

STATUS OF VIETNAM'S COFFEE PRODUCTION AND EXPORT IN THE PERIOD OF 2006 – 2015: STRATEGIES AND SOLUTIONS FOR DEVELOPMENT

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(Received: March 1, 2020; Accepted: November 9, 2021)

ABSTRACT

Vietnam has great potential and favorable conditions for coffee production and ranks as the second largest coffee producer in the world in the 2000 – 2008 period. From 2006 to 2015, the area cultivated, production quantity, and yield increased continuously, with an annual production quantity of 1.18 million tons. Export turnover reached 2.3 million USD per year, which accounts for 2.5% of the annual export turnover for Vietnam. Coffee became one of the most important agricultural products for export and has been exported to over 80 countries worldwide. The Vietnamese coffee sector developed rapidly over the past 30 years, creating jobs for local communities, contributing to hunger elimination, reducing poverty, and generating important foreign exchange earnings. This study sought to analyze Vietnam's coffee production and export, for the period of 2006 - 2015 and propose some solutions for the development of Vietnam's coffee sector. We used descriptive statistics to analyze data from Food and Agriculture Organization of the United Nations Statistics, World Bank Country Reports, and Vietnam Agricultural Census. We performed unstructured interview with farmers, enterprises, and state authorities and used SWOT matrix to identify strategies and solutions for the coffee sector. The results showed that Vietnam's coffee production and export has constantly increased during 2006 – 2013 period but showed signs of slowing down during the 2013 – 2015 period. Major weaknesses of the coffee sector were identified such as underdeveloped processing technologies and weak competitiveness. The study proposed specific solutions to address the shortcomings of the coffee sector, enhance the coffee production, improve its export quality standards and values, and to affirm a stable position in the world market.

Key words: agriculture, competitiveness, SWOT analysis, market.

INTRODUCTION

Coffee is one of the most important agricultural products in the world market and grown in more than 70 countries (Campbell and Ortíz 2011). The economy of several countries, such as Columbia, Brazil, and Central America, depend heavily on coffee production for foreign currency earnings (Sera et al. 2013). In Vietnam, coffee export value has usually occupied around 15% in total agricultural export value, and the share of coffee has always exceeded 10% of agricultural GDP in recent years (ICO 2019). Vietnam has great potential and favorable conditions for coffee production, and is the second largest overall coffee producer in the world after Brazil (Ho et al. 2018). Recently, coffee has expanded beyond the two largest regions of Vietnam – the central highland and southeastern

region, to the northern mountain region, which includes Son La, Lai Chau, Ha Giang, and Tuyen Quang provinces. Coffee production has played an important role in economic re-structuring, environmental enhancement, hunger elimination and poverty reduction in the mountainous region (Guingato et al. 2008). In addition, coffee production has created job opportunities in the processing industry. Over the past years, coffee production and export has been prioritized in Vietnam's agricultural development program (Nguyen and Sarker 2018). This facilitated production capability, renovating technology, and strengthening of global competitiveness on coffee quality and price. However, coffee production and export still have a number of shortcomings and challenges to be addressed.

Over the last decade, there was an increasing number of literature regarding Vietnamese coffee issues (Best 2014; Ha and Shively 2008; Ho 2011; Luong and Tauer 2006; Roldán-Pérez et al. 2009). However, most of these studies often focused on micro- and macroeconomic analysis of the coffee sector, with a little focus on solution-oriented analysis. In 2014, the Ministry of Agriculture and Rural Development of Vietnam (MARD) issued a Decision 3471/QĐ-BNN-TT in 2014 to ratify a proposal to develop Vietnamese coffee sector towards modernism, synchronism, sustainability, strong competitive ability, and high quality added value. Nowadays, in the context of integrated global economy and “open door” policies, especially the participation in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and ASEAN Free Trade Agreement (AFTA), Vietnamese coffee sector will have both great opportunities and challenges for development. In order to prepare itself for the integration process, the Vietnamese Prime Minister issued a Decision 1684/QĐ-TTg in September 30, 2015 to ratify the international integration strategy for the agricultural sector in 2030. Vietnam's Coffee and Cocoa Association (VICOFA) 2014 report also described the overall status of Vietnam and international coffee production, consumption and export during 2011 and 2013, as well as predicted some challenges for the period of 2014 to 2017 (Tam 2013).

Policy makers and coffee producers need more science- and evidence-based approaches for sound policies and solutions. However, contemporary studies and reports show a lack of comprehensive analysis on the status of Vietnam's coffee production and export, its limitations, causes and solutions for the future. Therefore, this study sought to provide an analysis of Vietnam's coffee production and export in the world market and propose solutions for enhancing production and export of Vietnam's coffee.

METHODOLOGY

This study used secondary data collected from both online and offline database from MARD, General Statistical Office of Vietnam (GSO), General Department of Vietnam Customs, and VICOFA from 2006 to 2015. For other countries, data from the International Coffee Organization (ICO), Food and Agriculture Organization (FAO), United Nation Comtrade: United Nations Commodity Trade Statistics Database, and United States Department of Agriculture (USDA) were used.

Unstructured interviews with coffee producers, businessmen and scientists enabled the study to generate a greater degree of trust for exploration of more in-depth information about complex issues arising in coffee production and export. Respondents were selected to represent major stakeholders involved in coffee production and export such as coffee growers, coffee enterprises and associations, government authorities, and scientists. Specifically, two groups of ten coffee producers, five provincial officers in the Central Highlands, four Chief Executive Officers of coffee companies and nine Vietnamese experts from VICOFA, Ministry of Agricultural and Rural Development and Vietnam National Economic University were interviewed. The interviews focused on the following issues: Coffee cultivation techniques; Lessons learnt from unstable coffee productivity and harvest in the period 2006-2015; Strategies for dealing with the areas of old coffee trees and plans for replantation; low prices of Vietnam's coffee export and strategies to improve added value of Vietnamese coffee. Based on the information collected through interviews, strengths, weaknesses, opportunities and threats

of Vietnam's coffee production and exports were identified and SWOT analysis was used to determine strategies for the coffee sector. Descriptive statistics were used to analyze secondary data to obtain average, growth rate, and proportion so as to analyze changes in Vietnam's Arabica and Robusta coffee production and export through time in comparison with other countries.

RESULTS AND DISCUSSIONS

Status of Vietnam's coffee production in the period of 2006 – 2015. While there are several species of coffee, Robusta (*Coffea canephora*) and Arabica coffee (*Coffea arabica*) are the two main ones cultivated in Vietnam, with Robusta coffee accounting for 95% of total cultivated area. In 2015, in the central highland alone, the cultivated area reached 580,000 ha, accounting for nearly 90% total coffee area and 92% of total coffee output nationwide. Data on coffee production in Vietnam from 2006 to 2015 are shown in Table 1. Although the government recommended maintaining a stable coffee area of 600,000 ha, the increase in coffee price gave farmers the incentive to expand the area up to 645,200 ha by 2015, with an increase of 21,200 ha per year or 2.9% per year (Mai 2017). Extreme weather conditions have prevailed more during the recent years and have influenced negatively coffee production. Drought reduced productivity from 2006 to 2015, especially in 2007 and 2012, where coffee productivity declined by 7.1% and 1.3%, respectively. Drought and hail caused a total loss of about 5,000 ha in the central highland in 2012. In addition, intensive farming, land degradation and diseases (e.g. *Planococcus kraunhiae* Kuwana, *Ferrisia virgate*, *Cockerell aulacaspis* sp., *Planococcus linacinus* Cockerell, *Coccus viridis* Green) reduced productivity (Thuy et al. 2011). According to the Department of Crop Production, Ministry of Agricultural and Rural Development, there were about 126,000 ha of old and senile coffee trees of poor growth and productivity in 2012 (Tam 2013). However, during the 2006 - 2015 period, coffee production still increased by 4.3% per year and productivity increased by 1.8% per year. Specifically, the nationwide coffee production increased from 0.99 million tons with a productivity of 2.04 tons/ha in 2006 to nearly 1.28 million tons with a productivity of 2.35 tons/ha, in 2011. While Robusta accounts for 92.9% of the total coffee growing area, Arabica varieties are responsible for only a few percent. Robusta coffee accounts for about 97% of total coffee production nationwide. The production rate increased 16% compared to the previous year. This is also the highest rate of change in the whole period (FAOSTAT 2016). Although cultivated area slowly increased by less than 1%, the output still reached 1.4 million tons and the productivity was about 2.4 tons per ha in the 2014 and 2015 crop years. These made Vietnam the second largest coffee producer and exporter in the world next to Brazil, and the largest Robusta producer and exporter in the world. Such remarkable results were due to several competitive advantages and policies of Vietnam compared to other countries.

First, Vietnam has the advantage of being located in the tropical northern hemisphere with favorable geography, climate and soil conditions for several industrial crops. The Central Highlands and the southeastern regions have a distinguished advantage of soil types for several industrial crops. The soil of the two regions is divided into 11 main groups (IUSS-Working-Group 2014) of which grey soil (acrisols) and red soil (ferrasols) are the most important. This makes the Central Highlands and the southeastern regions special zones for several agricultural crops, such as coffee, rubber, pepper, cashew, hybrid corn, cotton, tea, vegetables, flowers, and fruit trees. For coffee varieties, Vietnam has two distinctive climate regions. The northern climate is favorable for Arabica, while the southern climate is favorable for Robusta (Schaumburg-Müller and Chuong 2010). Second, Vietnam has a young population which provides an abundant source of labor for economic development. Therefore, the competitive advantage in labor over other coffee-producing countries can help Vietnam reduce production cost and increase net profit. Third, since 2013, Vietnam government has made plans, as well as supporting policies for zoning, creating new coffee varieties, and improving productivity and quality (Ha and Shively 2008). Price subsidy policy has been implemented to support coffee growers when global coffee prices decline.

In addition, due to the increasing demands of the international market and the global development trend, agricultural producers in general and coffee growers in particular have to pay more attention to quality standards and procedures guided by professional bodies. In some provinces in the central highland, number of certified agricultural farms and products have increased in recent years. For example, 34 businesses and nearly 27,000 households in Dak Lak province were certified for sustainable coffee production by 2017, with a total area of 45,000 ha, accounting for 22% of the provincial coffee area. The most common certification programs are: The Label and Program for Sustainable Farming (UTZ), Common Code for the Coffee Community (4C certification), Rainforest Alliance (RFA), and Fairtrade Labelling Organizations International (FLO International).

Beside the aforementioned achievement and advantages, Vietnamese coffee production also had some difficulties. Productivity was already very high in 2015 and it would hardly be higher unless new coffee varieties and production technologies be adopted. Furthermore, Vietnam still had more than 30% land planted to old and senile coffee trees that had to be revived to avoid lowered productivity and quality. Small production scale in the form of household level often leads to high investment costs and uneven output quality in the market. The small production scale is also a barrier to farmers to access advanced sciences and technologies, markets as well as other services such as credit and loans. Eventually, branding and obtaining certificates for coffee products are more difficult.

Thus, to promote sustainable coffee production, the local government tried to control coffee expansion, encouraged farmers to invest in new and drought resistant varieties and to apply Good Agricultural Practice (GAP) procedures. Other crops of high economic value, such as cocoa, could be considered since coffee may not provide any more good output. The development of a coffee processing industry for domestic consumption and export has been prioritized by MARD, specifically increasing the total installed capacity for the coffee processing industry to 125,000 tons per year and stabilizing the coffee area at 600,000 ha by 2020, with 80% of the area applying sustainable coffee production, thus allowing an expected productivity of 2.7 tons per ha and total output of 1.6 million tons per year.

Table 1. Vietnam's coffee production in the period of 2006 – 2015^a.

Year	Area cultivated		Area harvested		Ratio of Area cultivated to Area harvested (%)	Production quantity (bean)		Yield	
	1000 ha	Growth rate (%)	1000 ha	Growth rate (%)		1000 tons	Growth rate (%)	Tons /ha	Growth rate (%)
2006	497.0	-	483.2	-	97.2	985.3	-	2.0	-
2007	509.3	2.5	488.9	1.2	96.0	915.7	-7.1	1.9	-8.1
2008	530.9	4.2	500.2	2.3	94.2	1,055.8	15.3	2.1	12.7
2009	538.5	1.4	507.2	1.4	94.2	1,057.5	0.2	2.1	-1.2
2010	554.8	3.0	511.9	0.9	92.3	1,100.5	4.1	2.1	3.1
2011	586.2	5.7	543.9	6.3	92.8	1,276.6	16.0	2.3	9.2
2012	623.0	6.3	572.6	5.3	91.9	1,260.4	-1.3	2.2	-6.2
2013	637.0	2.2	584.7	2.1	91.8	1,289.8	2.3	2.2	0.2
2014	641.2	0.7	590.2	0.9	92.0	1,408.4	9.2	2.4	8.2
2015	645.2	0.6	602.1	2.0	93.3	1,445.0	2.6	2.4	0.6
Average	576.3	2.9	538.5	2.5	93.4	1,179.5	4.3	2.2	1.8

Source: GSO (2007 – 2016)

^a Data in this table represents for both Arabica and Robusta coffee varieties with Robusta account for major portion.

Status of Vietnam’s coffee export in the period of 2006 – 2015. The average growth of Vietnam’s coffee export was 3.1% per year from 2006 to 2015 and the export rate was still fairly high at 8.7% per year. Vietnam exported 980.9 thousand tons of coffee and its value reached 1,217.2 million USD in 2006. By 2012, exports reached 1,735.5 thousand tons, with an increase of 37.7% compared to 2011. Although the average coffee export price per ton in 2012 was 75 USD lower than 2011, export turnover still reached a total of 3,672.8 million USD, three times greater than in 2006 (Table 2).

Table 2. Vietnam’s coffee export in the period of 2006 – 2015

Year	Volume of export		Export turnover		Average export price
	1000 tons	Growth rate (%)	Million USD	Growth rate (%)	USD/ton
2006	980.9	-	1,217.2	-	1,241
2007	1,232.1	25.6	1,916.7	57.5	1,556
2008	1,060.9	-13.9	2,113.8	10.3	1,992
2009	1,183.5	11.6	1,730.6	-18.1	1,462
2010	1,218.0	2.9	1,851.4	7.0	1,520
2011	1,260.0	3.4	2,760.2	49.1	2,191
2012	1,735.5	37.7	3,672.8	33.1	2,116
2013	1,301.2	-25	2,717.3	-26	2,088
2014	1,691.1	30	2,557.4	-5.9	1,512
2015	1,293.5	-23.5	2,589.3	1.2	2,002
Average	1,295.7	3.1	2,312.7	8.7	1,785

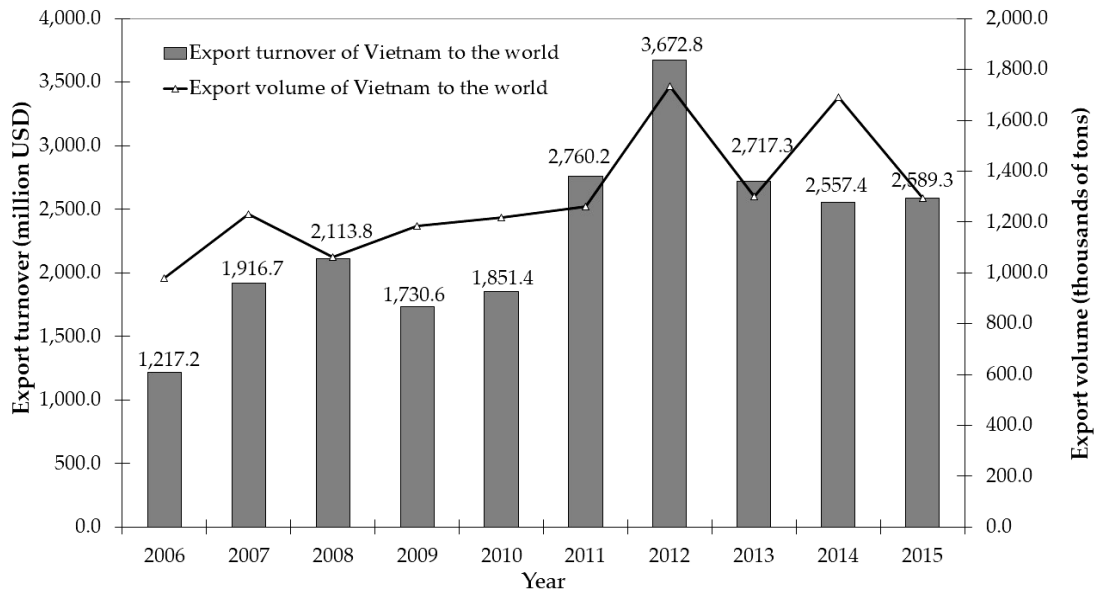
Source: GSO (2007 – 2016)

There were three main reasons for high export in 2012. First, suitable commercial structure and temporary storage were favorable for coffee export. Moreover, export price was only reduced by 30 USD/ton, compared to prices in London and New York exchanges. Second, Robusta coffee is more advantageous in terms of processing and cheaper than Arabica; therefore, Robusta is preferred by importers and consumers in a stringent economy around the world as a source of raw material for coffee processing industries. Thirdly, in terms of coffee cultivation technology, various Vietnamese coffee farmers have been applying advanced agricultural production technology to obtain national and international certifications, such as 4C certification (Common Code for the Coffee Community); VietGAP (Vietnamese Good Agricultural Practices); UTZ (UTZ Certified); and RFA (Rainforest Alliance). By the end of 2017, more than 200,000 ha, accounting for more than 30% of the total coffee growing area of Vietnam, were certified by sustainable development initiatives. According to the Department of Crop Production (DCP) of MARD only 10% of the total volume of coffee had such certifications in 2011; however, this had increased to approximately 50% of the total volume by 2014 (ICO 2019). The increased amount of certified coffee also helps Vietnamese coffee sector gains higher export turnover.

In 2013, both product and export turnover reduced by 25% compared to 2012. Export price was by 98.7% compared to the previous year. The reason for a sudden reduction in coffee export was due to the economic crisis in EU and the United States, the two largest coffee export markets of Vietnam, accounting for more than 50% of the total export turnover. Exports to the United States reduced by up to 34.3%, compared to 2012. In Asia, Japan and China are two major coffee export market targets of Vietnam, accounting for 9.7% total export turnover; however, exports to these two markets lowered, compared to 2012, with export to China lower by 26.2% and exports to Japan lower by 2.1%.

In 2014, export volume increased by 30% from 2013; however, export turnover lowered by 5.9%. In 2015, fluctuation in the world economy influenced coffee export in Vietnam. At the start of

2015, coffee price in Vietnam was still low; meanwhile, Real Brazil started to fall making coffee in Brazil competitive and affected coffee export in Vietnam. Export volume of coffee in Vietnam reduced by 23.4% compared to 2014, especially for fresh coffee. Even though coffee price had gone up by the end of 2015, the average export price for the year was only 2000 USD per ton, which increased by 490 USD per ton compared to 2014, and export turnover was 2,589.3 million USD per year, which also increased by 1.2%.



Source: GSO (2007 – 2016)

Fig. 1. Vietnam's annual coffee export turnover and volume from 2006 to 2015

However, considering the whole period of 2006 - 2015, export volume still increased at a rate of 34,700 tons per year, with export turnover increasing to 152.46 million USD per year, accounting for 2.5% of total export turnover of Vietnam products. Fig. 1 showed that 2009, 2013 and 2015 were three difficult years for the coffee export industry in Vietnam. The financial crisis in the world market had a negative impact on coffee export turnover and volume. In 2009, export price was only 1,462 USD per ton, which was lower by 27% compared to 2008. For 2013 and 2015, export turnover has constantly increased. In 2011, there was an average export price peak of 2,191 USD per ton, increasing by 44.1% as compared to 2010. Due to extreme weather and the increase old and low-yield coffee areas in Vietnam and other countries, productivity and output were reduced, allowing an increase in overall export price.

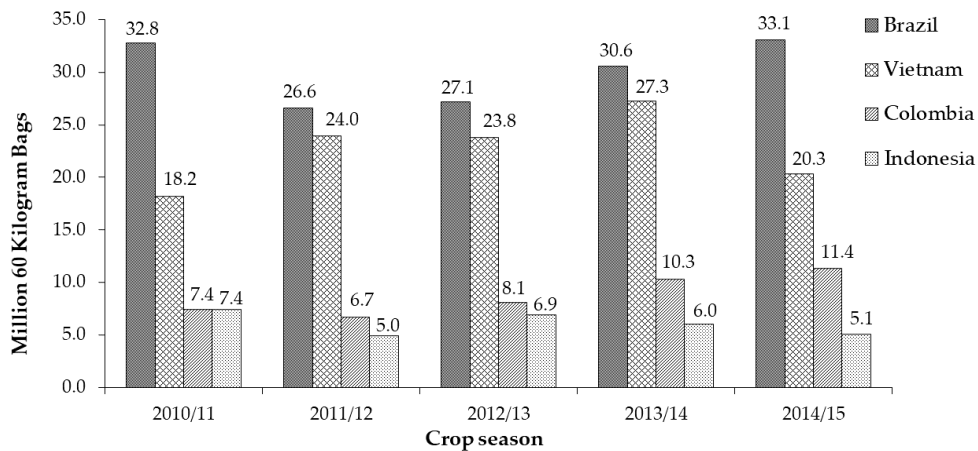
Vietnam has been exporting coffee for 30 years, and export turnover has consistently increased. However, Vietnam exports mainly pre-processed coffee beans, with Robusta being the major variety, resulting in low export turnover (Roldán-Pérez et al. 2009). On the other hand, our analysis showed that Vietnam's export price for coffee was only 54.3% the world average coffee price of 2011 (world average coffee price in 2011 was 4.037 USD per ton) (FAOSTAT, 2016). The price of Robusta coffee in the world market for the last 10 years was 55% of the price of Arabica coffee. The highest export price for Vietnam's coffee was in 2011; however, it is still very low compared to the world market. In 2011, export price of Vietnam's coffee was only 49.1% that of Brazil (FAOSTAT 2016).

There was a decline in the export price of Vietnam's coffee from 2012 to 2014. Vietnam's coffee export has two disadvantages: first, Vietnam's Robusta coffee price is always 30 to 120 USD per ton lower in the London Coffee Exchange (Mai 2017). Second, Vietnam exports mainly pre-processed

coffee beans, which are more susceptible to price than processed coffee products. Therefore, it is important for Vietnam to renovate the plant and also introduce policies to restructure the plant, increasing the area planted to coffee Arabica where the land and climatic conditions are suitable (Nhien 2016). Coffee enterprises should focus on improving product quality, processing capacity and competitiveness of Vietnam’s coffee in the world market.

Position and market share of Vietnam’s coffee in the world market. Coffee production and export plays an important role in the national economy, with coffee becoming the main source of income for about 600,000 farming households, providing a livelihood for about than 2.6 million people (Nguyen and Sarker 2018). More than 80% of coffee area is managed by farmers nationwide. This made an important contribution to the political and social stability in Vietnam Central Highlands and mountainous provinces (Nguyen and Sarker 2018). Coffee export does not only bring a significant source of income, but also contributes in improving Vietnam’s position in the world market.

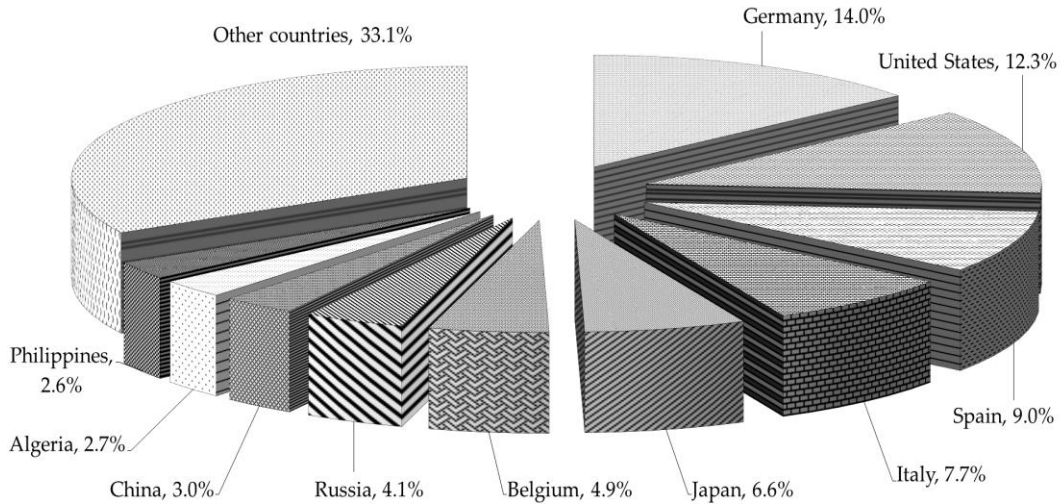
In the world scale, from 2010 to 2015 Vietnam was always in the top four of coffee exporting countries in the world after Brazil (Fig. 2). In 2000, Vietnam exported 0.734 million tons and took over the second position. In 2015, Vietnam exported 1.3 million tons, which was nearly 0.43 million tons lower than 2014, but Vietnam still held second position after Brazil. Moreover, Vietnam is the largest producer and supplier of Robusta in the world. In 2014/2015, Vietnam exported 20.3 million bags, comprising 20.1% the total of world coffee export. Vietnam mainly exports pre-processed coffee bean products; therefore, export turnover was modest, comprising 13% of the world’s total export turnover from 2006 to 2015.



Source: USDA, Coffee: World Markets and Trade (2015)

Fig. 2. Coffee export volume of the top four countries in the world.

Vietnam’s coffee market started implementing regulations, participating and coordinating with organizations, enterprises and farmers. Recently, the devaluation of bumper crop and the massive sales in coffee upon price decline have been controlled. At the same time, the competition between domestic and foreign companies has initially created an advantageous market for coffee growers. Vietnam’s coffee is exported to over 80 countries in the world, with the main importers being EU members (39% of export turnover), the United States (11.1%), and Asia (21.1%) in 2013. Among these countries, Germany and the United States were the two largest importers of Vietnam’s coffee. In Asia, Japan is the largest importer of Vietnam’s coffee. In 2015, the EU accounted for 44.8%, the United States accounted for 12.3%, and Asia accounting for 21.7% of the total export turnover in Vietnam’s coffee. Export turnover of Vietnam’s coffee to the ten largest importers already account for 66.9% of total turnover (Fig. 3).



Source: GSO (2016)

Fig. 3. Vietnam's coffee export markets by country of destination in 2015

Currently, processed coffee in Vietnam is still very limited. Vietnam ranks second in the world in terms of exporting pre-processed coffee bean, while its export of processed coffee has not placed into the top 20 coffee-exporting countries in the world. Vietnam has 200 coffee processing enterprises and 140 export enterprises of which there are only four major instant coffee brands and 20 roasted-ground coffee brands for export. Meanwhile Brazil has 20 brands of instant coffee and 3,000 brands of roasted coffee (Nhiem 2016). Thus, to increase export, Vietnam needs to improve its coffee processing industry through a good production development plan. Even though Vietnam is one of the leading countries for coffee export, each year it still imports a small amount of coffee beans, roasted coffee, and instant coffee from other countries, such as Lao PDR, Indonesia, and China. From 2006 to 2015, analyses showed Vietnam imported over 7,000 tons per year, with turnover of nearly 24 million USD per year. Compared with export from the same period, imported coffee only accounted for a small portion, at appropriately 0.54% of output or 1.03% of the export turnover. Coffee has been the product of export surplus in Vietnam, with total turnover of more than 23 billion USD from 2006 to 2015.

Recent World Bank data shows that the Vietnamese domestic market can potentially consume about 10% from the total coffee yield. However, the domestic consumption of coffee Vietnam is currently from 6-8%. Meanwhile, there is a big difference in coffee consumption between Vietnam and member countries in the International Coffee Organization, with consumption of International Coffee Organization members reaching 25.16% (Giovannucci et al. 2004; Gonzalez-Perez and Gutierrez-Viana 2012).

SWOT analysis of Vietnam's coffee production and exports

Internal factors

Strengths. First, compare to other countries, Vietnam has many natural and social condition advantages. Especially, the favorable climate and soil conditions in the Central Highland of Vietnam make it the unique region to produce coffee of high quality and productivity. Vietnam also has cheaper labor cost compare to other countries, that make Vietnam coffee price are more competitive. Second, the coffee production of Vietnam is concentrated mainly in the Central Highland region and located near export ports, which is convenient for international trade. Third, the Vietnamese policy system for coffee production and export is open and transparent, creating an equal environment for all agents

participating in coffee production, processing and consumption (Nhien 2016). Fourth, Vietnam is the world's second largest coffee producer and exporter, after Brazil. For Robusta coffee, Vietnam is a leading producer and exporter of the world, accounting for half of global Robusta coffee production (Van Long et al. 2015). Moreover, Vietnam is located closer to the northern hemisphere while other coffee producers (Brazil, Colombia, and Indonesia) are all closer to the southern hemisphere. Therefore, Vietnam has a different harvest period, giving the country an edge of being active for six months every year.

Weaknesses. First, coffee areas have increased quickly in recent years, of which large area was spontaneously expanded. There is also a large area of old and sanile coffee trees that need to be replanted. Although Vietnam has already zoned some areas for high quality coffee production for export, the overall production scale is small, with more than 80% of coffee area belonging to households. Therefore, the production which follows national and international quality certificates such as VietGAP standards, 4C certification, UTZ, and RA is still limited. Many small farms and households lack capital to invest in coffee production and processing for export. Second, the organization of production groups and cooperatives are weak and there is lack of good connection between producers and processing companies. Processing companies often buy coffee bean through local collectors. Therefore, the quality control is not secured. Third, quality of exported coffee bean is uneven due to poor cultivation and harvesting techniques. Specifically, facilities for preprocessing and preservation of coffee are backward; In addition, the State's support in terms of capital, processing technology, and training ... is not really satisfactory. Rural infrastructure development is fast but not commensurate with the potential. Management and inspection systems and monitoring of product quality standards are weak and outdated. Finally, Vietnam's coffee has not been widely recognized in the world market because Vietnam exports mainly Robusta coffee of which more than 95% are pre-processed coffee beans. Thus, Vietnam's coffee has very weak competitive prices in the world market. Coffee enterprises also lack experience and strategies to participate in international trade and commerce.

External factors

Opportunities. Firstly, international integration, especially in the economic sector, has become a popular trend around the world. Vietnam has signed a number of bilateral and multilateral trade agreements with other countries and associations and become a member of ICO since 1991. Second, the world's coffee consumption is constantly increasing each year, especially, US and EU markets. Besides, coffee consumption in Asia is also on a strong upward trend, in which Japan and China markets account for nearly 10% of Vietnam's total coffee export turnover. Meanwhile, the domestic consumption market is still full of potential for Vietnamese coffee sector. Third, the Industrial Revolution 4.0 has had a profound influence on the world economy and brought great opportunities to all countries.

Threats. First, climate change and pests across the globe is becoming more complicated and unpredictable, seriously affecting agricultural production in general and coffee in particular. The Central Highlands is one of the areas predicted to be most strongly affected by climate change, specifically on the biological cycle of coffee trees, reducing productivity, and possibly causing other natural disasters such as drought, flood, forest fire ...Second, production input costs such as fertilizer, pesticides are increasing rapidly and adding on coffee prices. The technical barriers in foreign trade activities are more and more stringent, hence the requirements on food safety and quality standards are also higher. There is an intense competition among multinational corporations and leading coffee exporters in the world. Third, Vietnam's agricultural products in general, especially coffee, are heavily influenced by international prices. While the price of roasted and ground coffee still increased significantly, the price of pre-processed coffee beans plummeted. Because of uneven quality, Vietnam's coffee is often paid lower than coffee of the same kind in London Market (Roldán-Pérez et al. 2009).

Based on combination of pairs of strengths, weaknesses, opportunities, and threats, we developed the following SWOT matrix to propose the most reasonable and effective strategies for Vietnam's coffee production and exports (Table 3).

Table 3. Strategies for boosting Vietnam's coffee production and export.

SWOT	Opportunities	Threats
Strengths	<ul style="list-style-type: none"> - Coffee growers, coffee enterprises and VICOFA should maximize inherent potentials and advantages of Vietnam's natural and social conditions. - Take advantage of international integration and the Government's supportive policies to accelerate the development of the coffee industry according to international standards and requirements to increase the value, and strengthen the international competitiveness ability. - Consolidate and expand the international market, take good advantages of the trade agreements to boost exports, and efficiently capture the domestic market. 	<ul style="list-style-type: none"> - Scrutinize policies and mechanisms to support coffee growers to scale-up production. - Coffee enterprises should continue to invest in deep processing of roasted and instant coffee in order to improve quality and export value. - Vietnam needs to take good advantages of being a top world coffee producing country, especially Robusta, to regulate a reasonable supply that is beneficial to the selling price. - Establish a price stabilization fund and regular coffee storage mechanism.
Weaknesses	<ul style="list-style-type: none"> - Promote foreign investment in capital, science and technology for deep processing for export. - Improve the quality of human resources through training and networking within and outside the countries; - Improve coffee production and processing capacity. - Promote exchanges of goods with countries in the region and around the world. - Promote Vietnam's coffee brand into a global product. 	<ul style="list-style-type: none"> - Strictly follow provincial and national agricultural planning, renovating the old coffee area to improve productivity and quality. - Strictly comply with national and international technical processes and quality standards in coffee production and processing, while strengthening the management and inspection system to improve coffee quality and export value. - Promote connection to global value chains to ensure stable coffee consumption and to minimize harsh competition from international markets.

Development solutions for Vietnamese coffee sector. Based on the the status of Vietnam's coffee production and export in the period of 2006-2015, as well as the strategies indentified in the SWOT matrix above, we have set out some specific solutions for coffee sector as follows.

Provinces with large coffee area, such as Dak Lak, Dak Nong, Lam Dong and Gia Lai need to re-evaluate their ecological conditions through a suitable coffee development plan for each province until 2030 and a vision for 2040 based on prevailing environmental conditions. Areas having favorable ecological conditions should be considered for intensive farming, such as grafting, to improve existing varieties or re-planting new coffee varieties. On the other hand, households and local authorities should also consider eliminating old and senile coffee trees. Areas that are not suitable for coffee production should be used and developed according to local land use planning. To ensure the successful development of Arabica coffee in the Northern mountain regions, it is necessary to carefully consider variety, technique, and climate conditions. In addition to supporting coffee production, it is important that the government should also invest and improve infrastructure in coffee-producing regions (Gonzalez-Perez and Gutierrez-Viana 2012).

Coffee quality and production can be improved by applying advanced technologies and increasing farmer awareness on quality and production standards. The State needs to support research in creating new varieties while the coffee sector focuses on transferring advanced coffee production technologies into 4C certification, UTZ Certified, RFA, FLO and GAP Standards (Tran 2014). Agricultural extension needs to be strengthened by transferring advanced technologies, and providing information and training for workers on production and processing, particularly on harvest and preservation. It is important to impart vocational training on farmers, to ensure accessibility of new technology, equipment, and machines for production and consumption (Tam 2013). Agriculture 4.0 should be applied into coffee production from farm to processing, marketing and consumption (Sott et al. 2020). Technologies should be carefully selected based on physical and socio-economic capacity of each households, farms and localities.

Coffee companies need to improve processing, to increase export value through building new processing infrastructures for coffee bean export; install comprehensive, modern and highly-automated production lines; establish coffee processing enterprises toward multi-owners and diversifying products, especially giving priority to building instant coffee processing enterprises with modern technologies; and connect coffee production with processing and consumption (Arnot et al. 2006).

The state needs to improve land use policies, remit taxes, support credits and technologies in accordance with WTO regulations, to provide favorable conditions for coffee growers and enterprises. Each locality needs to have a suitable support policy to speed up coffee replantation or conversion to other crops, encouraging the development of certified coffee productions. It is important to implement supporting policies on post-harvest loss, to encourage enterprise and households to re-invest in processing and preservation facilities (D'haeze et al. 2005). The state likewise, needs to establish strong management, inspection and supervision mechanisms for coffee processing and consumption, in such a way that it strictly follows technical and quality standards. The state also needs to create a clear legal corridor to attract resources from all economic sectors and non-governmental organizations interested in investing in coffee production (Luong and Tauer 2006).

The state needs to strengthen investment cooperation and association, such as strengthening international cooperation in research, production, preservation, processing and consumption of coffee. This would encourage domestic and foreign investors to cooperate in building and upgrading coffee processing enterprises with modern technologies, and diversifying and ensuring high quality safety products. On the other hand, the local government needs to provide households and farms with materials and advanced techniques, and to encourage the establishment of coffee growth, processing and consumption cooperatives. The local government should also extend cooperation among households, farms and enterprises on coffee production, processing, consumption and export (Gonzalez-Perez and Gutierrez-Viana 2012). In particular, exporters need to work closely with coffee growers to establish stable material areas for environmentally friendly and certified coffee.

Vietnamese coffee sector needs to remain a close association in the value chain, from production to consumption. This is to ensure that quality is controlled at every stage of production and a fair benefit for all actors. The linkages among farmers, scientists, entrepreneurs, and state authorities should be promoted and maintained to ensure a stable output for coffee growers and secured input for processing and exporting firms. At present, it is necessary to restructure subject groups in the value chain by establishing key companies with strong financial ability, research, processing and distribution to compete with other foreign coffee brands. Based on coffee production zoning, it is important to establish processing zones, logistic zones for export, especially in Vietnam Central Highlands. The state, coffee associations and companies need to strengthen their international cooperation in building supply chains for coffee companies and helping Vietnam's coffee companies to actively participate in the global distribution system, so as to stabilize price and step-by-step increase export price (Nguyen and Sarker 2018).

Finally, it is necessary to continue re-structuring the coffee sector (coffee varieties, types of product and areas), its production and business to improve its capability and effectiveness. Coffee companies and enterprises need to play an active role in forecasting the market, fostering trade and logistics through trade fairs, and broadcasting trademarks. Moreover, it is necessary to raise awareness and encourage companies to actively build their trademarks, criteria, and quality standards suitable with ICO and importing countries. The coffee terminal market and trading floors should be well-operated, forming effective coffee transaction markets in Vietnam with suitable international practices (Ferris et al. 2014).

CONCLUSION

Vietnam has both great potential and favorable conditions for coffee production. Coffee continues to hold an important position in Vietnam's economy, and economy many farming household in the mountainous areas, especially in the Central Highlands. From the analysis, we pointed out four competitive advantageous strengths of Vietnamese coffee sector. However, coffee production and export in Vietnam over the past years has not been up to par given its potential and strengths. The study also summarized the main weaknesses, such as a weak production system, unstable development, lack of supportive policies and infrastructure, underdeveloped processing, lack of effective production organizations, and low export price compared to the world market. However, Vietnamese coffee sector has a high potential local market, as well as opportunities to upgrade its processing technologies but there are difficulties such as small production scale, unpredictable climate change impact, ambiguous credit policies for replantation, weak competitiveness of enterprises, rising production input costs, and underdeveloped processing technologies. Therefore, the policies and solutions set out for Vietnam's coffee industry in the coming years are: strictly following agricultural planning and zoning for coffee; taking advantages of agriculture 4.0 to improve coffee quality and productivity; training and development of human resources; improving processing capabilities; building suitable mechanism, management and supporting policies; strengthening investments and joint-venture cooperation; promote the linkages among farmers, scientists, entrepreneurs, and state authorities to ensure stable output for coffee growers and secured input for processing and exporting firms; speeding up production and consumption in the value chain; enhancing competitiveness, fostering trademark and market development. These are crucial solutions for Vietnam's coffee production and exports that help to strengthen its position in the world market.

ACKNOWLEDGEMENTS

This study was funded by Vietnam International Education Development (VIED), Vietnam Ministry of Education and Training.

REFERENCES CITED

- Arnot, C., P. C. Boxall and S. B. Cash. 2006. Do ethical consumers care about price? A revealed preference analysis of fair trade coffee purchases. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*. 54(4): 555-565.
- Best, N. T. 2014. Vietnam's coffee export industry: an analysis of the potential long-term macroeconomic impacts. Master's thesis, Saint Mary's University, Canada. 57 p.
- Campbell, W. B. and S. Lopez Ortiz. (Eds.) 2011. Integrating Agriculture, Conservation and Ecotourism: Examples from the Field, ser. *Issues in Agroecology – Present Status and Future Prospectus 1*. Dordrecht: Springer Netherlands, Vol. 1. 302 p.
- D'haeze, D., J. Deckers, D. Raes, T. Phong and H. Loi. 2005. Environmental and socio-economic impacts of institutional reforms on the agricultural sector of Vietnam: Land suitability assessment for Robusta coffee in the Dak Gan region. *Agriculture, Ecosystems and Environment*. 105(1-2): 59-76.
- FAOSTAT. 2016. FAOSTAT statistical database. Retrieved May 20, 2016, from <http://faostat3.fao.org>.
- Ferris, S., P. Robbins, R. Best, D. Seville, A. Buxton, J. Shriver and E. Wei. 2014. Linking smallholder farmers to markets and the implications for extension and advisory services. *Modernizing Extension and Advisory Services Brief*. 4(10): 13-14.
- Giovannucci, D., B. Lewin, R. Swinkels and P. Varangis. 2004. Socialist Republic of Vietnam: Coffee sector report. The World Bank. 76 p.
- Gonzalez-Perez, M. A. and S. Gutierrez-Viana. 2012. Cooperation in coffee markets: the case of Vietnam and Colombia. *Journal of Agribusiness in Developing and Emerging Economies*. 2(1): 57-73.
- GSO. 2007-2016. General Statistics Office of Vietnam. Retrieved February 12 2016, from https://www.gso.gov.vn/default_en.aspx?tabid=626.
- Guingato, P., E. Nardone and L. Notarnicola. 2008. Environmental and socioeconomic effects of intensive agriculture: The Vietnam case. *J. Commodity Sci. Technol. Quality*. 47: 135-151.
- Ha, D. T. and G. Shively. 2008. Coffee boom, coffee bust and smallholder response in Vietnam's Central Highlands. *Review of Development Economics*. 12(2): 312-326.
- Ho, T. Q. 2011. Analysis of socio-economic factors affecting technical efficiency of small-holder coffee farming in the Krong Ana Watershed, Dak Lak Province, Vietnam. Master's thesis, University of Hawaii at Manoa, USA. 74 p.
- Ho, T. Q., V. N. Hoang, C. Wilson and T. T. Nguyen. 2018. Eco-efficiency analysis of sustainability-certified coffee production in Vietnam. *Journal of Cleaner Production*. 183: 251-260.
- ICO. [International Coffee Council]. 2019. Country Coffee Profile: Vietnam. International Coffee Council. No.124-9. 27. p.
- IUSS-Working-Group. 2014. World reference base for soil resources: international soil classification system for naming soils and creating legends for soil maps. FAO and IUSS. 203 p.

- Luong, Q. V. and L. W. Tauer. 2006. A real options analysis of coffee planting in Vietnam. *Agricultural Economics*. 35(1): 49-57.
- Mai, T. C. 2017. Price transmission of Vietnam's Robusta coffee. Master's Thesis. Massey University, Palmerston North, New Zealand. 101 p.
- Nguyen, G. N. and T. Sarker. 2018. Sustainable coffee supply chain management: a case study in Buon Me Thuot City, Daklak, Vietnam. *International Journal of Corporate Social Responsibility*. 3(1): 1.
- Nhien, N. T. H. 2016. The competitiveness of Vietnamese coffee into the EU market. Bachelor's Thesis, Centria University of Applied Sciences, Degree Programme of Business Management. Finland. 56 p.
- Roldán-Pérez, A., M.-A. Gonzalez-Perez, P. T. Huong, D. N. Tien, F. X. Riegler, S. Riegler, C. Tabares, M. Eusse and N. T. Hang. 2009. Coffee, cooperation and competition: a comparative study of Colombia and Vietnam. UNCTAD Virtual Institute: 92 p.
- Schaumburg-Müller, H. and P. H. Chuong. 2010. The new Asian dragon: Internationalization of firms in Vietnam. Copenhagen Business School Press DK. 255 p.
- Sera, T., C. R. Soccol, A. Pandey and S. Roussos. 2013. Coffee biotechnology and quality: proceedings of the 3rd International Seminar on Biotechnology in the Coffee Agro-Industry, Londrina, Brazil. Springer Science and Business Media. 536 p.
- Sott, M. K., L. B. Furstenau, L. M. Kipper, F. D. Giraldo, J. R. Lopez-Robles, M. J. Cobo, J. Manuel, A. Zahid, H. Qammer, and M. A. Imran. 2020. Precision Techniques and Agriculture 4.0 Technologies to Promote Sustainability in the Coffee Sector: State of the Art, Challenges and Future Trends. *IEEE Access*, 8, 149854-149867.
- Tam, T. T. 2013. Vietnam's Coffee Industry. Ipsos Agricultural Research and Consulting. 10 p.
- Tran, C. T. 2014. Overview of agricultural policies in Vietnam. FFTC Agricultural Policy Platform (FFTC-AP). http://ap.ftc.agnet.org/ap_db.php?id=195
- Thuy, N. T., P. T. Vuong and H. Q. Hung. 2011. Composition of scale insects on coffee in Daklak, Vietnam and reproductive biology of Japanese mealybug, *Planococcus kraunhiae* Kuwana (*Hemiptera: Pseudococcidae*). *Journal of International Society for Southeast Asian Agricultural Sciences*. 17: 29-37.
- USDA [United States Department of Agriculture]. 2015. Coffee: World Markets and Trade. United States Department of Agriculture. Foreign Agricultural Service. 7 p.
- Van Long, N., N. Q. Ngoc, N. N. Dung, P. Kristiansen, I. Yunusa and C. J. E. Fyfe. 2015. The effects of shade tree types on light variation and Robusta coffee production in Vietnam. *Engineering*, 7(11): 742-753.