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Vietnamese Mango Value Chain Analysis from Farm to Market

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Abstract

The main objective of this research are to identify vulnerabilities within the mango value chain in Vietnam, allocate costs, revenues, and net profits among the different stakeholders in the marketing channel, and recommend strategies to sustain the long-term viability of the mango sector in the region. This research used a value chain analysis to assess the overall economic efficiency of the value chain associated with Vietnamese mango production. The total of 2,046 sample observations was supplied by various stakeholders in the mango value chain, including farmers, cooperatives, collectors, wholesalers, local retailers, export enterprises, processing firms, and fruit stores. The aggregate economic performance within the Vietnamese mango value chain is estimated at $3.36 billion, accompanied by a net profit of $270.4 million. The export channels, namely channels 1, 2, and 3, provide a total sales revenue of $2.27 billion and produce a net profit of to $185 million. The revenue generated via domestic channels, namely channels 4 and 5 of marketing, amounts to $1.09 billion with a net income of $85.4 million. The results of the study emphasize that farmers are the most susceptible participants in the supply chain with regards to the production of low-quality and small-scale mangoes. This research proposes three policy recommendations, including benefit redistribution, technology progress, and quality improvement. The outcomes of this research provide support to the possible use of the value chain approach in policymaking, and they enhance our comprehension of the value chain analysis process for various tropical fruits and vegetables.

Keywords: *Mango, Vietnam, Distribution, Solution, Policymaking.*

Introduction

The use of Value Chain Analysis (VCA) is prevalent among bilateral and multilateral development organizations in the realms of research and policymaking. A comprehensive examination of a value chain analysis encompasses several factors such as inputs, outputs, local and worldwide markets, public and private sectors, as well as the environment and natural resources. The facilitation of policymakers in effectively managing the supply chain and ensuring fair distribution of research benefits in the agriculture sector might prove beneficial. VCA refers to a consortium of enterprises engaged in the production and distribution of goods, ensuring that the supply chain effectively caters to the preferences of customers with regards to volume, quality, and cost. Assume responsibility for managing inter-organizational, intra-organizational, and horizontal collaborations within the corporation. Establishing connections between rural and urban regions may provide several advantages. According to Rauch et al. (2001), there exists a significant financial interdependence between families in both rural and urban areas. According to Heike et al. (2016), the presence of entrepreneurs may facilitate the growth of rural economies by fostering connections between rural and urban regions, therefore enabling access to both local and worldwide markets.

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The use of VCA has been seen in policy analysis studies conducted by Bockel and Tallec (2005) within the context of the Food and Agriculture Organization (FAO). The VCA provided policymakers with comprehensive data pertaining to a diverse array of subjects, including both public and private entities, local and worldwide markets, input-output relationships, production variables, institutions, the environment, and natural resources. During our discussion, we examined several aspects pertaining to the economic and social backdrop, value chain output demand, institutional architecture, input and output markets, as well as conducted an economic and functional analysis. The use of VCA has promise in its ability to provide support to individuals facing economic disadvantages, as well as in its capacity to help governments in effectively managing food distribution networks. Agri-supply networks include both advantages and disadvantages. Supply chains provide many types of information, including timetables, quality guarantees, and needed quantities, with the aim of fulfilling production and delivery deadlines. Balyan et al. (2013) argue that the rise in fresh mango exports might be attributed to the heightened participation of nations in the World Trade Organization. India's export volume surpassed the established international limits. In order to ensure the sustainability of exports, it is essential to establish and enforce legislative protections. Meeting safety rules in countries that import goods from India might provide challenges. Regulations aimed at guaranteeing the safety of food must be grounded on scientific principles and establish connections with international legal frameworks.

Roehlano and Jesus (2013) propose the implementation of vertical linkages as a means to guarantee that the export market gets mangoes that adhere to the required requirements in terms of both quality and quantity. The potential enhancement of private sector vertical integration has the capacity to increase the value of the mango supply chain. At first look, it seems that the horizontal market structure has an influence on export activities. The fields of marketing and processing get advantages from economies of scale and a propensity for risk-taking. This category include transportation volumes, sales rejections by market authorities, and significant initial expenses, such as those incurred for the establishment of a treatment or processing facility. The study examines the cost structure and allocation of cost-benefit throughout the mango value chain in Vietnam. In order to facilitate the implementation of effective strategies aimed at enhancing profitability for vulnerable stakeholders and ensuring the sustainability of the value chain, it is imperative that this study assists in the identification of the existing collaborative dynamics between producers and consumers within the mango value chain in southern Vietnam.

Methodology

Sampling Technique

Multiple sample cycles were conducted in order to ascertain the most favorable site for the end research. The Mekong Delta and nearby regions in Vietnam were researched because of the good condition for mango growing there. The areas under consideration contribute approximately 75% of Vietnam's overall mango production, including 72% of the nation's total mango cultivation area. According to the General Statistics Office's report in 2022, the provinces of Dong Thap, An Giang, Tien Giang, Hau Giang, Vinh Long, and Tra Vinh together represent 71% of the whole volume and area of the Mekong Delta. Dong Nai province accounted for a significant proportion of the national production, surpassing 55% of production volume, and also had around 54% of mango farming area in the southeastern region. The research study included a total of 2,046 sampling observation, as shown in Table 1.

Table 1: Structure of Sampling Observations.

Stakeholders	N	Methods
Farmer	1.886	Questionnaires
Cooperative	9	Questionnaires
Collector	32	Questionnaires
Wholesaler	35	Questionnaires
Enterprise	12	Key informant panels - KIP
Retailer	48	Key informant panels - KIP
Supermarket/fruit shps	10	PP phát triển mầm
Central markets	3	Key informant panels - KIP
Agency of Phytosanitary Inspection 2	1	Key informant panels - KIP
Farmer groups	10	Group discussion
Total	2.046	

Literature Review

The concept of the "value chain" was introduced by Michael E. Porter and first denoted a series of operations undertaken to include the design, production, marketing, delivery, and support of goods. According to Porter (1985, p. 34), value systems include the whole integration of a company's supply chain, spanning from the acquisition of raw materials to the delivery of final products to end users. Value chain definitions were used by several disciplines of research. Alternative value chains to Porter's framework have been proposed in other scholarly works, including by Morris (2000), Kaplinsky & Morris (2001), Ponte & Gibbon (2005), and Schmitz (2005). The study was conducted by the researchers using value chain analysis. The significance of cost objectives was emphasized by Hergert and Morris (1989) due to the interdependence of activities within manufacturing processes. In 1999, Ramirez conducted an assessment of the organizational, managerial, and economic significance of co-productions. The concept of "value chains" refers to the series of activities and processes that a company does in order to create and provide The allocation of resources was established using Activity-Based Costing (ABC) methodology, which takes into account both inputs and outputs. This approach was used based on Mau's study on the process chain. According to Dekker (2003), the acquisition of domain knowledge is essential for the effective implementation of coordination and value chain optimization strategies.

Value delivery networks are formed by individuals or entities that engage in reciprocal cooperation with the same agents in both directions. The process is visually represented in the value chain diagram. The main areas of focus include marketing channels throughout the value chain, integrated economic efficiency, international competitiveness, regulatory decisions, and product differentiation. The emergence of Value Chain Analysis (VCA) may be attributed to Porter's thesis in 1985 (Porter, 1985), which garnered significant acclaim and was seen as a groundbreaking development throughout the whole of the 1990s. This approach facilitates the assessment of a company's competitive advantage within the context of contemporary global commerce. The value chain encompasses a series of activities aimed at optimizing the difference between the total income generated from product sales and the expenditures incurred throughout the production process. Every action carries with it a set of outcomes and interconnected connections. Academics and political leaders have developed strategies based on Porter's conceptual framework. The year 2011. Trienekens is a surname of Dutch origin. Globalization functions as a diagnostic tool for analyzing the interrelationships among members in a chain. A comprehensive study of the value chain encompasses the mapping and evaluation of institutional frameworks pertaining to governance, the

identification and implementation of value-adding strategies for chain upgrading, as well as the examination of stakeholder benefits.

There are both qualitative and quantitative methodologies available for studying value chains, as noted by Rich et al. (2009). Multiple qualitative studies (FAO, 2003; Van Melle et al., 2007; Hanemann et al., 2008; Krain et al., 2008; Huang et al., 2009; Xayavong & Islam, 2009) have provided evidence of the added value associated with the different functions performed by the chain, spanning from the initial acquisition of raw materials to the final production of the goods. These studies have also shed light on the potential advantages and disadvantages inherent in this process. In 2007, Van Melle et al. proposed the use of value chain analysis. Academic literature has documented the use of gross margin analysis within the context of value chain analysis (Mitiambo, 2008; Tu, 2009). The concept of VCA was informed by Porter's framework. Special emphasis is placed on examining the impact of globalization on the interconnections among members within a chain. According to Kaplinsky and Morris (2001), a value chain analysis may provide insights into stakeholders, governance, chain value, and stakeholder benefits.

Numerous experiments included the utilization of Variable Component Analysis (VCA). According to the findings of Michael and Deigan (1989), the establishment of cost targets is crucial due to the potential influence of the cost of one manufacturing phase on the costs associated with subsequent phases. Ramirez (1999) conducted a study that centered on the concept of value co-production, enabling a comprehensive understanding of market potential, management tactics, and existing norms. Kaplinsky and Morris (2003) made enhancements to the value chain. In the study conducted by Mau (2002), the author used value chain analysis as a methodological approach to examine the inputs and outputs of a given system. The study further aimed to illustrate the resource allocation process of Activity-Based Costing (ABC) via this analysis. According to Dekker (2003), the seamless exchange of information across the value chain plays a crucial role in enhancing internal company collaboration and process improvement. In the year 2017, What Douglas et al. (year) found in their study is that... The ultimate outcomes and offerings get advantages from the synchronized efforts of all entities involved in the value chain. The Dominic 2020 Group The map displays the channel transfers, cost and profit structures, and stakeholders. Bilateral and international aid agencies are progressively using value chain analysis as a strategic tool to inform and direct their development operations (Henriksen et al., 2010). Value chain analysis has shown to be a successful tool for both governmental and academic institutions. Consequently, aid groups are now using this approach as well. Lorenzo (2013) posits that the use of Value Chain Analysis (VCA) facilitates the streamlining of the allocation process for marketing channel expenditures and revenues. The Value Chain Analysis (VCA) is a technique that is not based on econometric principles, but rather focuses on assessing the economic efficiency of stakeholders, especially within the framework of social issues. Rich et al. (2011) argue that the ability of Value of Statistical Life (VCA) to measure policy trade-offs and outcomes is limited.

De Brauw et al. (2015) and Hawkins & Popkin (2015) The VCA (Value Creation Assessment) evaluates the feasibility, productivity, efficacy, and sustainability of collaborative efforts. The objective is to establish connections and facilitate communication among the wholesale, retail, and delivery sectors. In order to provide assistance to the most vulnerable component inside a system. Occasionally, market mechanisms exhibit failures. According to the Asian Development Bank (ADB, 2019), fruit and vegetable growers in Pakistan and Vietnam get a remuneration that is less than 30% of the final retail price. There is potential for improvement in all aspects of fresh mango exportation, including postharvest handling, farm management, and sales channels. Mango growers have the potential to achieve cost savings via collaborations with transporters and processors. Additionally, Tanzania is actively working on enhancing the volume, caliber, and availability of contractual distributors and

merchants for mangoes in strategically significant regions. Value chain research may provide valuable insights into competitive and efficient market signals.

A separate investigation carried out in Myanmar has shown the existence of six discrete mango value chains, including five within the local market and one inside the export market. The rate of mango exports is at 2%. The price of the mango is rather high. According to Naing (2015), Approximately 250 enterprises are dedicated to the field of exports, with 175 of them located inside the city, while the remaining 80 are engaged in wholesale activities. In 2017, Karina et al. conducted a study on the value chain of mangoes in the Philippines. The Republic of the Philippines is accountable for around 4% of the global mango exports. The mango fruit plays a pivotal role in several economic and manufacturing activities. A significant proportion, namely 73%, of mango exporters are engaged in cultivation on land areas of less than 3 hectares. The Philippines serves as a significant supplier of mangoes to several countries, including the United States, Hong Kong, South Korea, Japan, China, and Canada. Tothapuri/Alphonso accounts for 70% of the cellulose content found in Indian Chittoor. Mango cultivators and packaging entities collaborate in order to synchronize their efforts. According to the Food and Agriculture Organization (FAO) in 2018, a significant proportion, namely over 90%, of Vizianagaram mangoes that are commercially available are consumed in the cities of Delhi, Raipur, and Kolkata. Based on the findings of a study done by William (2014), it was determined that the Hoa Loc mango value chain has a domestic sales proportion of 77% inside Vietnam, with the remaining 63% being mostly exported, predominantly to China via border crossings. San et al. (2020) reported that a total of 150 Vietnamese firms are involved in the processing of mangoes, contributing to about 10% of the global mango production.

According to a study conducted by Romo and Bokelmann (2016), mangoes are the only crop sold by small-scale farmers in Dong Thap. The fostering of collaboration among agricultural practitioners. They serve as a dependable and trustworthy resource for guidance, resources, and valuable knowledge pertaining to the sector. The value chain include individuals and entities engaged in various stages of mango production, distribution, retail, wholesale, processing, export, and consumption. A minor percentage of exporters and manufacturers use refrigeration techniques. After being sourced by exporters, raw mangoes undergo several processes such as drying, freezing, canning, and being used as an ingredient in ice cream production. Truong et al. (2015) reported that the predominant variety of mango exported from China is Chu-mango, accounting for 74.5% of the total exports. China was the primary destination for the bulk of mango exports from Vietnam. The Vietnamese mango industry is mostly governed by a single dominant consumer market. The significance of high-quality data, especially in relation to competitiveness, market relationships, and targeted markets, is sometimes underestimated. The focus placed on mango production and consumption in Vietnam considerably benefits value chain partners and smallholder growers. Alam (2018) conducts an analysis of the advantages and disadvantages associated with the typical mango supply chain, examining the sequential trajectory of the fruit from its origin at the farm to its final destination at the shop. The distribution of profits and losses is allocated among distributors, retailers, and the farmers engaged in mango production. According to the research, mango cultivation was successfully carried out by farmers, despite the challenges posed by postharvest loss and middlemen. Value chains may provide significant advantages to merchants. The populace of Pakistan had a strong affinity for mangos.

According to a study conducted by Badar et al. (2015), mango purchasers in Pakistan placed importance on both the extrinsic attributes (such as safety and marketing) and subjective attributes (such as search and experience) of the mangoes. The cultivation of mangoes in the Embu region has been identified as a very lucrative enterprise (Krain et al., 2008). According to Badar et al. (2019), the mango export value networks include a range of classic, contemporary,

and value chains in order to effectively target diverse customer segments. Traditional value chains have a crucial role in supporting the primary consumer base of mango products, hence contributing to the stimulation of economic development. Nevertheless, consumers are drawn to contemporary value chains due to the notable emergence of new retail models. The efficacy of contemporary value chains is augmented by their engagement with producers, namely through the use of reverse integration strategies, which serve to improve the overall quality of products. There is a need for the evolution of interpersonal interactions among farmers. The realization of the mango industry's whole potential in contributing to the socioeconomic growth of the nation may be achieved via a gradual shift from an older to a modern value chain.

Empirical Model

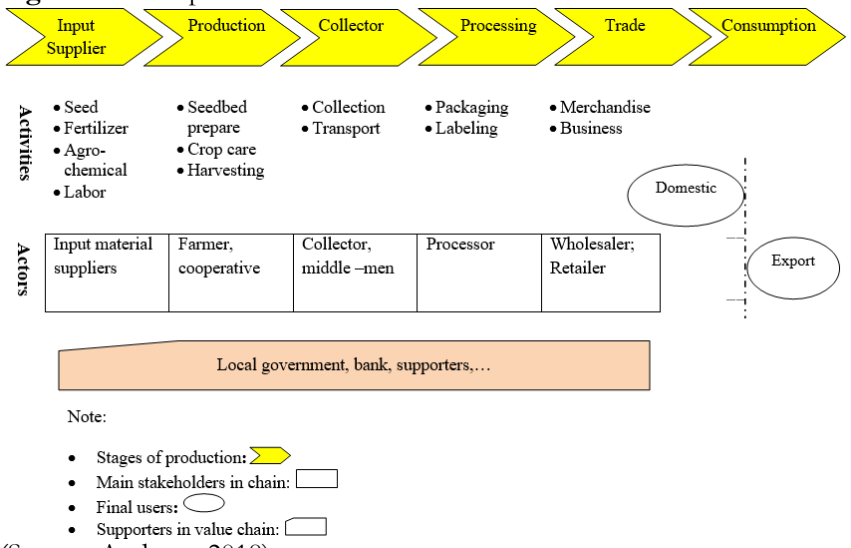
Value chain analysis is a compelling approach that elucidates the multifaceted contributions made by many entities. This text provides an elucidation of several aspects including the people involved, the economic factors at play, the flow of products, and the evolutionary processes. Enhanced operational effectiveness within the supply chain has been shown to contribute to increased competitiveness and the generation of more value, hence resulting in improved remuneration and living standards for workers. The aforementioned data has potential use for economists and policymakers. The value chain concept proposed by Andreas (2018) is used in the present investigation. The system included several phases of manufacturing, along with the various stakeholders, end consumers, and supporters engaged in each respective level. All individuals involved in the manufacturing process, ranging from suppliers of raw materials to end-users of the final product. Various components are essential at different stages of the agricultural process, including fertilizers, agrochemicals, labor, soil preparation, crop care, harvest, collection and transport (collector), processing (packing and labeling), merchandising and business (trade), and local and worldwide commerce. The process of generating value encompasses several stakeholders, such as suppliers of raw materials, agricultural producers, cooperative organizations, intermediates, processors, wholesalers, retailers, exporters, as well as domestic and international customers. Additional entities involved in the value chain include local and national governmental bodies, non-governmental organizations (NGOs), financial institutions, agricultural extension agencies, educational establishments, logistics providers, and shipping corporations.

Benefit-Cost Calculation

1. Input cost = root fertilizer + leaf fertilizer + paclobutrazol + herbicide + insecticide + fungicide
2. Marketing cost = energy + wrapping bag + machine depreciation + transport depreciation + hired labor + family labor + land rent
3. Total cost = Input cost + Marketing cost
4. Revenue = selling price of a ton of mango
5. Added value = Revenue – Input cost
6. Net profit = Revenue – Total cost
7. The marketing costs of traders and processors include the cost of packing, hired labor, transport, testing, and others.
8. The mango ton will be used to compute all indicators.
9. The value chain diagram rate of dispersed goods is calculated as follows:

- The total input products of the first actors will be 100%, and the entire output products of the final actors must equal 100%.
- Each actor must input and output equally.

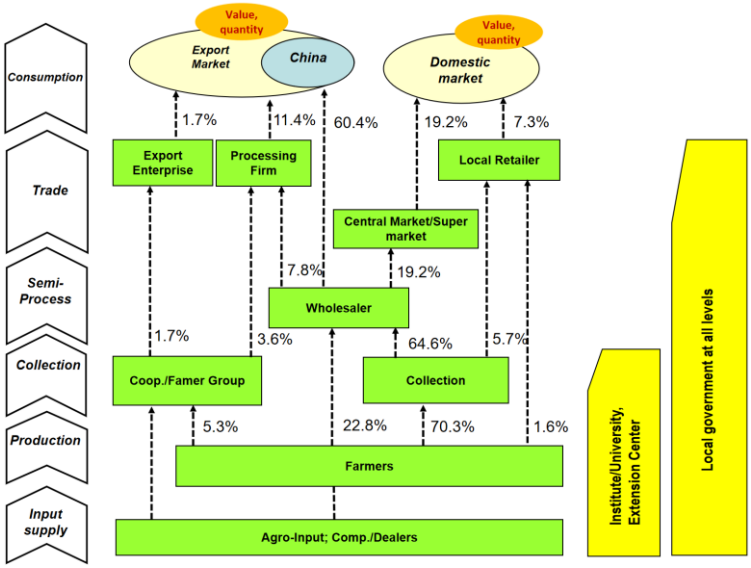
Figure 1: Conceptual Framework of Value Chain



(Source: Andreas, 2018)

Result and Discussion

Figure 2: Diagram of Vietnamese Mango Marketing Channels.



The investigation conducted by researchers on the mango value chain in Vietnam revealed that the proportion of mango volume generated from export channel was 73.5%, which is almost 2.8 times higher than that generated from domestic channel. China accounts for a substantial majority, namely 60.4%, of the global mango export market on an annual basis. This observation suggests that the mango sector is exposed to a significant level of market risk, mostly attributable to its heavy dependence on a single market, namely the Chinese market. The excessive focus of mango goods on a certain market has amplified the inherent risks associated with their sector. The function of farmers as producers is of significant importance to the whole supply chain. Conversely, they possess a very limited capacity to

assess fluctuations in market indicators and are often the last recipients of relevant information. Farmers face a multitude of production concerns, among which disease and harsh weather are only two examples. The study also indicates that the Vietnamese mango value chain has a total of five primary channels, including three channels for export and two channels for domestic sales. Each channel serves distinct customer segments and operates under certain quality standards and other characteristics.

Table 2 presents a comprehensive overview of the advantages and disadvantages associated with engaging in the export market route, as seen by different stakeholders. Based on the available data, producers who choose for export channels to sell their fruit tend to generate higher financial returns compared to those who choose other channels within the Vietnamese mango export value chain. Nevertheless, it is worth noting that farmers have the lowest mean annual income among all occupations. The net profit of channel 1 farmers is 1.50 times more than that of the cooperative and 1.13 times greater than that of the mango exporter, at a net profit of 347.1 USD/ton. The net profit earned by producers in Channel 2 is $149.10/ton, representing a 2.3 times increase compared to the net profit of the cooperative and wholesaler, and a 5.8 times increase compared to the net profit of the processing firm. The net profit of the mango growers in channel 3 amounts to 281.2 USD/ton, representing a net profit that is 3.5 times greater than that of the collector and 4.1 times more than that of the wholesaler. In contrast to their counterparts, farmers engaged in export channels 1, 2, and 3 often experience comparatively lower yearly average net profit. One significant determinant is the comparatively reduced production capacity of manufacturers in relation to other merchants. The predominant of mango growers in Vietnam consists of subsistence farmers who cultivate small-scale land parcels of less than 1 hectare. Based on the available data, it can be observed that farmers in Channel 1 exhibit an average annual mango production of 1.7 tons (with cooperatives contributing 74.6 tons and exporting firms contributing 88.4 tons). Similarly, farmers in Channel 2 demonstrate an average annual mango production of 4.9 tons (with cooperatives contributing 105.3 tons, wholesalers contributing 518.8 tons, and processing firms contributing 3,859.7 tons). Lastly, farmers in Channel 3 display an average annual mango production of 4.5 tons (with collectors contributing 81.3 tons and wholesalers contributing 68.8 tons). The outcomes of this research provide support for the significance of economies of scale in driving improvements in productivity and financial performance within the business context. Hence, the players engaged in export markets via channels 1, 2, and 3 are seen to be the most susceptible.

The distribution of mango marketing expenditures among domestic distributors in Vietnam is shown in Table 3. Farmers consistently generate the most net profit in domestic channels 4 and 5, topping even merchants. The farmer affiliated with Channel 4 generates a net profit of 281.2 USD/ton. This numerical value is 2.5 times more than that of supermarkets, and three times larger than the amount net profit of collectors. According to the data shown on channel 5, farmers earn a net profit of 125.8 USD/ton, which is 1.8 times more than the earnings of collectors. Farmers consistently exhibit the lowest yearly net profit across several domestic channels. The statement suggests that economies of scale have an influence on the operational efficiency of a corporation. According to a survey by Channel 4, mango farmers in Vietnam had an average volume of 6.2 ton/year. In contrast, collectors harvest a much higher amount of 218.3 ton/year, followed by wholesalers 628.9 ton/year and supermarkets 206.5 ton/year. This phenomenon is also seen on channel 5.

Tables 2 and 3 demonstrate that the export market has significant prominence as the primary component within the value chain for Vietnamese mango. During the same time frame, the export channel generated a profit of $185.1 million from revenue amounting to $2.27 billion. The value is equivalent to double the combined income and profit generated by the domestic channel. The mango value chain in Vietnam has yielded a total revenue of $3.36 billion, with a corresponding profit of $270.4 million.

Table 2: The Cost-Benefit Analysis of Actors in the Export Channels.

Indicators	Farmer	Cooperative	Collector	Wholesaler	Export Enterprise	Processing Firm	Total
The marketing channel 1							
Selling price (USD/ton)	1,847.8	2,273.7			7,828.4		
Input cost (USD/ton)	697.4	1,847.8			2,273.7		
Marketing cost (USD/ton)	803.3	190.7			5,247.5		
Net profit (USD/ton)	347.1	235.2			307.2		
Avg. volume/year (ton)	1.7	74.6			88.4		
Net profit/year (USD)	590.0	17,545.9			27,156.5		
The marketing channel 2							
Selling price (USD/ton)	847.9	1,071.6		1,071.6		1,665.7	
Input cost (USD/ton)	324.8	847.9		847.9		1,071.6	
Marketing cost (USD/ton)	374.1	158.1		158.3		568.5	
Net profit (USD/ton)	148.9	65.6		65.4		25.6	
Avg. volume/year (ton)	4.9	105.3		518.8		3,859.7	
Net profit/year (USD)	729.7	6,907.7		33,929.5		98,808.3	
The marketing channel 3							
Selling price (USD/ton)	1,494.1		1667	1,981.2			
Input cost (USD/ton)	563.7		1,494.1	1667			
Marketing cost (USD/ton)	649.2		91.6	245.8			
Net profit (USD/ton)	281.2		81.3	68.4			
Avg. volume/year (ton)	4.5		85.6	415.8			
Avg.net profit/year (USD)	1,265.3		6,959.3	28,440.7			
The integrated economic efficiency of export channels							
Volume (ton)	449,379.0	32,404.2	369,285.6	416,974.8	10,393.8	69,699.6	
Selling price (USD/ton)	1402.1	1457.2	1667.0	1,877.1	7,828.4	1,665.7	
Net profit (USD/ton)	262.2	120.0	81.3	68.1	307.2	25.6	
Total revenue (Thous. USD)	630,053.6	47,218.7	615,599.1	782,722.2	813,66.8	116,095.3	2,273,055.7
Total net profit (Thous.USD)	117,822.5	3,888.5	30,022.9	28,378.0	3,193.0	1,784.3	185,089.3
% Total revenue	27.7	2.1	27.1	34.4	3.6	5.1	100.0
% Total net profit	63.7	2.1	16.2	15.3	1.7	1.0	100.0

Source: Field survey data in 2022

Table 3: The Cost-Benefit Analysis of Actors in Domestic Channels.

Indicators	Farmer	Collector	Wholesaler	Central Market /Supermarket	Local Retailer	Total
The marketing channel 4						
Selling price (USD/ton)	1,494.1	1,678.9	1,906.7	2,744.8		
Input cost (USD/ton)	563.7	1,494.1	1,678.9	1,906.7		
Marketing cost (USD/ton)	649.2	91.6	173.3	719.7		
Net profit (USD/ton)	281.2	93.2	54.5	118.5		
Avg. volume/year (ton)	6.2	218.3	628.9	206.5		
Net profit/year (USD)	1,743.3	20,345.6	34,275.1	24,470.3		
The marketing channel 5						
Selling price (USD/ton)	1,153.7	1,310.4			1,657.7	
Input cost (USD/ton)	477.7	1,153.7			1,310.4	
Marketing cost (USD/ton)	550.2	85.4			56.1	

Net profit (USD/ton)	125.8	71.3			291.2	
Avg. volume/year (ton)	11.1	93.6			21.4	
Net profit/year (USD)	1,396.4	6,673.7			6,231.7	
The integrated economic efficiency of domestic channel						
Volume (ton)	162,021.0	152,238.6	117,388.8	117,388.8	44,632.2	
Selling price (USD/ton)	1,400.3	1594.5	1,906.7	2,744.8	1657.7	
Profit (USD/ton)	238.4	88.2	54.5	118.5	291.2	
Total revenue (Thous. USD)	226,882.8	242,751.2	223,823.2	322,213.0	73,988.6	1,089,658.8
Total net profit (Thous.USD)	3,8621.9	13,425.4	6,397.7	13,910.6	12,996.9	85,352.5
% Revenue	20.8	22.3	20.5	29.6	6.8	100.0
% Net profit	45.2	15.7	7.5	16.3	15.2	100.0

Source: Field survey data in 2022

The findings of this study indicate that farmers are the most susceptible component within the value chain. Therefore, the study presents illustrative instances that assist in identifying strategies to improve the profitability of agricultural stakeholders via the use of suitable marketing channels.

Scenario 1: Farmers engaged in the cultivation of mangoes, whose produce does not fulfill the required criteria for exportation. Consequently, the conventional retail system, also known as marketing channel 5, utilizes a total of 11.1 tons of unclassified normal mango. The projected yearly profit for Channel 5 producers is $1,396.4.

Scenario 2: In spite of failing to fulfill the requisite quality criteria for the exportation of fresh fruit, mango producers are engaging in the sale of their produce to the Chinese market (channel 2) and the megalopolis retail system (channel 4). A total of 4.9 tons and 6.2 tons are allocated to Channels 2 and 4, respectively. The farmers in this region generate an annual net profit of 3,008 USD/year, which may be further categorized as follows: channel 2 contributes 729.7 USD/year, while channel 4 contributes 1,743.3 USD/year.

Scenario 3: Farmers who have their goods sold via export channels have advantages through the implementation of stringent quality control systems. Mangoes of three different grades, namely grade 1, grade 2, and grade 3, are allocated to distinct distribution channels. Grade 1 mangoes are distributed at a volume of 1.7 tons/year, yielding a net profit of 590 USD/year. Grade 2 mangoes are distributed at a volume of 4.9 tons/year, resulting in a net profit of 729.7 USD/year. Lastly, grade 3 mangoes are distributed at a volume of 4.5 tons/year, generating a net profit of 1,265.3 USD/year. In the third scenario, the farmer's net income, after deducting costs, would amount to $2,585 a year.

Enhancing the quality of mango products might potentially lead to an increase in the yearly net profit of a farmer. When comparing Scenario 3 with Scenarios 1 and 2, it is seen that the farmer has an annual net profit gain of $1,188.6 higher than Scenario 1, and obtain the increase amounts to $112.5 higher than Scenario 2. The agricultural entity exhibits the least amount of yearly net profit among all the stakeholders involved in the Vietnamese mango value chain. The available evidence indicates that farmers play a crucial role in the upstream segment of the value chain, serving as providers of inputs to downstream firms and consumers. The proportion of the net profit derived from the five channels of distribution is the most significant. Nevertheless, the farmer who plays the role of a player within the mango value chain has the lowest annual net profit. The reason for this might be attributed to the limited scope of the farmers' output, rather than any disparity in the allocation of profits across the five distribution channels.

Solution Suggestions for Improving Vietnamese Mango Distribution Channels

In order to effectively adhere to market quality standards and regulatory obligations, foster the exchange of

market information, streamline extensive and secure manufacturing processes, and enhance collaboration among relevant parties, it is imperative for the Vietnamese mango value chain to fortify both vertical and horizontal connections. Furthermore, this would facilitate the distribution of market information. The significance of the supply chain vulnerability has been heightened in light of its exposure. This article presents the recommended policies that need to be enacted in response to the aforementioned challenges.

Quality Management

Production organization (horizontal linking): The objective is to establish a horizontal manufacturing system throughout the organization. Farmers that possess a keen interest in cultivating large-scale mango plantations while adhering to sustainable agricultural methods need to consider establishing or affiliating with a farmers' cooperative. The previously described joint endeavors might potentially serve as a catalyst for the adoption of suitable agricultural methodologies, leading to the attainment of safety certificates and adherence to traceability regulations. Cooperatives serve as an effective mechanism for enhancing relationships among producers, as well as other relevant stakeholders and networks. In order to effectively meet this need, educational reform should include the integration of environmentally sustainable farming methods, efficient harvesting techniques, postharvest management plans, a comprehensive grasp of market dynamics, and the expertise of agricultural business professionals. Consequently, due to individuals' diligent efforts, they are endowed with more autonomy in shaping their economic futures and establishing entrepreneurial ventures.

Collaboration (vertical linking): The primary aim of trade agreements should be to enhance commerce among farmers, cooperatives, and processing firms, therefore fostering vertical connectivity. This approach will enable the equitable and impartial distribution of expenses, advantages, and limitations. Farmers might potentially experience advantages such as enhanced productivity and improved bargaining power if their agricultural areas are situated in close proximity to processing plants. The increasing availability of larger-sized and higher-quality graded mangoes has contributed to the growing feasibility of this proposition. Stakeholders may find it easier to comprehend and value quality standards, compliance obligations, and supply-demand restrictions.

Commercial support: The act of providing cash or other resources to support business endeavors. The Vietnamese government is actively engaged in the endeavor of pursuing both domestic and international Free Trade Agreements (FTAs). Vietnam has entered into Free Trade Agreements (FTAs) with a total of thirteen countries, while ongoing discussions are being conducted with an additional three nations. Vietnam's agricultural exporters have the potential to participate in global value chains and attract foreign investment, provided they effectively capitalize on available possibilities. The ASEAN Economic Community (AEC), the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), the Europe-Vietnam Free Trade Agreement (EVFTA), and the United Kingdom-Vietnam Free Trade Agreement (UKVFTA) have significant influence on the global mango trade. Based on the research conducted by Brian et al. (2021) and Thang (2018), it has been observed that countries that have entered into Free Trade Agreements (FTAs) do not levy taxes on Vietnamese mangoes or any products produced from them. The Free Trade Agreements (FTAs) provide the need for this occurrence. The Department of Industry and Trade has the potential to provide sponsorship for conferences, seminars, and presentations centered on various issues such as taxes, standards, quality assurance, competition, and trade law. The primary objective of these events would be to disseminate knowledge and raise awareness among the general public about Free Trade Agreements (FTAs) and associated subjects. The implementation and execution of such initiatives are necessary in order to enhance the level of public consciousness about Free Trade Agreements (FTAs) and associated subjects. Consequently, exporters may have enhanced market penetration, decreased expenses related to market research, and amplified export quantities. In order to adequately cater to the demands of importers and adhere to global regulations, traders must possess a comprehensive comprehension of the various aspects

encompassing the value chain. This understanding can be facilitated through the adoption of a quality management system, which can enhance the yield of exportable premium quality mangoes. As a consequence of this, mangoes are expected to command a higher price on the market. All stakeholders along the supply chain, with a particular emphasis on agricultural producers, have the potential to benefit from this occurrence.

Technology Investment

Production organization (horizontal linking): The term of "horizontal connecting" is used within the realm of production organization to delineate the procedure of harmonizing and consolidating many departments or organizations situated at the same level within the organizational structure. The increasing interconnectedness among individuals enhances our capacity to exchange information and improves the dissemination of products and services. The suggestion suggests that the government should provide attractive financial incentives to farmer groups and cooperatives with the aim of promoting the use of new technologies. Examples of such developments include drip irrigation systems, water and fertilizer systems, and unmanned aerial vehicles (UAVs) equipped with pesticide spraying capabilities. The objective of these suggestions is to optimize the advantages derived from this technology.

Collaboration (vertical linking): The formation of collaborative vertical ties of utmost relevance for mango processing firms seeking to maximize the advantages of shifting their operations to mango-growing areas. The phenomenon of migration necessitates the allocation of specific financial resources to address the obligatory expenditures in advanced industrial technologies. The successful conclusion of the process relies on the widespread distribution of these investments. Crop cultivation necessitates the use of various equipment and technical advancements. The aforementioned facilities include conventional packaging facilities, cutting-edge cold storage facilities, vapor thermal treatment plants, and inventive processing procedures. The implementation of macroeconomic policies, such as the provision of loan packages, has the potential to facilitate the expansion of the mango sector. This strategy enables the manufacturing of items with high value, the integration of innovative product options, and enhanced operational efficiency. The intensity of competition in both domestic and global mango markets has increased due to the prevailing dominance of Vietnam in the sector. Technological advancements have the potential to provide more employment opportunities within the manufacturing and services sectors, hence enabling a larger portion of the population to secure gainful employment. The suggested strategy aims to attract potential investors, who would thereafter contribute to the company's growth by expanding its commercial and manufacturing capabilities. If this methodology is used to significantly augment mango cultivation and create novel mango cultivars, it has the potential to increase the accessibility and sustainability of the market.

The Reallocation of Benefit

Farmers play a crucial role within the supply chain since they constitute the most susceptible component and serve as a primary provider of raw materials for other enterprises. The transfer of benefits to manufacturers plays a crucial role in the improvement of product quality and the efficiency of the supply chain. Enhanced farmer engagement in cooperatives or farmer groups, serving as representatives for farmers' interests during talks and agreements, has the potential to foster a more equal allocation of benefits.

4. The reduction in commodity prices has resulted in a gradual dissemination of benefits to the broader population.
5. Enhancing training tactics to optimize mango manufacturing processes and improve product quality.
6. Fruit processing firms must give sufficient assistance in order to get quality certification.
7. The agricultural business often has significant labor expenses, which may be alleviated by promoting investments in state-of-the-art equipment by food processing enterprises.

8. The potential for reducing shipping and intermediate service costs might be realized via increased investment in digital marketing and online sales.

Conclusion

The farmers in Vietnam represent the most susceptible component within the mango value chain. The peasant players in the Vietnamese mango value chain have the lowest yearly net profit among all actors involved, mostly attributed to their limited scale of operations and the comparatively lower quality of their product. Furthermore, the neglect of the home market, along with the processing of goods for the global market, exhibits a deficiency in both innovative practices and variety. The development of the mango value chain in Vietnam is being facilitated by many mechanisms, including revenue redistribution, technological advancements, and improvements in product quality.

The article's primary contributions lie in its recognition of the importance of the analytical tool and the role that value chain analysis plays in the formulation of policy.

The user's text does not contain any information to be rewritten.The research included many economic variables, such as opportunity cost (including factors like land rent, family labor expenditures, and depreciation costs), alongside a comprehensive cost-benefit analysis to ascertain the value of the instruments. This study offers a thorough examination of the agricultural value chain, with a specific emphasis on economic efficiency rather than financial efficiency. The article included the calculation of a conversion coefficient for each market sector. This was achieved by using data from a provided matrix of Vietnamese mango categories, which were categorized based on their respective prices. This sets the stage for future investigations into the value chain of tropical fruits and vegetables. The valuation of the agri-food chain may be achieved by the use of an analytical approach, which involves the identification of the production-trading account and the consolidated account within the chain.

The study included precise measurement of stakeholders, along with a comprehensive evaluation of the cost-benefit relationship across the whole chain. Additionally, the research identified the most susceptible participants and their underlying factors. This study holds particular relevance for the agricultural sector as it showcases effective strategies for sustainable management of the entire supply chain. Additionally, it offers policy recommendations for the equitable distribution of benefits among marginalized stakeholders in the supply chain, as well as for enhancing product quality and fostering technological advancements. The allocation of risk and reward within the agricultural supply chain is distributed among several stakeholders. The study offers valuable insights into the many possibilities and challenges encountered by small company owners operating within these specific areas. This instance serves as an exemplary illustration of how economies of scale provide advantages to both the manufacturing entity and the resultant product. Therefore, the value chain analysis conducted in this study is based on actual information derived from thorough assessments. The report presents an overview of emerging concerns, the potential impact on policies, areas where more research is needed, and the key focus areas for future applied research and assessment, all stemming from the results of the study.

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