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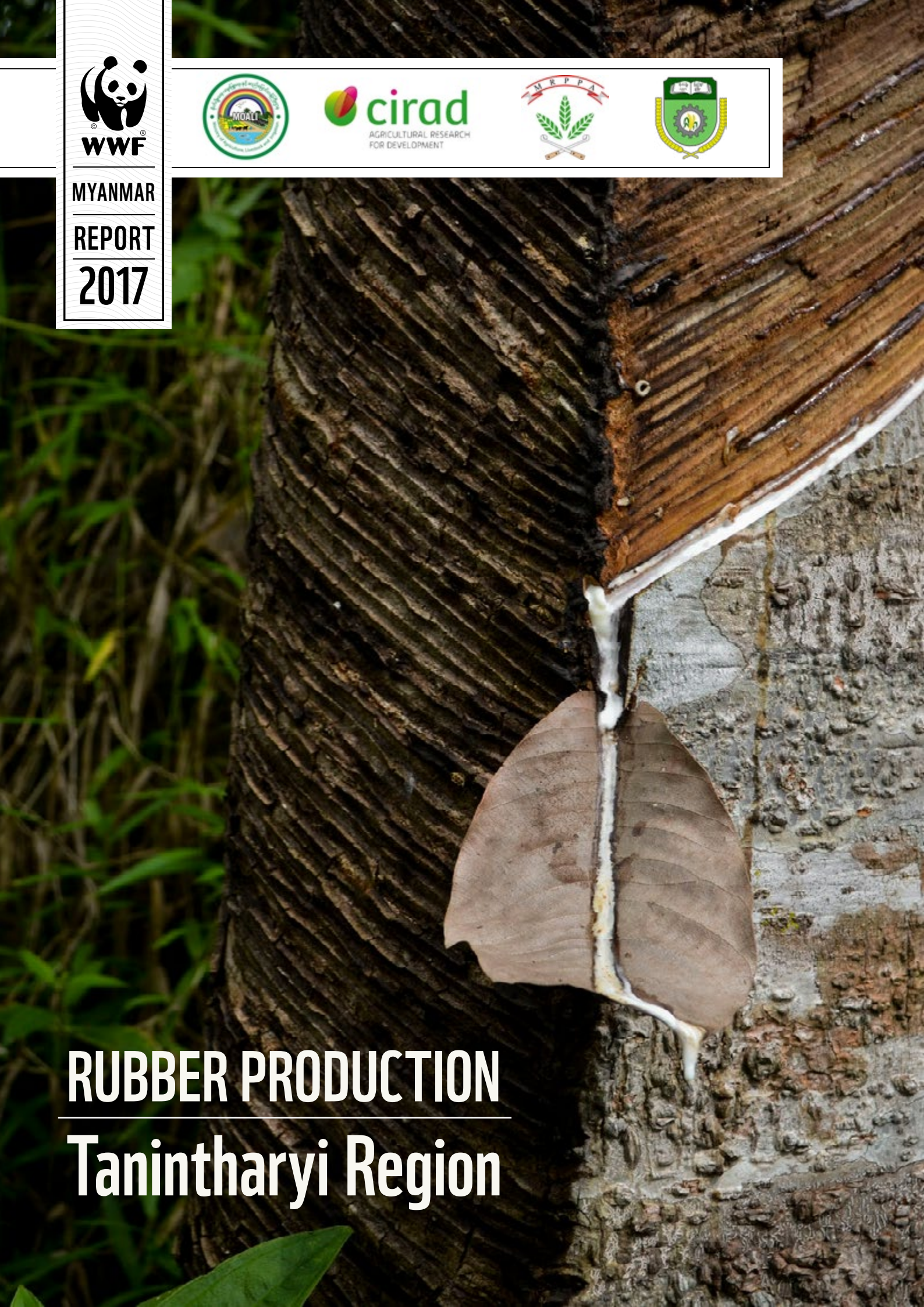

RUBBER PRODUCTION

Tanintharyi Region

Acknowledgements

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Contents

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Foreword

Sustainable rubber is the future and Myanmar has the chance to be a leading player - a win-win-win for the environment, communities and the economy."

Myanmar is one of the most biodiverse countries in Southeast Asia. Its pristine forests, free flowing rivers, beautiful lakes and other natural assets support the livelihoods of millions of people. However, these natural assets are in grave danger. Threats including infrastructure development, illegal logging and rapid rubber expansion are destroying forest habitat that is essential for wildlife, communities and the Myanmar economy.

It need not be this way. The global rubber market is shifting towards sustainability with the two biggest mobility companies, Michelin and General Motors, already committed to sourcing and using sustainable rubber. Others will follow.

Myanmar has a great opportunity to transform its rubber sector by producing sustainable rubber following a zero deforestation approach. This will protect forests, improve the livelihoods of communities, and contribute to the targets of the National Export Strategy for rubber.

This comprehensive analysis will help stakeholders understand the existing dynamics of rubber production and trade and why it is critically important to transform the industry to benefit both communities and environment. The tremendous effort by CIRAD and Yezin University in undertaking this study is truly commendable. The insights and data provided by the Ministry of Agriculture, Livestock and Irrigation (MoALI), and the Myanmar Rubber Planters and Producers Association (MRPPA) have been invaluable in driving important conclusions.

This is the moment for Myanmar to become a leader in sustainable rubber production, a decision that will be applauded by generations to come.

Executive Summary

The aim of this report is to analyse the rubber value-chain in Tanintharyi Region, and provide recommendations to improve the sustainability of rubber production. Tanintharyi Region was selected as the key area of focus due to its role as a major rubber producing area in Myanmar, representing 20% of the country's rubber farmers. The region has a large rural population, high poverty levels and one of the largest remaining tracts of primary forest in Southeast Asia. All of these factors combined make the region vulnerable to unsustainable production, especially if rubber plantation expansion continues in the future.

This report is based on a combination of primary and secondary research. It provides a comprehensive overview of the evolution of the rubber industry in Myanmar, including policies, institutions, regional trade and market prices. Various types of rubber stakeholders were interviewed in Taninthari Region, Mon State and Yangon to analyse the regional rubber value-chain.

Rubber Producers

Information about rubber production was gathered in four villages in the Tanintharyi Region: Thet Kal Kwat, Pyin Thar Taw, Pa Kar Yi and Thaung Thon Lon. The majority of farmers had established rubber plantations on former cashew nut plantations, fallow land or secondary forests in the 1990s. A few farmers specialised solely in rubber production, however for most rubber was part of a diversified farming system that included many crops. Cashew nut and areca nut were the most common alternative products, but some farmers also grew cardamom, black pepper, rice, durian, mango, banana, pineapple, agar wood or iron wood. At the time of the study, low rubber prices had pushed many rubber farmers to stop harvesting latex and to engage in other income-earning activities.

Rubber production methods were analysed for the immature and mature period of the plantation, and practices were compared with those of farmers in neighbouring Thailand. Many similarities could be observed in the planting densities, use of intensive tapping systems and the absence of cover crops. However, rubber yields were lower in Tanintharyi Region, with polyclonal or unselected seeds dominating plantations as opposed to the higher yielding clonal varieties observed in Thailand. Farmers also used less herbicides and fertilisers. Perennial crops were planted as intercrops in Tanintharyi as opposed to short term crops in Thailand. Final rubber products were also different; Thai farmers sold cup coagulum and latex rather than sheets sold in Tanintharyi, thereby limiting labour requirements after tapping. The cost of establishing a rubber plantation was generally lower in Tanintharyi than in Thailand due to cheaper planting material, lesser use of fertiliser and lower labour costs. Production costs were similar for small farmers in both countries.

Rubber Traders

Information about rubber trade was gathered in Dawei city, Mudon (Mon State) and Yangon. A variety of market operators are in charge of buying, smoking, drying, sorting, grading, storing and transporting the various types of rubber traded on the market:

- **Small-scale rubber collectors** located close to the plantations were in charge of collecting rubber and other agricultural products from the farmers. The total number of rubber collectors was unknown as collectors switched from one commodity to the other according to prices. A few collectors owned a vehicle and sometimes a warehouse. They employed temporary and permanent workers, depending on their level of activity.
- **Rubber traders in Dawei** were responsible for collecting the rubber brought by the farmers/collectors; checking the rubber for milk lines and impurities; grading and smoking (or re-smoking) the rubber sheets; storing them in the warehouse and organising the transportation of the sheets to Mudon, where most of the customers were located. None of the traders from Dawei exported rubber themselves. Some of the traders owned a rubber nursery, which allowed them to sell rubber seedlings during periods when rubber prices were high. Traders were also sometimes involved in the trade of agricultural inputs such as fertilisers and acid to process the rubber; other agricultural commodities such as betel and cashew nuts; and/or consumer goods such as motorcycles. The rubber trade formed between 75-100% of their income.
- **Rubber traders in Mudon** had similar operations to the traders in Dawei, but operated at a much larger scale. Rubber was sourced from a larger territory including Mon State, Tanintharyi Region, Karen State, Pago and from a more diversified network of suppliers. Many owned their own rubber plantation and storage facilities. The biggest ones traded exclusively in rubber. None of the traders owned an export license; those holding licenses were located in Yangon, Mandalay or Muse. The initial investment for the warehouses and the amount of cash needed to buy rubber were much higher and some traders spent up to 25 million USD each year purchasing rubber.
- **Exporters in Yangon** were involved in international import and export activities. Various grades of RSS, TSR, and crepe rubber were sold to customers in Asia and sourced from a variety of locations around Myanmar. Rubber traders of various scales were also present in the city, selling a variety of rubber products to factories and industries.

Tanintharyi Region Value Chain

The study revealed that different trade routes are used to export rubber from Tanintharyi Region:

- **Route 1:** 80% of the rubber sold by traders in Mudon (mainly low quality unsmoked and ribbed smoked sheets) goes to Mandalay before reaching China through the border crossing at Muse **(VC1)**
- **Route 2:** 20% of the rubber products go to Yangon, where they are either directly exported as RSS or further processed into TSR and then exported by sea to Singapore, Malaysia and other countries **(VC2)** or used by local industries **(VC3)**

A fourth value chain connected Tanintharyi Region rubber products to Thailand through an unofficial trade route **(VC4).**

Main Issues

The study in Tanintharyi Region emphasises a series of issues:

- **Fluctuating rubber market prices** increase farmer vulnerability and render rubber farming unprofitable when prices are low, to the extent that many farmers stop tapping their trees
- **An overall lack of coordination**[1] within the rubber value chain both between rubber farmers themselves (no cooperatives or associations) and between the farmers and the traders (no contract on farming agreements);
- **The "low quality curse"** explained by the poor quality of the planting material locally available to the farmers, poor harvesting, storage and processing techniques, weak logistic facilities for warehousing and transportation. Poor quality may also be explained by the lack of domestic regulations, grading standards, quality inspection laboratories, and by the heavy dependence of the rubber industry on other countries for processing and further exporting its products. On the market side, demand for low quality rubber from China also plays a role;
- **Complicated land allocation procedures** which were not always well understood by the farmers;
- **Deforestation -** many people were concerned about a loss of forest cover due to plantation expansion, illegal logging, fires, charcoal production and an increasing population. The decline in forest areas was associated with higher temperatures, lower access to water and limited access to various forest products that were important to the households' income and/or well-being. Long term impacts on the wider region also include loss in ecosystem services such as weather regulation and high levels of soil erosion.

[1] With the exception of the Myanmar Rubber Planters and Producers Association (MRPPA), which brings together large plantations and processors..

Recommendations

The following recommendations are proposed to improve the sustainability of the rubber value-chain in Tanintharyi Region:

1) **Provide farmers with technical training and improved planting material to increase productivity and yields:** farmers lack capital to establish and maintain high yielding plantations, so improving smallholders' access to high quality clonal planting material would increase productivity of the rubber plantations. Technical training on farming techniques such as fertilisation and tapping techniques would improve the growth of trees, shorten the immature period of plantations and optimise production.

2) **Improve research and development:** increased university research in rubber products and domestic markets in Myanmar would help identify the best rubber products for different regions and stakeholders.[2] Universities and vocational training centres could help design training programmes in collaboration with the private sector. The training programs could target workers and other operators of the sector and include programs on various subjects, including: production techniques, tire design, and performance analysis.

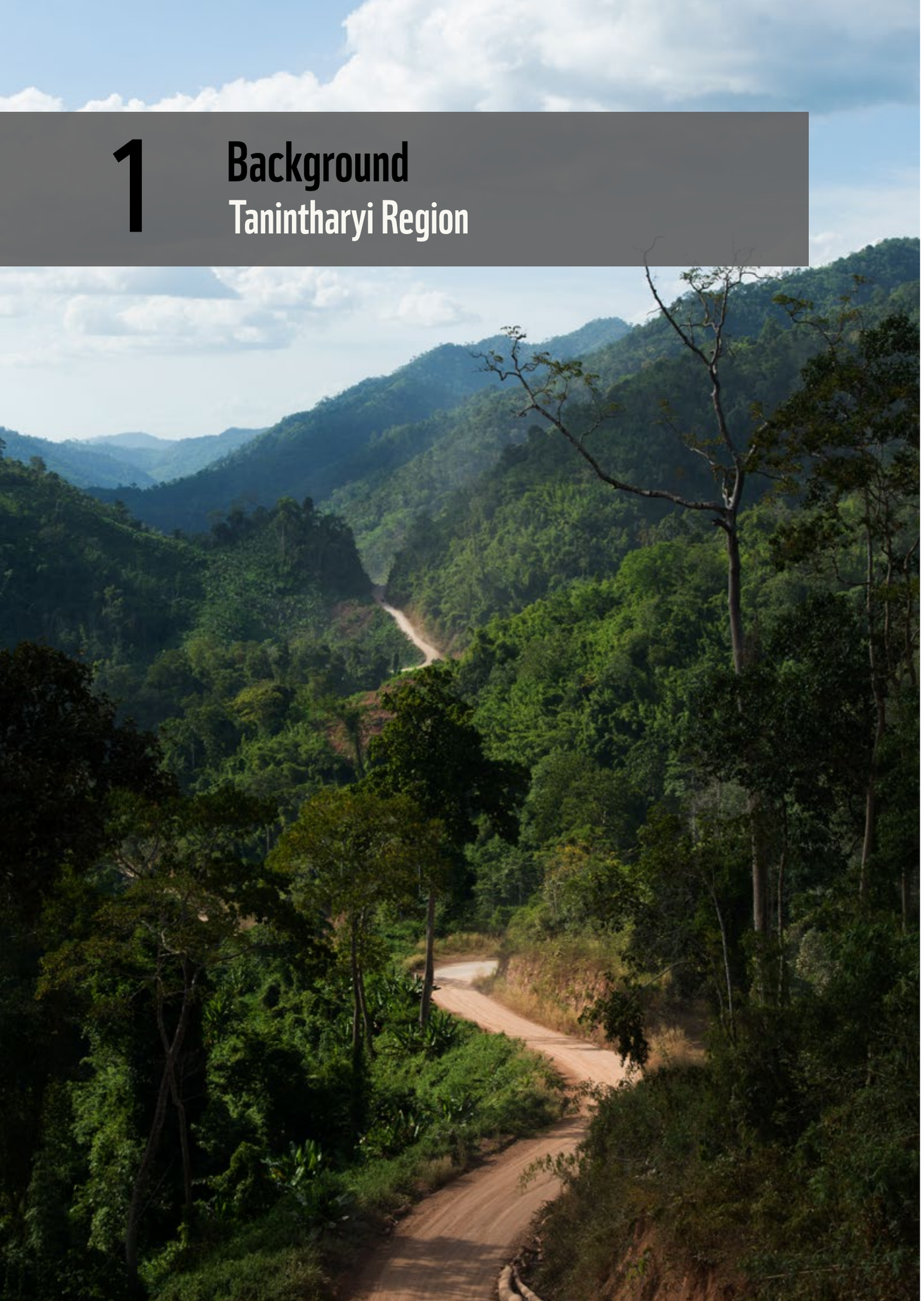
3) **Establish collective action groups:** collective action at the village level would improve the efficiency of rubber production through improved infrastructure (such as collective smokehouses or collective nurseries), improved logistics (such as bulk transport to trade cities) and labour exchange systems. Farmers within well-structured farmer organisations would also become important focal points for capacity building initiatives by government and/or private suppliers to improve access to farming inputs and training.

4) **Develop the use of fair and inclusive farming contracts:** official contracts would encourage the development of stable relationships between the rubber stakeholders. This would reduce livelihood vulnerability for smallholders by enabling farmers to negotiate higher prices in return for guarantees of volume and quality. It would also improve the traceability of rubber nationally, which is key for regulating the rubber industry and ensuring standards are met.

5) **Become a regional leader in sustainable rubber production:** Myanmar could increase rubber sector profits and improve its international reputation by positioning itself as a country that produces deforestation free, high quality rubber. This would appeal to international customers and companies that are increasingly looking for sustainable rubber and give Myanmar a market advantage over other Southeast Asian countries. By focusing on improving the yields and quality of rubber instead of expanding plantations into new areas, Myanmar's natural resources remain protected. This maintains important ecosystem services that benefit people and underpin other sectors of the national economy.

The production of sustainable rubber will become essential in the forthcoming years and will play an important role in attracting financial resources to assist Myanmar's national development.

[2] Most farmers sell unsmoked or smoked rubber sheets, which is a labour-consuming process. This reduces Myanmar's comparative advantage of very low labour costs over neighbouring countries such as Thailand.



1 Background
Tanintharyi Region

Introduction

Rubber *(Heavea brasiliensis)* was first cultivated by smallholders under the British colonial system in the early 19th century (Keong, 1973). There was a long period of stagnant rubber production after World War II, until the government of Myanmar introduced market liberalisation in the 1990s. The opening of the rubber sector to private trade and foreign investment, combined with a rise in international rubber prices, led to an expansion of production in Mon State, Kayin State, and Tanintharyi Region (Kenney-Lazar and Wong, 2016). The expansion of rubber in Northern Myanmar mainly took the form of large-scale rubber concessions directly financed by Chinese investment. In Southern Myanmar, the smallholder model was more prevalent. However, more large-scale rubber concessions linked to foreign investors have been granted in Southern Myanmar since 2010 (Woods, 2012; Lazar, 2016).

Rubber expansion is likely to increase in the future, meaning that the potential social and environmental impacts must be examined. Like other cash crops, rubber plantations can be detrimental to farmers if they do not control the land or the rubber trees, if contractual arrangements are unfair, or when rubber prices are very low (Lazar, 2016). Negative environmental impacts of rubber cultivation include deforestation, loss of biodiversity, surface erosion, loss of soil health, sedimentation of stream flows and increased risk of landslides (Fox et al., 2014).

Tanintharyi Region

One region that is particularly vulnerable to these impacts is Tanintharyi Region. Located in the South of Myanmar, Tanintharyi borders Mon State in the North, the Andaman Sea to the West and the Thai border to the East and South (Figure 1). The region covers over 43,000 km^2 of territory and is divided into three districts: Dawei, Myeik and Kawthoung.

Tanintharyi is one of the least populated regions in Myanmar, with a population density of 32 persons per km^2 and a total of 1.4 million people. Over three quarters of the population of Tanintharyi Region is rural (76%); living in either coastal areas or along one of the rivers. Despite an abundance of natural resources, poverty levels are high in the region; they are 7% higher than the national average, at 33%. Subsistence agriculture, both permanent and shifting, is the primary livelihood in the region.

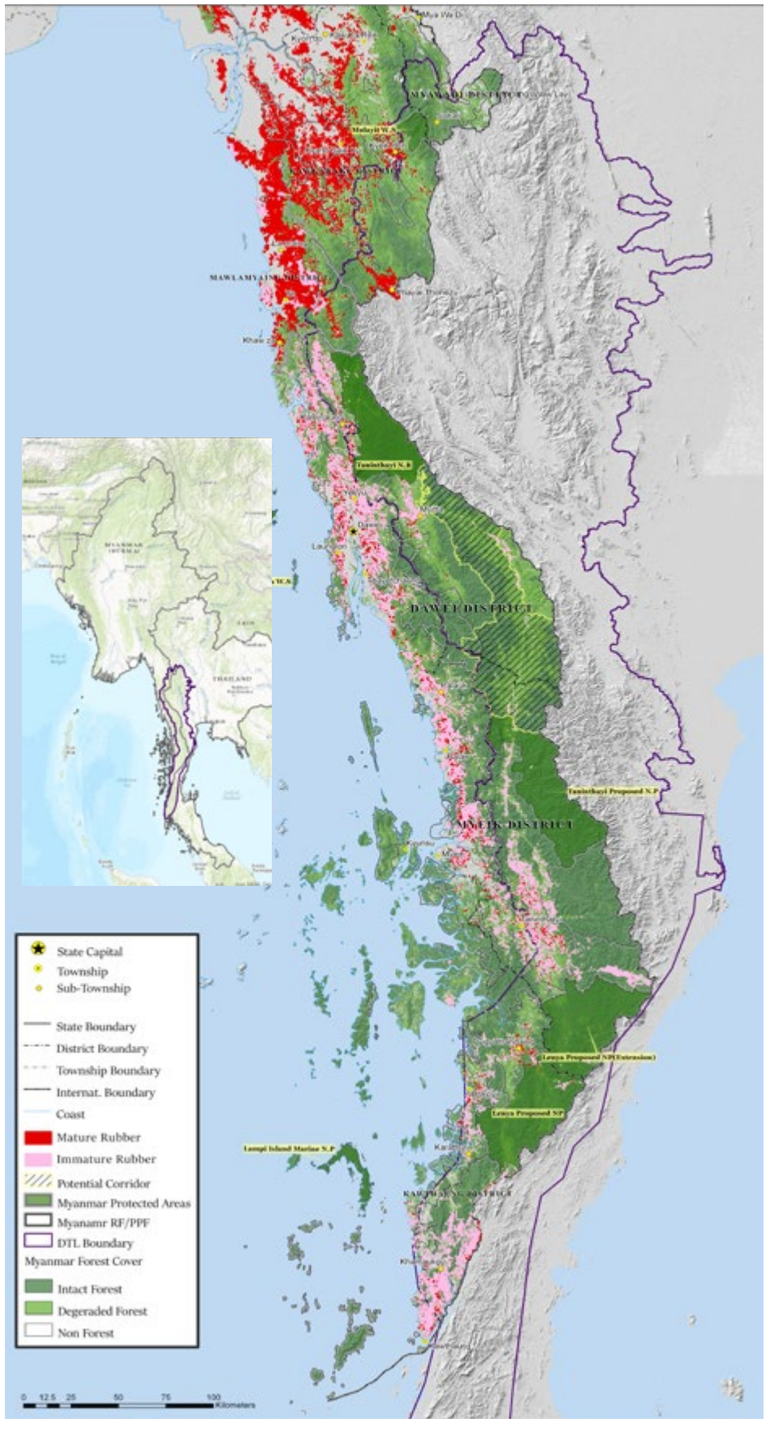
Rubber and oil palm plantations are also a key source of employment as Tanintharyi Region hosts nearly a third of Myanmar's agribusiness concessions (Woods, 2015). Small and medium sized rubber plantations have been developing in the North, whilst large oil palm concessions dominate the South. Studies using multi-sensor imagery have identified that 750,822 ha of the Taninathryi Region (23%) is covered by plantations (Torbick et al., 2015).

Sustainability Threats

Whilst this report focuses on analysing the rubber sector in Tanintharyi and how the sustainability of operations could be improved, it is also important to take into account other threats to sustainability in the region. These include:

- **Oil Palm Plantations:** Over 1.9 million acres of the oil palm concessions allocated to the private sector are located in forest reserves of high conservation value (Woods, 2015). Oil palm concessions are therefore one of the greatest threats to the region's forests. Mismanagement of plantation expansion also increases land-based conflicts.
- **Areas of Mixed Administration (Civil Conflict)**: Despite being one of the longest running conflicts in the world, the conflict in Tanintharyi Region has been inactive since 2012. However, ethnic groups continue to govern areas in the northern and eastern parts of the Region. Areas of mixed administration, where both the Karen National Union (KNU) and the Myanmar government contest control over territory, natural resources and development projects are particularly vulnerable to land grabbing and deforestation.
- **Mining:** Mining of cola, tin, tungsten and iron is another significant industry in the region with Tanintharyi Region supplying up to two thirds of Myanmar's tin and tungsten (UNHCR, 2014). According to TNI (2013), conflict areas in Karen State possess many valuable mineral resources that were targeted by foreign investors willing to take advantage of new ceasefire agreements with ethnic armed groups whose territories contain vast mineral wealth.
- **Infrastructure Development:** One of the three Special Economic Zones (SEZs) is planned to be hosted in Tanintharyi Region, with the aim of creating new job opportunities and promoting technological development. Developed in close collaboration with the Thai government and Thai companies since 2013, this project includes the construction of a deep seaport, a petrochemical plant, an oil refinery and a steel mill, along with the building of a cross-border road to Bangkok. The road link will cut directly across the densely forested areas that lie between Dawei and Bangkok (Figure 2), which will fragment the largest remaining tracts of lowland wet evergreen forest between the Indochinese and Sundaic regions (Donald et al., 2015). This not only threatens the unique wildlife of the region, but also the region's ecological integrity, which both local communities and the national economy heavily rely on (WWF, 2015).

Figure 1: Map of Tanintharyi Region



Source: WWF

2 National Overview
The Rubber Sector

National Rubber Production

Growth of the Rubber Industry

Rubber production in Myanmar is lagging behind other Southeast Asian countries. Thailand, Indonesia and Vietnam accounted for 70% of total global natural rubber production in 2015. Thailand's rubber production grew at a rate of 6.5% annually over five years and the country represented 36% of global rubber production in 2015. In the same year, Myanmar's natural rubber production represented only 6% of that of Thailand's (KPMG, 2016).

However, data from the Ministry of Agriculture, Livestock and Irrigation (MOALI) shows a huge increase (+288%) in the surface area of planted rubber, from almost 560,000 acres in 2005-2006 to almost 1.7 million acres in 2015-2016 (Table 1).

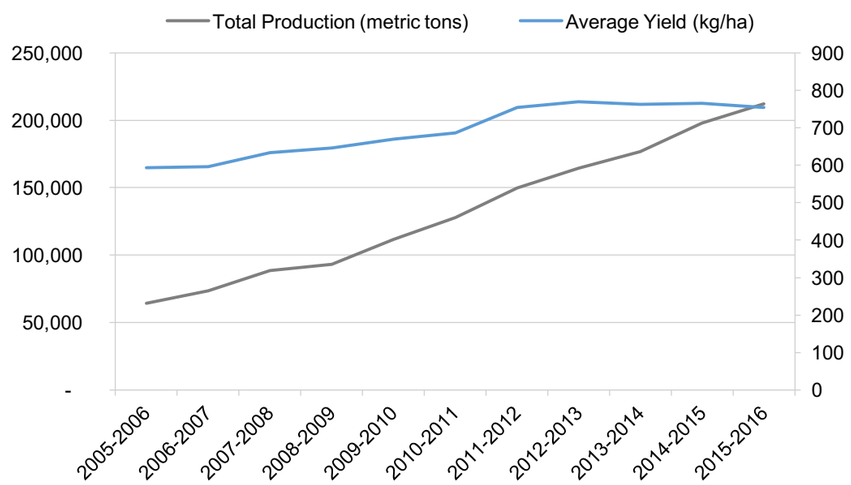
Table 1: Annual rubber production in Myanmar

Year	Planted area (acres)	Productive area (acres)	Average yield (lb/acre)	Total production (metric tons)
2005-2006	558,565	267,180	530	64,238
2006-2007	728,329	303,907	532	73,355
2007-2008	935,800	342,930	565	88,528
2008-2009	1,057,395	356,437	577	93,207
2009-2010	1,143,427	411,688	598	111,673
2010-2011	1,246,531	460,767	612	127,921
2011-2012	1,342,202	490,151	673	149,619
2012-2013	1,435,931	527,693	687	164,426
2013-2014	1,506,867	572,737	681	176,915
2014-2015	1,584,115	639,482	683	198,022
2015-2016	1,607,428	694,278	673	212,089

Source: Land Management and Statistics Department, MOALI (2016)

Only 43% of the planted rubber area was productive in 2015-2016, meaning that over half of the rubber planted areas were either immature or not tapped. As a result, production is likely to grow in the future as large areas of planted rubber begin to reach maturity.

Average rubber yields have not increased significantly in comparison to the volume of production (Figure 2). There has been an increase of 27% over a decade, from 530 lb/acre (595 kg/ha) to 673 lb/acre (755 kg/ha). Rubber yields in Myanmar are much lower than in other Southeast Asian countries such as Thailand (1,500 kg/ha), Malaysia (1,400 kg/ha), Vietnam (1,740 kg/ha) and Indonesia (1,104 kg/ha).



Source: Land Management and Statistics Department, MOALI (2016)

Main Production Areas

Disaggregated figures for 2015-2016 (Table 2) show that Mon State, Tanintharyi Region and Kayin State together represent 87% of Myanmar's rubber production:

- **Mon State** had the largest rubber planted area (491,100 acres), the largest productive area (317,448 acres) and the largest rubber production (105,130 MT). 65% of the planted surfaces were productive in 2015-2016;
- **Tanintharyi Region** had the second largest planted area (343,052 acres) but was the third largest in terms of the volume of rubber produced (32,941 MT). Only 37% of the planted surfaces were productive, which provides the region with opportunity for progression;
- **Kayin State** had the third largest planted area (267,820 acres), but was second in terms of the volume of rubber produced (46,233, MT). A little over half of planted surfaces were productive in 2015-2016;
- **Shan State** had the smallest area of rubber planted areas (183,394 acres) and only 24% of the rubber planted area was productive in 2015-2016. The yields in this region were among the lowest throughout Myanmar.

In 2014-2015, Mon State accounted for 47% of Myanmar's rubber farmers and 31% of the planted areas. Within this state, Thanintharyi Region accounted for 20% of all rubber farmers and 21% of the planted rubber areas.

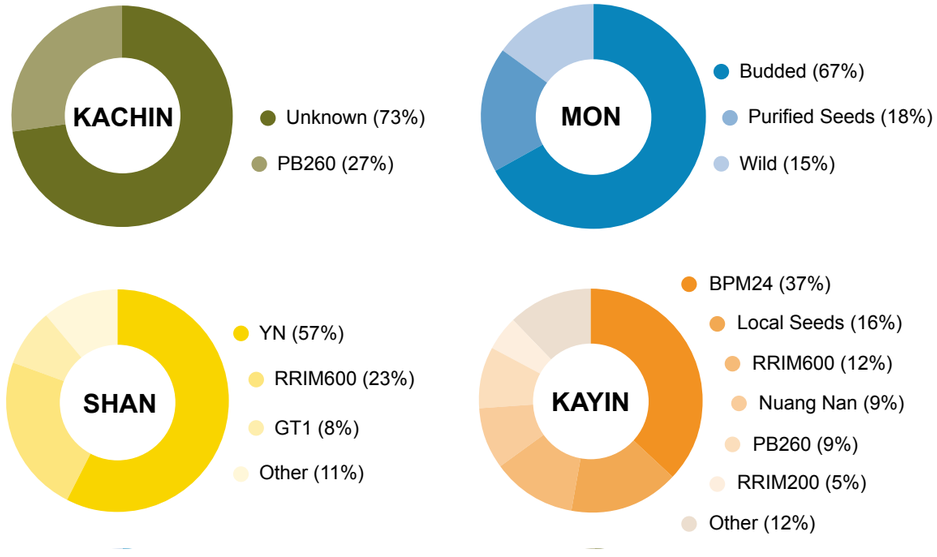
Table 2: Rubber production by region, 2015-2016

State / Region	Planted area (acres)	Productive area (acres)	Yield (lb/acre)	Production (metric tons)
Mon	491,100	317,448	730.11	105,130
Tanintharyi	343,052	128,396	565.60	32,941
Kayin	266,820	139,138	732.55	46,233
Shan	183,394	44,306	460.69	9,258
Bago	116,693	48,993	682.15	15,159
Kachin	78,950	2,039	523.52	484
Yangon	43,415	10,276	420.90	1,962
Rakhine	35,522	2,433	523.95	578
Ayeyarwaddy	35,274	842	681.46	260
Other	13,208	407	457.66	84
Total	1,607,428	694,278	673.47	212,089

Source: Land Management and Statistics Department, MOALI (2016)

Planting material plays a major role in the production potential of rubber plantations, which partly explains the differences in yields observed between the regions. The highest yields were found in Kayin state and in Mon State, where respectively 75% and 67% of the planting material was budded (Figure 3). Yields were much lower in Kachin State, where 73% of the planting material could not be identified. In Shan state, more than a half of the plantations were planted an unknown variety, possibly from Yunnan.

Figure 3: Rubber planting material by region



Source: MOALI (2016)

Rubber plantations are likely to expand further in Shan State, Tanintharyi Region and Bago as these areas are well endowed with vacant land that is suitable for rubber (MMC and ITC, 2015). In Kachin and Shan States, the government and ethnic groups have promoted large-scale industrial agricultural production.

Size and Ownership

State-Owned Enterprises (SOE) represented less than 3% of all rubber planted surfaces and rubber production in 2011. Since the late 1980's, the rubber sector has been dominated by the private sector (Table 3).

Table 3: Ownership of rubber plantations in Myanmar

Year	Planted acres		Total production	
	Private	State-owned	Private	State-owned
1989	90.4%	9.6%	83.4%	16.2%
2007	94.2%	5.8%	94.1%	5.9%
2011	97.4%	2.6%	97.7%	2.3%

Source: Perennial Crops Division, Department of Agriculture, MOALI (2016)

However, Myanmar's land has always been owned by the State. This is a constraint for smallholders because farmers cannot obtain credit from banks to use as investment. Converting the land to private ownership would leverage credit, bring investment in technology and incentivise producers to take better care of their land.

Smallholders with plantations of less than 20 acres represent over 90% of all plantations in Myanmar (Table 4).

Table 4: Plantation size in Myanmar

Plantation size (acres)	Number of plantations	Percentage of all plantations	Cumulative representation
Below 5	22,423	40.2%	40.2%
5 to 20	28,052	50.3%	90.6%
20 to 50	3,791	6.8%	97.4%
50 to 100	950	1.7%	99.1%
100 to 500	419	0.8%	99.8%
500 to 1000	65	0.1%	99.9%
Over 1000	31	0.1%	100.0%
Total	55,731		100.0%

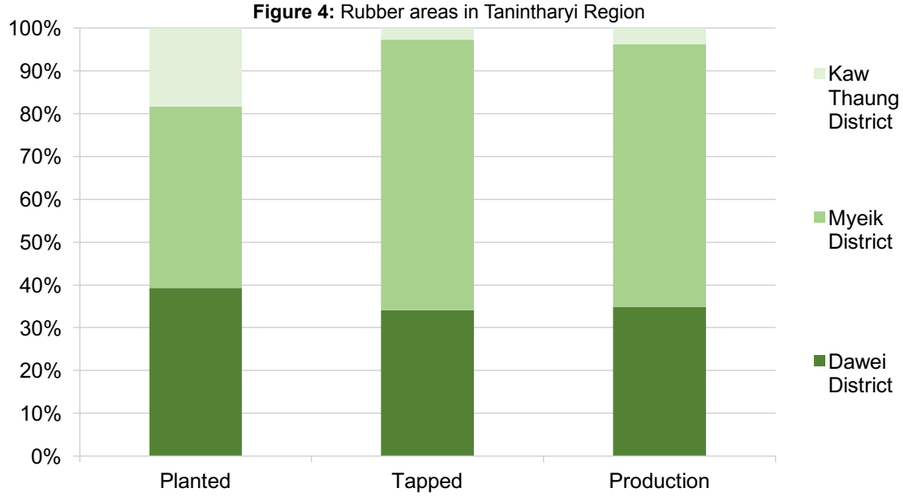
Source: Perennial Crops Division, Department of Agriculture, MOALI (2016)

Rubber Production in Tanintharyi Region

In 2016, rubber trees covered a total area of 343,052 acres in the Tanintharyi Region. The region produced a total of 72 million lbs. of rubber, with an average yield of 566 lb./acres (634 kg/ha). Studies using remote sensing estimated that mature rubber plantations cover 2.2% of Tanintharyi (Connette et al., 2016). Rubber plantations are mainly situated in the Northern part of the region, but only 37% of the rubber trees in this area were mature in 2016.

Myeik District was the biggest rubber producing area in the Tanintharyi Region in 2015-2016, representing 61% of all rubber produced, 63% of all tapped areas and 42% of all rubber planted areas (Figure 4). Dawei district represented roughly one third of the region's total production and total planted / tapped areas. Kaw Thaung represented 18% of the region's planted areas and was more marginal in terms of production, with only 6% of the planted areas being tapped. This district was one of the most recent areas of rubber expansion in the Tanintharyi Region.

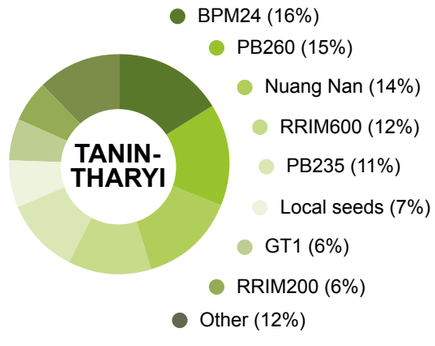
Figure 4: Rubber areas in Tanintharyi Region



Source: Management and Statistics Department, MOALI (2016)

Tanintharyi Region exhibited good clonal diversity in terms of planting material for rubber (Figure 5). However, nearly a quarter of the planting material (21%) had a poor production potential (Naung Nan and local seeds).

Figure 5: Planting material in Tanintharyi Region



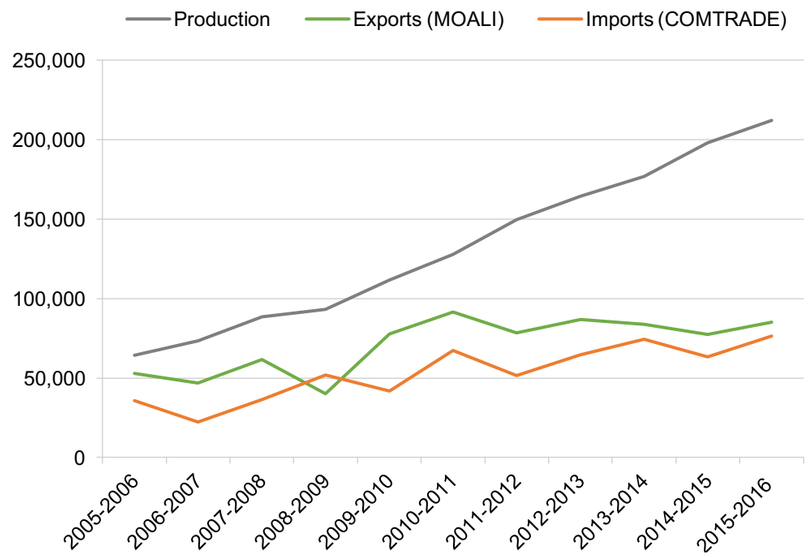
Source: Department of Agriculture

International Rubber Trade

Myanmar mainly exports ribbed smoked sheets (RSS) and technically specified rubber (TSR). In 2012, Myanmar ranked thirteenth in world rubber exports, with a global share of 0.76%. Natural rubber exports grew at a rate of 32%, compared with a global import growth of 20% over the same period (MOC, 2015).

A comparison of official export trade data from the government of Myanmar (MOALI) and data from the countries that import Myanmar's rubber (COMTRADE)[3] provide some interesting insights (Figure 6).

Figure 6: Rubber production and export trends in Myanmar, compared with partner imports (metric tons)



Source: MOALI (2016), COMTRADE (2017)

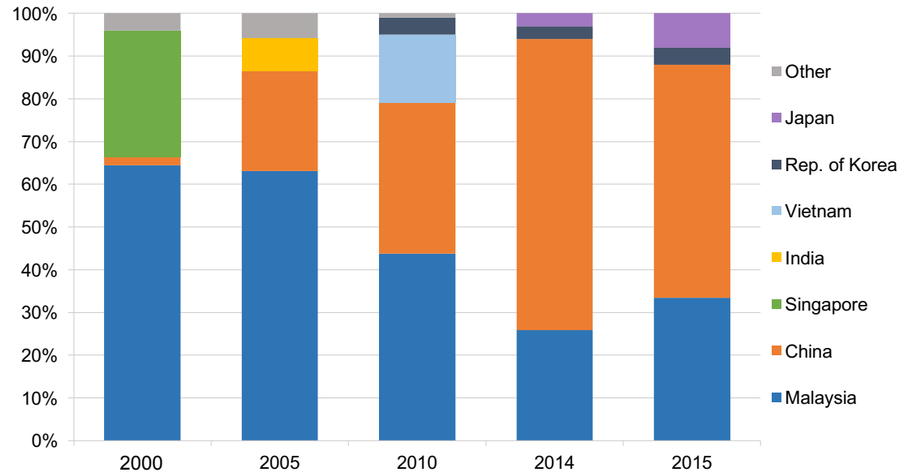
Official trade figures converge overall, despite a small difference of around 8,500 metric tons in 2015-2016. However, there is a widening gap between production and trade. At the start of the decade, 82% of total rubber production was exported. At the end of the decade, only 40% was exported. These production figures are either not accurate, or most of the rubber exported by Myanmar is unrecorded (i.e. illegally traded).

[3] COMTRADE is a repository of official international trade statistics based on the Harmonised System (HS) classification. Depending on economies and years, trade flows have been reported to COMTRADE under different definitions. In this case, the HS-92 nomenclature was used to gain a more complete geographical coverage and time scale.

Key Trade Partners

In 2015, China and Malaysia were the main importers of rubber from Myanmar, representing 87% of trade (Figure 11). Singapore was a major importer of rubber from Myanmar in the year 2000, but there was a major decline over the following fifteen years. Imports by India and Vietnam also declined. Japan and the Republic of Korea were other minor trade partners for Myanmar rubber in 2015.

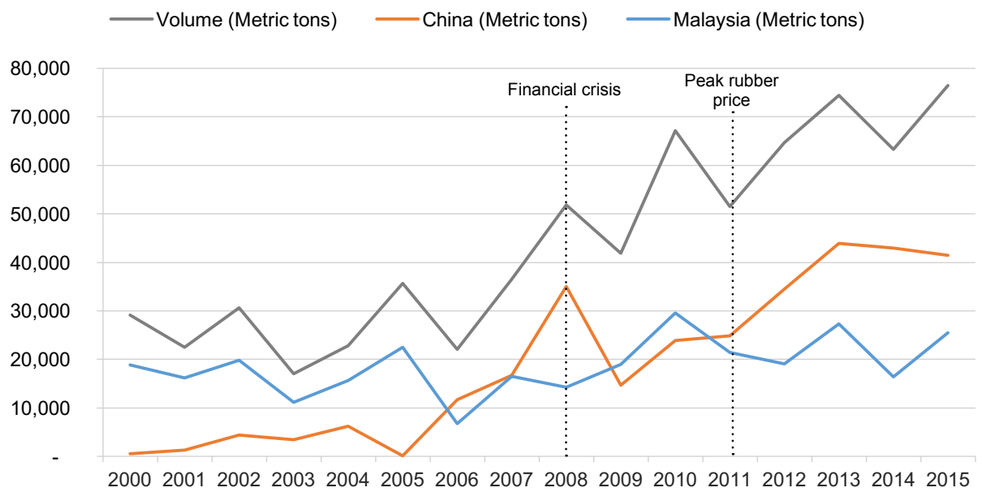
Figure 7: Main importers of rubber from Myanmar



Source: COMTRADE (2017)

An analysis of import data from Myanmar's key rubber trade partners, China and Malayisa, reveals different trends over a fifteen year period (Figure 9). China's import of rubber from Myanmar has significantly increased, despite a temporary decline in 2008-2009 after the global financial crisis. Malaysia imported more rubber from Myanmar than China did in 2000 but Malaysia's imports have fluctuated considerably over the fifteen year period. China overtook Malaysia as Myanmar's key rubber trade partner in 2011. The decline in Malaysia's imports after 2011 can be explained by the falling international price in rubber, as well as unfavourable exchange rates (Myanmar floated its currency from April 2012 onwards).

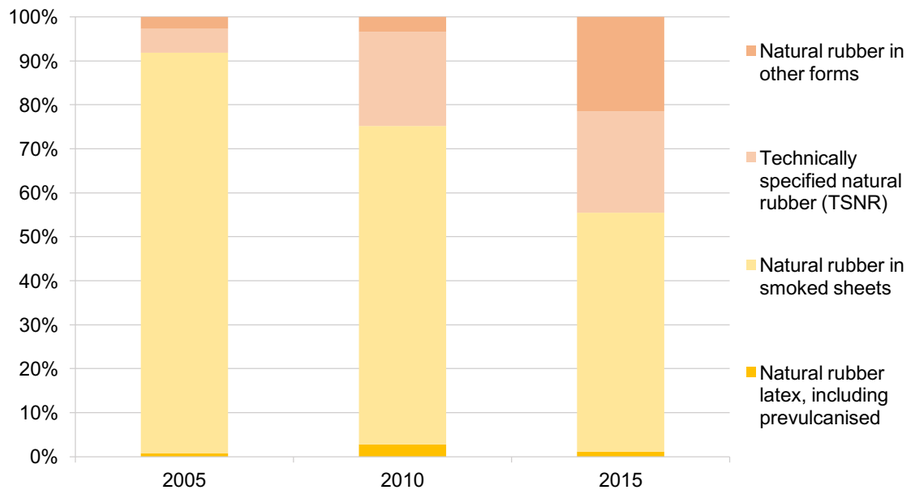
Figure 8: Import trends of rubber from Myanmar (metric tons)



Source: COMTRADE (2017)

There have been changes in the types of rubber imported by Myanmar's trade partners over the past decade (Figure 9).

Figure 9: Types of rubber imported by Myanmar's trade partners



Source: COMTRADE (2017)

Natural rubber in smoked sheet form was the most popular rubber product in 2005, representing an overwhelming majority of trade (91%). However, technically specified natural rubber (TSNR) and natural rubber in other forms have grown in popularity, representing nearly half of rubber imports in 2015 (44%).

Box 1: Rubber products

Once rubber tapping is completed, latex can be collected and either:

- sold as *fresh latex* without any processing
- processed by coagulating, sheeting or drying

Depending on how the rubber sheets are dried, farmers can sell:

- *Unsmoked Sheets* (USS) rubber sheets that are sun dried;
- *Air-Dried Sheets* (ADS) rubber sheets that are dried in a specific type of ventilated room;
- *Ribbed Smoked Sheets* (RSS) rubber sheets that are dried in a smokehouse. RSS are classified from RSS1 (the best grade) to RSS5, depending on the kind of defects that can be observed in the sheets.

After latex is collected for the main production, it can continue dripping for a short period of time and coagulate in the cup. This produces a product called *cup lumps*, which can be sold separately. The quantity of cup lumps varies but does not tend to exceed 25% of the total production.

Tree lace, latex coagulated on the trunk or on the ground can be collected and sold as *scraps*.

In some cases, latex is not collected after tapping. The latex is left to coagulate in the cup, either naturally or by adding coagulating solution. This product can be sold as *cup coagulum*. The coagulum can be collected after each tapping day, or after several tapping days.

At the factory level, fresh latex can be processed into *Concentrated Latex*, *Sheets* (ADS, RSS), *Pale Crepe* or *Technically Specified Rubber* (TSR5 and TSR3), which is also known as block rubber.

Coagulum (*cup coagulum* and *cup lumps*) can be processed as *Technically Specified Rubber* (TSR10 or TSR20) or as *brown crepes*.

USS and ADS can be smoked or included in the process of producing TSR.

Currently, Myanmar only sells two types of natural rubber: Ribbed Smoked Sheets (RSS) and Technically Specified Rubber (TSR). Synthetic rubber is not currently produced in the country.

The Tire Industry

International Tire Market

The tire industry has grown very rapidly in Asia over the past decade. Rubber has been one of the most important and dynamic export commodities due to the rapid growth of the Asian automobile sector, which was primarily led by China. In 2014, the world's top three natural rubber importers were China, the United States and Malaysia (Table 5).

Table 5: Leading importers of natural rubber, 2014

Country	Total import value (USD)	Share of world imports (%)
China	4,951,490	27%
United States	1,954,818	11%
Malaysia	1,783,217	10%
Japan	1,426,569	8%
India	840,978	5%
Republic of Korea	827,982	5%
Germany	798,091	4%
Brazil	494,370	3%
Spain	358,433	2%
France	341,673	2%

Source: *International Trade Statistics*, International Trade Center (2015)

China alone represented 27% of the total volume of natural rubber imports in 2014. The United States was the second largest importer (11%), followed by Malaysia (10%), Japan (8%) and India (5%). Most of the top global rubber importers were also prominent tire exporters (Table 6).

Table 6: Leading exporters of tires, 2014

Country	Total export value (USD)	Share of world exports (%)
China	16,446,634	20%
Japan	6,496,494	8%
Germany	6,295,369	8%
United States	5,622,782	8%
Republic of Korea	4,002,360	5%
Thailand	3,505,808	4%
France	3,353,897	4%
Spain	2,692,294	3%
Netherlands	2,509,184	3%
Poland	2,390,222	3%

Source: *International Trade Statistics*, International Trade Center (2015)

China dominated the global tire market in 2014, representing 20% of world tire exports. Japan was the second largest exporter (8%), followed by Germany (8%), the United States (8%) and the Republic of Korea (5%).

Expanding Domestic Market

Myanmar's tire market has been growing in recent years, due to a developing domestic market for vehicles. The number of registered vehicles increased from 2.1 million in 2010 to 4.4 million in 2014. Two-wheeled vehicles, such as motorcycles, are by far the most popular type of vehicles used in Myanmar. They represent 85% of all registered vehicles, followed by passenger cars (9%) and trucks (3%) (UNIDO, 2015).

According to Solidiance, the compound annual growth rate of the tire market reached 11% between 2008 and 2014. Myanmar's total tire imports reached USD 175.7 million in 2014 (Table 7).

Table 7: Myanmar Tire Imports, 2014

Country	Total value (USD)	Market share (%)
China	78,064	44.4%
Thailand	60,908	34.7%
Singapore	12,460	7.1%
India	12,360	7.0%
Indonesia	6,167	3.5%
Korea	4,376	2.5%
Japan	1,340	0.8%
Total	175,675	100%

Source: *International Trade Statistics*, International Trade Center (2015)

In 2014, Myanmar imported 2.6 million motorbike tires, worth USD 18 million. In the same year, Myanmar imported 1.35 million car and truck tires, worth USD 127 million (First Rangoon, 2015). Tires were mainly imported from China (44.4%), Thailand (34.7%), Singapore (7.1%) and India (7%).

The main tire brands currently sold in Myanmar are: Yokohama (14%), Bridgestone (13%), Maxxis (11%), Deestone (10%) and Apollo (8%) (UNIDO, 2015). Japanese tire brands make up 27% of the passenger and commercial vehicles market, mainly due to the dominance of second-hand Japanese vehicles in Myanmar. Customers have a strong belief that products made in Japan are of higher quality. The remainder of the market is fragmented among a variety of brands that are cheaper, such as: Maxxis (Taiwan), Deestone (Thailand), Apollo (India) and G-stone (China). Premier tire brands, such as Michelin, hold a smaller market share due to their higher prices.

Domestic Tire Manufacturers

Alongside foreign tire brands, four domestic tire factories operate in Myanmar. The three state- and military-owned enterprises have a combined annual capacity of 1.6 million tires. However, these factories do not run at full capacity due to lack of raw materials and up-to-date machinery. Therefore the tires manufactured by these plants fail to meet international standards, meaning the privately owned factory is the only one to export Myanmar's tires internationally:

- **Yangon Tire Factory** is the only privately owned plant in Myanmar and the only factory to export. The factory has been exporting tires by sea to Malaysia for two years, in batches of 800 tires. The company has earned around USD 200,000 in the last two years by exporting a total of 3,200 tires at USD 60 each. This success indicates that it is possible for domestic factories to become capable of exporting tires made in Myanmar.
- **No. 21 Heavy Industry Tire and Rubber Factory** in Thaton is a state owned enterprise (SOE) and the oldest factory in Myanmar; established in 1979 with machinery and equipment from the former Czechoslovakia. The factory is owned by the Ministry of Industry has the capacity to produce 480,000 tires annually (First Rangoon, 2015). The site is surrounded by many rubber plantations so it has good access to key raw materials. It also has a wide range of sophisticated-machines. The factory produces 27 different kinds of tires, including tires for: passenger cars, light trucks, heavy trucks, power tillers, tractors and trailers. It is also able to produce three different kinds of bicycle tires. The design of the tires is very modern, and the tires are very popular. As a result, demand for these products always exceeds the factory's supply.
- **No. 22 Heavy Industry Tire and Rubber Factory** at Belin is a radial tire plant owned by the Ministry of Industry, which started producing in 2010. The factory started operations with loans from China (USD 33 million). The China National Construction and Agricultural Machinery Import and Export Corporation (CAMC) entered into a Joint Venture (JV) to improve the Belin plant (First Rangoon, 2015). The factory has a production capacity of 300,000 tires annually and produces 12 different kinds of radial tires. The factory manufactures finished goods as well as semi-finished tire products. It also does CMP (Cutting, Making and Packing) contract manufacturing in Myanmar. Under this CMP: the factory receives raw material free of cost from a private Myanmar company; manufactures semi-finished tire products; and receives fees for manufacturing the products.
- **The Ywama Tire factory** is owned by Myanmar Economic Cooperation (MEC). The construction of the plant started in Yangon in late 2010 and ended in 2013. Engineering assistance was provided by the Chinese tire machinery manufacturer Qingdao Qingdao Mesnac Co. Ltd. (MESNAC), for the first overseas tire project. The 1.5 million sq.-ft. plant will produce 855,000 tires annually under the Tristar brand; 200,000 TBB Tires (Truck & Bus Bias Tire), 250,000 TBR Tires (Truck & Bus radial Tire), 400,000 PCR Tires (Passenger Car Radial Tire), 5000 Special Tires (First Rangoon, 2015)

3 National Overview
Rubber Institutions

Institutional Context

Rubber Policies

Realising the potential role of rubber in the country's economic and industrial development, the government of Myanmar designated rubber as a priority crop in national development plans in 1979. Market-oriented economic policies were adopted by the State Law and Order Restoration Council (SLORC) in 1989. 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 (Kenney-Lazar, 2016). As a result, smallholder production expanded. Since the mid-1990s, the main focus of government policy has been on the promotion of largescale estate forms of rubber production by private agribusiness. Further liberalisation occurred in the agricultural sector in 2004, when state-controlled prices and the compulsory sale of rubber, sugar and cotton to SOEs was lifted (ibidem).

Box 2: Early rubber projects (1979-1994)

The Rubber Project (1956-64) Under the Agriculture and Rural Development Corporation (ARDC), this project supported the nationalisation of many local or foreign-owned rubber estates.

Rubber Rehabilitation Project Phase 1 (1979-1984) Objectives: rehabilitation of government estate equipment and facilities; establishment of 4,500 acres of high yielding rubber on six government estates; introduction of modern tapping practices on government estates; upgrading of processing facilities (replacement of equipment; capacity expansion of the sole crumb rubber plant); Staff Development and Research (staff recruitment and training; technical assistance; introduction of a small scale adaptive research program to test planting materials and to improve rubber productivity).

Rubber Rehabilitation Project Phase 2 (1985 to 1993) Objectives: expand rubber production on government estates; promote exports and foreign exchange earnings; continue institutional strengthening and establish necessary supporting infrastructure for future participation by the private sector. Outputs; 11,000 acres of high yielding rubber established on government estates; 4,500 acres planted during the first project brought to maturity; technical assistance; local and overseas training. The project was jointly supported by an IDA credit of US$ 9 million and an initial UNDP grant of US$ 0.9 million, which was subsequently increased to US$1 million.

Applied Research Centre for Perennial Crops Project (1991-1994) was founded in Mawlamyaing within the Myanmar Perennial Crops Enterprise (MPCE), under MOAI. MPCE received an UNDP/ FAO grant amounting to US$1.09 million

Key Documents

Master Plan for the Agriculture Sector (2000 - 2030)

Managed by the Ministry of Agriculture and Irrigation (MAI), this master plan prioritises large-scale agriculture. The main aim is to convert 10 million acres of degraded unused land (wasteland) into industrial agricultural production for commodities such as rubber, oil palm, paddy rice, pulses and sugarcane crops.

Industrial Policy Paper

Within this master plan is an Industrial Policy Paper, which identifies six cross-sector areas for collaboration: Human Resources; Development of Technology and Innovation; Financing; Development of Infrastructure; Market Expansion; and Tax and Procedure Relief. In order to emerge as an attractive ASEAN country for foreign direct investment, the government plans to develop rubber and other key commodities into large and advanced industries.

National Export Strategy (2015 - 2019)

Managed by the Ministry of Commerce (MOC), The National Export Strategy (NES) 2015 - 2019 is a short-term trade strategy for Myanmar. Based on the assumption that export development is crucial for accelerating economic growth and industrialisation, the strategy identifies seven priority sectors and provides strategic guidance to add value and increase production. The seven priority sectors identified are: rubber, rice, beans, pulses and oilseeds, textiles and garments, fisheries and tourism. These sectors were selected based on current and potential trade performances, capacity to contribute to export growth, domestic supply conditions, socio-economic impact and current employment rate, along with other qualitative criteria determined by the NES team.

For the rubber sector, the main target of the strategy is to increase the share of processed rubber in total rubber exports by 10% per annum. The strategy aims to do this by improving downstream activities and increasing exports to non-traditional markets such as the European Union (EU), United States (US) and Japan. The main policies focusing on improving the upstream activities of the rubber value-chain are:

- improving harvesting technology
- improving land registration of rubber tenure
- replanting areas with high yielding planting material to reach 100% productive trees
- improving quality control in rubber sheet production
- improving investment and training
- eliminating the rubber export tax

Myanmar Investment Law

The Myanmar Investment Law was enacted in October 2016, replacing the Foreign Investment Law of 2012. The Myanmar Investment Rules by-law revised the following areas: types of investment, application procedures, long term lease agreements and tax incentives. In February 2017, a draft list of restricted investment activities was published.

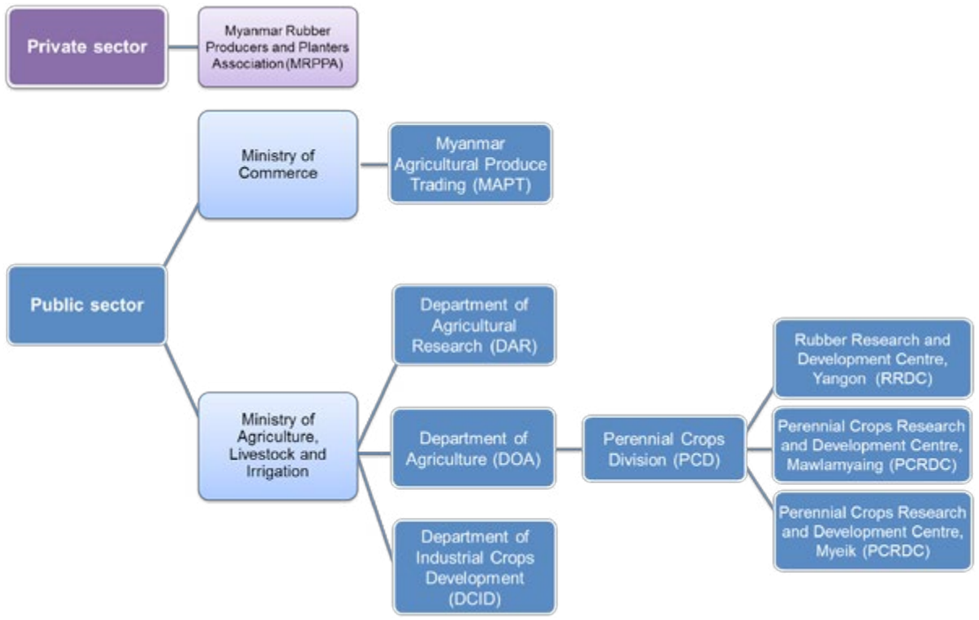
Under the Myanmar Investment Law, investors must now apply for a permit to the Myanmar Investment Commission (MIC) for investments that are considered to have potentially negative environmental or social impacts. These include:

- investments that are located in a designated reserve, protected area or major biodiversity area;
- investments that require rights to occupy or use land which would adversely impact on the legal right of at least 100 individuals occupying such land to continue to use such land (Allen & Overy, 2017)

Rubber Institutions

Support provided to the agricultural and rural sector in Myanmar has always been commodity focused due to the wide range of actors involved, with various government agencies responsible for supporting a specific aspect of production. Under this approach, the research and extension services provided treat each crop separately. Several public sector institutions have been involved in regulation of the rubber sector along with one major association in the private sector (Figure 10).

Figure 10: Public and private sector institutions responsible for rubber



Source: Authors' survey

Public Sector Institutions

The following government departments are involved in supporting the rubber sector, working under the Ministry of Agriculture Livestock and Irrigation (MOALI):

Department of Agricultural Research

The Department of Agricultural Research (DAR) is responsible for agricultural research and development. It conducts research to improve crop management, increase yields, protect against pests and adverse weather conditions, and develop cropping systems (Cho 2013). Compromised of six divisions, the DAR oversees seven research centres and seventeen satellite farms and had a budget of USD 3.8 million in 2012 (Than Tun et al., 2015).

Department of Industrial Crops Development

The Department of Industrial Crops Development (DICD) is responsible for the overall development of the rubber industry, including: planting, production, processing, research and development. The DICD has two centres undertaking research and training in agronomy and the processing of end-products:

- The Applied Research Centre for Perennial Crops (ARCPC) in Mawlamyaing, Mon State; founded in 1990 within the MPCE, which conducts research on variety improvement and production technology of plantation crops (mainly oil palm and rubber) (Cho, 2013);
- The Research Technology and Training Centre for Rubber Products (RTTCRP) in Yangon

Perennial Crops Division (PCD)

The Perennial Crops Division (PCD) is responsible for the promotion of rubber and other perennial cash crops under the Department of Agriculture (DOA). The PCD has been responsible for perennial crops since 2006, under different departments (Table 8).

The main goal of the PCD is to expand the area of production of key crops such as rubber, oil palm and cashew nut. The PCD is currently leading the elaboration of the Myanmar Rubber Industry Development Law. Other key functions include:

- Carrying out research and development activities for both existing and potential perennial crops
- Producing locally adaptable and high-yielding perennial crop cultivars
- Capacity building of technicians and staff
- Extending education and training services to farmers, producers and processors in the plantation industry

The PCD operates a Development Centre for Rubber Technology and directly manages: six rubber estates; nine oil palm estates; three macadamia estates and extension units; and three Perennial Crops Research and Development Centres (PCRDC) across the country. The PCD's Rubber Research and Development Centre (RRDC) in Yangon is in charge of organising the testing and certification of services for local rubber product manufacturers and raw rubber exports.

Table 8: Institutions responsible for perennial crops, 1956-2017

1956	Division of Rubber Planting Project, Land and Rural Development Corporation
1972	Rubber Section, Procurement and Supply Division, Agriculture Corporation
1981	Rubber Section, Myanmar Agriculture Service
1990	Perennial Crops Division, Myanmar Farm Enterprise
1994	Department of the Myanmar Perennial Crops Enterprise (MPCE)
2006	Perennial Crops Division, Myanmar Industrial Crops Development Enterprise (MICDE)
2012	Perennial Crops Division, Department of Industrial Crops Development (DICD)
2015	Perennial Crops Division, Department of Agriculture (DOA)

Source: Myint, 2013 cited by Kenney-Lazar, 2016; DOA (2016)

Myanmar Agricultural Produce Trading (MAPT)

Under the Ministry of Commerce (MOC), the Myanmar Agricultural Produce Trading (MAPT) oversees exports of commodities including natural rubber by inspecting the quality and quantity of exported rubber (Zaw & Myint, 2016).

Private Sector Institutions

Myanmar Rubber Planters and Producers Association

The Myanmar Rubber Planters and Producers Association (MRPPA) is a national association for rubber industry development, formed in March 2005. It is an affiliated sector association of the Union of the Myanmar Federation of Chambers of Commerce and Industry (UMFCCI); a member of the International Rubber Research and Development Board (IRRDB); and a member of the International Rubber Association (IRA).

In an effort to improve the quality of Myanmar's rubber, the MRPPA signed a memorandum of understanding with the Japan Rubber Manufacturers Association (JRMA) and the Rubber Trade Association of Japan (RTAJ) in November 2013. The aim was to create a third-party quality certification system. This allowed the MRPPA and the MOC to establish a Natural Rubber Quality Testing Laboratory in Yangon in 2014, with the support of the Japanese Ministry of Economy, Trade and Industry (METI) and the Overseas Human Resources and Industrial Development Association of Japan (HIDA). The laboratory is expected to become certified against ISO/IEC 17025 standards and receive IRA accredition in 2017.

MRPPA and the Perennial Crops Division (PCD) collaborated to exchange two rubber clones (ARCPC 2 and 6) from the Perennial Crops Research and Development Centre with other member countries through IRRDB's rubber clones exchange program.

MRPPA also removed the 5% commercial tax levied on rubber by meeting with the Ministry of Finance (MOF). The move was implemented in the Union Tax Law with effect from 2014-15, which gave rubber the same incentives as all other agricultural and industrial crops. MRPPA is also working in collaboration with the PCD and key rubber stakeholders to implement the Myanmar Rubber Industry Development Law.

Together with International Trade Centre (ITC), MRPPA was the Principal Coordinator in the formulation and preparation of Rubber Sector National Export Strategy. The strategy was approved by President Office in Dec 2014 and is now under implementation.

4 Tanintharyi Region
Rubber Stakeholders

Rubber Stakeholders

Study Objectives

The research aimed to analyse how the rubber value-chain of Tanintharyi Region operates, what risks and opportunities it brings to rubber farmers, and how it may (or may not) foster more inclusive and sustainable growth.

The research addressed the following questions:

- what incentives do smallholder farmers currently have to grow rubber?
- how is land occupied in rubber areas of Tanintharyi Region?
- how is the rubber value chain organised nationally and what is the position of Tanintharyi rubber producers within this rubber value chain?
- how are benefits from the trade distributed among the actors? How does the current structure of the value chain determine income distribution, market power, and benefit flows?
- how do Tanintharyi rubber farmers fit into regional value chains? How do they benefit from this involvement, and what prevents them from benefitting more?
- how can the rubber value chain be made more sustainable and competitive internationally?

The main purpose of the study was to support the development of a model for sustainable rubber production in the Tanintharyi Region.

Methodology

Research was carried out by interviewing different types of rubber stakeholders in three main locations: Taninthari Region, Mudon (Mon State) and Yangon (Table 9).

Table 9: Types of rubber stakeholders interviewed in each region

	Tanintharyi Region	Mon State	Yangon
Smallholder farmers	11	-	-
Largeholder farmers	3	-	-
Village leaders	4	-	-
Collectors	2	-	-
Traders/wholesalers	3	5	-
Exporters	-	-	1
Retailers	-	-	1
Government agencies	3	-	3
Other	-	-	2
Total	26	5	7

Source: Authors' survey

Information about rubber production was gathered in four villages in the Tanintharyi Region: Thet Kal Kwat, Pyin Thar Taw, Pa Kar Yi and Thaung Thon Lon. Qualitative data was collected through three types of interviews:

- Individual interviews were carried out with the village leaders about the characteristics of the village and the evolution of livelihoods and land use over time;
- Individual interviews were carried out with rubber farmers about rubber production and trade, and the farmers' awareness of issues associated with rubber production;
- Group interviews were organised with groups of 3-4 individual rubber farmers to understand the technical details of rubber production for both immature and mature plantations.

Wherever possible, the information obtained from smallholder rubber farmers about farming practices was compared with those of rubber farmers in Thailand.

Information about rubber trade was gathered in Dawei city, Mudon (Mon State) and Yangon. The various rubber traders interviewed were identified with the support of farmers themselves, other traders and the Tanintharyi Rubber Planters and Producers Association (TRPPA). Semi-structured interviews were used to collect market data from the traders about their business practices such as rubber collection, prices, quality and bargaining. General information about the agricultural sector, rubber production and trade in Myanmar was gathered through a series of semi-structured interviews.

The small sample size of the research means that the following section of results must be taken with caution.

4.1 | Rubber Producers

Rubber producers

The majority of farmers in the four villages of Thet Kal Kwat, Pyin Thar Taw, Pa Kar Yi and Thaung Thon Lon started planting rubber in the 1990s. The main incentive for establishing rubber plantations was economic; there was a peak in rubber prices during the mid-1990s which coincided with availability of land, good local climatic conditions and suitable soil type in the area. Some small and medium scale farmers had previous experience in growing tree crops or tapping rubber. The large plantation owners had all owned businesses previously.

To establish a rubber plantation, farmers usually selected land that was flat, fertile and located close to the village. Some farmers selected an area planted with local bamboo so that it could be cut and sold for local house construction, generating extra income for the household. Others replaced cashew nut plantations that had been destroyed by a fire. One large plantation owner applied for land and used whichever land the government chose to lease.

The current land use composition of each village in the study is shown below (Table 10).

Table 10: Land use in the surveyed villages *(acres)*

	Village 1	Village 2	Village 3	Village 4
No. of households	38	80	350	500
Average size of rubber garden	10	2	63	25
Forest land	150	71	-	-
Grazing land	-	3	30	300
Paddy land	-	80	20	-
Crop land	150	40	84	-
Rubber plantation (mature)	623	7	2,250	1,200
Rubber plantation (immature)	1,000	60	850	
Fallow land	-	50	-	-

Source: Authors' survey

A few of the farmers specialised solely in rubber production. However, rubber was part of a diversified farming system for most of the farmers. Cashew nut and areca nut were the most common alternative products, but some farmers also grew cardamom, black pepper, rice, durian, mango, banana, pineapple, agar wood or iron wood.

The percentage of the total landholding that was under rubber production varied for each type of stakeholder (Table 11).

Table 11: Total area under rubber production per landholding

	Total landholding (acres)	Total area under rubber (acres)	Percentage of rubber in total landholding	Total area of mature rubber (acres)
SF1	18.5	12	65%	3
SF2	13	7	54%	0
SF3	8	7	87.5%	0
SF4	16	6.5	41%	0
SF5	12	8	67%	0
SF6	35	20	57%	15
SF7	83	10	12%	0
SF8	10	10	100%	10
SF9	30	10	33%	10
SF10	30	15	50%	10
MF1	170	170	100%	30
LP1	1,950	1,950	100%	100
LP2	1,313	660	50%	240
LP3	2,200	2,200	100%	1,538

Source: Authors' survey

Rubber formed between 12% - 87.5% of the total landholding for smallscale farmers. Medium and largescale farmers tended to specialise solely in rubber production, but one also owned an oil palm plantation (LP2).

Farming Practices

Planting and immature period

Farming practices for the establishment and immature period of the rubber plantation varied by village.

Extensive (Pyin Thar Taw and Thaung Thon Lon villages):

- **Clearing:** Manual clearing was followed by burning. No contour lines were created, even if the plantation was located on sloping land.
- **Planting:** Neither chemicals nor organic matter were used at planting but herbicides could be spread. Rice was planted at the same time as the rubber to be harvested for one cycle, e.g. planted in March to be harvested in December. Because of financial constraints, farmers used local seedlings; germinating them on a seed bed and transferring them into a polybag until the planting season to reduce germination failure. Planting density ranged from low; 167 trees per acre (412 trees/ha) to very high; 480 trees pre acre (1186 trees/ha). Little fertiliser was used; urea, which is cheaper than NPK, was applied once a year (one month after planting in Year 1 and in July for Year 2), in limited quantities (7-9 g/tree/year of nitrogen) and used for 1-2 years.
- **Fertilising:** For fertiliser application, farmers made three holes (15 cm deep) with bamboo sticks around the rubber tree; approximately 10 cm from the tree in Year 1 and 20 cm from the tree in Year 2. The holes were filled with fertiliser but not re-covered with earth. Some farmers did not use any fertilisers due to low rubber prices; they instead opted to waiting for more favourable market prices before opening the trees. Mulching was performed for a few years and considered as organic fertilisation.
- **Intercropping:** Most farmers intercropped rubber with perennial cash crops such as areca nut, cashew nut, cardamom; woods such as agar and iron wood; and fruit trees such as pomelo, mango and rambutan. There was no intercrop if the plantation was on slopping land.
- **Time period:** Farmers estimated that latex harvesting could start after an 8-10 year immature period.

Medium intensive (Thet Kal Kwat village):

- **Clearing:** Manual clearing to fell or uproot large trees was followed by burning. Contour lines were created when slopes were steep.
- **Planting:** No chemicals were used at the time of planting, but organic matter such as the residues from clearing and burning were put into the planting hole. A cycle of rice could be planted with the rubber, but this was not systematic. The planting materials used depended on availability but the following were commonly used: PBIG seeds[4], Naung Nan seeds[5], and budded planting material in polybags. A diverse range of clones were planted: GT1, BPM24, PB235, RRIM600 and RRIM2000 series. Planting density ranged from 210 trees/acre (519 trees/ha) to 333 trees/acre (823 trees/ha).
- **Fertilising:** NPK fertiliser was used every year from planting to tapping with two applications per year after weeding (formula 15-15-15 from Year 1 to Year 5, then 15-7-18-2 from Year 6 to tapping). The total quantity used for the immature period was: 357 g/tree for Nitrogen, 223 g/tree for Phosphorus and 407 g/tree for Potassium.
- **Intercropping:** Most farmers intercropped rubber with perennial cash crops such as areca and cashew nuts; wood trees such as agar wood; and fruit trees such as rambutan, banana and pineapple.
- **Time Period:** Farmers estimated that latex harvesting could start after an 8-9 year immature period.

Intensive (Pa Kar Yi village):

- **Clearing:** Manual clearing was followed by burning. Contour lines were created when the slope was steep.
- **Planting:** Organic matter such as the residue from clearing and burning was mixed with chemical fertiliser (NPK) and put into the planting hole. One cycle of rice was usually planted with the rubber trees. Planting material used included: Naung Nan seeds, Be Yan seeds[6] or clones in polybags. A diverse range of clones were observed: BPM24, RRIM600, RRIM2000 series, RRIM717, PB235 and PB260. Planting density ranged from 210 trees/acre (519 trees/ha) to 300 trees/acre (741 trees/ha).
- **Fertilising:** Fertiliser use was high; NPK fertiliser (15-15-15) was used every year from planting to tapping with two applications per year after weeding. The quantity was 555 g/tree for the three elements. There were two different application methods: some farmers spread the fertiliser in the plantations, while others dug and filled holes with fertiliser on the line and the inter-line between the rubber trees. Mulching was done once each year, using weeds cut from the plantation.
- **Intercropping:** Common intercrops included rice at planting, followed by cassava and pineapple, or more rarely; areca nut and durian.
- **Time period:** Farmers estimated that latex harvesting could start after an 8 year immature period.

[4] Prang Besar Isolated Garden (PBIG) seeds are good quality polyclonal seeds originally introduced from Malaysia. The seeds are distributed from a government owned isolated seed garden in North Mudon, which is owned by the Applied Research Center for Perennial Crops, under the Department of Agriculture.

[5] Naung Nan seeds are good quality polyclonal seeds originally introduced from Malaysia and distributed from the government owned isolated seed garden in Myitkyina Township, Kachin state.

[6] Be Yan seeds are good polyclonal seeds, similar to PBIG seeds.

Three main types of technical farming itineraries were identified for the establishment of rubber plantations: extensive, medium intensive and intensive (Table 12).

Table 12: Farming practices during the immature period of the rubber plantation

	Extensive	Medium Intensive	Intensive
Clearing	Manual	Manual	Manual
Contour lines	None	On steep slopes	On steep slopes
Density (trees/acre)	167-480	210-333	210-300
Planting material	Seedlings (local) germinated on a seed bed and transferred into a polybag	Seeds (PBIG, Naung Nan) and budded planting material (polybag)	Seeds (Naung Nan, Be Yan) and budded planting material (polybag)
Clones	n/a	GT1, BPM24, PB235, RRIM600, RRIM2000 series	BPM24, RRIM600, RRIM2000 series, RRIM747, PB235, PB260
Fertiliser	Urea, once/year (Y1-Y2) Total quantity: 7-9 g/tree/ year (N)	15-15-15 (Y1-Y5) 15-7-18-2 (Y6-tapping) Total quantity: 357 g/tree (N), 223 g/tree (P) 407 g/ tree (K)	15-15-15 Total quantity: 555 g/tree for each element
Intercropping	Areca nut, cashew nut, cardamom, agar wood, iron wood, pomelo, mango	Areca nut, cashew nut, agar wood, rambutan, banana, pineapple	Rice (planting), cassava, pineapple, areca nut, durian
First harvest	8-10 years	8-9 years	8 years

Source: Authors' survey

Weed control was mechanical and the same for all three itineraries. A grass cutting machine was used on the whole plot for most farmers. Weeding was done twice per year at the beginning and end of the rainy season. Farmers from all three itineraries pruned their rubber trees until Year 4 or 5, when they planted clones.

None of the farmers irrigated, used any pesticides, nor introduced branching or cover crops.

Mature period

Maintenance during the mature period consisted of weed control and fertiliser application.

- **Weeding**: All farmers shared the same weed control practices. Mechanical weeding was done on the whole plot twice per year, at the beginning and end of the rainy season.
- **Fertiliser Application**: Farmers either did not use fertiliser at all during the mature period of the plantation, or they systematically applied chemical fertiliser once or twice a year. Different formulas of NPK were used: 15-7-18-2, 15-15-15 or 25-7-7. The quantity of each element applied therefore varied between: 38-84 g/tree/year for Nitrogen (N), 38-39 g/tree/year for Phosphorus (P) and 38-101 g/tree/year for Potassium (K).
- **Tapping**: Tapping started when rubber trees reached 40 inches tall with a trunk circumference of 18 inches, which is close to international recommendations. Bark consumption was estimated to be 30 cm/year. Tapping systems varied, but were intensive in all cases: S/3 5d6 or S/2 2d3 changed with season to S/2 3d4, S/2 6d7 or S/2 d1. Farmers did not use stimulation due to the high tapping frequency. The real number of tapping days per year was estimated to be around 155, which was due to tapping not taking place during the rainy season or wintering. Therefore, farmers tapped their trees for 5-8 months per year on average.
- **Production:** Small and medium scale farmers produced unsmoked sheets (USS), which they sold once a month.

No farmer used any pesticides or irrigation on mature plantations, and there were no cover crops. Farmers did not use or swathe the litter, but some collected small branches for fire.

Comparison with Thailand

Farming practices from the four villages in Tanintharyi Region were compared with those of farmers in neighbouring Thailand.The comparison study in Thailand interviewed 317 farmers in the following provinces: three northern provinces (Chiang Rai, Phitsanulok, Kampaeng Phet), three northeastern provinces (Khon Kaen, Buriram, Kalasin), three southern provinces (Ranong, Phattalung, Surat Thani) and one central-eastern province (Rayong).

Planting material and planting density

- **Thailand:** all farmers use clones as a result of government policy to replant old rubber plantations with monoculture plantations, which has been enacted since the 1960s. In a study conducted in 2012, it was found that the RRIM6000 clone was planted on 77% of 587 rubber plantations in Thailand. Whilst producing higher yields than heterogenetic plantations, the dominance of one species reduces genetic diversity which makes the plantation more vulnerable to outbreaks of disease or adverse weather conditions. Myanmar's higher levels of clonal diversity is therefore better in terms of risk management.
- **Myanmar:** farmers have historically planted polyclonal seeds (PBIG, Naung Nan, Be Yan) or unselected seeds picked from rubber plantations. Plantations created with this planting material have lower levels of productivity compared to those planted with budded planting material or clones, due to the heterogeneity of the trees. Planting density practices were comparable to those in Thailand: 500-900 trees/ha/year (Somboonsuke and Wettayaprasit, 2013)

Fertiliser application

- **Thailand:** farmers used a quasi-systematic fertilisation system for both immature and mature periods. The intensity of fertilisation is consistently high, even in mature plantations. Recommendations from the RAOT for the immature period are: N=504-884 g/tree; P=249-359 g/tree; K=304-884 g/tree (depending on the soil and replanting or new planting), and for the mature period; N=300 g/tree/year; P=50 g/tree; K=180 g/tree. During the immature period, the main NPK formula recommendation in Thailand is either: 20-8-20, 20-10-12 or 20-10-17.
- **Myanmar:** only the farmers who applied the most intensive itinerary during the immature period applied the minimum quantity of Nitrogen recommended by the RAOT. Due to the formula used (15-15-15), the quantity of Phosphorus and Potassium applied were either in line with the RAOT recommendations or much higher. During the mature period of the plantations, fertiliser application was much lower than Thailand in both RAOT recommendations and practice.

Weed control

- **Thailand:** many farmers used herbicides during the immature period, following the recommendation of the Rubber Authority of Thailand (RAOT) to combine chemical and mechanical weed control. During the mature period, the RAOT recommends only mechanical weeding. Some farmers used chemicals for weeding during the mature period, but fewer than during the immature period. Weeding was not systematic, some farmers stopped weeding because the growth of the vegetation in the inter-row was limited.
- **Myanmar:** during both the immature and mature period, weeding was mechanical.

Use of the inter-row

- **Thailand:** farmers either did not grow anything in the inter-row, or they grow short term intercrops during the 3 or 4 first years of the plantation. These crops were used for subsistence or to generate a monetary income. Very few farmers grew perennial crops that lasted until the mature period of the plantation.
- **Myanmar**: short term crops were rare, farmers planted perennial cash crops in most intercrops. The use of cover crops was non-existent in Myanmar and extremely rare in Thailand.

Production

- **Thailand:** rubber production was more diversified than Myanmar, and sheets were not as common. In new rubber producing areas in Thailand, many farmers sold their rubber as cup coagulum. In traditional rubber producing areas, where latex collection points were very well developed, many farmers sold latex. Both latex and coagulum limited the labour requirements after tapping.
- **Myanmar:** all farmers sold their rubber as sheets; unsmoked for the small and medium holdings and smoked for the large holdings.

Tapping

- The intensive tapping systems used in Myanmar are comparable to the systems used in Thailand, particularly in the traditional rubber producing areas. The real number of tapping days was much lower than what would be expected with the tapping systems selected. This was also observed in Thailand.

Environmental Impact

Rubber plantations in Myanmar are established on four main types of land: reserved forest; vacant, fallow and virgin land; farm land or grazing land (Land Core Group).

Many farmers in Tanintharyi Region cleared secondary forests to plant their rubber plantations, meaning that rubber production was a driver of deforestation in the area. An assessment conducted by WWF in eastern Tanintharyi Region estimated that as much as 70% of the rubber tree area was covered with forest before the year 2000. The systematic burning of vegetation during the land clearing process also had negative environmental impacts. In Thailand, very few plantations were established on degraded forest as most rubber plantations were replanted in traditional rubber areas or replaced other crop plantations such as sugarcane or cassava (Table 13).

Table 13: Land type replaced by rubber plantations in Thailand

	North	North-East	South	Centre-East	Total
Forest	6%	1.4%	10.6%	2%	6.3%
Fallow	12%	3.4%	8.8%	8.2%	8.3%
Plantation, rubber	1.2%	0%	35.4%	71.4%	19.9%
Plantation, other	9.6%	8.3%	18.6%	8.2%	12.6%
Plantation, multi-annual crops	68.3%	81.4%	14.6%	10.2%	46%
Multi-annual crops and trees	2.4%	2.8%	1.8%	0%	2%
Data unavailable	0.6%	2.8%	10.2%	0%	4.8%

Source: Chambon et al., 2017

Perceptions

Many of the farmers interviewed did not perceive rubber production as contributing to deforestation because the plantations were mainly established on degraded or vacant land, rather than by clearing primary forests. Those who did acknowledge the link between rubber farming and deforestation explained that large areas of bamboo forests had to be cleared to establish the plantations. Some farmers perceived planting rubber trees as a kind of reforestation, whilst others acknowledged that natural forests were quite different from rubber forests, especially in terms of biodiversity. Interestingly, one farmer mentioned that rubber forests provide benefits mostly to one person (the owner), whereas natural forests benefitted many people.

Box 3: Community Forests in Myanmar

A Community Forest Project was developed by the Forest Department in 2014. All households in this project had to grow two acres of “big trees” (such as mahogany or iron wood) on land that was either vacant or covered by bamboo forests. By 2016, the forest had reached four acres and the aim was to reach twenty acres.

This program enabled farmers to cut some wood for their own use, following cutting guidelines provided by the Forest Department. Visiting staff explained the benefits associated with healthy forests to the farmers, and why they should not expand their crops into forest areas. As a result, deforestation was limited. Monthly meetings were also arranged between the Community Forest Committees of each village of the project to share their experiences and problems.

Awareness of environmental sustainability was relatively high among farmers, but few linked the concept to rubber production. The traders and few farmers who knew about sustainable rubber production were connected to the MRPPA. However, they mainly assimilated sustainable rubber to Good Agricultural Practices (GAP). Smallholder farmers who were not previously aware of sustainable production indicated that they indicated would be willing to learn how to produce sustainable rubber if their efforts were rewarded with higher prices.

Economics

Initial investment

The total investment required to establish a rubber plantation, from land clearing to tapping, varied between the rubber farmers in Tanintharyi Region:

- **Smallholder plantations:** 329 - 2,745 USD/ha
- **Medium plantations:** 3,825 USD/ha
- **Large plantations:** over 6,000 USD/ha

Overall, the investment required to establish a rubber plantation for smallholders was lower than in Thailand, where the investment was estimated to be 3,054 USD/ha (Office of Agricultural Economics). The amount of support from the Office of Rubber Replanting Aid Fund (ORRAF) was around 2,857 USD/ha. The difference in initial investment can be explained by:

- **the lower cost of the planting material used in Myanmar:** 0.25 USD/clone (250-300 MMK/clone), compared to 0.5 USD/polybag in Thailand. Farmers had much lower costs when they used different clonal seedlings such as Naung Nan, Be Yan or PBIG;
- **the smaller quantity of fertiliser used in Myanmar;**
- **the lower labour costs in Myanmar:** labour costs are slightly under 4.5 USD/day, compared to almost 10 USD/day in Thailand. Several farmers also limited the initial financial investment by using family labour.

Production costs for mature plantations

There was limited data available for the mature stage of the rubber plantations. The cost of production for small farmers was 328 USD/ha/year when no fertiliser was used, and around 500 USD/ha/year when fertiliser was used. This was close to the cost of production in Thailand, which was estimated at 448 USD/ha/year by the Office of Agricultural Economics. In medium and large scale plantations, production costs were much higher because of maintenance costs and high labour costs for tapping.

Net revenues

Huge variability was observed in the net revenues among plantations in Tanintharyi Region (Table 14, 15).

Table 14: Annual net revenue for rubber plantations, excluding family labour

	Investment* (USD/ha)	Mature period (USD/ha/year)			Revenue (USD/ha/year)	Net revenue (USD/ha/year)
		Fixed cost**	Variable cost	Total cost		
SF1	1,516	62	483	546	215	- 331
SF2	1,077	44	-	-	-	-
SF3	2,345	95	-	-	-	-
SF4	826	33	-	-	-	-
SF5	329	14	311	325	430	105
SF6	431	18	-	-	-	-
SF7	567	24	-	-	-	-
SF8	2,745	110	-	-	-	-
SF9	2,013	82	393	475	84	- 391
MF1	3,825	153	538	691	282	- 409
LF1	6,446	259	859	1,119	1,397	278
LF2	2,600	105	729	833	936	102
LF3	2,480	99	534	633	1,180	547

* investment = total cost from planting to tapping, excluding the cost of land acquisition
** based on 25 years of harvesting period
Source: Authors' survey

For two smallholder plantations (SF1 and SF9) and one medium scale plantation (MF1), net revenues were negative. These findings could be explained by:

- the rubber yield given by these farmers was very low at 200-300 kg/ha/year, compared to the regional average of 622 kg/ha/year. One farmer's plantation yields were around 100 kg/ha/year in the first year of production.[7]
- the rubber price was low in 2015, which was the year of reference for the calculation.

In the interview, the medium-scale plantation (MF1) stated that the revenue could not cover the cost of production and therefore only 30% of the mature area was tapped. A rubber price of 1,180 MMK/lb. would be required to generate a profit (or 1,330 MMK/lb. if family labour was used).

For the smallholder farmers, a minimum rubber price of 1,280 MMK/lb. (SF1) or 3,700 MMK/lb. (SF9) would be necessary to generate a profit.

Six of the farms were not tapping at the time of the study due to either their plantation not being mature or rubber prices being too low. Two smallholder plantations (SF7 and SF8) had tried tapping for one month but stopped because there was no profit. Another (SF5) had a positive result in 2014, but stopped tapping in 2015 due to low market prices.

[7] The yields recorded are approximate because the contribution of cup lumps was excluded from analysis

Table 15: Annual net revenue for rubber plantations, including family labour

	Investment* (USD/ha)	Mature period (USD/ha/year)			Revenue (USD/ha/year)	Net revenue (USD/ha/year)
		Fixed cost**	Variable cost	Total cost		
SF1	2,258	92	580	672	215	- 457
SF2	1,378	56	-	-	-	-
SF3	3,369	136	-	-	-	-
SF4	1,159	46	-	-	-	-
SF5	404	17	311	328	430	102
SF6	970	40	-	-	-	-
SF7	567	24	-	-	-	-
SF8	3,138	126	-	-	-	-
SF9	2,013	82	393	475	84	- 391
MF1	4,319	173	602	775	282	- 493
LF1	6,446	259	859	1,119	1,397	278
LF2	2,600	105	729	833	936	102
LF3	2,480	99	534	633	1,180	547

* investment = total cost from planting to tapping, excluding the cost of land acquisition
** based on 25 years of harvesting period
Source: Authors' survey

The contribution of rubber to total income varied amongst the farmers (Table 16).

Table 16: Contribution of rubber to total income

	Off-farm income	Contribution of rubber to total income (%)
SF1	No off-farm income	5%
SF2	Commercial activity & farm labour	0%
SF3	Community forest & remittance	0%
SF4	Farm labour & service (truck)	0%
SF5	Remittance	15%
SF6	Commercial activity	50%
SF7	No off-farm income	0%
SF8	Service (workshop)	0%
SF9	No off-farm income	0%
SF10	No off-farm income	3%
MF1	Commercial activity & remittance	8%
LF1	Commercial activity, construction, president CCI	20%
LF2	Family business in Yangon	70%
LF3	Condominium rental	50%

Source: Authors' survey

For some farms, rubber did not generate any income at all, either because the plantation was still immature (SF2, SF3, SF4, SF7) or because the farmers stopped tapping (SF8, SF9). For others, the contribution of rubber to total income remained limited so most of the income was derived from other agricultural commodities or activities (SF1, SF10), or from off-farm incomes (SF5, MF1/LF1). Three farmers had off-farm incomes, but rubber still generated 50%-70% of their total household income

Land Ownership Rights

Many smallholder farmers applied for their land title after the rubber plantation was established (Table 17).

Table 17: Land application process for rubber plantations

	Document	Application Process
MF1	Form 105	Applied when the plantation was established. Land title was obtained after all rubber trees were planted.
SF1	Form 7	Applied after half of the rubber trees were planted. Land title was obtained after all rubber trees were planted.
SF2	Form 7	Applied after all rubber trees were planted.
SF3	Form 105	Applied before planting the rubber trees. Land title was obtained after all rubber trees were planted.
SF4	Form 7	Applied before planting the rubber trees. Land title was obtained after all rubber trees were planted.
SF5	Form 7	Family already had the land title certificate (unclear as to whether it was before or after planting the rubber)
SF6	-	Land was classified as mining land after the rubber trees were planted.
SF7	Form 105	Applied after planting the rubber trees.
SF8	Form 7	Applied after planting the rubber trees.
SF9	Form 7	Applied after planting the rubber trees.
SF10	Form 105	Applied after planting the rubber trees.
LP1	Certificate	Grant from the forestry department. Most rubber trees were planted after the certificate was issued.
LP2	Certificate	Grant from the government (30 years). Rubber trees were planted after the certificate was issued.
LP3	Certificate	Plantation was bought from the government. Certificate was issued at the time of purchase

Source: Authors' survey

Political reforms in 2012 lead to a new process being developed for smallholders to obtain land rights for their plantations. The Form-7 certificate was created by the Farmland Law to provide rights to use, possess, sell and exchange land. The Forest Department can give commercial plantation certificates for degraded forest land and reserved forest. Under these certificates, the land can be used over the owner's lifetime but cannot be transferred.

The application process includes a visit to the plantation by an officer from the Settlement Land Record Department (SLRD) and the submission of Form-105, which is obtained in advance from the SLRD. Farmers need to submit a payment to get their land registered. After completing Form-105, the farmer provides a 5-year plan for Vacant Fallow and Virgin Lands. The application is then forwarded, together with the Forest Department certificate, to the district and regional levels of SLRD. If the plan is not followed, the land will be returned to the government. The full process can take up to 5 years.

Large plantations did not need a Form-7 certificate, but could instead purchase the land or obtain a grant from the government.

Most farmers acknowledged the importance of land registration, particularly after 2010. Although the rubber plantations did not tend to be planted with the purpose of gaining official land occupation, the political reforms concerning land rights in 2012 provided an opportunity to officially register land.

4.2 | Rubber Traders

Rubber traders

The rubber value chain hosts a variety of traders who are in charge of several activities, including: buying, smoking, drying, sorting, grading, storing, and transporting the various types of rubber that can be sold on the market. Market intermediaries also sometimes provide additional services to farmers such as advice, training, inputs or credit. However, trader roles were reduced to a minimum during the period of the study due to low rubber prices.

Small rubber collectors

Main characteristics

Rubber collectors are small traders located in the villages where rubber is produced. Two collectors were present in Tanintharyi Region during the study. Their main responsibilities included:

- collecting rubber from a large number of geographically scattered farmers
- checking the rubber for defects
- transporting the rubber to the next trader located in a larger market place (Dawei)

Rubber was traded in many forms: unsmoked and smoked rubber sheets, cup lump and rubber scraps. Collectors either specialised entirely in rubber, or traded in a variety of agricultural products.

Although their main task was to create a link between the market and geographically scattered farmers, collectors also occasionally provided farmers with additional services such as: advice on rubber growing, fertiliser application, tapping and processing; cash credit to maintain plantations during the low season; products such as planting material and fertilisers. These additional services serve as a way to secure access to rubber when competition is harsh.

Trends

At the time of the study, the number of collectors operating in all four villages and Dawei city was quite low. Several factors are thought to have contributed to this:

- **Improvements in road infrastructure** have made it possible for farmers to bring their rubber to the main trader in Dawei more quickly and/or at a lower cost. It also allows them to access inputs needed for their plantation, such as fertilisers;
- **Technological developments** have reduced the role of the small collector as a source of market information as farmers can now access international rubber prices and other information through their mobile phones;
- **Global market trends** have depressed rubber prices so farmers tend to prefer to negotiate directly with the traders, to cut out the small margin paid to collectors.

However, these market intermediaries are unlikely to disappear completely, instead switching to other commodities until the price of rubber improves again. Overall, the size of the rubber market had dwindled, the overall volume of trade declined and the price was too low for any intermediation to be feasible.

Destination of Tanintharyi rubber

Rubber was brought to Dawei, which was the central trade platform for the Northern Tanintharyi Region.

Agreements and contracts

When farmers had rubber to sell, they called the collector directly. The collector would go to the plantation, check the rubber and offer a price, which would be negotiated with the farmer. The collectors offered higher prices for good quality rubber and to the farmers who produced larger volumes of rubber to secure their rubber supply. When both the demand and the supply of rubber was high, the collectors would organise rubber collection more efficiently to save on transportation costs, for example not visiting the farms daily. In the context of depressed market prices with a lower number of buyers and sellers, the collectors would visit the plantations as soon as they were called to secure access to the rare rubber sheets available.

The collectors usually owned vehicles to transport the rubber and a warehouse to store the rubber. They employed temporary workers to help them load and unload the rubber sheets during peak season or permanent workers if they were successful.

Before bringing the rubber to the trader, collectors would contact the trader to discuss the volume and price. Other times, they were paid in advance by the trader to collect the rubber; receiving around 20 MMK/lb for transportation. Quality was checked by the collector at the plantation and by the trader upon delivery. The main quality issues were caused by a high degree of humidity. The presence of water lines in the sheets would lead to a price penalty that was passed on to the farmer. There were no contracts between the collectors and the buyers or between the collectors and the farmers.[8] All transactions were spot market transactions. The relations between the buyers and the collectors therefore seemed to involve some degree of trust and many had built long-term personal relationships.

Costs, output and profits

The collectors in Tanintharyi Region traded low volumes of rubber, between 130-225 tons/year, which was supplemented by other agricultural commodities such as cashew nuts, betel nuts or black pepper. The overall profit of the collectors ranged between 5-11 USD/ton of rubber traded (Table 18).

Table 18: Costs, income and profit for rubber collectors in Tanintharyi Region

	Fixed costs (USD/ton)	Variable costs (USD/ton)			Total costs (USD/ton)	Total income (USD/ton)	Profit (USD/ton)
		Rubber purchases	Material input*	Labour			
C1	4	939	3	14	960	972	12
C2	3	896	14	30	943	947	4

* Vehicle, fuel, mobile phone etc.
Source: Authors' survey

The largest expense was the purchase of rubber from farmers (95-98%), followed by the hiring of labour (3%) and travel expenses such as fuel (>1%). One of the collectors owned a smoking house, but no longer used it due to the low volume of trade.

[8] The only exception was when the farmers needed money immediately; the collector then signed a fixed-price contract with the trader at that day's price, received the money and paid the farmer(s).

Rubber traders in Dawei

Main characteristics

Around 10-13 rubber traders were active in Dawei during the study. These traders had started their businesses in the early 2000s, during the rubber boom. Dawei rubber traders were responsible for:

- collecting the rubber brought by the farmers/collectors;
- washing the rubber and checking the rubber for impurities such as milk lines;
- grading and smoking (or re-smoking) the rubber sheets;
- storing them in the warehouse
- organising the transportation of the sheets to Mudon, where most of the customers were located.

None of the traders from Dawei exported rubber themselves. Some had tried to export directly to Thailand, but the rubber was seized by the Thai army. A few of the traders owned a rubber nursery, which allowed them to sell rubber seedlings during periods when rubber prices were high. Traders were also sometimes involved in the trade of agricultural inputs such as fertilisers and acid to process the rubber; other agricultural commodities such as betel and cashew nuts; and/or consumer goods such as motorcycles. The rubber trade formed between 75-100% of their income.

The peak season for rubber trade was indicated as occurring between November and February, with activity reducing to negligible levels between May and October.

Trends

Traders in Dawei bought directly from smallholder rubber farmers, collectors operating in the villages surrounding Dawei and other traders. The traders indicated that the number of farmers selling rubber directly to them had been increasing, which corresponded with the trends reported by the collectors in Tanintharyi Region. Improved road infrastructure and communication technology combined with low market prices allowed farmers to minimise the role of collectors, which stiffened competition between the larger traders located in Dawei. Traders were keen to secure a constant supply of rubber and provided extra services such as cash advances to ensure supplier loyalty. Similar trends were also observed in Mudon.

Destination of Tanintharyi rubber

Most of the rubber collected in Taninthary Region was sold to China through Mudon (Mon State) and Muse (Northern Shan State). Traders in Dawei mainly bought ribbed smoked sheets (RSS3), unsmoked sheets, cup lumps and scraps. The type of rubber seemed to matter less than the quality of the rubber, as the main requirement from customers was that the rubber should be dry and without impurities. Some traders indicated that the quality requirements from Chinese customers were less stringent. However, traders also said that most of their customers were increasingly asking for RSS3 instead of RSS5, and for unsmoked sheets.

Agreements and contracts

No contracts were signed between the traders and the farmers. Farmers usually phoned the traders to ask for the daily price. However, if demand was high the traders would call the farmers and propose a price. If the price offer was appealing, the farmers brought their bales or sheets of rubber to the trader. The rubber was then weighed and checked before price negotiations started. Small price adjustments were sometimes made based on the quality of the rubber. Poorly processed rubber was smoked again by the traders. The traders paid the farmers cash in advance during off-peak season, but during peak season they would pay cash upon delivery or later the same day. Traders sometimes gave advice to the farmers about rubber tapping, processing and marketing, or provided farmers with inputs or cash advances, later deducting the money from the price paid for the rubber. However, traders were becoming increasingly reluctant to do so as rubber prices dropped and farmers became indebted.

Costs, output and profits

The traders interviewed in Dawei were heterogeneous in size and able to trade between 500-5,000 tons/year. The overall profit of the traders located in Dawei ranged between 3-13 USD/ton of rubber traded (Table 19).

Table 19: Costs, income and profit for rubber traders in Dawei

	Fixed costs (USD/ton)	Variable costs (USD/ton)			Total costs (USD/ton)	Total income (USD/ton)	Profit (USD/ton)
		Rubber purchases	Material input*	Labour			
T1	0	1,052	17	7	1,075	1,083	8
T2	0	914	13	4	931	944	13
T3	1	999	18	12	1,030	1,033	3

* Transportation costs, fuel, electricity, fire wood, storage costs, phone, trade license, taxes, etc.
Source: Authors' survey

The breakdown of costs for these traders was similar to that of the collectors in Tanintharyi Region. The largest expense was the purchase of rubber products from farmers and collectors (97%), followed by the purchase of fuel/fire wood for the smoking houses (1%), transportation costs (1%) and the hiring of labour (1%).

The main difference between the traders in Dawei and the collectors was that these traders usually owned a warehouse to store the rubber sheets, and a smoking house to re-smoke the rubber sheets. These buildings did not involve a large initial investment as they were rudimentary and they also had a long life span. Traders did not usually own a specific vehicle for collecting rubber as most of the rubber was directly delivered to their warehouse or smoking house by the farmers or the collectors. To send the rubber to Mudon, the traders usually hired the services of the local transportation association.

Rubber traders in Mudon, Mon State

Main characteristics

Mudon had approximately 10 medium to large scale traders, and 10 small scale traders. The large scale rubber traders started their business in the mid-1990s. Several were family businesses that were created by the parents of the current owners. These traders were mainly involved in the same areas of the value chain as those in Dawei, but they operated at a larger scale:

- they traded larger quantities of rubber, sourced from a wider territory, including Mon State, Tanintharyi Region, Karen State and Pago;
- they had a more diversified network of suppliers, including nearby farmers and collectors, traders from other regions and their own plantations.

Business relationships with collectors were less volatile than those with individual farmers, averaging 4-5 years. However, some traders changed suppliers annually. Competition between traders of all scales had increased since they first started operating.

The traders in Mudon bought ribbed smoked sheets, unsmoked sheets, cup lumps and scraps. They mainly sold ribbed smoked sheets and undried sheets, along with selling coagulum and scraps to crumb rubber processors. These traders were busy throughout the year and they often had large storage facilities. This helped them withstand price fluctuations; at times of high prices they could sell their rubber stocks, and at times of low prices they could buy to refill the stock.

The peak season for trade lasted from November to February, with trade progressively declining from March to May. The volumes of rubber purchased during the rainy season were low, as minimal tapping was done. During this period, traders used smoking houses to process their stocks and performed maintenance on idle smoking houses.

Agreements and contracts

No contracts were signed between the traders in Dawei and Mudon. Written documents were only used when advance payments were made. The trade partners seldom met in person, instead agreeing the rubber price, volume, type, quality and delivery date over the phone. Some traders had records of past transactions. The buyers in Mudon sometimes provided cash advances to the traders in Dawei, based on the agreed price and the grade of rubber. Cash advances between traders sometimes commanded an interest rate of up to 15 MMK/lb/month. Traders in Mudon usually paid the traders in Dawei quickly, even though there could be a long wait for the rubber. Several traders mentioned paying for the rubber in advance but not receiving the rubber until several months later, which they resented.

Offering a good price was important for maintaining the loyalty of the sellers and for securing access to the rubber. Smaller neighbouring collectors brought the rubber to the trader and were paid individually by cash upon delivery. Traders never offered cash advances to farmers, instead operating payment upon delivery. Many traders who had lent money to farmers never received it back.

Traders in Mudon performed quality checks when they received rubber from their suppliers. Moisture content was the main quality criteria, which is why all of the traders owned several smoking houses. Traders also checked the rubber for foreign bodies. Quality issues were settled by applying price penalties of around 5-10 MMK/lb, or by sending the rubber back to the trader/collector/farmer. Traders acknowledged that there was a high risk of misevaluating the moisture content, which would result in a loss of profits.

Destination of Tanintharyi rubber

Traders in Mudon mentioned several advantages of buying rubber from Tanintharyi Region: they could buy large volumes, the price was low, the quality was high, they trusted the traders and the traceability of the products was good.

The traders in Dawei were responsible for bringing the rubber from their warehouses to Mudon. From Mudon, the rubber went to either:

- Muse (via Mandalay, where the rubber was transferred to smaller trucks more adapted to mountain roads), and then on to China
- Yangon, and then on to Malaysia, China, Japan, Singapore or other foreign countries

The main difference between these two rubber markets was quality; exporters in Yangon worked according to international standards with high quality requirements and official contracts. Most of the traders located in Mudon, who sent their rubber to China via Muse, did not have an export license. The traders holding the export licenses were located closer to the border, either in Mandalay or Muse.

Costs, output and profits

The traders in Mudon traded large volumes of rubber, ranging between 1,500-25,000 tons/year.[9] Several of the traders were initially rubber farmers and some owned a rubber plantation themselves. Whilst some also traded other agricultural inputs and commodities such as seedlings and black pepper, the largest traders operated exclusively in rubber trade and derived their income solely from rubber sales. The profit calculated for these medium-to-large traders ranged from 3-20 USD/ton of rubber traded (Table 20).

Table 20: Costs, income and profit for rubber traders in Mudon

	Fixed costs (USD/ton)	Variable costs (USD/ton)			Total costs (USD/ton)	Total income (USD/ton)	Profit (USD/ton)
		Rubber purchases	Material input*	Labour			
T4	0	1,203	1	2	1,206	1,209	3
T5	49	892	25	20	987	1,007	20
T6	1	741	4	8	734	760	6
T7	1	1,079	30	12	1,121	1,132	11

* Transportation costs, fuel, electricity, fire wood, storage costs, phone, trade license, taxes, etc.
Source: Authors' survey

Profit variations were mainly due to differences in rubber storage infrastructure, scale of operation, types of products sold and final markets. The initial investment was much larger for the traders in Mudon because they owned several warehouses and smoking houses. These traders needed a strong financial background to be able to produce the cash necessary to buy the rubber and to transport it to its next destination. Some traders spent up to 25 million USD/year on rubber purchases alone.

[9] The government plans to establish Myanmar's rubber exchange market in Mawlamyine, the capital of Mon State, which is located around 30 km away from Mudon.

Cost comparison

A cross-comparison of collectors in Tanintharyi region, traders in Dawei and traders in Mudon reveals that overall costs and profits were similar (Table 21).

Table 21: Average costs, income and profit per category of trader

	Fixed costs (USD/ton)	Variable costs (USD/ton)			Total costs (USD/ton)	Total income (USD/ton)	Profit (USD/ton)
		Rubber purchases	Material input	Labour			
C(T)	3	917	8	22	951	960	8
T(D)	0	988	16	8	1,012	1,020	8
T(M)	13	979	15	10	1,017	1,027	10

Source: Authors' survey

However, traders in Mudon bore significantly higher fixed costs, which were related to the buildings and equipment they owned. They also had higher labour costs because they hired a permanent workforce, in contrast to traders in Dawei who mostly relied on temporary workers.

Rubber traders in Yangon

Yangon hosts approximately ten exporters, many of whom own a factory. The breakdown of costs for each exporter was unavailable, but to illustrate the difference of operations in the capital city, two businesses were selected as case studies from opposite ends of the spectrum. The case studies illustrate the wide range of market opportunities for rubber products in Myanmar, some of which are related to the presence of a large domestic market.

Small rubber trader

Located in South Okkalapa market, this trader sold high quality rubber sheets to large factories producing slippers, as well as bamboo sticks to cottage industries; crumbs and cuttings to sponge factories; and deformed sheets to the crumb industry. Customers were mostly located in Yangon, but rubber sheets were also supplied to slipper factories located in Mandalay, Pyay, Pathein and Myingyan. The thickness of the rubber sheets was the main quality requirement for the slipper factories.

The trader mainly bought unsmoked rubber sheets, ribbed smoked sheets (RSS3) and rubber cuttings. The main suppliers of the rubber sheets were 10-15 smaller producers and a rubber plantation located in Mon State. Rubber was also bought from rubber producers around Yangon. The trader would buy rubber sheets when the supply was high and then sell them to the factories when the supply was low.

As a former plantation owner, the trader gave advice to buyers on how to choose high quality rubber and to suppliers on the amount of acid to use in the rubber process. The trader paid for transporting the rubber from the producers' plantations in Mon State, but the farmers around Yangon paid for transportation themselves. There was no contract for the different transactions.

Large exporter

The first trader owned a company that began as a family business before expanding to a large exporter of agricultural commodities to the international market. The main products included: rubber, sesame, yellow maize, rice, pulses and beans; which were exported countries such as Turkey and India. The company imported machinery, cement seeds and fertilisers for the domestic market.

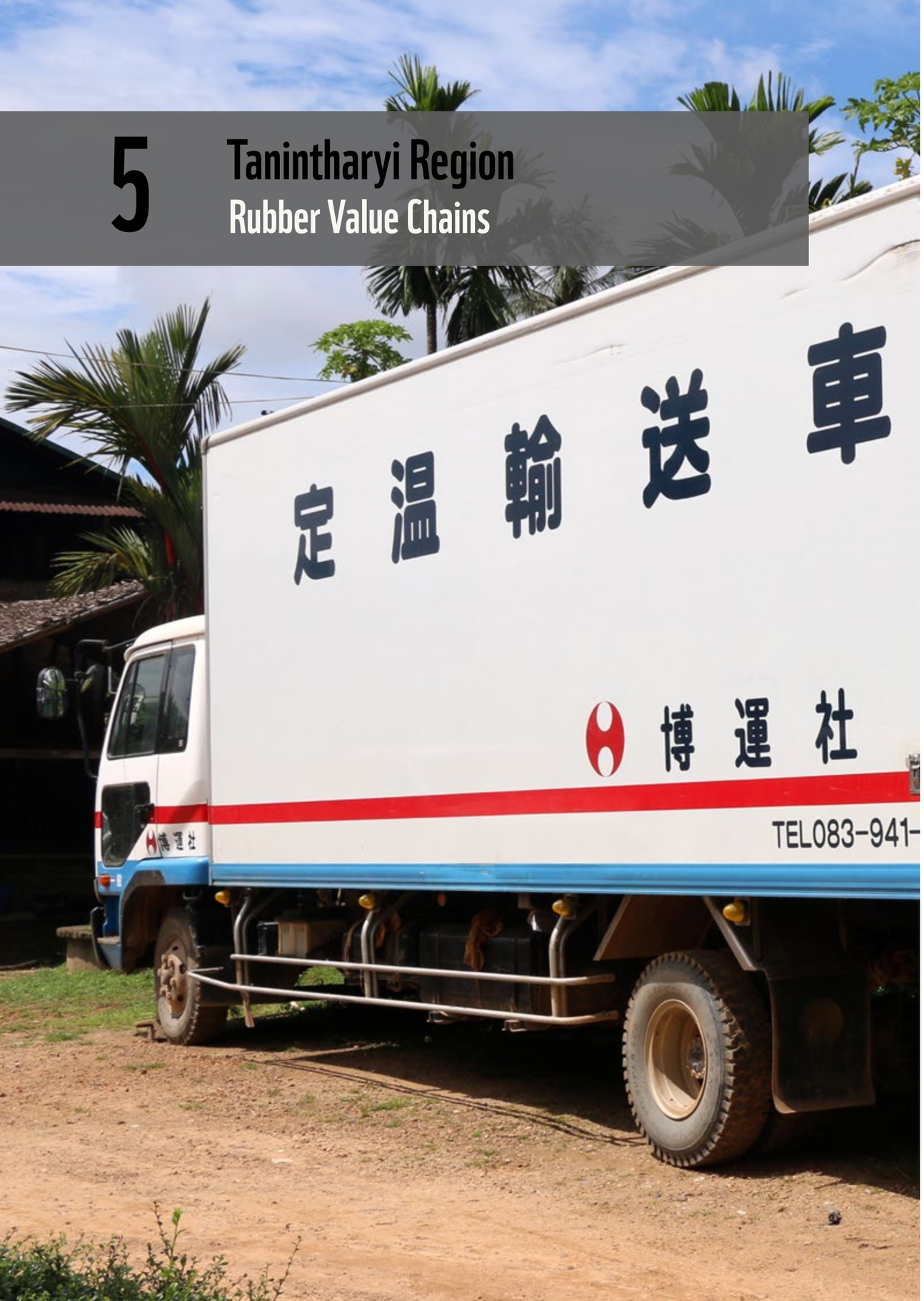
Rubber represented 60% of the total volume of trade. The trader exported various grades of RSS, TSR, and crepe rubber to 10 customers located in Malaysia, Singapore and Vietnam (5 regular and 5 irregular customers). One buyer alone represented 40% of all rubber sales. The main challenges were the availability of sufficient cash resources to fund the rubber purchases in Myanmar, and the investments in technology and education needed by the suppliers to help them upgrade.

The company sourced its rubber as follows:

- 30% from Pago (to 5-6 core suppliers-plantations)
- 60% from Mon state (mainly large rubber traders selling RSS1 and TSR)
- 10% directly from Dawei (5 suppliers, RSS 1-3)

Price was the main determinant in the choice of supplier. The company provided cash advances to the traders to help build relationships and ensure a regular flow of rubber. The company also gave advice to plantation owners about which chemicals to use to shorten the drying time of the sheets, as well as occasional 2-3 month credit plans to plantation owners who faced difficulties. The suppliers were paid by cash or cheque.

The company was the only stakeholder in the study to hold an export license and use a written legal contract, as a letter of credit is necessary to enable exports. The letter of credit included information about the price, quality, delivery date and legal arbitration. However, the company did not use contracts to deal with its own suppliers of rubber.



5 Tanintharyi Region
Rubber Value Chains

Rubber Value Chains

Trade Routes

The study revealed that different trade routes are used to export rubber from Tanintharyi Region:

- **Route 1:** 80% of the rubber sold by traders in Mudon (mainly low quality unsmoked and ribbed smoked sheets) goes to Mandalay before reaching China through the border crossing at Muse **(VC1)**

- **Route 2:** 20% of the rubber goes to Yangon, where it is either directly exported as RSS or further processed into TSR and then exported by sea to Singapore, Malaysia and other countries **(VC2)** or used by local industries **(VC3)**

A fourth value chain connects Tanintharyi Region rubber products to Thailand through an unofficial trade route **(VC4)**. This trade is very difficult to assess and quantify (Figure 11, dotted blue line).

Figure 11: Trade routes for rubber from Tanintharyi Region

Source: Authors' survey

Rubber Value Chains

Based on these trade routes, three main rubber value chains have been identified for the Tanintharyi Region (Table 22).

Table 22: Value chains for Tanintharyi rubber

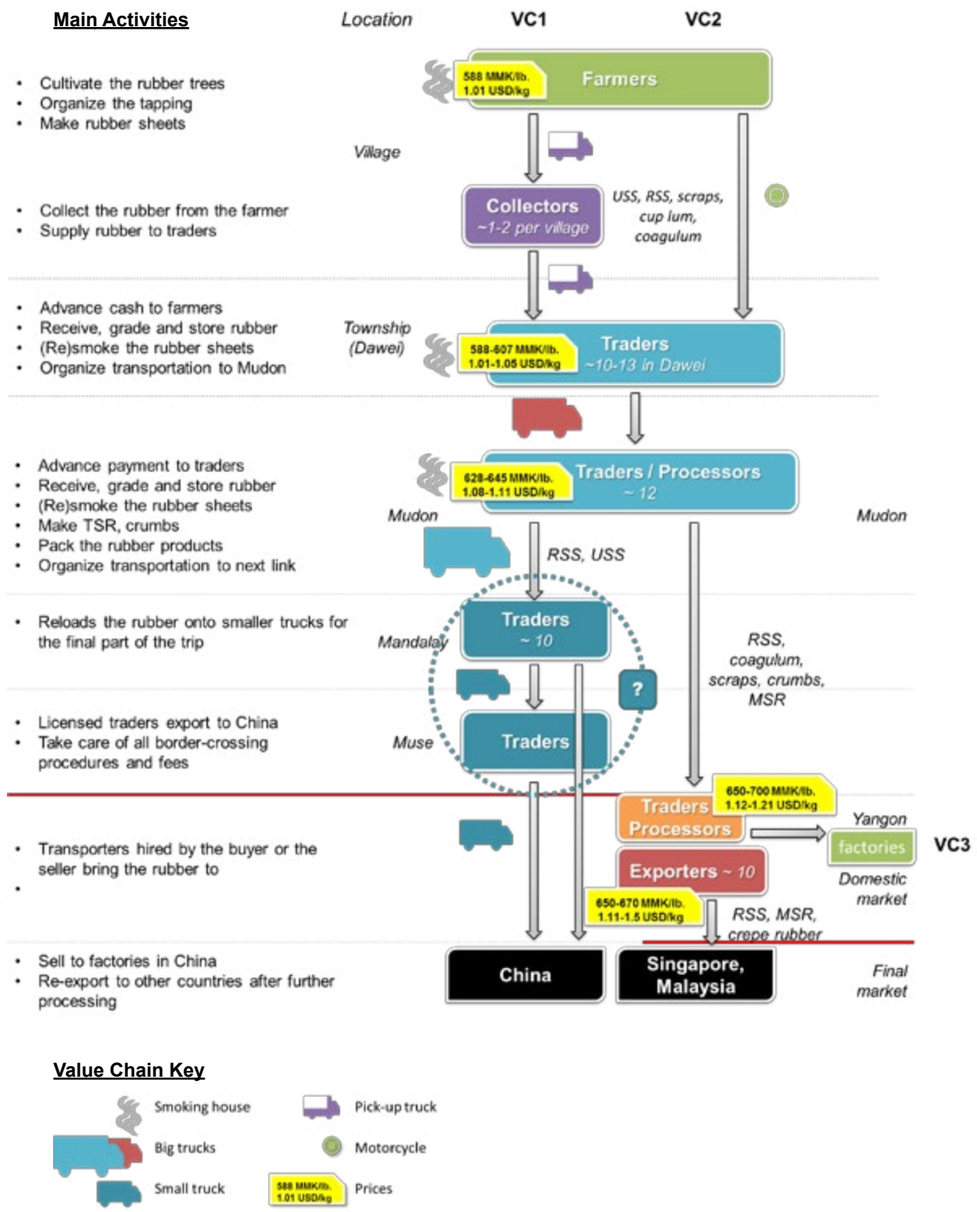
	Value chain 1	Value chain 2	Value chain 3
Destination	Export market (China)	Export market (Singapore, Malaysia, Japan etc.)	Domestic market
Type of products sold	RSS, USS	RSS, TSR, crepe rubber	RSS, scraps, crumbs
Importance of quality	Low	High	Low
Opportunities	- Large volumes - Established VCs	- Higher prices - Adding value	- Large domestic market
Constraints	- Very price competitive - Little incentive for quality	- High quality requirements	- Small industrial fabric - Low skilled workers

Source: Authors' survey

Figure 11 offers a visual presentation of the three main value chains for the rubber produced in Tanintharyi Region. The figures provided in the chart are estimations of (1) the number of stakeholders at each stage; (2) the selling and buying prices for the different types of stakeholders involved in the chain.

The pending Dawei Special Economic Zone (SEZ) and deep-sea port is likely to transform Tanintharyi Region's rubber sector. This could lead to the creation of a completely new value chain for the direct export of RSS and other processed rubber exports, should the corresponding manufacturing industries develop accordingly. Improved access to international markets could present a key opportunity for the development of high quality rubber, with upgrading and value adding opportunities for local farmers, traders and processors.

Figure 12: The rubber value chains of Tanintharyi Region



Source: Authors' Survey

Rubber Prices

International rubber prices have fluctuated significantly over the past decade (Figure 13). There was a drop in rubber prices shortly after the financial crisis of 2008, followed by a recovery and then a sharp increase up until 2011. Rubber prices reached an all-time high at 5,600 USD/ton before decreasing again due to a decline in China's rubber import volumes, an increase in the level of global rubber production and a drop in the price of crude oil. It is estimated that between 2010 and 2016, there was a 56% decline in international rubber prices (KPMG, 2016).

Figure 13: International rubber prices (USD/lb)

Source: Index Mundi (2017)

Rubber prices in Myanmar follow international rubber prices, which vary according to the demand in China. Myanmar's prices are also affected by extreme weather events in neighbouring rubber producing countries, and by exchange rate fluctuations between the USD and the MMK. The small price increase observed in 2016 was driven by favourable exchange rates and higher demand from China and Malaysia.

Traders within the rubber value chain in Myanmar receive the daily selling price from China. They deduct 10-20 MMK and fix that as the buying price at which they buy from different farmers and small collectors. The difference between smoked and unsmoked sheets is around 20-30 MMK.

Information about rubber prices is also easily accessible by producers. Farmers access the daily prices through the internet or by watching television channels such as Skynet TV or Bluebird.

One of the most widely traded rubber products in the Tanintharyi Region value-chain was Ribbed Smoked Sheets of grade 3 (RSS3). Buying and selling prices were higher in Mudon than Dawei, mainly due to traders in Mudon having a larger supply basin outside of the Tanintharyi Region (Figure 14). Rubber selling prices ranged between 529-745 MMK/lb for Mudon and 503-760 MMK/lb for Dawei. Rubber buying prices ranged from 511-728 MMK/lb in Mudon and 485-742 MMK/lb in Dawei.

Figure 14: RSS3 rubber buying and selling prices in Dawei and Mudon (MMK/lb)

Note: small sample size means that figures should be taken with caution

Source: Authors' survey

At the producer level, the decision to harvest latex was largely determined by the evolution of prices. For smallholder farmers, rubber was the main source of income so they stopped hiring workers to tap their trees and stopped tapping altogether if prices fell below 500 MMK/lb. (0.86 USD/kg). For farmers whose plantation was in the immature period, 600 MMK/lb. (1.03 USD/kg) was the minimum price to tap. While there was no profit under 600 MMK/lb (1.03 USD/kg), qualified tappers were difficult to find so tapping would often continue in order to provide income to the tappers and maintain the workforce. When prices were low, the strategy was to stop tapping the older rubber trees and instead focus on producing higher quality rubber.

In one large plantation, 400 MMK/lb. (0.69 USD/kg) was the price below which tapping would stop; in another, profit could still be made at 480 MMK/lb. (or 0.83 USD/kg) which was the lowest price of 2015.

No rubber farmer at any scale mentioned cutting the rubber trees or shifting entirely to other crops.

6 Tanintharyi Region
Main Issues

Sustainability Threats

Land Allocation Procedures

Among the communities surveyed, one of the smallholder farmers interviewed indicated that securing land was the main incentive to start planting rubber. However, the issue of land ownership is of paramount importance in Myanmar, especially as the government is encouraging foreign investment in agriculture. Whilst many rural households in Myanmar are engaged in farming activities on very small plots of land, there are also widespread issues of landlessness and tenure insecurity (Global Witness, 2014). Interviews in this study show that land allocation procedures are diverse and complicated, and that farmers do not always understand them.

Large-scale rubber concessions do not currently threaten the land allocation of smallholder rubber farmers in the Tanintharyi Region, but this could change once the new deep sea-port is constructed.

Deforestation

Deforestation levels as a result of plantation expansion were low at the time of the survey, due to poor rubber prices. However, this resulted in many farmers depending on non-timber forest products which imposed new pressures on the environment. Many people expressed concern at the loss of forest cover in their areas and noted a net decline in forested areas since their childhood. The main causes of forest loss were identified as:

- Illegal logging
- Agricultural practices such as slash-and-burn, and the development of rubber and oil palm plantations
- Wild fires originating on farmers' plots
- The collection of fire wood from the forest by villagers for charcoal production
- Population increases

The decrease in forested areas was associated with higher temperatures, less rain and lower access to water from natural springs. Fires became more frequent and wildlife became scarce, which reduced income for hunters. There was less access to natural orchids, medicinal plants and various kinds of forest products, all of which negatively impacted on the general well-being of communities along with household income.

Loss of forested cover also has long term impacts in the wider region. Important ecosystem services are lost such as weather regulation, which can result in droughts in some areas and extreme flooding in others. Deforestation also results in high levels of soil erosion, which has long term effects on soil quality for future agricultural production.

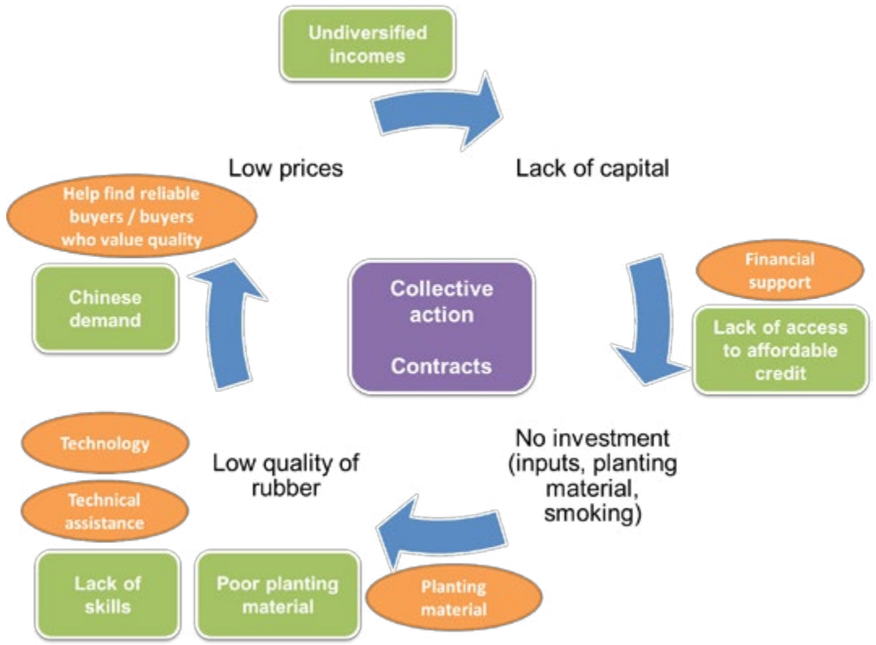
The Poor Production Cycle

The main issues identified by the interviewees of rubber growing in the region were:

- the very low price of rubber, which is currently below the cost of production;
- the lack of traders interested in high quality rubber and high production standards;
- the lack of knowledge in the farmers regarding rubber production and the lack of qualified workers to correctly tap the rubber;
- absence of credit institutions; traders were often the main providers of credit and sometimes provided credit in exchange of very unfair agreements i.e. at very high interest rates (5-7%/month), against the farmers' promise to sell them products the following season

This creates a vicious circle where the lack of money for investment on individual rubber plantations means farmers cannot purchase the inputs needed to improve the quality of their rubber, which in turn traps them in a low-cost, poor-quality production cycle (Figure 14).

Figure 14: Tanintharyi Region rubber farmer poor production cycle



Source: Authors' survey

Causes

Lack of coordination

- **No coordination between the farmers:** Most farmers grew their trees individually and did not collaborate to process or sell rubber to the traders. The only case of collective action in the rubber sector was supported by the Myanmar Rubber Planters and Producers Association (MRPPA), which brought together large plantations and processors. Historically, there has been a lack of agricultural organisation across Myanmar due to cooperative models being perceived as inefficient government entities and the freedom of assembly being prohibited. Decades of tight restrictions on farmer gatherings and organisation have caused a scarcity of farmer-initiated collective ventures and the related deficit of organisational skills (Haggblade and Boughton, 2013).
- **No official coordination with traders:** Most transactions along the rubber value chain were spot market transactions. Farmers accessed market prices through the internet or on their phone, brought their rubber to the nearest market place and sold it to the buyer offering the highest price. Traders provided the farmers with little to no inputs or advice, apart from some rare cases of cash advance or technical advice. Unlike other countries in the region, such as Lao PDR, there was no evidence of any official contracts linking farmers with traders. This may be explained by the structure of the market; low demand for high quality products did not provide incentives for information sharing to improve rubber quality. Little market intermediation and oversight also lead to a lack of official procedures and documentation. Myanmar ranked low on contract enforcement in the World Bank's 'Doing Business Indicators' in 2013 and 2014, showing that this issue extends beyond the rubber sector.

The low quality curse

- **Endogenous factors:** Rubber yields in Myanmar are low compared to neighbouring countries, which is mainly caused by the poor planting material locally available to the farmers. Poor harvesting, storage and processing techniques and poorly organised logistics further aggravate the problem, by lowering the quality of the final product and increasing the cost of delivering products to the market. Lack of domestic regulations, grading standards and facilities also cause a gap in quality assurance. This leads to large discounts on the international price for Myanmar's rubber, which can be as high as 27% (UNIDO, 2015). There is a heavy dependence on other countries for processing and further exporting Myanmar's rubber.
- **Exogenous factors:** Market demand has a significant influence on the provision of rubber and incentives to improve quality. With 80% of rubber from the TR value chain going to China, where there is strong demand for large volumes of low quality rubber, there is currently little incentive to improve production quality. Whilst several large State Owned Enterprises (SOE) in China are progressively turning towards sustainable production, this is not yet the case for the majority of small rubber manufacturers in Yunnan and elsewhere.

7 Conclusion
Rubber Sustainability

Summary

This report has provided a comprehensive analysis of the rubber trade networks that extend from the small villages of Northern Tanintharyi Region to Dawei, Mudon, Yangon and beyond.

The study took place during a period when international and domestic rubber prices were extremely low. As a consequence, rubber production levels were also low as many farmers did not consider it economically profitable to keep tapping their trees, and instead relied on other crops for income. This contributed to the adoption of more diversified income earning strategies by the farmers. Smallholder farmers that did produce rubber mainly produced low quality rubber sheets. This was partly due to demand, with around 80% of rubber from this region being bought by Chinese traders who required large volumes of low quality rubber. It was also due to a lack of support received by these farmers in terms of technical knowledge, access to finance and land. A total absence of collective action between farmers and official agreements between farmers and traders further increased farmer vulnerability.

Table 23: SWOT analysis of the Tanintharyi Region rubber value chain

Strengths	Weaknesses
• Increasing production • Low labour costs • Young rubber plantations • Available rural manpower to work in plantations and/or downstream rubber industries • All key ingredients to produce sustainable rubber • Suitable soil	• Low productivity • Low quality of planting material • Extreme vulnerability for smallholder farmers: - lack of skills and poor extension services - lack of access to credit - limited access to and use of farm inputs - absence of collective action - no bargaining power - difficult access to land • Lack of industries to process rubber into useful end product • Land use mapping and planning
Opportunities	**Threats**
• Strong demand for rubber in neighbouring countries • Potential market for sustainable rubber • Dawei deep sea-port (near future) • Domestic market potential • Future Myanmar Rubber Industry Development Law	• Volatility of the rubber market • High market competition • Low quality trap • Risk of oversupply when plantations reach full maturity • Forest degradation when prices pick up

Source: Authors' survey

Recommendations

To develop a sustainable rubber value chain in Tanintharyi Region, the following recommendations are provided:

Provide farmers with technical training and improved planting material

Benefits: Improving smallholders' access to high quality clonal planting material and extension services would increase productivity of the rubber plantations. Technical training on farming techniques such as fertilisation and tapping techniques would improve the growth of trees, shorten the immature period of plantations and optimise production. This could be done in collaboration with the private sector.

Actions: Using a certified and uniform budded planting material is the first step to increase rubber plantation productivity. A review of quality standards is needed to ensure that the Malaysian standards currently used are the best technical norms for Myanmar. Improving access to affordable credit could be done by leveraging financing mechanisms which combine public sector capital with private sector capital, reducing the risk for banks to do business with smallholders. To decrease the cost of operations, credit could be injected through innovative channels such as mobile money or extension staff or cooperatives.

Improve research and development

Benefits: Increased university research in rubber products and domestic markets in Myanmar would help identify the best rubber products for different regions and stakeholders. Universities and vocational training centres could help design training programmes in collaboration with the private sector. The training programmes would target workers and other operators in the rubber sector, covering various subjects such as production techniques, tire design and performance analysis.

Actions: Increase investment in research. Improve production standards to enable participation in international producer associations, such as the Association of Natural Rubber Producing Countries (ANRPC). Assistance from these associations would be necessary to further improve research and development practices.

Establish collective action groups

Benefits: Collective action at the village level would improve the efficiency of rubber production through improved infrastructure (such as collective smokehouses or collective nurseries), improved logistics (such as bulk transport to trade cities) and labour exchange systems. Farmers within well-structured farmer organisations would also become important focal points for capacity building initiatives by government and/or private suppliers to improve access to farming inputs and training.

Actions: The Perennial Crop Department (PCD) and MRPPA should work together to promote collective action amongst amongst rubber farmers, based on existing models in India and Thailand.

Box 4: Collective warehouses

Establishing collective warehouses in strategic locations would allow the quality of rubber sheets to be assessed and discussed with the farmers before trading, to standardise and improve the quality of the rubber.

Quality certificates could be issued at the collective warehouse, which would help facilitate better access to markets and price setting agreements. Collective warehouses managed by farmer groups with government and trader support could also be a place where different types of stakeholders meet and share technical information.

Ultimately, the warehouses could act as a financing mechanism, where a title is provided to the farmers as a guarantee and permits financial support once the product is in storage and the quality is certified.

Develop the use of fair and inclusive farming contracts

Benefits: Official contracts would encourage the development of stable relationships between the rubber stakeholders. This would improve livelihood stability for smallholders by enabling farmers to negotiate higher prices in return for guarantees of volume and quality. It would also improve the traceability of rubber nationally, which is key for regulating the industry to ensure standards are achieved.

Actions: The development of such contracts would require setting up a framework of contract guidelines and templates. Regulations would also be needed to ensure the development of fair contract conditions, the subsequent enforcement of such contracts and the implementation of dispute resolution procedures. Providing support to collective action farmer groups would strengthen the position of farmers when discussing contract conditions with traders.

Become a regional leader in sustainable rubber production

Benefits: Myanmar could increase rubber sector competitiveness and improve its international reputation by positioning itself as a country that produces deforestation free, high quality rubber. This would appeal to international customers and companies that are increasingly looking for sustainable rubber, and give Myanmar a market advantage over other Southeast Asian countries. By focusing on improving the yields and quality of rubber instead of expanding plantations into new areas, Myanmar's natural resources remain protected which maintains ecological integrity and important ecosystem services which underpin other sectors of the national economy.

Actions: The rubber industry should commit to find the best management practices to reduce the environmental impact along the entire value chain. This could be done by collaborating with the current leaders in sustainable rubber such as Michelin, General Motors, WWF and CCCMC to identify the best standards for sustainable natural rubber production. The production of sustainable rubber will become essential in the forthcoming years and will play an important role in attracting financial resources to assist Myanmar's national development.

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