensions are not specific to Myanmar but may potentially be applied to the Myanmar context.

Smallholder production has the greatest potential to provide benefits directly to the household and alleviate poverty. Smallholder rubber is not just an ideal – the majority of rubber production in the largest producer countries comes from smallholders: 93% of the sector in Malaysia, 90% in Thailand, 92% in India, and 85% in Indonesia (Global Witness 2014). Not only can smallholder production increase incomes, it can do so in a way that empowers households and communities as they maintain control over the production process, most importantly over their lands and labor, in comparison to the loss of power many experienced when working as wage laborers on large-scale plantations. However, it is important not to assume that this is always the case and further research is needed in the case of Myanmar to better understand the actual benefits to smallholders, including how much control they maintain over the production and sale of rubber.

Smallholder rubber production has been shown to be more effective when organized in production and marketing cooperatives (Global Witness 2014). Cooperatives have played an important role in the rubber industry of India, which is the fourth largest producer of rubber globally.⁸ In the 1960s, the Rubber Board of India helped support the organization of district-level rubber cooperatives through organizational and financial support. In the state of Kerala, these cooperatives helped to improve the

8 Indian Natural Rubber Board Market Promotion Department. <http://www.indiannaturalrubber.com/AboutINR.aspx> (accessed 1 November 2015).

efficiency and productivity of smallholder rubber systems, enabling them to achieve a lower cost of production and better prices for their products compared to non-members. Rubber growers adopting a group approach could produce superior grades of rubber due to training from the Board and provision of facilities for processing good quality rubber. Growers were also more likely to adopt new technologies due to financial support from the Rubber Board, as well as the strengthened bargaining power from being in the cooperative (Anjula *et al.* 2012; Varghese 2012).

From an environmental perspective, there are still a number of problems with smallholding production similar to those of large-scale plantations – agroforestry is one strategy of reducing environmental impacts, while also reducing the social risks of production.⁹ Discussions of rubber agroforestry models are often based upon the model of ‘jungle rubber’ from Indonesia, which is a balanced, diversified system derived from swidden cultivation in which planted forests with a high concentration of rubber trees replace swidden fallows (Gouyon *et al.* 1993). Most of the income is derived from rubber, complemented with temporary food and cash crops during the early years. Perennial species that grow spontaneously with rubber provide fruits, fuelwood and timber, mostly for household consumption, and overall the system requires less input and labor (Gouyon *et al.* 1993). Since the 1960s and 1970s, with the development of high-yielding clones, the traditional jungle rubber system, which uses seed-derived planting material, has become much less efficient compared to monoculture systems (Penot 1999), and consequently most farmers now practice monoculture. However, research by ICRAF has shown that high-yielding rubber clones can be combined with swidden cultivation without loss of latex productivity (Wibawa *et al.* 2006).

However, there are other types of rubber agroforestry or mixed cropping systems, some of which can be more productive and economically viable, such as mixed cropping systems in southern Thailand, as well as in Malaysia (FAO 2002). Thailand is the largest producer of rubber in the world, producing 3.5 million metric tonnes annually, almost a third of total global output during 2012. The Thai government has promoted Rubber Integrated Livelihood Systems, a program through which smallholders are supported to combine rubber with livestock, fruit, fisheries, rice and other crops (Viswanathan 2008). There are four main types of rubber agroforestry or mixed cropping systems in southern Thailand (Somboonsuke *et al.* 2011):

1. *Rubber–food intercropping systems*: Short-lived plants such as pineapples, chilies, bananas, rice, sweet potatoes, long beans and maize, can be grown in between the rubber tree rows for up to 3 years before the trees shade out the crops.
2. *Rubber–fruit cropping system*: Fruit tree species, such as guava, gnetum, long kong, salacca, mangosteen, durian and livistona, can be grown in between the rubber tree rows throughout the whole productive period as the fruit trees grow up with the rubber trees and thus continue to gain sunlight.
3. *Rubber–timber species systems*: Timber species such as neem (*Azadirachta indica*) and teak can be grown in between the rubber tree rows throughout the life of the rubber trees.
4. *Rubber–livestock farming systems*: cows, poultry, swine, goat and sheep can be raised in the plantations once the trees are older than 18 months. An average of 2–3 livestock can be raised per acre.

One of the main benefits of agroforestry and mixed cropping systems described above is that they diversify income and subsistence, thereby increasing the economic resilience of the farming system. Farmers can rely upon other trees, crops, or livestock for income or consumption when rubber prices are low, thus creating a buffer for farmers’ incomes against price fluctuations. In Indonesia, when smallholders combine the production of rubber and rice, rubber provides income to meet needs for purchasing market goods while rice meets subsistence needs – this provides flexibility to smallholders in that they can abandon rice cultivation when rubber prices are high but return to it in economic downturns. This diversity is perceived by smallholders as important – local farmers surveyed in Indonesia by ICRAF (2011) found agroforestry to be the most important use of land in comparison to both monoculture and simpler rubber crop systems, as it could provide a range of sources of income and food.

⁹ Agroforestry can be defined as the production of trees and crops or animals in the same area, either at the same time or in rotation. Agroforestry integrates trees, plants and animals in a long-term, productive system, maximizing land use (Somboonsuke *et al.* 2011).

The other main ‘green’ dimension of agroforestry and mixed cropping systems is their ability to maintain and even enhance ecosystems. Such systems have a positive impact upon soil quality, which leads to increased tree productivity – intercropping improves the soil due to nitrogen inputs from other crops, thus improving performance of the trees (Webster and Baulkwill 1989 cited in Douangsavanh *et al.* 2008). One study in China showed that rubber trees yield more when grown with other crops than on their own in a monoculture plantation because fertile topsoil is lost in monocropping due to erosion, leading to lower yields overall and over time (Cardinale *et al.* 2011). Small-scale and diverse rubber systems can also reduce detrimental effects of monoculture rubber plantations on species diversity and ecosystems. Species diversity is higher in agroforestry systems than monocultures and studies have shown that agroforestry systems can play an important role in the conservation of primary forest species (Cotter *et al.* 2008). Finally, mixed cropping systems, such as a tea–rubber intercropping system in Xishuangbanna, China, have been shown to sequester atmospheric CO₂ and increase soil organic carbon better than monoculture rubber (Zhang *et al.* 2007).

5.2 Governance mechanisms for promoting green rubber

There are a number of different governance approaches and mechanisms through which the types of green rubber systems described above could be promoted in Myanmar. In this section, we focus on three broad avenues for promoting green rubber: traditional state-led regulatory mechanisms, community-based mechanisms and novel or emerging regulatory mechanisms. All three mechanisms face significant challenges in the Myanmar governance context, but nonetheless should be promoted and could be more effective if promoted concurrently. Additionally, it is important to learn lessons from the experiences of neighboring countries that have a larger sector of rubber production. Changes that could be made in Myanmar would now have greater impact as the expansion of rubber in Myanmar has just begun.

5.2.1 Traditional state-led regulatory mechanisms

Traditional state-led regulatory mechanisms are discussed first as they are likely to have the largest impact considering the powerful role of the state in the economy. As reviewed in section 3 on the policy context, there are a number of dimensions of Myanmar government policy and legislation that create a bias toward large-scale rubber investors and against smallholding producers. If smallholding rubber production is to be promoted instead of large-scale estates, major changes in policy and legislation need to be made in the areas of land tenure security, financing, technical extension and marketing.

First, farmers without land tenure security will constantly experience difficulties growing rubber. Farmers without secure land tenure will have difficulties securing access to loans and finance. More importantly, their land may be confiscated for large-scale plantations or concessions for other resource projects. If farmers are not confident that they will have long-term access to land then they may not wish to cultivate a long-term crop due to the risk of losing the land and trees at a later point in time, especially if they are deemed not to have legitimate long-term land-use rights. Therefore, farmers’ land tenure security needs to be strengthened, for all types of land including *taungya* fields and fallows, communal lands and lands held under customary tenure. Strengthening land tenure can create an essential basis for encouraging farmers to engage in growing long-term crops like rubber. Additionally, there is a large portion of the rural population that is landless and would need access to land to produce rubber. The VFV Law could potentially be used to provide social land concessions to landless people.

Second, farmers need to have access to financing in order to be able to grow rubber. The investment in seeds or seedlings, fertilizer and tools alone is high for farmers, plus they need to be able to survive during the 7 years prior to harvest – rubber is a big investment for poor farmers and to engage in it they need support. Countries with a strong smallholding rubber sector have some sort of state financing support (Fox and Castella 2013). At present, state-backed financing in Myanmar is largely channeled toward larger private companies rather than smallholders. While some financing goes toward smallholders, it is primarily only provided for lowland, paddy rice production (Woods 2015b).

Third, countries with a successful smallholding sector have agencies that provide technical extension to farmers (Fox and Castella 2013), without which they may not be able to grow, or might produce suboptimal quality rubber. This aspect is particularly important if seeking to promote agroforestry or mixed cropping models of rubber production that require a high level of technical knowledge of cropping systems that farmers do not yet possess. Fourth, the state can play a role in supporting farmers to market their products effectively, especially by supporting the establishment of cooperative groups so that they can bargain for higher prices.

Another important role that the state can play is in processes of spatial planning of economic activities and land uses to ensure that rubber does not replace intact primary forest and thus lead to unnecessary deforestation. Spatial planning efforts are part of the ongoing revisions to the Land Law and thus spatial planning of rubber to reduce environmental impacts could be built in to this process. Land-use planning processes can be used to ensure that rubber is planned out for locations that are not forested or have sparse forest or tree cover. Land-use planning processes can also be used to ensure that rubber is planted on lands that are ecologically appropriate for rubber production. An important caveat, however, is to recognize the importance of other non-forest land uses that could be replaced, such as *taungya* fields and fallows, that are labeled in policy documents as ‘wastelands’ but play important roles in food security and livelihood resilience. It is important to pursue land-use planning as a participatory process, as envisioned in the draft National Land Use Policy.

Finally, the state can play an important role in promoting and establishing rubber cooperatives at the village level, or among several villages, and ensuring that benefits from the crop are shared equitably in such arrangements. However, different terminology may need to be used – cooperatives is a tainted concept because of the forced cooperatives in lowland villages during the socialist period. As discussed above, cooperatives can be an effective approach for compensating for assets that households lack at the individual level, such as land, labor and capital, so that all households in the village can engage in production. They are also particularly useful for marketing products collectively, so that the community can negotiate a higher sale price than a single household could independently. Sometimes, these types of cooperatives might emerge organically or informally, but in many other cases the government could play a role in supporting their establishment. Setting up a cooperative in a way that is appropriate for villagers’ livelihoods, and has a fair and democratic governance structure is challenging and requires external guidance, carried out in a participatory way that ensures that villagers’ inputs are incorporated and that they provide their free, prior, and informed consent throughout the process. A non-state organization that could play a role in supporting the establishment of cooperatives, as well as in supporting access to technical extension and credit, is the Myanmar Rubber Planters and Producers Association (MRPPA). They work to disseminate up-to-date information on rubber technologies and market information and prices, and seek to improve the income and living standards of those involved in the rubber industry. Currently, though, MRPPA is comprised of large private rubber companies and thus their focus and group composition would have to be significantly changed in order to support smallholders and cooperatives.

5.2.2 Community-based mechanisms

Communities can play an important role in the governance of rubber production, including decisions as to whether rubber should be grown at all on their lands. However, the opportunities for communities to play such a role are limited in Myanmar due to the constraints and challenges of self-governance of communal forests and land. One of the most significant challenges is weak land tenure and the common threat that their lands might be lost to concessions or some of the types of contract farming described above. Communities often have little input into these processes.

Communities could play a much stronger governing role if land rights and land governance were strengthened. Strengthening of household and communal land tenure could be accomplished in a number of ways as described above, particularly by recognizing customary and communal land tenure. While recognizing customary land tenure is important, an important caveat is that customary systems have been weakened in many parts of the country due to war, conflict and internal displacement, which has affected traditional social systems and related land-management practices (BEWG 2011).

Communities are in the best position to decide which types of land are most suitable for conversion to cash crop production, albeit with support from technical agencies regarding environmental dimensions of land-use conversion. Communities should be given the rights to make informed decisions as to whether to grow rubber, how much to grow, and upon what lands. An important process through which this can occur is the continued implementation of community forestry throughout uplands, as described in section 3. Community forestry has proven to be an effective strategy for enabling communities to refuse to provide land for rubber concessions and thus it strengthens communal land tenure (BEWG 2011). Community forestry has thus far only focused on planting high-value timber species, but could potentially be a future strategy for establishing agroforestry systems, including rubber.

Community forestry could also play a role in generating collective production and marketing of rubber. Communal rules and institutions for managing the forest could potentially be applied to rubber cultivation. This would enable communities to produce rubber more efficiently, improve their chances of negotiating fair contracts with rubber companies, and to sell latex at a higher price.

5.2.3 Novel or emerging regulatory mechanisms

There are some novel and emerging regulatory mechanisms that could potentially play an important part of the process of moving the Myanmar rubber sector closer to 'green' systems. These include sustainability initiatives led by the private sector, PES schemes and the program for Reducing Emissions from Deforestation and Forest Degradation (REDD+). Such mechanisms would likely be most effective if integrated with the state-led and community-based mechanisms described above.

Guidelines are slowly being developed for the global rubber industry to rein in the worst social and environmental impacts of rubber plantations, with the establishment of the 'Sustainable Rubber Initiative', which was endorsed by the World Rubber Summit in Singapore in May 2013. The aim of the initiative is to define a set of sustainability standards for rubber production to be implemented by all industry stakeholders along the supply chain. In addition, some tire companies, such as Michelin, want to minimize risks associated with sourcing natural resources, including rubber, and have developed independent sourcing policies applied throughout their supply chain to do so (Global Witness 2014).

PES and REDD+ are two other novel regulatory schemes that could potentially address some of the problems faced by farmers and communities engaged in rubber production or impacted by rubber land concessions. PES can provide an income to farmers who maintain or enhance ecosystem services through improved cultivation practices. In cases where investors use farmers' or communities' lands to plant rubber, payments could be made to the farmers and communities for ecosystem services foregone, such as the collection of NTFPs, firewood and construction wood. Payments as part of REDD+ could potentially be used to dissuade farmers and rubber companies from converting intact primary forest to rubber plantations if there was a great enough financial incentive. There are doubts, however, as to whether REDD+ could be devised in a way that effectively motivates farmers to maintain or increase natural forests as the payments to farmers may be too small to motivate them to switch from rubber (Fox *et al.* 2014; Wong *et al.* 2014). Additionally, REDD+ has the potential to be misused in order for politically powerful acquirers to dispossess rural peoples of access to land, as has been shown to be the case in many other developing countries (Fairhead *et al.* 2012).

5.2.4 Implementation and evaluation of green rubber governance

In order to implement and evaluate traditional state-led regulatory mechanisms, community-based mechanisms, and novel or regulatory mechanisms, it is important to develop specific criteria for measuring 'green' rubber in comparison to non-green rubber. Some of the broad dimensions of green rubber systems have been outlined above in section 5.1, including:

- Smallholder or collectively organized rubber production systems that enable producers to earn the majority of revenue from production and increase their income.
- Agroforestry models, which (a) diversify income and increase farmers' socioeconomic resilience, and (b) enhance soil quality, better sequester atmospheric CO₂ and better maintain species diversity.
- Land use and landscape zoning measures, which ensure that rubber is planted on ecologically suitable lands and does not lead to the clearance of dense forest areas.
- Strengthening of land tenure security and land allocation to landless peoples for smallholder rubber production.

These aspects of green rubber are not definitive, by any means, and are open for debate and discussion. It is important to arrive at consensus as to how rubber can and should be 'greened', based upon the perspectives and inputs of key stakeholders. Once the broad dimensions of what constitutes green rubber production have been agreed upon, it is necessary to detail specific criteria and indicators for green rubber systems, which can be used to measure the effectiveness of various governance approaches for developing green rubber.

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Over the past decade, rubber cultivation has expanded throughout the Mekong region, from established centers of production in Thailand, China and Vietnam to new sites in Laos, Myanmar and Cambodia. Rubber has brought opportunities for increased incomes and livelihood improvement as well as social and environmental risks. The 2012 drop in rubber prices has sent the sector into disarray, halting the expansion of rubber and constraining the ability of farmers and companies to profit. This study examines how rubber production in Myanmar is governed, especially the socio-ecological dynamics of varying forms of production: smallholding, contract farming and large-scale estate plantations. Based upon an analysis of secondary literature and interviews with key stakeholders, it was found that rubber production in Myanmar is for the most part not 'green', meaning that it has not reduced poverty and protected ecosystem services and forested areas. The price crash has prevented most smallholding farmers from increasing their income. Wages on large-scale plantations have been low and only a limited amount of work for Myanmar people is available. Large-scale estates have been developed on land expropriated from communities and have replaced forested areas that provide important ecosystem services to local communities. The paper argues that if rubber is to be truly green then significant changes to production and trade must be made, including minimum price supports from the state, appropriate land use planning measures, the establishment of cooperatives, the protection of community land rights, and the implementation of agroforestry rubber production models.



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