



Vietnam Rubber Industry

Current status and sustainable development solutions



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Vietnam Rubber Industry: Current status and sustainable development solutions was jointly produced by Vietnam Rubber Association (VRA), Vietnam Timber & Forest Product Association (VIFORES), Handicraft and Wood Industry Association of Ho Chi Minh City (HAWA), Forest Products Association of Binh Dinh (FPA Binh Dinh) and Forest Trends. The study, conducted from 2017 to September 2018, aims to broadly assess the industry with a focus on production, processing, trading and product consumption. The report works to clarify the rubber industry's current role and position, and the advantages and difficulties that it is facing in the context of increasing global integration. The information within this report will help inform practical policies that can minimize market risks and promote future sustainable development. The information in this report is also expected to open opportunities for cooperation between stakeholders, especially between businesses with shared concerns and between enterprises and other stakeholders, and to create momentum for expanding the consumption of sustainable rubber products.

The research team would like to express our sincerest appreciation to the Norwegian Agency for Development Cooperation (NORAD) and the United Kingdom (UK) Department for International Development (DFID) for their resources and support. We would like to thank the leaders of VIFORES, VRA, FPA Binh Dinh, HAWA, and Forest Trends for enabling our team to complete the research. We also would like to express our appreciation for data and information provided by the General Statistics Office, General Department of Customs (GDC), Statistics Department and provincial Departments of Agriculture and Rural Development, and Vietnam Rubber Group (VRG). The report also uses information gathered from surveys of enterprises and members of the VRA. We also received the support of officials, specialists, and experts from the management agencies, rubber producers and processors in Binh Phuoc, Binh Duong, Gia Lai and Son La during the field visits.

The key findings of this report were presented at the Workshop entitled ***Natural rubber and rubber wood supply chain: Status and sustainable development solution*** in Ho Chi Minh City on September 28, 2018 by VRA, VRG, VIFORES, HAWA, FPA Binh Dinh, Binh Duong Furniture Association (BIFA) and Forest Trends. The authors truly appreciate participants' comments and suggestions at the Workshop.

This is the first report outlining key features of Vietnam's rubber supply chain. Conditions did not allow us to include detailed information about the industry in this report. It is our hope that the report will pave the way for future research activities which will provide a clearer, accurate overall picture of the position and role of Vietnam's rubber industry will be accurately identified, which will create a foundation for policy recommendations on future sustainable development solutions for the industry.

Research Team

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1. Introduction

The production and processing of rubber (hereinafter referred to as the rubber industry) is currently one of Vietnam's most economically, socially, and environmentally important industries in the agriculture and forest sectors. In 2017, Vietnam's rubber area reached 969,700 ha, with 67% of the total area ready for latex harvesting (the remaining 37% remains immature). Currently, there are numerous economic actors involved in rubber production, most of which are state-owned enterprises belonging to the Vietnam Rubber Group (referred to as Rubber Group or VRG) and smallholders (also known as rubber smallholders). In 2017, 51% of Vietnam's total rubber production area consisted of smallholdings.

The rubber industry remains export oriented. Currently, three main categories of product are exported: natural rubber materials (natural rubber, or latex), processed rubber products,¹ and more recently, rubber wood and furniture made from rubber wood. In 2017, the total export turnover of these three groups reached over 6.2 billion USD, accounting for 3% of Vietnam's total export turnover. Domestic consumption of rubber products is smaller in both volume and turnover compared to the export market, but is increasing. The rubber industry's strong development and growth has created jobs for approximately 500,000 workers in different stages of the supply chain, including 264,000 rubber smallholders who directly participate in production.

Vietnam's rubber industry has been intensely integrating with the world market. The industry's opportunities to expand its export market continue to expand through free trade agreements that have been signed or are under negotiation by the Vietnamese Government. However, integration also increases international competition pressure and creates difficulties for market access due to trade barriers and risks. One basic condition for many consumer markets, particularly for buyers based in the United States (US) or European Union (EU), is compliance with sustainability requirements. These take the form of company-specific commitments, but also laws, regulations, taxes, and fees related to environmental impact, labor use, and other socioenvironmental factors in a product supply chain. These regulations are not only limited to the policies of the countries of production and where the business activities take place, but also provisions of the international treaties to which participating Governments have committed.

In order to adapt to new market regulations, enhance competitiveness, and reduce risks for the rubber industry in the context of integration, Vietnam Rubber Association (VRA), Vietnam Timber & Forest Product Association (VIFORES) and Forest Trends Association conducted an overview study of the rubber industry. This study outlines basic features of the rubber industry, of the industry, from production, processing, and transport, to product consumption. The findings of this study aim to clarify the rubber industry's current role and position, along with the advantages and difficulties that the industry is facing in the context of market integration. Findings of this report will help inform the creation of practical business policies, thus contributing to expanding development opportunities, minimizing market risks, and promoting sustainable development in the rubber sector. The findings of this study are expected to open collaboration opportunities for stakeholders, especially among businesses that have shared interests, and between enterprises and other stakeholders (for example, rubber and wood industries); to promote market expansion; and, to contribute to the sustainable development both individual rubber enterprises and the industry as a whole.

Vietnam Rubber Industry: Current Status and sustainable development solutions outlines each stage of the natural rubber and rubber product supply chain. In particular, the report focuses on the supply chain of natural rubber and rubber products, assesses the current state of the supply chain, and presents key opportunities and challenges in each stage. In addition, the report reviews policies related to of each stage in the supply chain. Rubber wood and rubber

¹ Products of manufacturing as gloves, conveyors, tires, rubber threads, etc.

wood product supply chains are the focus of another complementary report produced by the same research team.²

The data used in this report was gathered from various sources. Secondary sources include statistics on area, production, yield, quantity, and participant composition of the supply chain collected by the General Statistics Office (GSO) data, General Department of Customs, and survey data of other agencies and organizations. Additional secondary sources include technical reports of external organizations, industry statistical data, VRA newsletters, and reports by provincial Departments of Agriculture and Rural Development and Statistical Offices. Furthermore, secondary information was collected from the data shared by 14 natural rubber companies that were consulted by the research team through online surveys, and interviews with representatives of natural rubber companies in Gia Lai, Binh Phuoc, Binh Duong and Son La, where the fieldwork was conducted by the research team in 2017-2018.

The report consists of four parts. Part two describes the context of Vietnam's rubber industry, including its key features and expansion to meet global market demand. Part three details the natural rubber supply chain from production and processing, to trade and consumption; this section also includes information on Vietnam's natural rubber and rubber product exports as well as imports from a number of supplier countries into Vietnam. These findings inform the report's discussion (part four) and recommendations for the industry's future sustainable development.

2. The Development and Current Status of Vietnam's Rubber Industry

2.1. Increasing global market demand for natural rubber

The formation and development of Vietnam's rubber industry, especially in the last 10-15 years, is influenced by several factors including increasing global market demand for natural rubber. Similar to other commodities such as wood, coffee, and pepper, Vietnam's rubber industry is export oriented. Currently, 81-83% of Vietnam's natural rubber output is exported (VRA, 2018a).

Between 2013 and 2017 the world's natural rubbers supply continued to increase, reaching 13.45 million tons in 2017, a 1.1-million-ton year-on-year increase. Global consumption of natural rubber also increased during this period, but at a slower rate: in 2017, it reached nearly 12.86 million tons, up from 11.74 million tons in 2015 and 11.37 million tons in 2013. Supply remains greater than demand, which has triggered price pressure (Vietnam Rubber Association, 2018b).

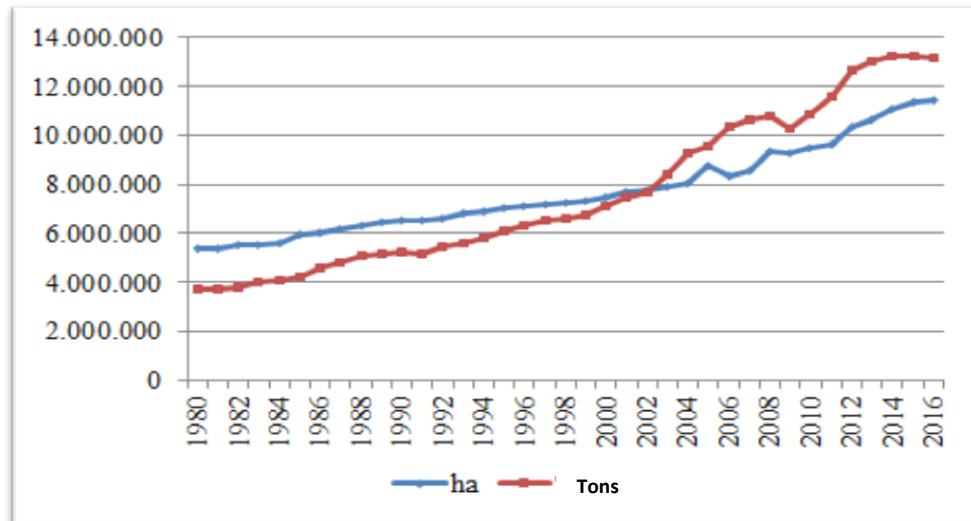
During the global economic crisis (2008-2010), demand for natural rubber drastically declined (International Rubber Study Group [IRSG] 2018). The demand for natural rubber then increased sharply, mainly as the result of national stimulus policies in many countries with the expectation that the economy will recover. This dramatic increase in demand was not met with a similar uptick in supply, which pushed natural rubber prices unusually high in 2011. This made rubber's profit margin superior to that of other crops, and quickly spurred the expansion of rubber plantation area in many countries, especially some Asian countries (Figures 1 and 2). Since 2012, most government stimulus policies have stopped or been scaled back, as the world economy gradually recovered but at a slow pace. This has led to an increase in demand, but at a rate of only 3-4% per year. Meanwhile, high rubber prices created a drive for intensive farming and collection, which resulted in a rapid natural rubber output increase that exceeded demand from 2011-2013.

² Nguyen Quang Vinh, To Xuan Phuc, Tran Le Huy, Cao Thi Cam and Huynh Van Hanh (2018). Rubber wood supply chain: Current situation and some aspects of policy. Forest Trends and VIFORES .

In the meantime, rubber planted between 2010-2011 matured and became ready for latex harvesting six to seven years later, once again pushing supply above demand (Figure 2), increasing inventory, and reducing export prices.

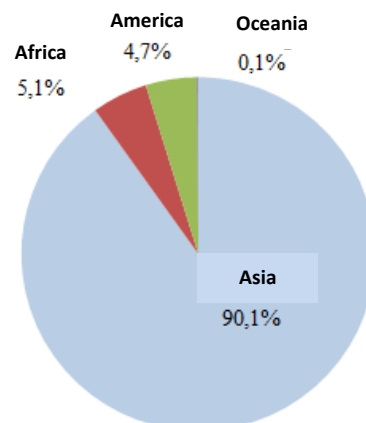
These trends show that if the producing countries have no solution to balance supply and demand, the price of natural rubber will not soon recover.

Figure 1. Global rubber harvesting area and output



Source: FAO (<http://www.fao.org/faostat/en/#data/QC>)

Figure 2. World's rubber areas in 2016



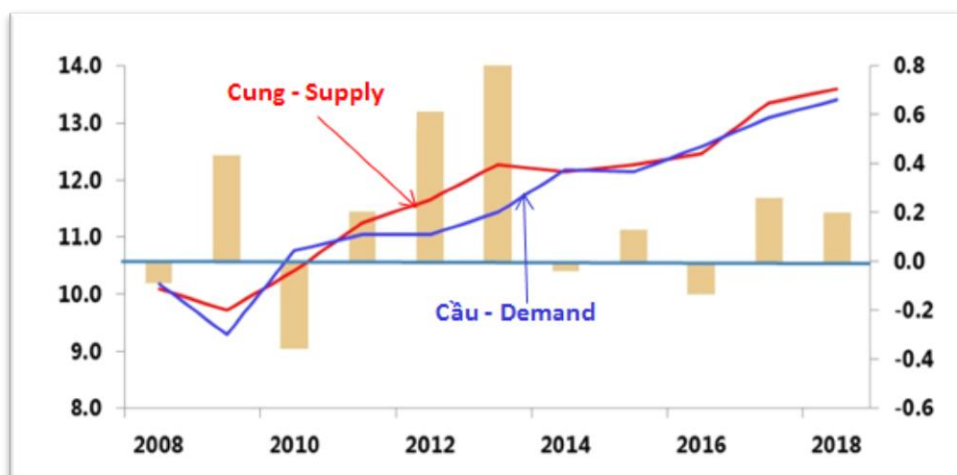
Source: FAO (<http://www.fao.org/faostat/en/#data/QC/visualize>)

A study by the World Bank (excerpted from 2017 Rubber Group Report) summarizes the following characteristics of global natural rubber supply and demand:

- Global rubber supply will decrease because countries with large rubber supplies already have policies to limit their output
- Rubber producing countries work together to balance supply
- China's auto industry recovered, which will increase rubber demand
- The global rubber inventory is on a downtrend

According to IRSG (2018), the large excess supply of natural rubber during the period of 2011-2013 brought accumulated inventory to a high level. With that, numerous countries that supply natural rubber introduced solutions to balance supply and demand between 2014-2016, through measures and mechanisms to reduce supply. However, the oversupply returned in 2017; according to certain forecasts, supply will continue to exceed demand in 2018 (Figure 3). This creates pressure which makes it difficult for rubber prices to recover if there is no solution to control the supply and avoid an increase in accumulated inventory.

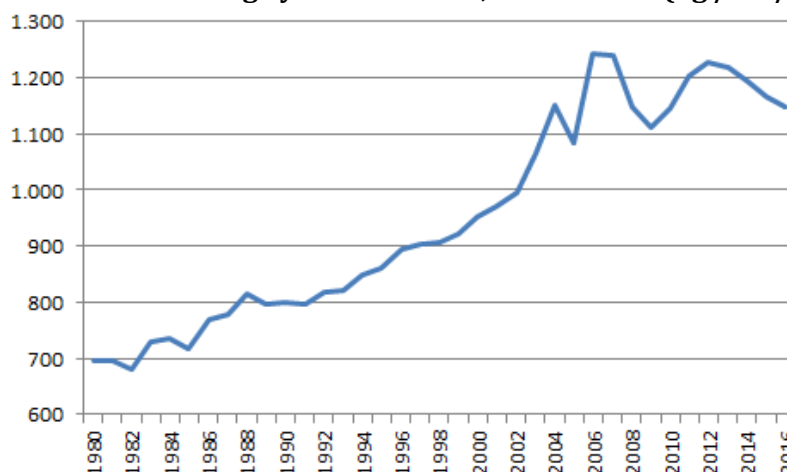
Figure 3. Global supply and demand of natural rubber (million tons)³



Source: IRSG (2018). *Global Rubber Market Trend Analysis: Prospects and Challenges*. Global Rubber Conference 2018, Sihanoukville, Cambodia, 5 - 7 April 2018

Before 2012, the global natural rubber price highly increased, creating a drive for intensive farming to increase yield. However, when global prices decreased, the economic benefits of rubber plantations declined; farmers did not invest in intensive farming, thereby reducing the average yield per area unit (Figure 4).

Figure 4. Global average yield of rubber, 1980 - 2016 (kg / ha / year)



Source: FAO (<http://www.fao.org/faostat/en/#data/QC>)

Thailand, Indonesia, Vietnam, China, India and Malaysia are the leading rubber producers in Asia. In 2016, these six countries accounted for 86.6% of total global rubber output (Table 1).

Table 1. Natural rubber output of 6 Asian countries in 2017

Country	Total area (thousand hectares)	Harvest area (thousand hectares)	Yield (kg/ha/year)	Quantity (thousand tons)	Proportion (% of total world output)
Thailand	3,658.2	3,075.5	1,440	4,429	33.2
Indonesia	3,659.0	3,054.0	1,188	3,629	27.2
Vietnam	971.6	649.0	1,674	1,087	8.1
China	1,176	744.0	1,118	798	6.0
Malaysia	1,081.9	531.0	1,420	740	5.5
India	822.0	479.0	1,489	713	5.3

Source: ANRPC, 8/2018.

³ Forecast figures for 2018

2.2. Development of Vietnam's rubber industry

With over 80% of Vietnam's natural rubber being exported, so far, the rubber industry's development has been greatly influenced by export markets, especially China, which consumes 60-70% of Vietnam's total natural rubber export volume.

The rubber tree was first introduced into Vietnam by the French in 1897. Plantations were soon developed in southeastern provinces such as Dong Nai, Binh Duong, Binh Phuoc and Tay Ninh (Nguyen Thi Hue, 2006). Since 1955, a number of Vietnamese enterprises and smallholders invested in planting rubber in the South, then the Central Highlands. By the end of 1960, the total rubber area in Vietnam reached 142,000 hectares, which produced about 79,650 tons of output (ibid).

In the period between 1958 and 1963, rubber trees were planted in other provinces such as Quang Tri, Quang Binh, Nghe An, Thanh Hoa and Phu Tho, mainly with clones from China. The cultivated areas of these provinces during this time frame reached about 6,000 hectares and gradually decreased during the war to about 4,500 hectares in 1975 (Tran Thi Thuy Hoa, 1993). In 1975, Vietnam's rubber area was approximately 75,200 hectares, of which Vietnam Rubber Group managed 55,790 hectares. The rest (19,410 ha) was managed by local and private authorities (Nguyen Thi Hue, 2006).

Recognizing rubber's potential contribution to economic development, the Vietnamese Government, beginning in 1975, enacted various policies to expand the country's rubber area (summarized in Table 2). In general, these policies encourage investment in rubber production to meet the increasing demand of export markets and have enabled the expansion of rubber area in excess of the Government's original plans. Significantly, policies to catalyze rubber production in the late 2010s allow for planting rubber in forest land, which has further enabled a rapid production increase – and also enabled the involvement of smallholders. Yet this development has, especially in the Central Highlands, negatively impacted forest resources (To Xuan Phuc and Tran Huu Nghi, 2013).

Global rubber prices fell sharply since 2012, while rubber output continued to increase due to the expansion of rubber production area. This required the Government to change its policy orientation. The Government's policies after 2016 mainly focused on controlling the expansion of Vietnam's rubber area, especially those which were not included in the planning and limiting of conversion of natural forest land to rubber plantation land (191 / TB-VPCP on July 22, 2016). These policies, combined with the decline in global rubber prices, caused a loss in the drive to expand area. Farmers in some places even decided to convert part of their rubber-growing areas to other crops that have higher economic value.

By 2017, Vietnam's rubber area reached 969,700 hectares, 3,800 hectares lower than in 2016 (973,500 hectares) and 15,900 hectares lower than the area in 2015 (985,600 hectares). In 2017, Vietnam's rubber output reached 1,094,500 tons. As a result, Vietnam was ranked as the world's third-largest producer of natural rubber.

Table 3 shows Vietnam's area, yield, and output of rubber by region, illustrating the current concentration of rubber production in the Southeast and Central Highlands.

From 1980 to 2015, Vietnam's rubber area grew rapidly at a rate of approximately 7.4% per year. In 2011, Vietnam's rubber area reached 834,200 hectares, while the government's planned amount was 800,000 hectares. By the end of 2015, the country's rubber area reached 985,600 hectares, the largest among perennial industrial crops. In 2016, the rubber area started to gradually decrease, mainly due to the pressure of falling prices. As a result, some regions observed farmers switching to other crops (Figure 5).

Table 2. Rubber production development policies, 1975 – 2017

Policy	Key aspects
Decision No. 93-CP dated March 24, 1980	Established the General Directorate of Rubber under the Ministry of Agriculture. The rubber area in 1980 was 87,700 hectares, mainly managed by central and local state-owned companies.
Resolution No. 281-HDBT dated December 12, 1985 of the Council of Ministers	Planned the rubber area to 2000 with an area of 600,000 hectares, concentrated in the Southeast region and Central Highlands, with an output of 1 million tons. Actual area in 1985 reached 180,200 hectares; the annual export volume reached 50,000 tons.
Decision No. 86-TTg dated February 05, 1996 of the Prime Minister	Approved Vietnam's rubber industry master plan, according to which, the area by 2000 was expected to reach 350,000-450,000 hectares, and 500,000-700,000 hectares by 2005. However, the area in 1995 was only 278,400 hectares, much lower than the planned area.
Decision 349 / QD-TTg dated April 25, 1998 of the Prime Minister	Approved the Agricultural Diversification Project with the goal of planting 60,000 hectares of smallholder rubber from 1993-2006, concentrated in three Central Highlands provinces and seven Central coastal provinces. This was the period of smallholder rubber promotion in the region.
Decision 168/2001/QD-TTg dated October 30, 2001 of the Prime Minister	Approved Central Highlands socio-economic development plan, which included rubber development solutions with multi-stakeholder participation (state-owned rubber, private rubber, smallholder rubber), with the new planting area of 20,000-30,000 ha/year. According to the plan, there were various sources of funding, including preferential loans from the World Bank and the French Development Agency (for state-owned and smallholder rubber). By 2000, the national rubber area reached 412,000 hectares, much lower than the targets set out in Decision 86 in 1996.
Decision 150/2005 / QD-TTg dated June 20, 2005 of the Prime Minister	Approved the planning of nationwide restructuring of agriculture, forestry, and fishery production to 2010 and a vision to 2020, which accepts the expansion of rubber areas where conditions permit.
Decree 23/2006 ND-CP dated 3/3/2006; Decision 186/2006 / QD-TTg dated August 14, 2006 of the Prime Minister	Allowed land use conversion of three forests types (special-use forests, protection forests, and production forests); allowed production forest development by planting trees with a business cycle of 15 years or longer. This policy opened up opportunities for expanding rubber area on production forest land.
Notice No. 125 / TB-VPCP dated August 14, 2006 of Government Office	Localities were required to develop about 90,000-100,000 hectares of rubber in the Central Highlands in the 2006-2010 period. Land conversion was allowed for land of low-efficiency crops, poor coffee land, and forestry land that was currently managed by forestry farms to rubber plantations.
Directive 1339 / CT-BNN-TT dated May 17, 2007 on rubber development	Aimed to continue developing new rubber plantations on areas of adequate land, climate, and infrastructure conditions.
Circular 76/2007 / TT-BNN dated 21/8/2007 of the Ministry of Agriculture	Guided the process of converting forests to rubber plantations, specifying that production forest land, exhausted poor natural forest, young restored forests, bamboo forests, and low-efficiency forests are allowed to be converted.

Decision 2855 / QD-BNN-KHCN dated September 17, 2008 of the Ministry of Agriculture	Announced rubber trees as multi-purpose trees, being used in both agriculture and forestry. This decision allowed rubber plantations on both forestry and agricultural land.
Decision 750 / QD-TTg dated June 3, 2009 of the Prime Minister	Approved rubber development planning to 2015, with a vision to 2020. According to the plan, rubber area would increase from 700,000 hectares to 800,000 by 2020 with an output of 1.2 million tons. (Actual area up to 2009 reached 677,700 hectares). The expanded land fund included inefficient agricultural land, unused land, and exhausted poor natural forest.
Directive 1685 / CT-TTg dated September 27, 2011 of the Prime Minister	Suspended newly invested projects on forestry land with natural forests. In reality: Rubber area was massively expanded, including a number of unregulated expansion activities.
Official Letter 1039 / VPCP-TH dated February 22, 2012 of Government Office	Requested that the Ministry of Agriculture handle a number of provinces, namely Thanh Hoa, Hoa Binh and Ha Giang, that are not included in the rubber development planning but still conducted large-scale trial planting on large areas.
	• Rubber area expanded the most during 2007 - 2012, due to increased global demand, and governmental policy allowing rubber area expansion. • In 2011, Vietnam's rubber area reached 801,600 hectares, equivalent to the planned target of 2020. • Since 2012, global market prices decreased, and exports decreased. • Smallholder rubber area continued to increase. By 2014, the national rubber area reached 987,900 hectares (exceeding the planned area of 178,900 hectares); in 2015, the area reached 985,600 hectares (exceeding the planned area of 185,600 hectares).
Notice No. 191 / TB-VPCP dated 7/22/2016 of Government Office	Strictly prevented the conversion of poor natural forests to industrial crops, including rubber. Actual rubber area in 2016 was 973,500 hectares, a decrease of 12,100 hectares compared to 2015. The area in 2017 was 969,700 hectares, a decrease of 3,810 hectares compared to 2016.

Table 3. Vietnam's rubber area, output, and yield by region, 2015 – 2017

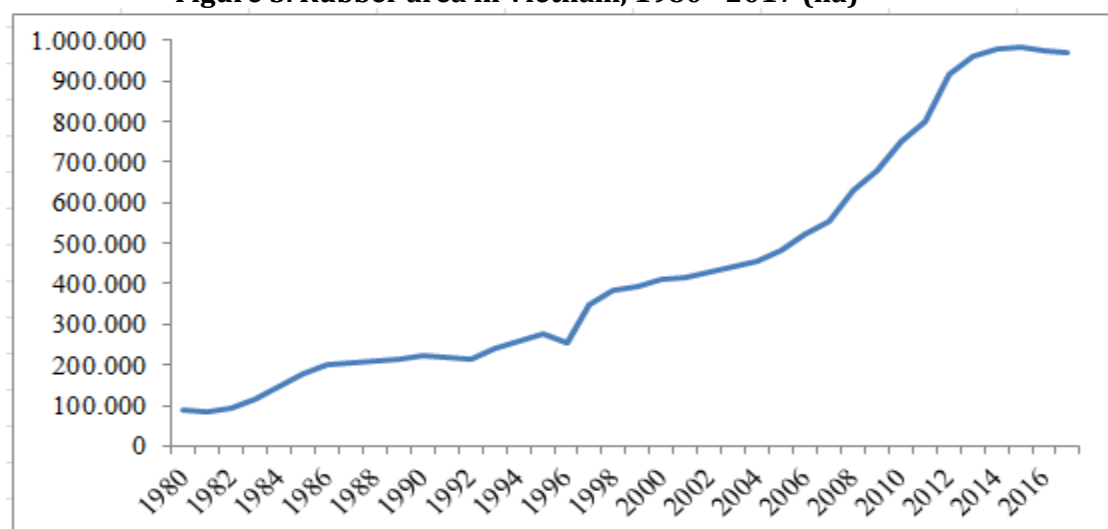
Region	Area (thousand hectares)			Harvest area (thousand hectares)			Output (thousand tons)			Yield (kg/ha)		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
The South (mainly Southeast)	546.1	543.0	548.9	395.4	404.2	417.2	728.8	748.0	777.2	1843	1850	1863
Central Highlands	258.9	252.9	249.0	135.2	140.2	152.5	193.8	193.7	215.4	1433	1382	1412
Central	150.0	147.1	141.5	73.7	76.9	80.9	90.1	93.6	100.0	1223	1218	1237
Northern	30.6	30.5	30.3	0.0	0.1	2.6	0.001	0.04	1.9	121	600	732
Total	985.6	973.5	969.7	604.3	621.4	653.2	1,012.7	1,035.3	1,094.5	1 676	1,666	1,676

Source: General Statistics Office, Department of Statistics and Provincial Department of Agriculture & Rural Development; compiled by Vietnam Rubber Association, excerpt from Rubber Newsletter in August 2018 by Vietnam Rubber Association - Developing rubber trees in Viet Nam to 2017.

Notes:

- The South consists of six rubber growing provinces and cities: Binh Phuoc, Binh Duong, Dong Nai, Tay Ninh, Ba Ria-Vung Tau, Ho Chi Minh city
- The Central Highlands consists of five rubber growing provinces: Kon Tum, Gia Lai, Dak Lak, Dak Nong and Lam Dong.
- The Central consists of 13 rubber growing provinces: Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan and Binh Thuan.
- The North consists of six rubber growing provinces: Ha Giang, Lao Cai, Yen Bai, Dien Bien, Lai Chau and Son La.

Figure 5. Rubber area in Vietnam, 1980 - 2017 (ha)



Source: Annual statistics by General Statistics Office, compiled by Vietnam Rubber Association

Vietnam's rubber output increased rapidly following the increase in area. Thanks to advancements in varieties and techniques, yields also increased continuously since 1980, from about 700 kg/ha per year in the 1980s to an average of 1,700 kg/ha per year from 2009-2017. Vietnam became one of the highest yielding countries in Asia. Average output grew by 9.5% per year over the previous decades, from 41,100 tons in 1980 to 1,094,500 tons in 2017; 26.6 times high than the former amount. With this output, Vietnam is world's third highest natural rubber supplier, accounting for about 8.1% of the total global rubber output, following Thailand (33.2% of the global market share) and Indonesia (27.2%) (Association of Natural Rubber Producing Countries, ANRPC 2018). Table 4 shows Vietnam's rubber yield and output in recent years.

Table 4. Viet Nam's rubber output and yield

Year	Output (ton)	Yield (kg/ha)
2007	605,800	1,603
2008	660,000	1,654
2009	711,300	1,698
2010	751,700	1,712
2011	789,300	1,716
2012	877,100	1,720
2013	946,900	1,728
2014	966,600	1,696
2015	1,012,700	1,676
2016	1,035,300	1,666
2017	1,094,500	1,676

Source: General Statistics Office, compiled by Vietnam Rubber Association in 2018

Figures 6 and 7 show the changes in Vietnam's rubber production and yield over the past three decades.

Figure 6. Viet Nam's natural rubber output, 1980 - 2017 (tons)

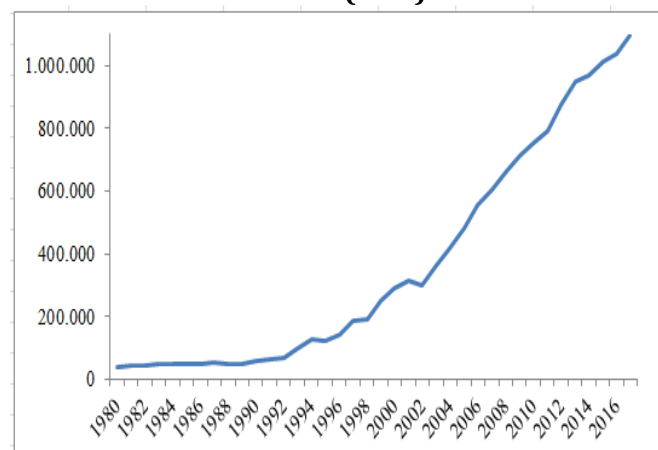
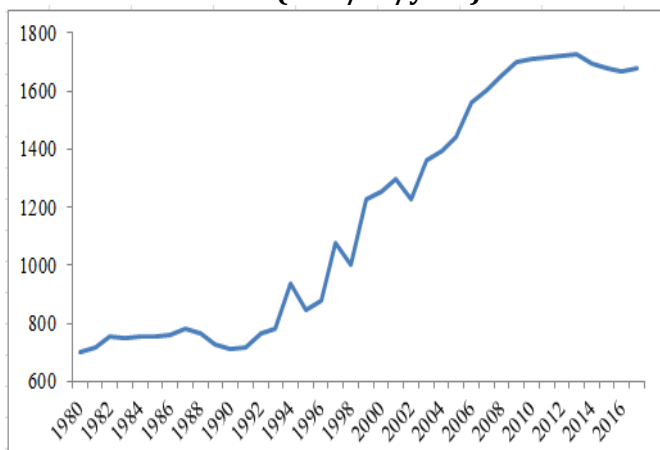


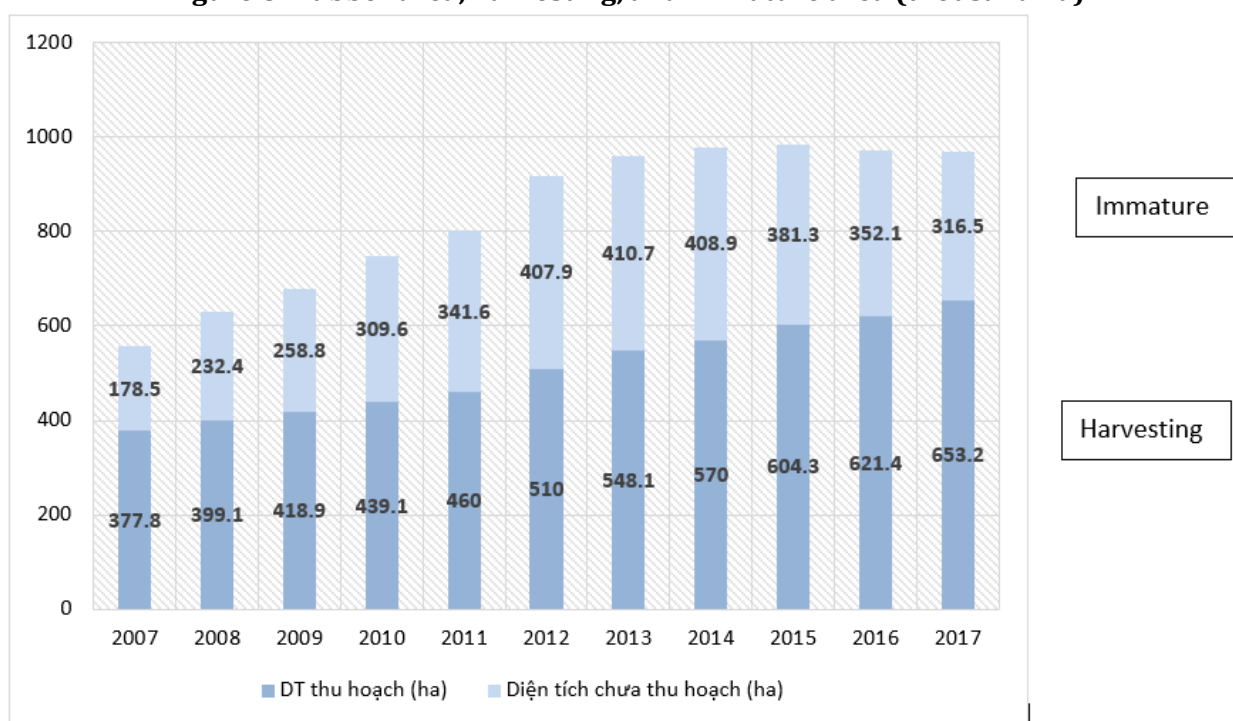
Figure 7. Viet Nam's natural rubber yield 1980 - 2017 (tons/ha/year)



Source: General Statistics Office, compiled by Vietnam Rubber Association

Latex is being harvested on over 67% of the current rubber area in Vietnam. Therefore, despite a slight decrease in total area and yield, rubber production still continues to increase (Figure 8).

Figure 8. Rubber area, harvesting, and immature area (thousand ha)



Source: General Statistics Office, compiled by Vietnam Rubber Association in 2018

3. Vietnam's current rubber supply chain

Viet Nam's rubber industry currently has three main product groups:

- **Natural rubber – Raw material.** Natural rubber's characteristics of elasticity, waterproofing, fireproofing, and heat resistance make it an important source of raw materials for many industries. Tire production consumes approximately 70% of the total amount of natural rubber.

- **Rubber products.** Several rubber products grew rapidly in recent years including tires, gloves, automobile spare parts, shoe soles, mattress, pillows, rubber mats, rubber threads, etc. The rubber manufacturing industry contributed to enhancing added value and reducing the trade deficit as well as raw material exports. Currently, rubber products only consume approximately 18-20% of Vietnam's total natural rubber supply. Being high value-added products, rubber products' export turnover is equivalent to natural rubber's export turnover (accounting for 80 - 82% of output).
- **Raw rubber wood and rubber wood products.** Rubber wood is bright yellow, light, and easy to process. This source of wood is considered environmentally friendly and harvested 25-30 years after the economic cycle of latex harvesting. In recent years, rubber wood became an important source of raw materials in the timber industry, not only for processing export products but also for domestic products' consumption. This product group's importance is described in detail in the Rubber Wood Report (Nguyen Vinh Quang et al, 2018).

The three product groups above are mainly for exports, and have similar export values. The general Department of Vietnam Customs' statistics, compiled by the research team, show the following export turnovers of these three products groups in 2017:

- Natural rubber: 2.25 billion USD, up 34% compared to 2016 (1.67 billion USD)
- Rubber products: 2.18 billion USD, up 32.9% compared to 2016 turnover (1.64 billion USD)
- Wood and rubber wood products: 1.74 billion USD, up 13% compared to 2016 (1.54 billion USD)

The rubber industry reached an export value of about US \$ 6.2 billion, an increase of more than 27.2% compared to the turnover in 2016.

Currently, there are supply chains for three main product groups in the rubber industry, including: (i) natural rubber, (ii) rubber products and (iii) rubber wood and rubber wood products. These supply chains differ in certain aspects, including dynamics of the chain, stakeholders in each stage, information content, science and technology, financial resources, etc. In general, there are three basic components in each supply chain: Upstream, midstream, and downstream.

The natural rubber supply chain's upstream includes rubber production and raw material purchasing. In this stage, the input is field latex from rubber plantations (latex and coagulated rubber) and rubber wood (round timber). There are various individuals and organizations involved in upstream, including state-owned enterprises, private enterprises, foreign-invested enterprises (FDI), smallholders, and co-operatives. The output of this stage is input for midstream, which includes preliminary processing of latex and rubber wood.

Preliminary products are mainly block rubber, centrifuged natural rubber concentrate, smoked sheet rubber, etc. and sawn timber, finger joint boards, MDF, etc. In this stage, enterprises are the key producers. Part of this stage's output is exported directly, and the rest is used in domestic manufacturing, which is the final product of the supply chain. Products of natural rubber manufacturing include tires, automobile components, shoe soles, gloves, threads, conveyor belts, pillows and cushions, sports equipment, etc. Rubber wood finished products include interior and exterior furniture and decorative items. Finished products serve both the domestic and export markets.

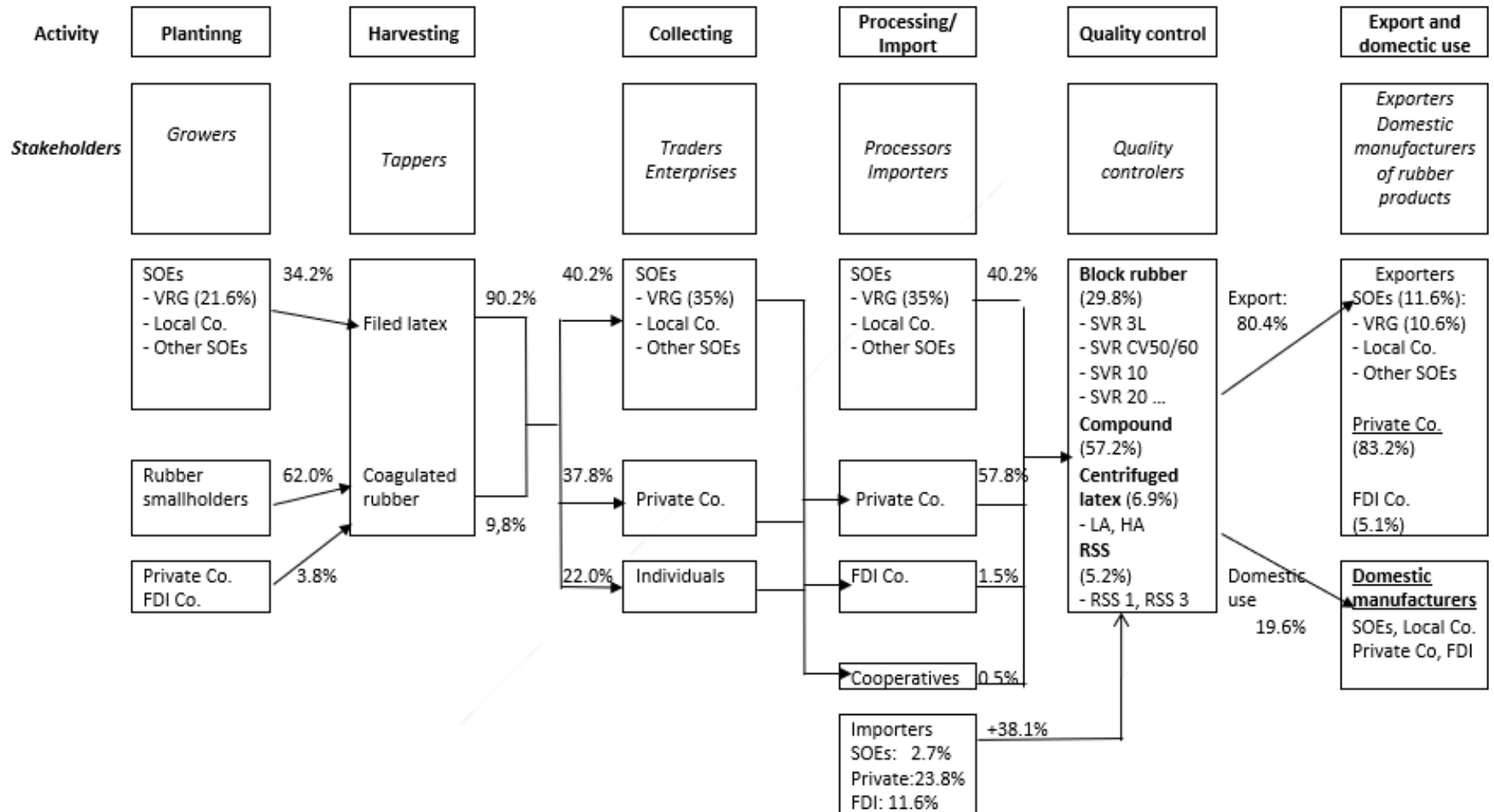
Various central and local regulators directly participate in each stage of the supply chain. For example, the Ministry of Agriculture and Rural Development (MARD) is responsible for managing natural rubber production, which is the beginning of the supply chain. The Ministry of Industry and Trade manages manufacturing, import, and export. The Vietnam Rubber Association connects

businesses, members, policy-making authorities and product markets. Local governments enforce policies and directly manage the activities of businesses within their scope of management. The Rubber Research Institute of Vietnam recommends high-yielding clones and advanced technical solutions.

Figure 9 shows details of natural rubber and rubber product supply chain components. The supply chains of timber and rubber wood products are separated and covered by a separate report on rubber wood (Nguyen Vinh Quang et al., 2018).

Although Figure 9 clearly shows the roles of individuals and organizations that are involved in different stages of the supply chain, it is relatively common for an individual or organization to participate in many stages of the process (for example, rubber plantations, processing, and export). For the above reason, this report's following attribution of boundaries to individuals, organizations, and groups in the supply chain's different stages is only relative.

Figure 9. Vietnam's natural rubber supply chain in 2017



3.1. Production

There are a large number of organizations and individuals that participate in natural rubber production, including state-owned enterprises, which consist of enterprises under the Vietnam Rubber Group and enterprises under the local authority, enterprises under department of national defense, private enterprises, foreign-invested enterprises (FDI) and rubber smallholders.

Table 5 shows the differences in area, productivity, and production between large scale and smallholder rubber. Figure 10 shows the pattern of changes in areas of these two production types. Although the areas of large scale and smallholder rubber are nearly the same (48.9% and 51.1% of Vietnam's total rubber area, respectively), the harvesting area of large scale plantations is nearly 20% lower than that of smallholding rubber, due to the higher replanting area of large scale plantations (39.3% of the total harvesting area of large scale plantations compared to 60.7% of the harvesting area of smallholding rubber). The average yield of smallholding rubber is now higher than that of large-scale rubber plantations.

The area yield and output of large scale rubber plantations tend to be lower, partly due to a larger replanting area. This which partly illustrates the supply adjustment in macro policies of natural rubber companies, mainly state-owned enterprises, who aim to reduce the natural rubber supply to the market.

The area, yield, and output of rubber smallholders continue to increase, possibly because smallholders have insufficient access to the global natural rubber supply and demand. It is also possible that rubber smallholders are limited in income, which forces them to accept the reduction in profit; they also may not count their own labor in cost calculation. In addition, the majority of the smallholder rubber area is newly developed and is currently experiencing their peak production period.

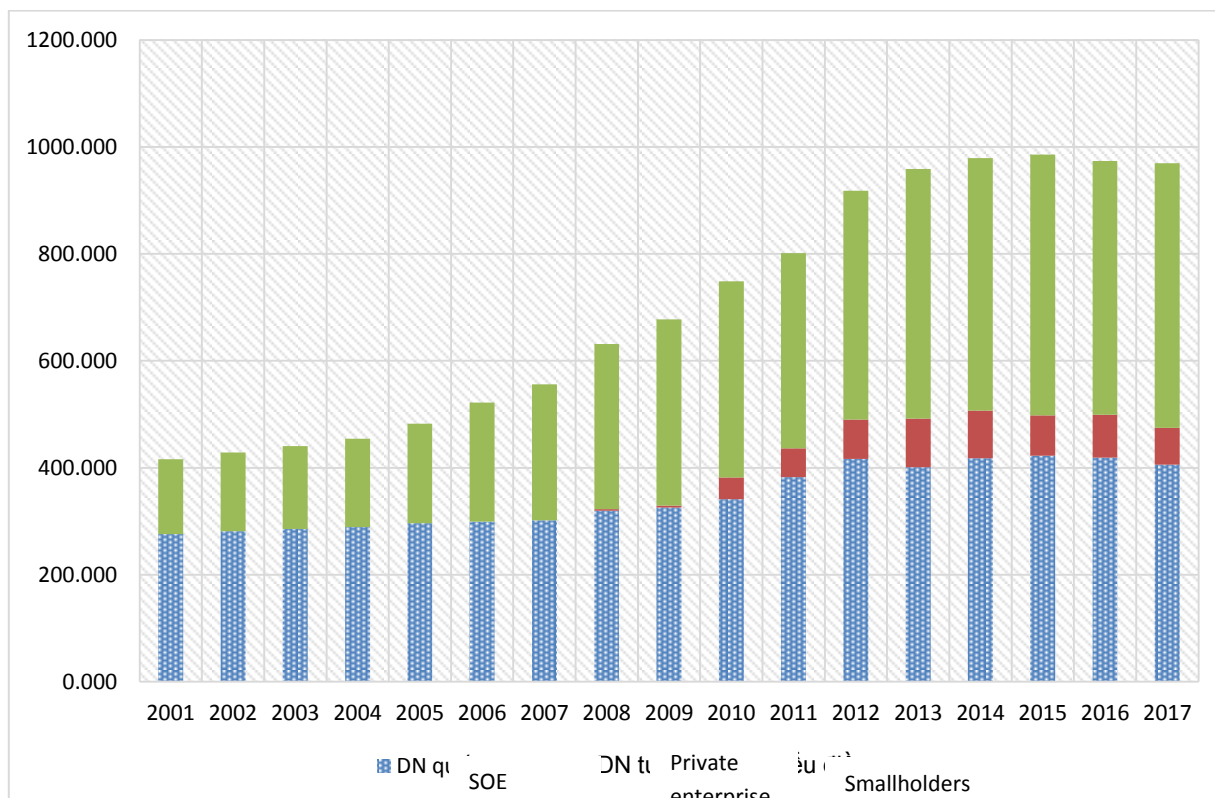
The smallholder rubber output is on the rise, and the global natural rubber price, which is still recovering slowly, will make it difficult for businesses and management authorities to limit the supply. This means the accumulated inventory pressure remains high.

Table 5. Vietnam rubber area, output, and yield by production type, 2014 – 2017

Type of production	Area (thousand hectares)			Harvest area (thousand hectares)			Output (thousand tons)			Yield (kg / ha / year)		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
<i>Large scale plantation</i>	<i>497.7</i>	<i>498.9</i>	<i>474,7</i>	<i>260.1</i>	<i>264,0</i>	<i>256.8</i>	<i>434.2</i>	<i>440.9</i>	<i>416.3</i>	<i>1.670</i>	<i>1,671</i>	<i>1.621</i>
- State-owned	422.5	418.8	405,6	240.2	244,0	230.8	407.2	407.9	375.3	1,696	1,672	1.626
- Private	75.2	80.1	69.1	19.9	20.0	26.0	27.0	33.0	41,0	1,355	1,654	1,579
<i>Smallholders</i>	<i>487.9</i>	<i>474,6</i>	<i>495,0</i>	<i>344.2</i>	<i>357.4</i>	<i>396.4</i>	<i>578.5</i>	<i>594.4</i>	<i>678.2</i>	<i>1,680</i>	<i>1,663</i>	<i>1,711</i>
Total	985.6	973.5	969,7	604.3	621.4	653.2	1,012,7	1,035.3	1,094,5	1,676	1,666	1,676

Source: Vietnam Rubber Association, 2018. Source: General Statistics Office, Department of Statistics, Provincial Departments of Agriculture and Rural Development.

Figure 10. Trend of rubber area by owner types (thousand hectares)



Source: General Statistics Office, compiled by Vietnam Rubber Association

Rubber plantation enterprises

Data from the General Statistics Office shows that in 2017 among over 391,500 hectares surveyed out of the total 474,652 ha, there were 159 enterprises and organizations involved in rubber plantations, with about 106,000 employees (Table 6).

Table 6. Organizations involved in rubber planting, surveyed in 2017

Enterprise types	Quantity (unit)	Rubber area (ha)	Labor (people)	Proportion of area (%)	Proportion of labor (%)
State-owned enterprises	60	344,536	100,204	88	94.6
Private enterprises	95	45,698	5,317	11.7	5.0
FDI enterprises	4	1,290	354	0.3	0.4
Total	159	391,525	105,875	100	100

Source: General Statistics Office 2018

SOEs include enterprises of Vietnam Rubber Group, enterprises that are managed by the provincial People's Committee, enterprises under the department of national defense, joint-stock enterprises, and joint-venture enterprises with over 50% state capital. Private enterprises include enterprises with 100% private capital, joint-stock enterprises with more than 50% of stock owned by foreign entities, and cooperatives and FDI enterprises with more than 50% of capital coming from foreign investment.

In the scope of Vietnam Rubber Group's enterprises, the Group Equitization Plan Report, approved by the Prime Minister on December 26, 2017.⁴, specifies:

- The Group's land area, managed by 20 single-member limited liability companies, is 206,879 hectares of agricultural land and 3,923 hectares of non-agricultural land.
- The Group's land area that is owned by joint stock companies and 2-member limited liability companies is 279,464 ha, of which 265,679 ha is agricultural land; The rest is non-agricultural land, in which 129,899 ha (46.5%) is Vietnam's land, the rest is Laos (29,279 ha) and Cambodia's (120,285 ha).
- By 2020, the Group's enterprises will have a rubber area of about 400,000 hectares, of which domestic area will be 285,000 hectares, and foreign area will be 115,000 hectares, and the total output will be around 414,000 tons.

Table 7 summarizes information of the 14 businesses surveyed by the research team in early 2018. The information on these 14 enterprises does not represent all rubber companies but is meant to serve as reference only.

⁴ <https://thuvienphapluat.vn/van-ban/Doanh-nghiep/Quy-dinh-2090-QD-TTg-2017-Phuong-an-co-phan-hoa-Cong-ty-me-Tap-doan-Cong-Industry-Rubber-370646.aspx>;
<https://vnrubbergroup.com/media/congbothongtin/Du%20thao%20PA%20CPH%20VRG.pdf>

Table 7. Basic characteristics of surveyed businesses

Criteria	Characteristics
Characteristics of the companies	12 out of 14 companies are SOEs. Except for two companies with immature plantations and which have not started their latex harvesting (in the Northwestern region), the remaining 12 companies are harvesting and processing latex.
Rubber plantation land	On average, each enterprise has nearly 9,600 hectares of rubber, of which latex harvesting area accounts for about 50%. These enterprises' rubber land is mainly agricultural land that has been used stably with land use certificates. Some enterprises have land in the Central Highlands and some newly established enterprises (in the Northwest region) have a part of their rubber land on forestry land. Currently, two companies have land disputes. A number of companies have narrowed their land in recent years, mainly due to local government's acquisition of land for other projects.
Revenue	The average revenue is about VND 658.6 billion per year, per company, of which 66.1% is from latex; the rest (33.9%) is generated from other sources such as wood from liquidated rubber plantations, deposit interest rates, cashew nut processing, petrol stations, etc.
Latex from external supply	Nine out of 14 companies buy latex from smallholders; there is one company that buys from both smallholders and other companies. Supply from smallholders is often less than 10% of the total latex of each company. However, there are two companies with smallholder supplies that account for 31% and 37% of the total latex of each company respectively. These companies buy directly from nearby smallholders and through intermediaries (traders).
Business expenses	The average annual cost of an enterprise is approximately VND 485.5 billion. The largest cost is labor (30.4%), followed by input materials (16.22%), and other expenses (25.9%, which includes depreciation of assets, outsource services, land lease, etc.), and the cost of small loans (4.3%).
Labor	Every company employs a large labor force, with an average of 2,140 people. Labor is the largest cost of these enterprises. The average monthly salary of a worker is around VND 5.4 million.
Capital	All of the surveyed companies use equity, which includes funding from the Vietnam Rubber Group (in case of the Group's companies). The equity often accounts for 60-70% of a company's capital. There are five companies with 100% equity. The other nine out of 14 companies utilize loans. The loan ratio often accounts for less than 20% of the total capital of a company. Private companies have a higher loan ratio. Some companies have other sources of capital, though it is not clear what sources these are. Most of the companies (11/14) have no difficulties in accessing capital sources.
Natural rubber supply to the market	Except for the two companies with immature rubber plantations (in the Northwest region), all of the other companies surveyed are supplying natural rubber to the market. On average, a company supplies about 14,400 tons of natural rubber to the market each year.

State-owned enterprises

In 344,536 ha of the 2017 survey, there were 60 state-owned enterprises that participate in rubber planting, with more than 100,000 employees (Table 6).

Among the organizations involved in planting, state-owned enterprises hold the leading position, with 88% of the land and nearly 95% of labor (Table 6), one reason being that the production scale of state-owned enterprises is much larger than that of private enterprises. On average, each state-owned enterprise has about 5,700 hectares of rubber and around 1,700 employees.

Vietnam Rubber Group is the state-owned enterprise with the largest production scale; including its member companies, which are situated in most of Vietnam's key rubber areas, it had a total rubber area in Vietnam of approximately 293,300 ha and an output of 277,300 tons in 2017.

Vietnam Rubber Group plans to increase its purchase of rubber latex from smallholders from 60,000 tons in 2017 to 105,000 tons in 2020.⁵

A number of state-owned enterprises in Vietnam are managed by local authorities and the department of national defense that have a large rubber area. Included among these are General Corporation 15, Dakruco Ltd., Binh Phuoc Rubber Company Limited, Song Be Rubber Company Limited, 30/4 Tay Ninh Rubber One Member Co. Ltd, 1-5 Tay Ninh Rubber Joint Stock Company, Thong Nhat Rubber Joint Stock Company, Viet Trung Company Limited, and Le Ninh Company Limited - Quang Binh.

Private enterprises

Private enterprises operate on a much smaller scale than state-owned enterprises. On average, each private enterprise has 480 ha and 56 employees. In 2017, the number of private enterprises involved in production was 95, much higher than the number of state-owned enterprises involved in this stage (60 enterprises). However, the total rubber area of private enterprises is less than 45,700 ha, equivalent to 13.2% of state-owned enterprises' area.

Private enterprises started planting rubber in 2008, much later than state-owned enterprises and smallholders. In 2001, the rubber area of state-owned enterprises was 275,900 hectares, and the smallholder rubber area was 139,900 hectares; private enterprises had not participated in this stage at that point in time. It was not until 2008, when the rubber price on the world market reached a high, that private enterprises began planting rubber, with an area of about 3,000 hectares during that year. By 2017, the total rubber area of private enterprises reached just 69,100 ha, much lower than that of smallholders and state-owned enterprises.

That said, some private enterprises have large rubber areas, namely Hoang Anh Gia Lai Joint Stock Company, Hoa Lam Rubber Joint Stock Company, Trung Nguyen Rubber Joint Stock Company, and Phuoc Long Rubber One Member Company Limited, etc.

Some rubber planting enterprises also operate through foreign investment. However, by the end of 2017, the rubber area of these enterprises only accounted for around 1,300 hectares.

⁵ <https://thuvienphapluat.vn/van-ban/Doanh-nghiep/Quyiet-dinh-2090-QD-TTg-2017-Phuong-an-co-phan-hoa-Cong-ty-me-Tap-doan-Cong-Industry-Rubber-370646.aspx>

Rubber smallholders

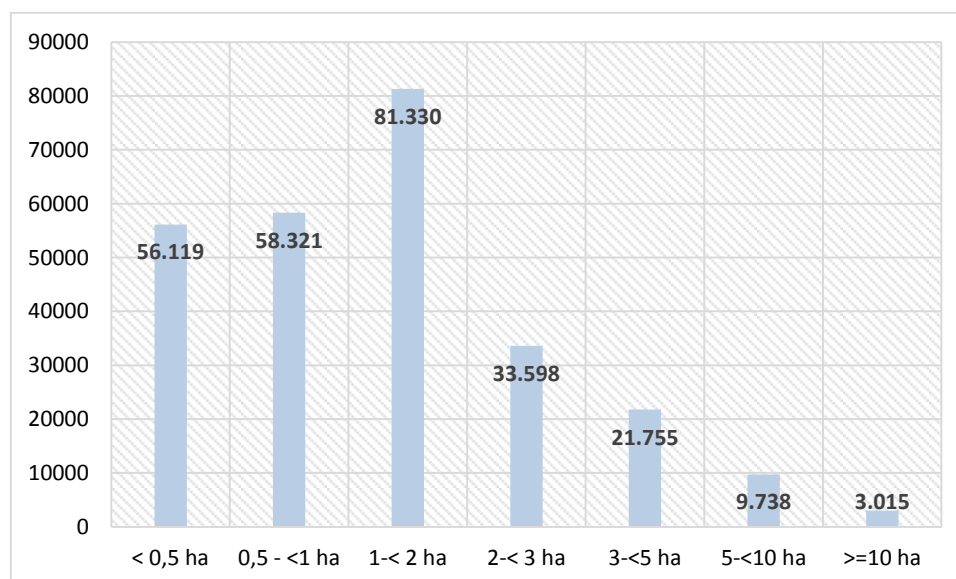
GSO data shows that in 2017, the number of Vietnamese rubber-growing households was 263,876, accounting for 3.1% of Vietnam's total agricultural households (8,454,263 households). This year households' rubber planting area thus far has been 495,033 ha, of which latex harvesting area is 396,376 ha, accounting for 80% of the total area owned by the households (the remaining 20% is in its immature period). The average rubber area is 1.88 ha per household.

Smallholder rubber began to redevelop in Vietnam in the 1980s, and this type of production has grown rapidly, particularly between 2006-2015. By 2011, the total number of households participating in rubber plantations was over 258,000, an increase of more than 43% compared to that number in 2006. Smallholder rubber is concentrated in three key regions: the Southeast (accounting for 56% of total households planting rubber in 2017, an increase of 118% compared to 2006); the Central Highlands (22% of total rubber planting households in 2017, an increase of 290% compared to 2006); and the Central Coast (accounting for nearly 20% of total rubber planting households in 2017, an increase of 103.6% compared to 2006).

Given the assumption that it takes one laborer to work on 3 ha of rubber for average, then the number of laborers working for smallholder households in 2017 was approximately 135,000. Smallholder rubber plantations were developed in the Northern Midlands and Mountains in recent years. In 2017, there were 5,200 households involved in rubber planting in this region, accounting for only 2% of Vietnam's total number of rubber planting households.

Around 30% (equivalent to 81,330 households) of total rubber planting households operate an area of 1 to 2 ha. A large number of households areas also have under 0.5 ha and from 0.5 to 1 ha, making up 19.4% and 21.7% of the total households involved in rubber planting, respectively. Households with an area of 5 hectares or more account for a smaller percentage (Figure 11).

Figure 11. Viet Nam's rubber growing households in 2017 by area



Source: General Statistics Office 2018

Currently, the supply of natural rubber from smallholder farmers accounts for a larger proportion than that of other sources. In 2017, the supply from smallholders accounted for 62% of Vietnam's total supply, followed by state-owned enterprises (34.2%), and private enterprises and FDI enterprises (3.8%).

In recent years, due to the low price of natural rubber, some smallholder farmers switched part of their rubber area to alternative crops to yield higher economic performance. According to reports from Agriculture and Rural Development Departments of 18 provinces studied by the research team in 2018, nine provinces (50%) observed some smallholders switching from rubber to other crops. Although the conversion area is small, this is a sign that if natural rubber prices do not recover, many rubber smallholders will continue to face difficulties and the pressure to switch from rubber to alternative crops will continue to increase.

In some provinces, such as Binh Duong and Gia Lai, the agricultural authorities are encouraging households to not switch to other crops and keep rubber area by intercropping short-term crops to diversify income sources. Another method recommended by the agricultural authorities includes extending the immature stage (from 5 years to 6-7 years before tapping). In areas where latex has already been harvested, the harvesting should be limited, reducing the number of tapping days. However, these solutions are only short-term and the market plays an important role in the decision making of the households.

3.2. Purchasing process

The purchasing process involves state-owned enterprises, private enterprises, and traders. Currently, information about this process in terms of the number and composition of individuals and organizations, specific activities, human resources, finance, and relations is very limited.

According to the research team's calculation, in 2017, approximately 40.2% of the total natural rubber supply came from state-owned enterprises, 37.8% from private enterprises, and 22% from traders.

Among state-owned enterprises, the supply from Vietnam Rubber Group's companies accounts for about 35% of the total supply of enterprises in this group.

Most large-scale rubber plantation enterprises have their own latex processing plants and trade through direct export or entrusted export.

Approximately 90.2% of the total harvested latex is fresh field latex, the rest (9.8%) is coagulated rubber (including cup-lump and scrap rubber).

Many state-owned rubber enterprises purchase latex from smallholders (see section 3.1). Smallholder latex is mainly sold directly to nearby local rubber processing factories or sold by intermediaries and traders. The intermediaries are composed of diverse traders, including traders from the hamlets and villages, districts, and purchasing agents of factories and they may be organized as single or multi-tiered entities.

Price manipulation by traders is relatively common in some places.⁶ According to the 2018 report from the Department of Agriculture and Rural Development of Kon Tum, smallholder latex must go through several intermediaries before reaching processing factories, and latex prices still depend greatly on traders. According to the Department's report, there is a lack of mechanisms to ensure transparency in price information and this results in a loss to the smallholders.

⁶ This situation was reported by the media: <https://thitruongcaosu.net/2018/07/10/tang-cuong-chinh-sach-ho-tro-thu-mua-mu-cau-su-tieu-dien/> ; <https://vov.vn/kinh-te/bat-cap-gia-thu-mua-mu-cau-su-tieu-dien-o-binh-duong-288593.vov> ;

Smallholder rubber prices are lower in some areas due to a number of factors including when (Tran Thi Thuy Hoa 2017):

- A rubber plantation's location is far from the purchasing point and/or processing plant
- The purchase process has to go through several intermediaries
- The latex is of low quality due to the lack of technical guidelines and quality control
- There is a small quantity of the smallholders

Recently, thanks to a more developed mobile phone network and the internet, smallholders in some localities can update buying prices daily, and can therefore partly prevent price manipulation by traders.

Since the beginning of 2016, the Vietnam Rubber Association has conducted communications with its members around smallholder latex purchasing price via email, phone, and its website. This approach which helps prevent competition in buying and selling, which leads to a loss to farmers and factories. Appendix 1 shows a number of websites that provide rubber purchasing prices.

That said, smallholder's access to market price information is still extremely limited in general, and smallholders remain in a vulnerable position.

3.3. Processing

Processing involves many organizations, and includes latex processing (raw processing) and the production of rubber products (manufacturing).

Latex processing

In 2017, Vietnam had a total of 196 processing plants, with a design capacity of over 1.3 million tons of dry latex per year (Table 8).

Processors of latex are mainly enterprises, and include central and local state-owned enterprises, private enterprises, foreign-invested enterprises, and some cooperatives.

The number of natural rubber processing factories corresponds to the rubber plantation areas in a region. The Southeast region has the largest rubber area (Table 3), and is also the region with the biggest number of factories (118), whose designed capacity is 1 million tons per year. The North Central, South Central, and Central Highlands regions are smaller in rubber areas and also in their number of factories.

The factory design capacity is greater than the total current supply of raw materials. This means that the actual capacity of existing plants may increase if the market supply increases.

In 2014, there were 164 natural rubber processing factories in Vietnam with a total designed capacity of 1,218,100 tons, 25.1% higher than 2014 output of 973,700 tons and 20% higher than 2015 output of 1,017,000 tons. The Southeast had 106 factories with a capacity exceeding 36.8%. During that year, the Central Highlands had 19 factories with capacity lower than output, meaning that a part of rubber collected from this region was processed in the Southeast. The Central region had lower rubber output, but its number of factories was 36, with a total capacity of 19.8% higher than the raw material supply (Department of Agro-forestry Processing and Salt Industry, 2015).

By 2017, the number of newly established factories was approximately 35, calculated based on to the number of factories in 2014. By the end of 2017, there were still no latex processing factories in the North, and some provinces sent rubber to the Central provinces for processing. The Central

Highlands' plant capacity is lower than its output, and therefore, natural rubber produced in this region is transferred to the Southeast for processing.

Table 8. Number and capacity of natural rubber processing factories by region, 2017

Region	Number of factories	Design capacity (tons / year)	Regional output (ton / year)	Capacity versus output (%)
Northern	0	0	1,917	0.0
Central:				
- North Central	31	83,497	40,042	208.5
- South Central	27	63,000	59,943	105.1
Highlands	20	167,860	215,374	77.9
South East	118	1,013,981	777,188	130.5
Mekong Delta		0	55	0.0
Total	196	1,328,338	1,094,518	121.4

Source: Vietnam Rubber Association's estimation based on the data of Department of Agro-forestry Processing and Salt Industry 2015 and General Statistics Office 2018.

According to Department of Agro-forestry Processing and Salt Industry (2015), private enterprise factories accounted for over 70% of 164 rubber processing factories in 2014, and the rest were factories of state-owned enterprises (Vietnam Rubber Group's enterprises, enterprises managed by local governments, and department of national defense (27.4%), and cooperatives and FDI enterprises (2.6%). Table 9 shows types of natural rubber processing factories in 2014.

Table 9. Number of natural rubber processing factories in 2014

Type	Quantity	Design capacity (tons / year)	Design capacity (%)
Private enterprise	115	701,600	57.8%
SOEs	44	488,000	40.2%
FDI	first	18,000	1.5%
Cooperatives	2	6,000	0.5%
Total	162	1,213,600	100%

Source: Department of Agro-forestry Processing and Salt Industry, 2015

The design capacity of processing plants in 2014 shows that private companies had the largest proportion of design capacity, accounting for 57.8% of the industry's total, followed by the Vietnam Rubber Group's factories, local state-owned enterprises, and department of national defense's enterprises, which accounted for around 40.2%. FDI enterprises and cooperatives accounted for the remaining proportion.

It is estimated that in 2017, around 57.8% of total latex was processed by private enterprises, 40.2% by state-owned enterprises, and the rest by FDI enterprises (1.5%) and cooperatives (0.5%) (Figure 9).

Rubber product manufacturing

Rubber products are diverse and including tires, shoe soles, conveyors, gloves, rubber thread, and a wide array of other products. These products require much higher technological, machinery, and workmanship levels than raw material (latex) processing.

According to GSO data, by the end of 2016, there were 456 manufacturers of rubber products (Table 10), with the number of employees reaching over 61,701 in Vietnam.

Private enterprises accounted for the largest proportion, at about 70.4% of total manufacturers, but their number of employees accounted for just 23% of the total employees in rubber manufacturing. These figures indicate that the majority of private enterprises are small-scale. While FDI enterprises accounted for only 27% of total manufacturers, they accounted for nearly 61% of the total employees. State-owned enterprises accounted for 2% of the manufacturers and 16% of total employees.

Table 10. Rubber product manufacturers in Viet Nam, 2016

Type of enterprises	Number of enterprises	Employees	Female employees	Employees / Enterprise
State-owned enterprises	10	9,874	3,194	987
Private enterprises	321	14,240	5,670	44
FDI	125	37,587	17,531	301
Total	456	61,701	26,395	135

Source: General Statistics Office 2018

3.4. Natural rubber imports

Vietnam's annual natural rubber export volume is over 1.3 million tons, and domestic output stands around 1 million tons. This gap between export and domestic output is offset by imports, mainly from Cambodia, Laos, and Thailand.

On average, Vietnam imports annually around 300,000-500,000 tons of natural rubber. Most of the imports are comprised of Vietnamese enterprises with rubber plantations in Laos and Cambodia which are ready to harvest. The tapping area of these projects continues to expand, and the import volume from this source, therefore, will continue to increase. Table 11 shows Vietnam's natural rubber import volume during the period of 2007-2017.

As mentioned, Cambodia and Laos are the largest suppliers of raw materials to Vietnam. In 2017, Cambodia's supply accounted for about 16.4% of the total natural rubber imported into Vietnam, and the supply from Laos accounted for about 9.3%.

Besides natural rubber, Vietnam also imports its entire demand of synthetic rubber (from crude oil), for rubber product manufacturing due to the fact that synthetic rubber has not yet been manufactured in-country.

Table 12 shows Vietnam's import value of rubber products in recent years. Each year, Vietnam imports various types of rubber products, equivalent to approximately 2 billion USD in value. Products of highest import value include technical rubber products, tires, rubber sheets, rubber hoses, and shoe soles. The average annual import value of rubber products is equivalent to around 30% of the total export value of natural rubber, rubber products, and rubber wood and rubber wood products of Vietnam, which are currently on the upswing.

Table 11. Vietnam's imports of natural rubber by countries, 2007 - 2017 (thousand tons)

Year	Thailand	Indonesia	Malaysia	India	Vietnam EPZ ⁷	Laos	Myanmar	Philippines	Cambodia	Other	Total
2014	11.56	0.85	4.94	0.53	23.56	21.58	0.00	0.09	44.46	145.04	252.60
2015	12,32	1.70	5.27	0.00	29.78	30.50	0.00	0.10	58.75	161.59	300,00
2016	11.66	1.79	10.43	0.58	26.91	38.47	1.04	0.10	56.32	270.99	418.30
2017	19.31	20.08	18.95	0.10	5.80	48.90	1.10	1.30	86.01	325.05	526.60

Source: Vietnam Rubber Association, based on the data of General Department of Customs 2007 - 2017

Table 12. Import value of Vietnam's rubber products by product type, 2012 - 2016 (Million USD)

Year	Tires (HS 4011)	Inner Tubes (HS 4013)	Plates (HS 4008)	Outer soles (HS 640620)	Hygienic products (HS 4014)	Gloves (HS 4015)	Threads (HS 4007)	Threads, textile covered (HS 560410)	Mattresses (HS 940421)	Belts (HS 4010)	Hoses (HS 4009)	Spare parts (HS 4016)	Hard rubber (HS 4017)	Others	Total
2012	262.15	5,95	45.47	76.18	12.27	46.02	12,53	78.82	0.34	66.46	85.05	240.96	1.66	5.96	939.82
2013	280.88	4.75	55.31	88.54	11.58	113.17	13.00	108.48	1.14	54.97	58.91	259.16	3.99	7.02	1,061.21
2014	278,00	4.92	95.58	120.29	11.87	109.77	17.36	57.22	1.13	86.51	84,70	305,21	2,51	6,62	1.181,70
2015	416,15	7,82	289,75	138,82	13,98	94,48	20,34	92,81	0,96	119,04	212,34	482,09	3,06	5,54	1.897,19
2016	369,86	6,31	277,83	133,23	14,78	90,86	21,39	69,33	4,49	129,99	207,28	636,13	2,41	6,61	1,970.50

Source: Vietnam Rubber Association (VRA) (2018). Vietnam rubber statistics 2007 - 2017. Agricultural Publishing House, based on the data of International Trade Center, General Department of Customs

⁷ Foreign enterprises in export processing zones (EPZs) buy natural rubber from external suppliers to produce export goods (mainly shoe soles, technical rubber parts, etc.). Under Vietnam's applicable regulation, this is recorded as import in the General Department of Customs' import and export statistic.

3.5 Vietnam exports of natural rubber and rubber products

In 2017, around 80.4% of natural rubber production in Vietnam was used for export purposes; the remainder (19.6%) was used domestically for the rubber product manufacturing industry (Figure 9).

Export of natural rubber

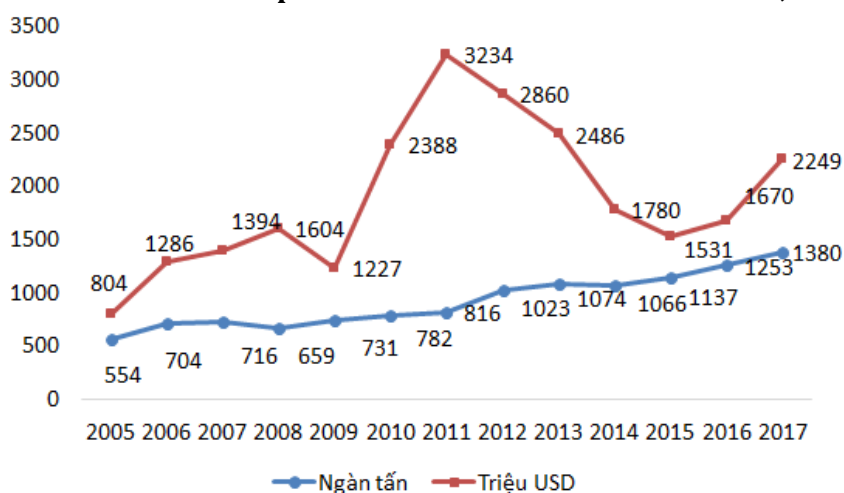
Table 13 shows the volume and value of exports of Vietnam's natural rubber since 2007. In 2017, the export volume was more than 1.3 million tons, and the turnover reached nearly US \$ 2.25 billion. The volume of natural rubber has been increasing year by year, however the price has decreased continuously from 2012 to 2016 and recovered slightly in 2017 (Figure 12).

Table 13. Vietnam natural rubber exports, 2007 - 2017

Year	Export		
	Ton	Thousand USD	USD / Ton
2007	715,600	1,393,838	1,948
2008	658,700	1,604,100	2,435
2009	731,393	1,226,857	1,677
2010	782,213	2,388,225	3,053
2011	816,366	3,233,800	3,961
2012	1,023,104	2,859,838	2,795
2013	1,073,956	2,486,427	2,315
2014	1,066,134	1,780,080	1,670
2015	1,137,368	1,531,469	1,347
2016	1,252,990	1,669,601	1,332
2017	1,381,052	2,249,775	1,629

Source: General Department of Customs, Vietnam General Rubber Association

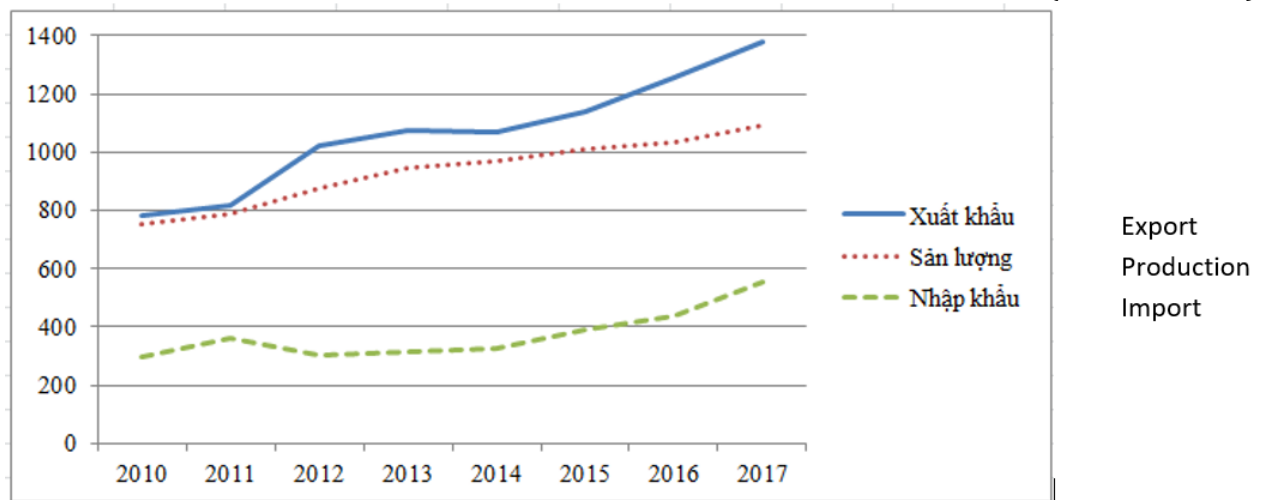
Figure 12. Natural rubber export volume and turnover of Vietnam, 2005 - 2017



Source: General Department of Customs through the years, compiled by the Vietnam Rubber Association

Figure 13 shows trends in exports, domestic production, and imports of natural rubber during the 2010-2017 period.

Figure 13. Export, import, and output of Vietnam natural rubber, 2010 - 2017
(thousand tons)

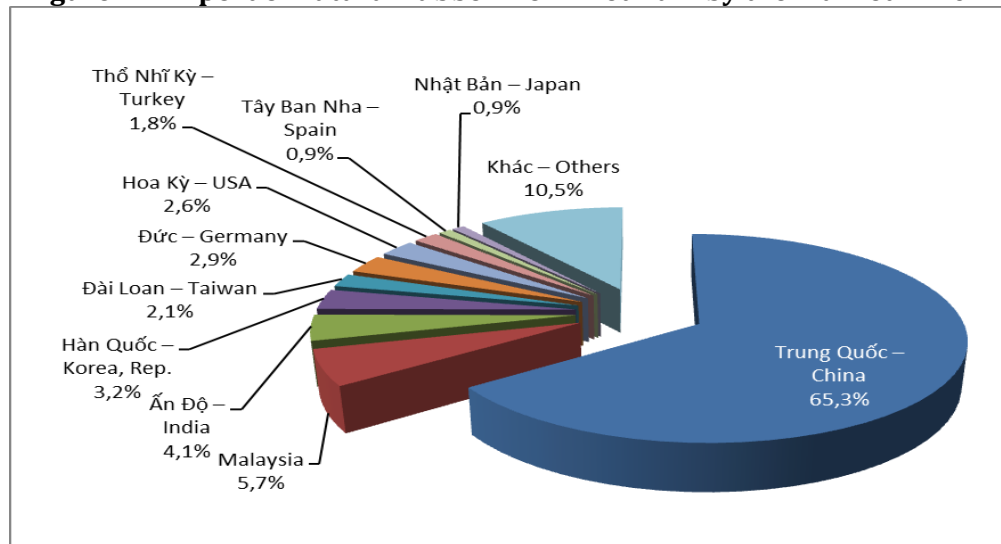


Source: General Department of Customs by the Vietnam Rubber Association

In 2017, Vietnam was the third-largest natural rubber supplier in the world, after only Thailand and Indonesia. The supply from Vietnam accounts for about 11.7% of the total natural rubber supply in the world.

China is Vietnam's most significant natural rubber import market, and in 2017, the country imported approximately 65.3% of Vietnam's total natural rubber. Import markets such as Malaysia, India, Korea, and Germany have a much smaller proportion, accounting for around 2-4% per market. Figure 14 illustrates these market shares.

Figure 14. Export of natural rubber from Viet Nam by the market in 2017



Source: General Department of Customs, compiled by the Vietnam Rubber Association

Table 14 shows the details of natural rubber export volume from Vietnam to other markets, and the corresponding proportion of these markets to Vietnam's total natural rubber exports during the period of 2012 - 2017. Among these markets, China occupies a particularly essential position. It is also a market that has a vast expansion speed; this is contrary to the situation in Malaysian and Indian markets, which are experiencing a relatively fast decline.

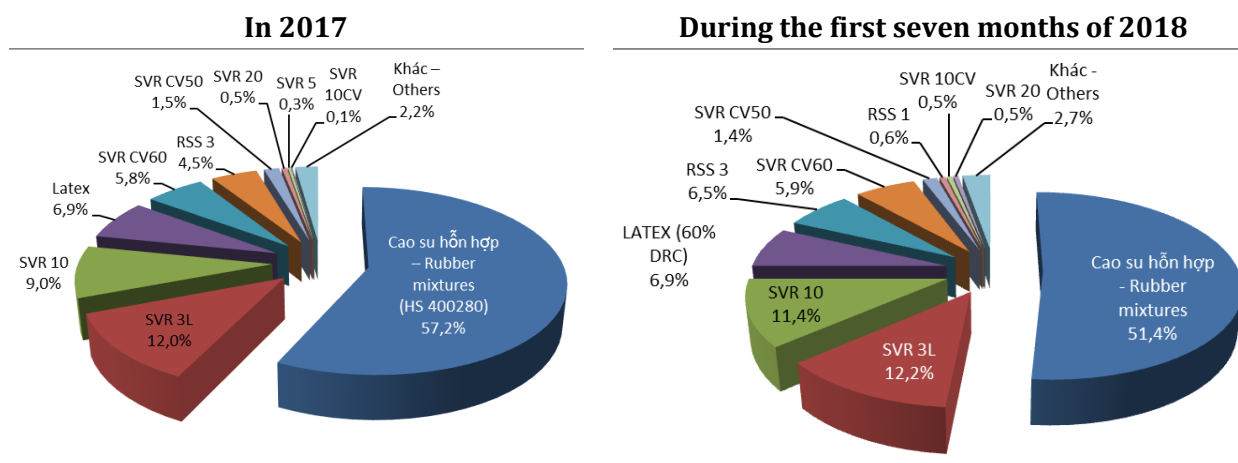
Table 14. Exports of Vietnam natural rubber by market, 2012 – 2017

Market	2012		2013		2014		2015		2016		2017	
	Ton	%	Ton	%	Ton	%	Ton	%	Ton	%	Ton	%
China	372,303	36.4	450,047	41.9	470,339	44.1	572,636	50.3	743,267	59.3	901,634	65.3
Malaysia	200,400	19.6	223,571	20.8	202,095	19.0	170,124	15.0	101,269	8.1	78,198	5.7
India	71,676	7.0	86,393	8.0	90,898	8.5	89,303	7.9	86,941	6.9	56,042	4.1
South Korea	39,997	3.9	35,548	3.3	32,555	3.1	29,653	2.6	38,252	3.1	43,744	3.2
Taiwan	38,939	3.8	30,314	2.8	27,916	2.6	26,812	2.4	28,118	2.2	29,180	2.1
German	33,728	3.3	29,842	2.8	32,335	3.0	29,941	2.6	36,060	2.9	39,699	2.9
USA	23,453	2.3	28,940	2.7	32,325	3.0	39,367	3.5	36,114	2.9	36,484	2.6
Turkey	13,905	1.4	16,175	1.5	20,834	2.0	21,142	1.9	21,877	1.7	25,312	1.8
Spain	9,343	0.9	10,388	1.0	12,908	1.2	11,297	1.0	13,527	1.1	13,073	0.9
Japan	9,712	0.9	9,812	0.9	11,301	1.1	5,886	0.5	11,050	0.9	12,095	0.9
Other	209,648	20.5	152,926	14.2	132,628	12.4	141,207	12.4	136,515	10.9	145,591	10.5
Total	1,023,104	100	1,073,956	100	1,066,134	100	1,137,368	100	1,252,990	100	1,381,052	100

Source: General Department of Customs, compiled by the Vietnam Rubber Association

Among the group of natural rubber for export, rubber mixtures (HS code 400280) have the highest turnover, accounting for 57.2% of the total export turnover in 2017. This trend remained during the first seven months of 2018 (Figure 15).

Figure 15. Export of Vietnam natural rubber by type and grade in 2017 and during the first seven months of 2018



Source: General Department of Customs by the Vietnam Rubber Association

Table 15 shows the volume of exported natural rubber, classified by different categories into key markets. Parameters in the table show that China imports mainly rubber mixtures, while Malaysia imports SVR 10, India imports SVR 3L, Germany imports primarily SVR CV 60.

Data from the GDC show that 221 enterprises directly participated in exporting natural rubber in 2017. Of these, only 27 enterprises have an export value of USD 10 million or more.

According to the GDC, in 2017, 76 companies were participating in the export of rubber mixtures, of which 24 companies had an export value of USD 10 million or more. Notably, there are two companies with a substantial export turnover with over 200 million USD/company.

Table 15. Exports of Vietnam natural rubber by key market, 2016 - 2017 (ton)

<i>Types / Grades</i>	China		Malaysia		India		South Korea		Virtue		USA	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Rubber compound/mixtures (HS 4005 & 400280)	558,167	778,582	2,479	7,039	129	629	80	-	-	-	-	-
SVR 3L	63,232	34,961	7,119	3,024	53,261	28,745	11,170	11,906	5,922	5,566	11,598	12,144
SVR 10	49,661	12,288	80,050	60,592	10,053	5,162	14,244	17,413	1,592	1,794	1,903	418
LATEX (60% DRC)	20,070	33,022	126	21	1,000	1,457	1,483	1,342	5,637	3,186	13,194	11,898
SVR CV60	5,975	8,942	529	952	1,140	1,376	6,343	7,886	16,592	21,269	6,934	7,662
RSS 3	20,428	12,076	1,467	852	19,492	17,520	1,046	1,369	410	255	876	359
SVR CV50	-	13	-	279	40	5	2,964	3,508	4,617	6,008	1,058	840
RSS 1	1,506	793	38	43	630	327	39	24	40	38	181	1,331
SVR 10CV	161	343	-	-	-	20	-	-	1,149	827	423	653
Others	24,067	20,614	9,461	5,396	1,196	801	883	296	101	757	368	1,178
Total	743,267	901,634	101,269	78,198	86,941	56,042	38,252	43,744	36,060	39,699	36,114	36,484

Source: General Department of Customs by the Vietnam Rubber Association

Export of rubber products

Vietnam exports a variety of rubber products including tires and tubes, conveyors, shoe soles, gloves, and more.

Data from the GDC show that in 2017, the total export turnover of rubber products from Vietnam to the US was \$ 2,176 billion. The two groups of products that were exported the most were tires (over \$920 million in turnover) and technical rubber components (over \$480 million).

According to data from the GDC in 2017, 211 enterprises participated in the export of automobile tires, including 165 private enterprises, 10 state-owned enterprises, and 36 FDI enterprises. Although FDI enterprises account for only 17% of total exports, exports from this group account for 89% of total exports of this rubber product commodity.

For industrial rubber spare parts, in 2017, the number of enterprises involved in exporting reached 1,126, including 569 FDI enterprises, 03 state-owned enterprises, and 554 private enterprises. The number of manufacturing enterprises was relatively smaller (51), FDI enterprises (27), and private enterprises (23).

Table 16. Export turnover and number of enterprises producing and exporting 03 rubber products groups in 2017

Product Groups	FDI enterprises	SOEs	Private Enterprise	Total
1. Tires (thousand USD)	819,238	90,377	10,414	920,029
Proportion of turnover (%)	89.0	9.8	1.1	100.0
Number of exporting enterprises	36	10	165	211
Number of manufacturing enterprises	18	3	52	73
2. Technical rubber s	359,362	23,967	96,998	480,327
Proportion of turnover (%)	74.8%	5.0%	20.2%	100.0%
Number of exporting enterprises	569	3	554	1.126
Number of manufacturing enterprises	27	1	23	51
3. Gloves (thousands of dollars)	63,790	37,603	48,382	149,775
Proportion of turnover (%)	42.6%	25.1%	32.3%	100.0%
Number of exporting enterprises	271	1	675	947
Number of manufacturing enterprises	12	2	16	30
Total				
- Export Turnover (thousand USD)	1,242,390	151,947	155,794	1,550,131
- The proportion of turnover (%)	80.1%	9.8%	10.1%	100.0%
- Number of exporting enterprises	876	14	1.394	2.284
- The proportion of export enterprises	38.4%	0.6%	61.0%	100.0%
- Number of manufacturing enterprises	57	6	91	154
- Proportion of manufacturing enterprises	37.0%	3.9%	59.1%	100.0%

Source: General Department of Customs and General Statistics Office in 2018 by the Vietnam Rubber Association

Additionally, in 2017, there were 947 enterprises engaged in manufacturing gloves for export, of which private enterprises accounted for 71.3%, and the rest were FDI enterprises (28.6%) and state-owned enterprises (1). Similarly to the group of enterprises exporting tires, FDI enterprises participating in exporting gloves only accounted for 28.6%, but the export turnover reached 42.6% of the total export turnover. Although only one state-owned enterprise was involved, the export turnover of this enterprise alone reached 37.6 million USD, equivalent to over 25% of the total export turnover.

Table 16 details the export turnover of three product groups, including tires, technical rubber spare parts, and gloves, classified by different types of exporting and manufacturing enterprises. The data in the table shows that FDI and private enterprises dominate the production and export of rubber products. Regarding turnover, FDI enterprises account for greater than 80% of the total turnover.

3.6 Processing and domestic consumption of natural rubber

In 2017, around 19.6% of Vietnam's natural rubber production was used for domestic consumption. Vietnam is the 11th largest consumer of natural rubber in the world with a relatively high growth rate of 7.6% per year in the last five years. However, the volume of natural rubber consumed domestically is only about 214,000 tons, accounting for 1.6% of the total natural rubber consumed in the world (13.22 million tons).

Vietnam's domestic natural rubber consumption rate is on the rise, from 16.3% in 2013 to 19.6% in 2017 (VRA, 2018b).

Table 17 lists the number of manufacturing enterprises by product group in 2017.

Table 17. Number of manufacturing enterprises by product group in 2017

Product Groups	FDI enterprises	SOEs	Private Enterprise	Total
Conveyor	4	1	12	17
Balloon			2	2
Sole	2		1	3
Gloves	12	2	16	30
Spare parts	27	1	23	51
Tire	18	3	52	73
Pillow		1	7	8
Tube			4	4
Rubber products of all kinds	59	1	173	238
Thread	1	1	15	17
Rubber roller	2		11	13
Total number of enterprises	125	10	321	456
Total number of employees	37,587	9,874	14,240	61,701

Source: General Statistics Office, 2018.

The information in Table 17 shows that in 2017, there were 456 enterprises involved in rubber product manufacturing, most of which were private enterprises (70.4%), followed by FDI enterprises (27.4%) and others.

Private and FDI enterprises were overwhelmingly involved in manufacturing, showing that the private and foreign investment focused on high value-added production. In contrast, state-owned enterprises focused mainly on rubber raw material production and natural rubber processing.

4. Discussion: Policy implications and recommendations for sustainable development and global market integration

4.1. Supply chain of Vietnam's rubber industry

The natural rubber industry has been and will continue to be one of Vietnam's most critical production and export industries. Its importance is reflected not only in the figures of export turnover, with an average annual turnover of over 6 billion USD, but also in terms of social aspects. The industry creates stable jobs for around 500,000 employees, including 264,000 smallholders involved in the various supply chain stages. Rubber trees were once considered to be 'white gold' or 'poverty alleviation trees' for many households, including ethnic minorities (To Xuan Phuc and Tran Huu Nghi, 2014). Until now, despite the low price of natural rubber, rubber acreage is still leading among perennial industrial crops in Vietnam, with an area of nearly 1 million hectares.

The current natural rubber production chain includes production, processing, export, and domestic consumption. Throughout this supply chain, production involves a large number of state-owned enterprises and smallholders, as these two groups have the best access to rubber land. Private enterprises have a small area of rubber plantations due to the fact that this group has only participated in production since the late 2000s when the price of natural rubber in the global market increased rapidly.

Smallholders play an essential role in production, holding over 51% of the country's current rubber area. The rubber supply from smallholders currently accounts for approximately 62% of Vietnam's total natural rubber production. The price of natural rubber started to decrease in 2012, with the main reason being that the supply was higher than the demand, and thus the rubber area of the country fell slightly. Recently, the government and the rubber industry of natural rubber producing countries, including Vietnam, have made efforts to control the supply and limit price drops due to oversupply, which slows the area expansion in producing countries. However, in Vietnam, the decline in the rubber area only affected large-scale rubber; rubber area and output from smallholders continued to increase and led to production growth nationally. These trends suggest that there are difficulties in determining the effectiveness of measures to limit and control supply in Vietnam.

In the latex processing stage, private enterprises account for greater than 70% of the total number of enterprises participating, and their capacity accounts for 57.8% of the whole industry. SOEs account for more than 27%, but with a capacity of over 40.2%, the majority of SOEs have large-scale factories. Similarly, in the rubber products manufacturing stage, the number of private enterprises account for over 70% of participating businesses. That said, most of these enterprises are small-scale, employing much lower labor force compared to state-owned and FDI enterprises.

Up to now, over 80% of Vietnam's natural rubber has been exported, which indicates that the development of the industry thus far has mainly relied on the export of raw materials. China is Vietnam's most significant natural rubber market, consuming over 65% of Vietnam's total natural rubber, annually. Given this figure, the proportion of this market far exceeds that of other consumer markets. The volume and value of Vietnam's natural rubber exports to the Chinese market are in an upswing.

The export market determines the narrowing or expansion of Vietnam's rubber growing area, the size of the natural rubber processing sector, the income of hundreds of thousands of workers involved in other stages of the supply chain, and the livelihood of more than 264,000 rubber growing families. Currently, the state's mechanisms and policies mainly function to support product development, meet market demand, or limit production in the period of world market decline. However, these policies and mechanisms are still limited, especially for smallholders, due to the

difficulties of households in accessing information about policies. Additionally, smallholder farmers face many challenges in obtaining market information and prices. Various studies have shown that by 2030, it will be difficult for the global natural rubber's price to return to its 2011 level (VRA 2018). In the context of supply exceeding demand, businesses and especially rubber growers will continue to face market difficulties.

Imported natural rubber has become increasingly crucial for Vietnam's rubber industry. Imports come mainly from projects of Vietnamese enterprises planting rubber in Cambodia and Laos, and supply from these projects is increasing since plantation establishment in the rubber area is complete and is gradually expanding into the harvesting area. This supply is an indispensable part of the rubber industry, as it is an essential contribution to the total export turnover of the industry. However, the supply chain of this source is quite complex, as production goes beyond the country and involves aspects of land, labor, laws of the host country, and international commitments. Up to this point, there has been a potential market, social, and environmental risks within this chain of supply. Risk identification and fundamentally addressing these risks do not only bring significant value to foreign investment projects, but also contribute to reducing risks for the whole rubber industry of Vietnam.

In manufacturing rubber products, private enterprises and FDI enterprises play a leading role, both in the number of participating businesses as well as in export turnover. Although FDI enterprises are small in quantity, the export turnover of enterprises in this group is very high. The number of state-owned enterprises participating in the manufacturing sector is not high, thus proving that the interest of this group of enterprises in deep processing is limited. Producing and exporting raw materials is advantageous for countries that have begun to participate in the market. However, once the market has developed, countries' policies and regulations regarding investment become more open and inviting. Cheap labor is either no longer exists or holds no national advantage, and the export of raw materials does not only fail to create added value, but also discourages businesses to improve technology and invest in skilled labor. Instead, it diminishes the industry's competitive advantage in the world market. It is time for Vietnam's rubber industry, especially for state-owned enterprises engaged in rubber products production and manufacturing, to change its business and production strategies. The industry must shift from the business production model focusing only on export expansion based on the increase in the volume of raw material export, to a model centered around increasing scientific content, enhancing the efficiency of using capital and labor in products, and productivity improvement. These transformations of strategic development models need to be further strengthened to increase the added value of the industry.

4.2. The role of the export market in the rubber industry

Studies around the world have shown that commodity crops for export such as cashew, coffee, or soybean are cyclical when the consumption market hits its peak; the price of these goods soars and becomes the motivation to expand production (Nevins and Peluso, 2008; Hall et al. 2011). Within a short time, the supply of goods and products on the market increases quickly while the product's demand remains at a slow growth, eventually leading to debts in stock and thereby, product's prices, once again, fall. This same trend applies to natural rubber. The price of natural rubber soared high during the late 2010 to 2011 period and plummeted from 2012 to current-day. When natural rubber's price in the world market reached a new high, Vietnam's rubber plantation area was expanded rapidly, especially in the Central Highlands and some localities in the Northwest. Many households and businesses started engaging in this rubber plantation trend due to the soaring price. However, the decline of natural rubber's worth in the world market has created difficulties for all participants in the supply chain, including thousands of workers and around 264,000 smallholders.

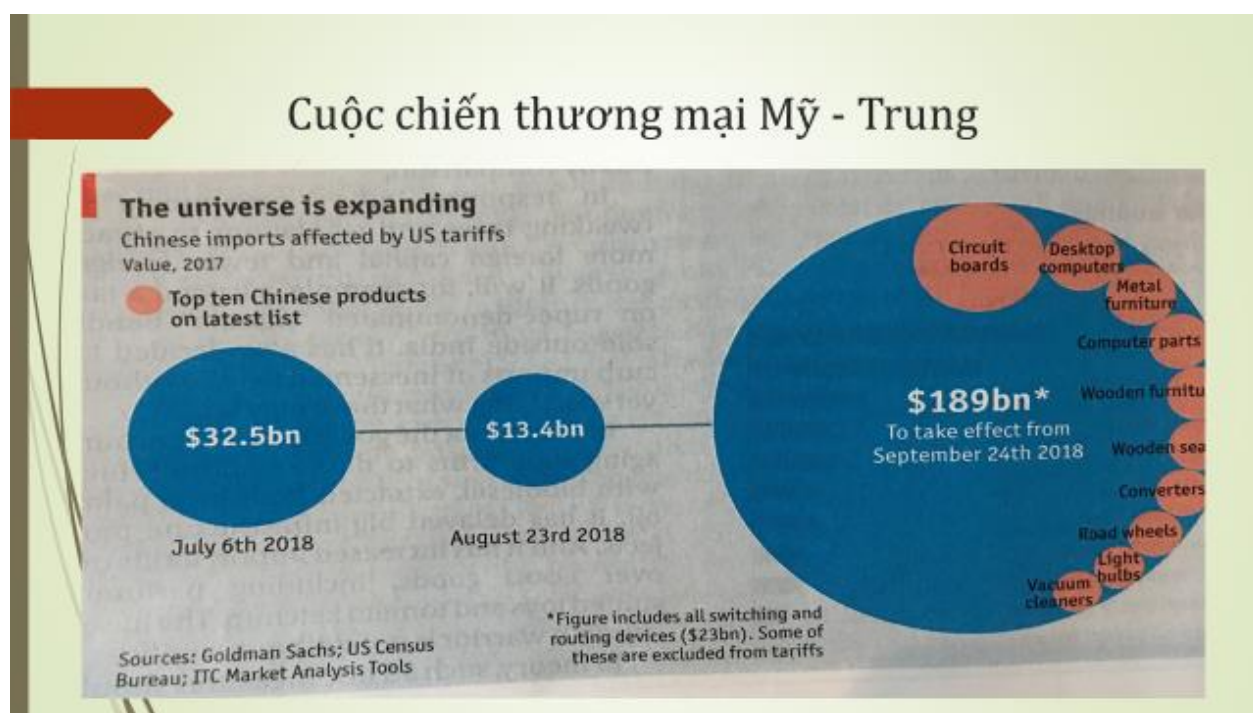
In recent years, the natural rubber producing countries have joined forces to reduce the supply to the market, but so far, this approach has not been effective. Notably, in countries with industries dominated by rubber smallholders, inter-country initiatives to reduce global supply appear to be

challenging to control and do not have much effect. In Vietnam, the management agencies and the Vietnam Rubber Association have been advising participants involved in production to limit supply and expansion, but these recommendations only work with the business sector and big holders. For smallholders, there are many limitations and challenges. Nationally, smallholders' area and output continue to increase. In this context, there are still too many difficulties awaiting management agencies and the Vietnam Rubber Association regarding natural rubber supply to the market.

4.3. The impact of the US-China trade war on the rubber industry

The trade war between the US and China certainly has a direct impact on Vietnam's rubber industry. On September 13, 2018, the administration of the President of the United States decided to continue imposing 189 billion USD of tax on Chinese imports, including wooden products and automotive spare parts. The new tax policy of the Trump administration will take effect from September 24, 2018, with the tax rate increasing to 25% on January 1, 2019, and then pushed to the highest possible level (up to 44%) if China and the United States cannot come up to a solution to resolve this trade war. Figure 16 depicts the scale of the trade war between the two nations.

Figure 16. The scale of the US-China trade war



Source: The Economist, September 22nd -28th, 2018

The listed products subject to the new tax rates include wooden furniture and wooden chairs and wheel components (Figure 16). Wood and wooden products made from rubberwood are currently one of the crucial groups of wood products exported to the US market. Every year, a relatively large amount of rubberwood (about 200,000 m³) is also exported to Cina. The trade war between these two countries will undoubtedly impact the wood industry. Some aspects of this impact are discussed in the rubber supply chain report.⁸

⁸ Nguyen Vinh Quang, To Xuan Phuc, Tran Le Huy, Cao Thi Cam, Nguyen Ton Quyen, and Huynh Van Hanh (2018). The supply chain of Vietnamese rubberwood: Current situation and policy. VIFORES, VRA, BIFA, FPA Binh Dinh, HAWA, and Forest Trends.

In the case of natural rubber and rubber products, and with the high tax rates imposed on Chinese auto parts exported to the US, China's rubber product industry – and thus its imports of Vietnamese natural rubber – will be inevitably and negatively affected. China is the leading import market for Vietnam's natural rubber, and with 70% of natural rubber entering its tire manufacturing sector, Vietnam's rubber exports to China are expected to be affected as well. A representative of a rubber tire manufacturing and exporting enterprise shared that before the US-China trade war, Chinese automobile tires imported into the US were subject to a (very high) 30% tax rate. To avoid it, Chinese tire manufacturers have shifted their investment to other countries, particularly to Thailand. Tires exported from Thailand to the US are subject to a lower tax rate. An increase in import taxes on Chinese tire products coming to the US could increase the shift in Chinese tire manufacturing investment to other countries.

So, how does the increase of the Chinese tire import tax on the US affect Vietnam's rubber industry in general, and Vietnam's tire export industry in particular? Because over 60% of Vietnam's natural rubber is exported to China, and over 70% of the world's natural rubber goes into the tire industry, Vietnam's natural rubber exports to China will be affected. Raising the import tax of Chinese tires will reduce imports of this item from China to the US. The new US government's tax policy will be able to reduce demand for natural rubber from the Chinese market, thereby decreasing exports from Vietnam.

The question at hand is whether Vietnamese tire manufacturers have an opportunity to fill the gap in this market. According to the information shared from the enterprise mentioned earlier, the tire production capacity of Vietnamese enterprises is quite feeble, and these enterprises have almost no chance to squeeze into the market. Currently, automobile tire products in Viet Nam are mainly of imported origin, Vietnamese tire manufacturers have low competitiveness compared to foreign enterprises. Therefore, there would be few export market opportunities for Vietnamese tire manufacturers. China's investment shift to other non-Chinese countries, in an attempt to change the origin of goods when exporting to the US, can help these enterprises avoid high taxes applied by the US government. However, this shifting movement might be considered tax evasion. Vietnamese businesses that supply natural rubber to Chinese enterprises with non-Chinese country investments might also be subject to joint responsibility which would ultimately undermine Vietnam's rubber industry image.

However, the impact of the US-China trade war on Vietnam's rubber industry and the extent of its implications require a detailed assessment of the industry. The impact assessment study includes not only an evaluation of aspects such as Vietnam's exports to China, but also an evaluation of the automotive industry and auxiliary sectors in China, and the US-China trade war's impact on products in related industries. This assessment should be carried out as soon as possible, with the support of the Government of Vietnam and the Vietnam Rubber Association.

4.4. Organize the market of natural rubber consumption

The organization of the natural rubber consumption market, especially the purchasing stage, still faces many difficulties. Many natural rubber processing enterprises, including large ones, have processing plants and are directly involved in purchasing raw materials from smallholders, but with relatively smaller proportions. Most of the smallholders' rubber purchasing is from private enterprises that have rubber processing factories but do not have land. For these businesses, smallholder rubber is an essential source of input for processing.

However, with a large number of households participating in the production process, the network of purchasing rubber materials from smallholders has become quite complicated. Approximately 90% of the rubber supply from smallholders goes through traders, and it is a crucial intermediary stage, connecting smallholders and processing plants. The procurement network operated by traders is

present in several places with a large number of individuals involved. However, up to this point, information on the actual operation of this system, including purchasing formats, participants, product information channels, prices, and purchase methods is quite minimal.

The Department of Agriculture and Rural Development's (DARD) and enterprises' reports and news agencies' data show that the buying and selling competition in the rubber industry is quite common. It happens between traders, between traders and enterprises, and between enterprises themselves. The complex purchasing network and competitions lead to information disturbances, especially about the market price, causing negative impacts on participating households. So far, no agency is responsible for the management of this purchasing network, and only a few localities have announced the purchasing prices. As a result, the organization and operation of the purchasing system, especially those purchased from smallholders, are still spontaneous. A detailed assessment needs to be conducted, which later could be used as a policy foundation to help increase the efficiency of this purchasing system, minimizing the disadvantages for smallholders participating in the production chain.

In recent years, the Vietnam Rubber Association and a number of its member enterprises have made efforts to provide latex's market price on their websites (see Appendix). Households with access to market information can improve their position during market participation and price negotiation, as well as reduce their disadvantages while joining the market. However, this form of information dissemination still has limitations since many households have not had access to information technology.

The Vietnam Rubber Association and management agencies, especially local agencies, play an essential role in connecting rubber growers with market information. The Association needs to diversify the market price information channel, and not rely solely on official website channels; this would require a more popular and accessible information channel accessible to everyone. There is currently as telephone message service being applied in the models which provides information on coffee prices in the coffee raw material area in the Central Highlands, or fertilizer price information in some Mekong Delta region. This has the potential to be an active market information channel for smallholders. Additionally, the Association and enterprises in the rubber industry can create a means to connect directly with local authorities, especially at district and commune levels, to convey market price information to rubber growing households in the area.

Up to this point, most smallholders have not participated in a specialized rubber organization, which is the reason leading to limited access to market information, causing disadvantages for these households. Smallholders lack a representative organization to manage the buying and selling activities between tenants and private traders, which is one of the causes that lead to them being price-squeezed by traders. Vietnam Farmers' Association⁹ or Vietnam Forest Owners Association¹⁰ could play the role of representative organizations for smallholder rubber households. Smallholders can also set up teams, groups or cooperatives, and appoint their representatives to sign direct and stable contracts with processing enterprises consuming latex for households. The model of processing enterprises in cooperation with families to stabilize the supply of input materials is currently being developed and expanded, including in the timber industry.¹¹ These may be the linkage models that the rubber industry needs to develop in the future.

⁹ Reference information at the website: <http://www.hoinongdan.org.vn>

¹⁰ Reference information at <http://hcr.siteam.vn/>

¹¹ The household model combined with companies in the rubber and timber industry can be found at <http://goviet.org.vn/upload/aceweb/content/Bao%20cao%20lien%20ket%20Ikea%20-%20cong%20ty%20-%20ho.pdf>

4.5. Brand and product quality

For any export-based agroforestry industry, brand and product quality are always one of the core values. Failure to create a brand and to guarantee product quality may be the obstacle to the industry's breakthrough and its ability to create added value and expand into large export markets. This weakness will make it difficult to transform from low-value raw materials exports and processing to a manufacturing industry, with high value-added products, known in the international market.

Up to now, the brand and product quality of Vietnam's rubber industry has a significant number of limitations. There is no national standard or quality standard for the supply of field latex in the supply chain. Additionally, there are still no Regulatory authorities responsible for checking and monitoring the quality of field latex input, either. Many reports released by DARD and shared with the research team shown that the status of low-quality rubber, especially from smallholder supply, is partly due to the mixing of impurities into pus, to increase output sold. The inadequate and uneven quality of rubber makes Vietnam rubber selling prices consistently lower than that of other, similar products from other countries.

Vietnam also does not currently have any mandatory national standards for both consumed and exported natural rubber quality, and currently only has Vietnam Standards (TCVN), which are applied for some businesses to output products. However, this is not compulsory but instead only a recommendation, and therefore, to apply the standards or not is a choice. In order to ensure quality and uniformity, specialized management authorities need to develop national quality standards while all companies supplying these products to the market (including both domestic and export) need to guarantee their products will meet these requirements. It is necessary to have independent agencies to appraise the quality of natural rubber products and apply close monitoring mechanisms to ensure independent testing and quality assurance for products supplied to the market.

The industry also needs to mobilize and encourage businesses in the sector to pioneer in branding through quality assurance in order to build customers' trust and expand markets. Recently, the Vietnam Rubber Association and the Rubber Group have strived to create an image and reputation for the industry. In 2016, the Association started implementing the project of branding Vietnam's rubber industry, through the certification mark "Vietnam Rubber" granted by the Association to all enterprises whose products meet the criteria proposed. To be certified, products need to meet the following requirements (Tran Thi Thuy Hoa 2018):

- The legality of the enterprise, factory and product origin
- Ensure product quality according to national, international standards, or standards accepted by the Association
- Production, management, and inspection with a stable process according to national or international standards
- Having effectiveness and reputation in the business
- Compliance with social and environmental responsibilities prescribed by Vietnamese laws and international conventions to which the government has committed

By the end of January 2018, there were 59 Vietnamese natural rubber products which received this certification, and has been protected in international markets such as China, India, and Taiwan. The Association is expected to continue to register protection in other key markets.

Although the number of products certified as "Vietnam Rubber" is not large, the branding initiative of the Vietnam Rubber Industry is an important step in the right direction, and is conducive to the deep integration within the world market (see section 4.6). In the future, this initiative must be

expanded to ensure that the criteria are in line with sustainability criteria accepted by international organizations. Furthermore, it is necessary to broaden the spectrum of natural rubber and rubber products, as well as rubberwood products. In addition to the role of the Vietnam Rubber Association and the Vietnam Rubber Group, it is essential to have policies and supportive measures by the government and other stakeholders.

4.6. The legality of rubber commodities in the context of international market integration

With over 80% of Vietnam's natural rubber output exported, the export market is crucial to the survival of the industry. Similar to other commodities such as seafood, wood, coffee, pepper, or cashew, when exporting to consuming markets, Vietnam must comply with all requirements of the country where the product is sold.

In recent years, the market requirements for sustainable rubber products have been increasing, especially in demanding markets with strict requirements on the quality and legality of products such as Europe and the US, or Japan. These requirements are not merely about quality, but also include rigid compliance of organizations and individuals participating in the market on labor and environmental laws and regulations, social, and financial responsibility. It requires all components of the product supply chain, including the households involved in the production, to be aware of relevant information around these requirements, and to fulfill all responsibilities. Non-compliance with the regulations results in market risks, including loss of export markets and customers. In developed countries, the environmental and social criteria applied in products are increasingly expanding. All enterprises that participate in supply chains of these markets need to abide by these criteria and are subject to independent assessments and periodic monitoring to obtain certificates of sustainable products. Enterprises with products that do not meet these criteria will not have a competitive advantage and may not be able to access the market.

The Sustainable Natural Rubber Initiative (or SNRI) initiative was launched by the International Rubber Research Organization (IRSG) to ensure that products meet the requirements of the sustainability criteria. The required criteria under this initiative include the following:

- Improvement of productivity through using recommended varieties, density optimization, and rational use of chemicals
- Improvement quality (commitment to standard quality, compliance with quality control)
- Support for sustainable development (compliance with laws, protection of protected areas)
- Water resource management (compliance with laws and rights of indigenous peoples, wastewater treatment)
- Respect for human rights and labor (no use of child labor, no forced labor, freedom of Association, and collective bargaining).

Globally and as of September 2018, 53 enterprises were participating in this initiative, which includes many large enterprises operating in the rubber industry and currently importing natural rubber from Vietnam such as Bridgestone, Michelin, and Goodyear. These enterprises have announced purchasing policies of input materials with requirements that need to meet all criteria set by the initiative. In the future, the number of businesses participating in this initiative will undoubtedly increase.

Vietnamese businesses that supply natural rubber to companies participating in the initiative are required to comply with the sustainability criteria that companies have committed to abiding by. If they fail to do so, it will be a massive risk for Vietnamese businesses, and expose them to market share loss. In the future, the pressure on Vietnam's rubber supply enterprises will become more significant and more prominent. The rubber industry currently playing a part in the integration must undergo a change in both thinking and actions to respond to the increasing requirements of the market.

The next steps that the rubber industry must take are to collect and build a complete database, regularly update information in the supply chain and market needs, and share it with its stakeholders. This will help build a basis for assessing the situation and proposing suitable solutions and policies for sustainable development and risk reduction. Enterprises need to comply with all national laws (including the countries where they are currently investing in, such as Cambodia or Laos), international regulations committed to by the government, as well as regulations in markets where their products are being directly or indirectly consumed (through buyers). Additionally, the rubber industry and companies in the industry need a risk management strategy, including market legality of the product risks. The industry needs practical steps to restructure the supply chain, from focusing on exporting raw materials to instead high value-added products, and must pay attention to developing the domestic market. Implementing these steps will contribute to reducing risks for the industry, and especially in integration context will help to promote the rubber industry for sustainable development in the future.

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Appendix: Enterprises' websites that announced the purchase price of smallholder's latex

No.	Name of Enterprises	Website
1	Binh Long Rubber Co., LTD.	http://www.binhlongrubber.vn/
2	Dong Nai Rubber Corporation	http://www.donaruco.vn/gia-purchasing-purchasing-rubber-consumer-electricity-gn43
3	Loc Ninh Rubber Co., LTD.	https://locninhrubber.vn/
4	Phuoc Hoa Rubber Joint Stock Company	http://www.phr.vn/
5	Phu Rieng Rubber Co., LTD.	http://www.phuriengrubber.vn/
6	Tay Ninh Rubber Joint Stock Company	http://www.taniruco.com.vn/article.php?id=4731