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RESEARCH ARTICLE

Mapping the Coffee Value Chain in Lao PDR: Issues, Insights, and Strategies

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Abstract: Coffee is a major agricultural export product that generates foreign currency for Lao PDR. While several studies have been conducted on coffee in Lao PDR, none have focused on the value chain. This research seeks to fill that gap by analyzing the coffee value chain in Laos. The study uses both quantitative and qualitative methods, such as interviews, value chain mapping, and value-added estimation, to examine the structure, roles, activities, and performance of the value chain actors. The study finds that coffee farmers have the highest value-added, but they are facing various issues of pests and disease, low productivity, and limited access to finance. Laos has a high export potential for coffee, especially to European markets, but also faces constraints such as limited market access, transportation costs, and non-tariff measures. The study provides recommendations for improving the coffee value chain in Laos, such as strengthening farmer groups and cooperatives, enhancing quality and certification standards, and diversifying markets and products.

Keywords: Value chain; Export potential; Non-tariff measures

1. Introduction

Coffee is one of the significant agricultural production and exports of the Lao PDR. It is the third largest agricultural export product for Laos following cassava and banana, which the main export country is China. Coffee is the dominant farming system on the Bolaven Plateau, known by volcanic fields in the southern part of the Lao PDR. This area covers about 500 sq. km, ranging across altitudes of 600 to 1,300 meters above sea level, at about latitude 15°North, and produces about 80% of Laos cof-

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fee.

The Ministry of Agriculture and Forestry (MAF) aims to increase coffee production to 280,000 tons by 2025 and improve quality along the value chain [1]. To meet the goals, many activities must be improved. Coffee producers must expand the plantation area and production. Production groups should be established in many areas. Market price should be determined among the middlemen. The government should negotiate with trading partners for export quota and remove Non-Tariff Measures (NTM) for coffee export.

Little research has discussed the agriculture value chain in the Lao PDR [2-4]. Some research focuses on coffee production and export [5-7]. The value chain analysis includes quantitative and qualitative approaches which qualitative method is suggested to be used prior to the quantitative one [8]. According to Boehlje [9], there are six dimensions for value chain analysis: processes; product flow; financial flow; information flow; incentive systems; and governance. The value chain analysis is helpful in studying the industry, particularly the supply-side constraints. As in most research utilizing value chain analysis, progressive policies, and effective interventions, especially by the government, were indicated as necessary in addressing issues faced by the industry [10]. In Kaplinsky and Morris's study [11], Value chain analysis addresses the weaknesses of traditional analysis, which tends to be static and limited in identifying factors for success Value chain analysis focuses on the dynamics of complex linkages within a network.

The agricultural commodity value chain was primarily used in developing countries for agricultural development areas. It is found that value chain analysis is a tool for improving productivity, competitiveness, and business performance in general, especially for SMEs. Furthermore, the study by Kanhgile et al. [12], highlights that there is a gender imbalance in the coffee value chain in Tanzania but, gender equality empowerment in accessing land and credit and offering trade facilitation services will help to reduce the gender gap. Salam M., et al. [13] analyze the coffee value chain in Toraja, Indonesia using the qualitative method to identify total cost, revenue and margin in each actor. The result shows that house whole processing industry and collectors who sell coffee outside the district have the highest margin while the main issues are farmers' limitation of capital, knowledge, cultivation, and management skills.

There are few studies on the agricultural products value chain in Laos including the coffee value chain. The study on the commercialization of the rice and vegetable value chain found that low farm productivity causes high consumer prices for both rice and vegetables [4]. Specifically, the profit of rice is high, but the transaction cost affects the margin. While the price of coffee at the farm-gate of vegetables is low, the low-value chain management skill, marketing management system, as well as wet market management, causes high consumer price for vegetables.

The value chain of strategic sectors of Lao PDR including rice, coffee, maize, livestock, and wood furniture showed growth potential and market structure. Household participation in the agricultural products value chain can improve household income and well-being. The study of the coffee market in Laos shows that coffee production is threatened by cassava plantations, market access barriers, low labor efficiency, and climate change [7].

Understanding the value chain of coffee would help the Laos government to develop policies supporting actors, especially smallholders of the value chain. This research aims to address some questions as follows: (1) what is the structure of the coffee value chain, (2) what the roles and activities of actors are, (3) what are value added of each actor, and (4) what are the issues and challenges for the coffee value chain. The overall objective of this research is to analyze the coffee value chain in the Lao PDR. The specific objectives are to analyze the coffee value chain's structure, explain the roles and activities of members, and estimate the value added by each member.

2. Materials and Methods

In order to achieve the objectives data collection and data analysis are identified as the following. Five different sets of interview guides were developed for key stakeholders in the coffee value chain, including producers, collectors, production groups, exporters, processing factories, and coffee shops. The main questions in the interview guides were about the respondent's characteristics, activities, production costs, revenue, and main problems and challenges.

A total of 26 interviews were conducted, including 8 farmers, 4 collectors, 2 cooperatives, 4 production groups, 2 exporting companies, 2 processing companies, and 4 coffee shops. The interviews were conducted in Champasak province from January to February 2023. In addition to the interviews with key stakeholders, the Department of Industry and Commerce, the Department of Agriculture and Forestry, the Department of Public Works and Transportation, and the Laos Coffee Association were also interviewed to identify policies that support the coffee value chain.

This study applies the Export Potential Indicator (EPI) developed by Decreux & Spies in 2016 to identify the potential export value for any exporter in each product and

target market based on an economic model that combines the exporter's supply, the target market's demand, market access conditions, and bilateral linkages between the two countries [14]. The method calculates potential trade values based on a country's projected share in a given market and the market's projected demand.

$$EPI_{ijk} = \frac{x_{ik}}{x_k} \frac{x_{ij}}{\sum_k \left(\frac{x_{ik}}{x_k} m_{jk}\right)} m_{jk} \quad (1)$$

where EPI_{ijk} is export potential indicator of country i to country j on product k. x_k is export of country i on product k. x_k is the world export of product k. x_{ij} is total export from country i to country j. m_{jk} is import of country j on product k. A theoretical model of *EPI* consists of three components. Supply, $\frac{x_{ik}}{x_k}$, which is exporter i's world market share in product k. Demand, m_{jk}, is market j's imports of product k. Ease of trade, $\frac{x_{ij}}{\sum_k \left(\frac{x_{ik}}{x_k} m_{jk}\right)}$, bilateral trade divided by hypothetical trade.

A higher EPI indicates a higher potential for exporting more products. In other words, the exporting country can either expand its production or negotiate with trade-importing countries to reduce trade barriers. The difference between the EPI and the actual trade shows the unexplored export potential that can be realized by promoting targeted trade. This can be achieved by helping firms overcome non-tariff measures, meet the rules of origin or adapt to consumer preferences in the target market. By comparing the unexplored potential with potential trade losses, Lao PDR can prioritize either negotiating better tariff regimes or trade promotion strategies [14].

Three parts of the analysing value chain include a value chain map and value-added. Data from the interviews is used to draw a value chain map and identify the activities of each member. SWOT analysis is applied to the coffee value chain.

Total production value, intermediate input, and consumption of fixed capital are three items to estimate the value added. Total production value is estimated by net production multiplied by price per unit. The cost of intermediate inputs is obtained by pricing items at their purchase prices that prevail when they enter the process of production [15]. For example, intermediate production costs of farmers include seeds, pesticides, and fertilizer. The consumption of fixed capital is determined from the depreciation of equipment, machinery, vehicles, and buildings and structures.

3. Results

3.1 Coffee Export Potential

Laos coffee production contributes to job creation and income generation. There is a promising market opportunity for the Lao coffee sector, as the local and export market for coffee is increasing. In 2019, coffee production was 171,380 tons; however, coffee production reduced to 158,190 tons in 2020 and 161,200 tons in 2021. However, coffee exports increased from USD 6.43 million in 2019 to USD 8.99 million in 2021 due to the increase in the world market price.

Lao PDR mainly exports coffee to the ASEAN market. In 2021, Lao PDR exported coffee to Vietnam amounting to approximately USD 48.20 million. Total exports of coffee from Lao PDR to ASEAN amounted to approximately USD 20 million, including Thailand for approximately USD 14 million, Cambodia for USD 5 million, and Singapore for USD 0.03 million [16]. The export of coffee to the EU market under GSP amounted to USD 11.39 million. Belgium imports coffee from Lao PDR worth approximately USD 5.92 million while Germany imports approximately USD 3.1 million. Under the GSP, Japan and the USA also import coffee from Lao PDR amounting to USD 2.67 million and USD 1.22 million, respectively [17].

Table 1. Export potential of Laos coffee.

Unit: million USD

Country	Export potential	Actual export	Unrealized potential
Germany	27.0	8.1	19
Vietnam	21.0	49.0	0
Thailand	14.0	12.0	3.1
Sweden	8.7	0.5	8.2
Japan	6.6	8.4	0.04
Belgium	5.9	8.1	0.01
United States	4.7	2.1	2.6
Italy	3.3	1.2	2
China	2.7	0.98	1.8
France	2.2	1.9	0.22
World	116	103	54

Source: Export potential map, 2023.

Table 1 shows the export potential of Laos coffee. Lao PDR has an export potential of approximately USD 116 million while the actual export of coffee is USD 103 million. The unrealized export potential is USD 54 million which means Lao PDR has the capacity to export more coffee if there is a demand from a market. Lao PDR has the highest export potential to export to Germany, but the actual export of coffee is worth only USD 8.1 million. There is a huge potential to export coffee to Germany. Unrealized export potential for coffee is relatively high in Thailand, Sweden, and USA. However, Lao PDR has actual export more than export potential in Vietnam, Japan,

and Belgium which means Lao PDR uses its full potential to export to these countries. In other words, it is difficult to export coffee to these markets.

3.2 Value Chain Map

The key members of the coffee value chain include farmers, collectors, coffee producers/cooperatives, processing companies, retail shops, coffee shops, and exporting companies (See Figure 1).

The roles and activities of each member are explained as follows. Coffee producers are individual farmers, farmer groups, and large-scale commercial coffee producers who were set up by foreign investors. Most coffee producers are smallholder farmers.

Coffee plantation starts by preparing the seed or buying from other farmers. Before plantations, farmers cleared their land using tractors. It takes an average of three years to get a coffee cherry. Farmers must clear grass 1-2 times per year and add fertilizers. The coffee harvest season is from October to February. Picking coffee cherry uses a lot of time and labor. Farmers must collect 15,000 cherries to get one pound of coffee. Many of them have insufficient labor; therefore, they hire other farmers or laborers to collect coffee. Most of the farmers sell red cherries to collectors. Some farmers do primary processing including washing, milling, and drying before selling dry parchment to collectors or exporting companies.

The farmer group in this study refers to a production group and cooperatives. The production group is relatively smaller than the cooperative in terms of members and production. Production group is an informal arrangement in the villages. They have the commitment to share knowledge, information, and machines and equipment among the members of the group. However, the members of the group prefer to sell their products individually. On the other hand, cooperatives collect production from members and sell it to exporting companies as a group. Some cooperatives have the capacity to operate the whole process from red cherries to green coffee for export and roasted coffee for the domestic market.

Coffee collectors are intermediaries between coffee producers and exporting or processing companies. They can access the production area through information on the source of production and their relationship with coffee farmers and companies. They sometimes have a contract with farmers or production groups. The contract is based on the trust between coffee producers and collectors. Coffee collectors sell red cherries or dry parchment to exporting companies or processing companies depending on their network. They are also the first screening of the defects.

The processing companies produce finished products such as roasted coffee, instant coffee, ready-mixed coffee, and the like. They buy red cherries and dry parchment from farmers, production groups, and collectors to produce finished products. They target both domestic and foreign markets.

Exporting companies are trading companies that mainly export green coffee to Vietnam, Thailand, Japan, and EU countries as they have access to those markets. They

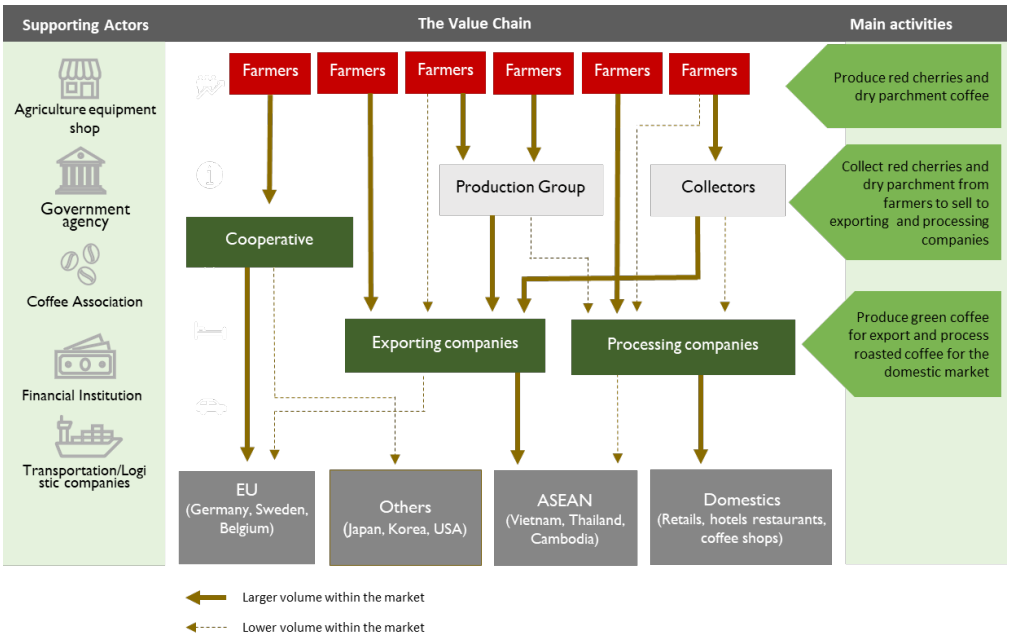

Figure 1. Coffee value chain.

buy red cherries or dry parchment from farmers. Exporting companies can do the entire process from red cherry to green coffee. They invest in advanced machines such as milling, gravity separator, optical sorting, etc.

The domestic consumption of coffee is a tiny proportion of total production. Most of the coffee used in the domestic market is in processing companies, retailers, and coffee shops. Retail shops sell roasted coffee, instant coffee, ready-mixed coffee, and the like. There are many coffee shops serving local and tourist customers. Coffee shops buy roasted coffee to brew varieties of coffee such as espresso, americano, cappuccino, café late, and the like. Some coffee shops have roasting machines while many of them buy roasted coffee from roasters.

Government agencies involved in supporting the coffee industry such as the Ministry of Industry and Commerce (MoIC), Ministry of Agriculture and Forestry, Ministry of Public Work and Transportation, Ministry of Finance, Ministry of Planning and Investment, Bank of Lao PDR, Ministry of Information, Culture and Tourism and other related organizations. These governmental agencies have different roles and responsibilities but collectively in promoting Lao coffee production, and access to the market. MoIC, for example, provides regulatory frameworks and relegations regarding trading, market access, and other supporting activities. MAF provides technical support on the plantation, producing natural pesticides and fertilizer processing and other ministries work in a similar way.

Financial institutions provide loans to farmers, producers, and companies as well as providing other financial services such as money transfers, and other transactions for coffee industry participants. These institutions are important for both domestic coffee trading and exporting. Currently, there are 43 commercial banks in Laos and many of them provide services for agriculture and trading. Besides banking institutions, there are several microfinance institutions that offer loans and financial services to farmers, collectors, exporting companies and processing companies. One way to obtain financial resources is through the Small and Medium Enterprises (SMEs) funds, which are managed by SMEs Promotion Fund under MoIC. These funds give preference to agriculture and agriculture processing SMEs, granting them access to loans with an annual interest rate of 3%. Additionally, the Lao government supports other SMEs funds, which provide loans to agriculture SMEs with an interest rate of 6-9% per year. Commercial banks charge interest rates of over 9% per year, depending on the borrower's credit rating.

Lao National Chamber of Commerce and Industry (LNCCI) is an independent agency that works as a representative of business groups. LNCCI supports its members to grow stronger and problems that its members face will be raised to the government. It works as a connecting point between the business units and the government which aims to facilitate the businesses to operate in a friendly business environment. LNCCI mainly supports the coffee sector by arranging coffee events, workshops, and business matching. They also work closely with the Lao Coffee Association (LCA) to support the coffee sector.

LCA is a Non-Profit Association established in 1994 with the aim of promoting Lao coffee and improving the quality and efficiency of coffee production. Its main role is to support the members to access the market, improve competitiveness, and enhance technical necessary skills and knowledge. LCA members gain benefits from information sharing and access to information about the coffee industry and market. In recent years, the LCA has been very active in participating in national and international trade fairs. LCA is one of the members of LNCCI.

Transportation agencies, both public and private, are important for delivering products from producers to consumers. Logistic companies support exporting companies to transport coffee from Lao PDR to seaports in Vietnam and Thailand. However, exporting companies use the services of foreign logistics companies because of competitive prices.

Agriculture equipment shops sell tools, machines, fertilizer, and pesticides to farmers. Most of the products in the shop are imported from neighboring countries such as Thailand, China, and Vietnam. Agriculture equipment shops also provide credit to farmers through machine leasing.

3.3 Value Added

This section discusses value-added along the coffee value chain. Several assumptions are set here. Arabica is used in the analysis because of the volume of production and demand from the market. The wash processing is assumed here. The exporting price of green coffee refers to the market price in Thailand because most of the green coffee is exported to Thailand. The output value, intermediate input cost, gross value added, consumption of fixed capital, and net value added are estimated in USD per kg. Coffee shops sell various menus of coffee such as espresso, latte, cappuccino, etc. It assumed the price of espresso as it is the base form of other coffee recipes.

The results showed that the farmer's net value added from selling red cherry and dry parchment is approximately USD 0.27 per kg and USD 2.18 per kg, respectively. Dry parchment has a higher value-added both absolute value and the share to the output value than red cherries,

Table 2. Value added along the value chain.

Unit: USD/kg

Description	Farmers		Collectors		Exporting companies	Processing company	Coffee shop
	Red cherry	Dry parchment	Red cherry	Dry parchment	Green coffee	Roasted coffee	Espresso
Output value	0.67	4.00	0.69	4.33	6.00	18.67	51.92
Intermediate input cost	0.40	0.73	0.67	4.00	4.74	12.00	18.67
Gross value added	0.27	3.27	0.02	0.33	1.26	6.67	33.25
Consumption of fixed capital		1.08	0.00	0.03	0.13	4.00	10.38
Net value added	0.27	2.18	0.02	0.31	1.13	2.67	22.87

Note: The exchange rate is 15,000 LAK/USD.

Source: Field survey, 2023.

Table 3. Share of value added to the output value.

Description	Farmers		Collectors		Exporting companies	Processing company	Coffee shop
	Red cherry	Dry parchment	Red cherry	Dry parchment	Green coffee	Roast coffee	Espresso
Output value	100%	100%	100%	100%	100%	100%	100%
Intermediate input cost	60%	18%	97%	92%	79%	64%	36%
Gross value added	40%	82%	3%	8%	21%	36%	64%
Consumption of fixed capital	0%	27%	0%	1%	2%	21%	20%
Net value added	40%	55%	2%	7%	19%	14%	44%

Source: Filed survey, 2023.

but it requires investment in machines and equipment. Collectors make an average of USD 0.02 per kg value added from selling red cherries and USD 0.31 per kg for dry parchment.

Exporting companies buy red cherry and dry parchment coffee beans from collectors to process the green beans. They gain approximately value added of approximately USD 1.13 per kg. Processing companies earn approximately a value-added USD 2.67 per kg from selling roasted coffee. Coffee shops earn the highest absolute value added per kg accounting for USD 22.87.

Table 3 shows the share of value added to the output value. Farmers gain the highest share of value added to output value on dry parchment coffee. Recently, farmers invested in machines and equipment to produce dry parchment. Collectors gain the lowest percentage of value added. However, they benefit from the volume of buying and selling coffee.

4. Discussion

The coffee value chain in the Lao PDR has improved in recent years due to public and private support for training. This has led to an increase in both the quality and quantity of coffee produced in the country. Some Arabica varieties are now considered to be of speciality grade, which commands a higher premium [18].

The market environment surrounding the Lao coffee sector is also quite promising. The demand for coffee is growing rapidly in neighboring Asian countries, and China has emerged as a new potential market opportunity. Exporters and processing companies have the opportunity to enter these markets and capitalize on the growing demand for Lao coffee.

Domestic demand for coffee has been increasing as well. The launch of many new coffee shops or cafés as well as small-scale roasters in recent years is an indicator of the increasing popularity of Lao coffee among locals. Some established coffee brands such as Sinouk Coffee, Saffron Coffee, Yuni Coffee, and Dao Coffee are marketed locally, hoping that booming tourism can boost their sales.

Farmers in Laos have solid knowledge and skills in coffee production. This knowledge has been passed down from generation to generation, and it is also supported by various training programs from the public and private sectors. As a result, farmers have a low cost of production and a high profit margin. This is similar to the findings of a study on the supply chain of premium coffee in Thailand [19].

Many coffee farmers face challenges that affect their livelihoods and the quality of their products. One of these challenges is the shortage of labor, especially during harvest seasons, when many workers migrate to neighboring countries in search of better opportunities. Another

challenge is the lack of knowledge and skills to cope with pests and diseases that can reduce yields and quality. Furthermore, some farmers are reluctant to produce high-quality coffee because they perceive certification as too costly and time-consuming. Moreover, coffee farmers have limited access to low-cost finance because they lack collateral which is consistent with the rice farmers by Wongpit and Sisengnam [20]. This prevents them from borrowing money to invest in their businesses, such as expanding their production or processing facilities. Consequently, they are unable to increase their productivity or improve the quality of their coffee.

The demand for cassava has significantly increased in recent years. Casava is easy to grow with a low cost of planting and harvesting. In addition, casava produces 86.25% value-added which is higher than the 44% value-added of coffee [7,21]. Many farmers change from coffee to casava which will reduce coffee production in the long run.

The Laos government has prioritized policies to support production groups and cooperatives, which provides many advantages. Information, skills, knowledge, and resources such as machines and equipment can be exchanged and shared among members. This helps to improve the efficiency and productivity of production groups [22]. The quality of coffee can be controlled and guaranteed. This is important for ensuring that coffee produced by production groups meets international standards. Production groups have more negotiation power than individual farmers. This means that they are better able to bargain for better prices for their coffee. The lack of legal documents for production groups makes it difficult for them to access credit from banks, which can hinder their ability to invest in quality improvement [20]. Cooperatives shorten the value chain member and connect to the export market.

Exporting companies have an advantage in accessing foreign markets. They apply advanced technology to produce a large volume of products that benefit from the economy of scale. Processing companies have their own brand but not exporting companies do. They have various market segments to serve consumers. They own a supply chain from coffee plantations to coffee shops. They sell products in both domestic and foreign markets. Exporting and processing companies are facing volatility in coffee prices and exchange rates. They also pay the high cost of transportation and services. The export procedure requires many documents from related government offices and high cost of fees. Graduation from the Least Developed Countries (LDC) in 2026 will be a challenge for Lao PDR. The export of coffee will face high tariffs from developed and developing countries as the Generalized System Preference is terminated [14].

Non-tariff measures have become more challenging for the export of coffee. Importing countries impose various NTMs to protect local producers and consumers. Sanitary and Phyto-sanitary Technical Barriers to Trade are the most common measures used for coffee export. The more NTMs the higher the cost of export and the result in losing competitiveness [23,24].

5. Conclusions

Coffee is one of the strategic agricultural products of the Laos government. Many opportunities for exporting coffee to the world market due to the increasing coffee demand in domestic and foreign markets. However, there are many challenges to overcome. The coffee value chain in the Lao PDR has improved in both quantity and quality in the last decade. The production group is the key member in the value chain to increase skills, share information, link farmers to the market, and access finance. Farmers seem to have the highest value-added along the value chain. With a small scale of production and volatility of market price, the total income of farmers is not secured for expenditure. Exporting and processing companies benefit from large-scale production, but the lack of an in-house brand means that the world coffee market does not recognize Lao coffee.

The coffee sector has good opportunities in the global market. The demand in regional countries is growing. However, the coffee sector is facing challenges. NTMs are increasing in the coffee sector pushing the cost of export. Climate change, diseases, and pests impact the quality and quantity of coffee. To improve the coffee value chain in the Lao PDR, some policies should be implemented.

In the short term, the protection of coffee plantation areas, especially the Bolaven Plateau, through the implementation of policies on agriculture zoning and the enforcement of land management agreements. It suggests encouraging farmers to replace old coffee varieties with new ones to increase productivity and promote speciality coffee. The article also emphasizes the need for promoting and certifying coffee standards such as organic, good agriculture practices, and fair trade with support from relevant organizations. Additionally, it mentions that promoting speciality coffee requires significant efforts in changing mindsets, improving skills, and marketing strategies, implementing standards, and identifying geographic indications. Finally, the article suggests that the MoIC can assist farmers in accessing the speciality coffee market by promoting different market positions for coffee through exhibitions, trade fairs, and websites.

In the medium term, financial institutions should devel-

op financial products tailored to farmers' unique requirements, such as group loans. It also proposes the establishment of a Lao coffee promotion fund by organizations such as CCCI and LAC, which can provide low-interest loans to cooperatives. MoIC should disseminate information on market access to exporters and producers through social media, posters, and the website of laotradeportal.gov.la. MAF should provide training to farmers on using natural fertilizers and pesticides and support the development of new innovations aimed at increasing productivity and reducing production costs through partnerships with universities and research institutes. The article emphasizes the importance of embedding capacity building for research and development of agriculture products within universities and research institutes to ensure continued progress and advancement in the field.

In the long term, to promote modernization in the local transportation sector, the MoIC and MPWT should collaborate with the private sector to streamline processes and encourage efficiency by reviewing and revising unnecessary procedures and documents. Additionally, a national logistics database should be established to enhance coordination and improve communication between exporters, importers, and domestic and international transportation companies to reduce the cost of inland transportation and cross-border transportation.

To promote coffee as a key export product, the MoIC, MAF, and LCA should establish trade relationships with potential partners such as Germany, Sweden, and China. The article also emphasizes the need to improve market access in these high-potential markets through trade policy negotiations. To meet the requirements of importing countries and graduate from LDC status, identifying a quality standard for coffee and supporting farmers and cooperatives to improve their quality and meet international standards is crucial.

This study has some limitations that should be considered. The sample size of the survey was small, but there was no significant difference in the cost and margin between the different groups of respondents. However, the study only focused on the domestic market, so it is recommended to conduct further analysis of the coffee value chain in the foreign market to understand who the customers of Lao coffee are in the international market.

Author Contributions

The first author as well as corresponding author Piya Wongpit took the lead in research design, analysis, interpretation and writing of the manuscript while co-authors including Pakaiphone Syphoxay, Bounthom Sisoumang, and Sengsulixay Sykhanthong, support the first author in the writing and analysis.

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Data Availability

The data are available upon request from the corresponding author.

Conflict of Interest

The authors disclosed that they do not have any conflict of interest.

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