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Article

Identifying opportunities and challenges of horticulture production: A case study of Tuong-Mango value chain in the southern Vietnam

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Abstract: This study's primary objective is to determine the financial repercussions, including expenses, profits, and losses, that certain stakeholders in the Tuong-mango value chain face at various distribution stages. This was achieved through the utilisation of stakeholders cost-benefit value chain analysis. These individuals collectively contributed 849 sample observations to the dataset including 732 farmers, 10 cooperative, 32 collectors, 25 wholesalers, 30 retailers, 12 exporters and processors, and 08 grocery stores/fruit. The robust financial performance of the Tuong-mango value chain is attributable to its integrated economic efficiency, as evidenced by its over USD 1 billion in revenue and USD 98.2 million in net income. The marketing channels, specifically channels 1, 2, and 3, generate a total of USD 906.1 million in revenue, yielding a net profit of USD 81.9 million. The combined sales from domestic marketing channels 4 and 5 total USD 160 million, yielding a net profit of USD 16.2 million. The findings indicate that due to their limited scope and suboptimal grade 1, farmers are the most vulnerable link in the supply chain. This study proposes three strategies for augmenting quality, fostering technological advancement, and facilitating the spread of benefits. This study's findings contribute to the existing literature on value chain analysis as it pertains to various tropical fruits and vegetables. The study provides empirical evidence supporting the utility of the value chain method in policy formulation.

Keywords: actor; channel; export market; domestic market

1. Introduction

Value Chain Analysis (VCA) is often used by bilateral and multilateral development organizations within the realms of academic research and policymaking. In order to conduct a comprehensive analysis of the value chain, it is important to include several factors such as inputs, outputs, both local and global markets, the involvement of public and private sectors, the impact on the environment, and the use of natural resources. Backing legislators in their endeavors to equitably allocate proceeds derived from agricultural research and supervise the logistical network might yield significant and extensive ramifications. A "value chain alliance" (VCA) is a collaborative arrangement of many firms seeking to collectively engage in the production and distribution of commodities. The primary objective of the organization is to enhance customer satisfaction via the enhancement of product availability, price competitiveness, and overall product quality. Assume responsibility for overseeing the management of various projects, including both horizontal and vertical interdepartmental and interorganizational interactions. There are many potential benefits associated with mitigating the disparities between urban and rural populations. According to a study conducted by Rauch et al. (2001), there exists a

notable financial interdependence between families residing in both rural and urban regions. According to Heike et al. (2016), it is argued that entrepreneurs possess the capacity to enhance rural economies by fostering deeper economic connections between geographically distant regions and densely inhabited centers. This development holds promise for small enterprises functioning in both local and international markets.

Vietnam's mango production was rated twelfth among Asian countries and seventh globally. Vietnam ranked third in terms of mango volume within the Southeast Asian region, trailing behind Thailand and Indonesia (FAOSAT, 2019). The Mekong Delta (MD) is well recognised as the primary hub of mango production in Vietnam. In contrast, mango cultivation mostly involves small-scale farmers who typically operate on an average land size ranging from 0.5 to 1.0 hectares. The primary concerns linked to smallholder production are to the use of new technologies and the intricate and decentralised connections established between farmers and markets. The implementation of modifications at the farm level in response to market signals pertaining to food safety, variety, quality, and demand poses significant challenges (Peter, 2020; William, 2014). According to William (2014), a significant proportion of Vietnam's mango output, especially over sixty percent, is allocated for the purpose of exportation, with China being the primary destination. Furthermore, it has been noted by Anh et al. (2020) that processed commodities are specifically tailored to cater to the demands of the international export market. The prioritisation of cooperative endeavours among various stakeholders, such as the scientific community, corporations, the state, and farmers, has been emphasised in the agricultural development plan of Vietnam. As a result, the Vietnamese government has actively advocated for the implementation of the "production-consumption linkage following value chain" plan. This project is to facilitate the establishment of cooperatives and farmer groups, as well as foster enduring partnerships with enterprises via contractual arrangements including input supply, extension advice by corporate agents, and predetermined pricing for the procurement of agricultural commodities to reduce transaction costs for enterprises and farmers, as well as facilitate improvements in agricultural production via enhanced coordination and connections.

The primary objective of this study is to identify cost-benefit distribution among actors in Tuong-mango value chain as well as determine stakeholders' collaboration from production to consumption. The findings of this study show that the most vulnerable actors in chain and suggest solutions to improve it.

2. Literature review

2.1. Theory of value chain

Michael E. Porter popularized the term "value chain" by using it to characterize the entire sequence of activities involved in the development and delivery of a product, beginning with its conception and ending with its distribution to consumers. According to Porter (1985), the concept of "value systems" in an organization refers to the strategies used to supervise and harmonize all aspects of its supply chain, from the acquisition of resources to the distribution of the final product. The concept of value chain has been extensively implemented in numerous academic fields. As

evidenced by the works of Morris (2000), Kaplinsky and Morris (2001), Ponte and Gibbon (2005), and Schmitz (2005), the academic literature on value chain frameworks departs from the conventional approach advocated by Porter. The researchers employed the methodology of value chain analysis. According to Hergert and Morris (1989), the integration of production process phases emphasizes the significance of cost targets. Ramirez (1999) conducted an exhaustive study to assess the managerial, financial, and organizational benefits of coproductions. The term "value chains" refers to an organization's entire production and distribution processes. Activity-Based Costing (ABC), which takes into account both inputs and outputs, was utilized to determine resource allocation. Mau's studies played a crucial influence in the ultimate adoption of the approach. According to Dekker (2003), a comprehensive understanding of a particular domain is essential for the effective implementation of coordination and value chain optimization strategies.

The researchers Bockel and Tallec (2005) used VCA in their policy analysis study conducted, which received funding from the Food and Agriculture Organization (FAO). The VCA provided policymakers with a diverse array of subjects, including input-output relationships, production variables, institutions, the environment, and natural resources. During our discussion, we delved into a range of topics, such as the institutional framework, the input and output markets, the economic and social context, the significance of value chain outputs, and a comprehensive economic and functional analysis. The use of Value Chain Analysis (VCA) has the potential to provide benefits for persons situated at the lower end of the socioeconomic spectrum, while also affording governments the chance to improve the efficiency of food distribution networks. Agricultural supply networks include a range of benefits and drawbacks. In order to ensure timely achievement of production and delivery deadlines, efficient communication of pertinent information on production schedules, quality controls, and quantity requirements is essential within a supply chain. Balyan et al. (2013) assert that the increase in fresh mango exports may be primarily attributed to the growth and development of the World Trade Organization. The export volume of India had a substantial increase, surpassing the previous record. The construction and maintenance of legal frameworks play a crucial role in ensuring the success of an export-oriented organization. Indian exporters may have difficulties in meeting the safety requirements imposed by countries that import Indian products. The formulation of food security standards requires the use of rigorous scientific techniques and strict adherence to internationally accepted standards. According to Roehlano and Jesus (2013), it is recommended to establish vertical linkages in order to ensure that mangoes destined for the export market adhere to the required requirements in terms of both quality and quantity. The mango supply chain's potential value might be enhanced via the use of vertical integration by the private sector. The influence of the market's horizontal structure on the export business seems to be evident. The marketing and refining industries derive advantages from economies of scale and have a propensity to undertake risks in order to achieve profitability in their operations. The costs and revenues of the whole supply chain for Vietnamese mangoes are calculated. This category includes notable expenditures related to transportation, instances of sales being declined by market authorities, and the construction of a facility dedicated to treatment or processing.

A value delivery network is established through the collaborative efforts of individuals and organizations, resulting in mutual benefits for all parties involved. As a visual representation of a process's sequential stages, a value chain diagram is utilized. Our exhaustive investigation will focus on analyzing marketing distribution networks, product differentiation, international market competitiveness, and regulatory decision-making. The concept of Value Chain Analysis (VCA), which received widespread acclaim and was viewed as a significant advancement throughout the 1990s, was largely influenced by Porter's seminal thesis from 1985 (Porter, 1985). This methodology facilitates the evaluation of a company's ability to compete effectively in the globalized business environment of today. Businesses use the value chain as a strategic method to reduce the gap between sales revenue and manufacturing expenses. As a result of their inherent interdependence, the enduring effects of one activity on another persist indefinitely. Porter's conceptual framework has been utilized by academics and political figures to formulate strategic approaches. Typically, the preponderance of Trienekens (2011) family members hail from the Netherlands. Globalization may function as a diagnostic tool for analyzing the interdependencies between various components within a supply chain. The examination of stakeholder benefits, the selection and implementation of value-enhancing strategies, the analysis and evaluation of institutional frameworks, and the evaluation of governance-related institutional frameworks can lead to a comprehensive understanding of the value chain.

According to Rich et al. (2009), the examination of value chains can be conducted using either qualitative or quantitative methods. Several qualitative studies have evaluated the value added at various stages of the supply chain, from the procurement of raw materials to the distribution of the final product (FAO, 2003; Van Melle et al., 2007; Hanemann et al., 2008; et al.). These studies have demonstrated the potential benefits and drawbacks of employing this methodology. According to Van Melle et al. (2007), the application of a value chain analysis may yield beneficial results. Numerous scholarly works (Mitiambo, 2008; Tu, 2009) have elaborated on the incorporation of gross margin analysis into value chain analysis at length. The Value Chain Analysis (VCA) is based on Porter's approach's conceptual framework. The study of the effects of globalization on the interrelationships between various system components is an essential field of study. According to the findings of Kaplinsky and Morris (2001), conducting a value chain analysis can yield valuable insights into a variety of factors, including stakeholders, governance, chain value, and stakeholder benefits.

Researchers have utilized video content analysis (VCA) in several initiatives. According to Michael and Deigan (1989), it is essential to define specific cost objectives due to the potential influence of one production stage's costs on subsequent stages' costs. According to Ramirez (1999), the elevation of the concept of value co-production facilitates an in-depth comprehension of market potential, management strategies, and cultural norms. In 2003, Kaplinsky and Morris made improvements to the value chain. Mau (2002) examined the inputs and outputs of a particular system by employing the analytical technique of value chain analysis. The investigation also examined the use of Activity-Based Costing (ABC) in budget formulation. According to Dekker (2003), the promotion of internal corporate cooperation and the enhancement of process development are dependent on the facilitation of seamless

information exchange across the value chain. On the Gregorian calendar, 2017 is the current year. According to research conducted by Douglas et al. (year), collaboration between firms throughout the value chain offers the opportunity to improve overall performance and the customer experience. The principal emphasis is on the organization in 2020. This study identifies the Dominican Republic's stakeholders and analyzes the nation's cost and profit structures. In addition, the report investigates potential alterations to the country's distribution routes. The strategic application of value chain analysis has been observed in the practices of bilateral and international assistance organizations as a means of educating and supporting development initiatives (Henriksen et al., 2010). Performing a value chain analysis can be beneficial for both government entities and educational institutions. Consequently, more and more humanitarian organizations are employing this strategy. According to Lorenzo (2013), Value Chain Analysis (VCA) can facilitate the allocation of financial resources to marketing channel expenditures and revenues. This method assesses the economic effectiveness of stakeholders by placing social variables above statistical principles. According to a study conducted by Rich et al. (2011), the evaluation of policy trade-offs and outcomes utilizing the Value of Statistical Life (VCA) could present some challenges.

2.2. Empirical studies of value chain

In the academic literature, De Brauw et al. (2009) and Hawkins and Popkin (2015) are two examples cited. The Value Creation evaluation (VCA) is a comprehensive method for measuring the profitability, productivity, efficiency, and sustainability of joint ventures. The primary purpose of this initiative is to integrate the wholesale, retail, and delivery sectors. The objective is to further strengthen the resilience of the system's vulnerable regions through improved communication. Market operational dynamics may give rise to prospective obstacles. According to a 2019 study conducted by the Asian Development Bank, producers in Pakistan and Vietnam receive less than 30 percent of the retail price for their agricultural products. Several facets of the mango export industry, such as post-harvest processing, field administration, and distribution networks, are promising. Collaboration between producers, transporters, and processors has the potential to yield cost savings and resource optimization. Tanzania has undertaken initiatives aimed at bolstering the prevalence of trustworthy contractual distributors and merchants specializing in mangoes in particular geographical regions. Utilizing data derived from a value chain analysis can facilitate the improvement of market efficiency and competitiveness comprehension.

Multiple investigations have identified six fundamental value chains within the mango industry of Myanmar. In this context, the sixth value chain is primarily focused on international sales, whereas the preceding five value chains are primarily focused on the domestic market. The annual development rate of mango exports is roughly 2 percent. Mangoes are commonly perceived as being expensive. The plurality of the city's exporting firms, 175 out of 250, are located within the metropolitan area, according to a study conducted by Naing (2015). Presently, 80 individuals are actively employed in the wholesale sector. In 2017, Karina and her associates conducted an exhaustive investigation of the mango industry's value chain in the Philippines. The

Philippines is responsible for 4% of the world's mango export. It is essential that there be a consistent supply of mangoes for the proper operation of a variety of organizations and industries. The majority of mango exporting businesses, 73%, operate on less than three hectares of land, which is significantly more than two-thirds. Canada, the United States, Hong Kong, South Korea, Japan, and China import significant quantities of Philippine mangoes annually. In the Chittoor region of India, the tothapuri/alphonso species accounts for a plurality of the cellulose content, more than 70%. The entire mango industry is standardizing its manufacturing and distribution processes. According to the Food and Agriculture Organization (FAO), approximately 90 percent of the global output of Vizianagaram mangoes was consumed in Delhi, Raipur, and Kolkata in 2018. According to a 2014 study conducted by William, the majority, or 77%, of Hoa Loc mangoes are distributed within the Vietnamese domestic market. Approximately 63% of the time, these mangoes are sent to China. In the examined chain of distribution, the distribution pattern of this specific produce is readily discernible. According to San et al. (2020), approximately 10% of the global mango harvest is processed by over 150 Vietnamese businesses.

In their investigation, Romo and Bokelmann (2016) discovered that small-scale producers in the province of Dong Thap only market mangoes. fostering cooperation between farmers and industry experts to increase agricultural output and information transfer. They provide essential assistance to the industry, in-depth knowledge, and substantial skills. Mango production, retail, wholesale, logistics, processing, export, and consumption are included in the mango value chain. There are few exporters or manufacturers that employ refrigerated storage techniques. After acquiring fresh mangoes, exporters subject them to a variety of procedures, such as dehydration, refrigeration, preservation, and even incorporation into ice cream formulations. 74% of China's mango exports, according to research conducted by Truong et al. in 2015, consist of Chu-mangos. The significance of the Chinese market cannot be overstated, as it was Vietnam's principal mango export market. The Vietnamese mango market is dominated by a small number of wealthy consumers. Even though its relevance is frequently undervalued, the significance of high-quality information cannot be exaggerated in terms of client targeting, market penetration, and obtaining a competitive advantage. Mangoes play a vital role in Vietnam's agricultural sector, functioning as an important staple food. The country prioritizes the cultivation and consumption of mangoes. The purpose of Alam's (2018) study is to assess the advantages and disadvantages of the traditional mango supply chain. Beginning with its origin on the farm and concluding with its final destination in the grocery store, the path of the fruit is meticulously described. Positive and negative economic outcomes of the mango industry, which includes numerous producers, distributors, and retailers, have a significant impact on all parties involved. Despite obstacles such as post-harvest loss and intermediaries, the study conducted by researchers revealed that mango producers were able to make significant progress. Merchants gain multiple benefits from value chains. Upon gaining access to mangoes, the Pakistani population experiences an overwhelming sense of happiness.

The objective of Badar et al.'s (2015) study was to evaluate Pakistani consumers' perceptions of mangoes. Extrinsic and intrinsic factors, such as safety and marketing, were found to have equal significance, according to the findings. According to Krain

et al. (2008), mango cultivation in the Embu region has been recognized as a highly lucrative industry. According to Badar et al. (2019), the networks that contribute to the export value of mangoes use a combination of contemporary and traditional value chains to effectively serve diverse consumer groups. Preserving traditional value chains is essential for sustaining the primary market for mango products and fostering economic expansion. The proliferation of innovative retail design has increased the appeal of contemporary value chains to consumers. The effectiveness and overall quality of current value chains are enhanced through collaboration with manufacturers, particularly through reverse integration-focused programs. The need for increased cooperation among producers emphasizes the importance of expanding farmers' networks. The process of modernizing the mango industry's antiquated value chain could significantly facilitate the country's potential for significant economic and social development.

3. Methodology

3.1. Sampling technique

The selection of the optimal research region was accomplished by the use of a sequence of iterative sampling methodologies. The research was centered on the Mekong Delta in Vietnam and its adjacent areas, since they provide favorable conditions for the cultivation of mangoes. The areas indicated above account for 75% of Vietnam's overall mango output and 72% of the country's total mango-growing land area. Based on data released by the General Statistics Office in 2022, it is observed that the provinces of Dong Thap, An Giang, Tien Giang, Hau Giang, Vinh Long, and Tra Vinh together account for 71% of the total volume and area of the Mekong Delta region. Dong Nai accounted for around 55% of the southeastern region's total output and 54% of the mango land area in the southeastern region. The study included a total of 849 observations, consisting of 732 individuals engaged in mango cultivation, 10 agricultural cooperatives, 32 collectors, 25 wholesalers, 12 companies, 30 retailers, and 8 supermarkets or fruit stores.

Questionnaires of the thesis stemmed from the Technology and science program for sustainable development of the Mekong Delta region by the Ministry of Technology and Science in Vietnam through project "Value chain development of Vietnamese mango fulfilling requirement for domestic and international markets" that I was team leader of mango value chain component. The project carried out investigation stakeholders of mango value chain in seven provinces (An Giang, Dong Thap, Tien Giang, Vinh Long, Hau Giang, Tra Vinh, and Dong Nai) for four key mango varieties in Vietnam (Chu-mango, HoaLoc-mango, Tuong Mango, and Num-mango). The study only focused on data source of Tuong-mango value chain in Dong Thap, An Giang, Tien Giang, Hau Giang, Vinh Long, Tra Vinh, and Dong Nai. Information on questionnaires as follows: Questionnaire for farmer actor, it comprises two main parts. Part A (general information) contains farmer household: education, farming experience, family labour, land use, mango area, plant density, farming seasons. Part B (production and trade activities) presents detail information on farming technique of each cropping season. For example, labour days and hire labor price of weed control, soil preparation and pruning mango tree; information on labour days,

hire labor price, and agro-inputs use (fertilizer, herbicide, insecticide and fungicide (name of agrochemicals, purchasing price, dose, and origin)) in production following each stage from flower to harvest; irrigation; wrapping bag; harvest; machine and equipment for farming; total revenue; mango trade activities with other actors; loan for production; and shares of advantages and disadvantages in production and trade activities.

Information on questionnaires of other actors also has two parts. Part A (general information) is education, business experience, family members, numbers of factory, machines and equipments, hired labour, wage, etc. Part B is business information such as mango merchandising, price, quality standard, classification, loan, packing cost, fuel cost, revenue, profit, tax and fee, domestic and export markets. Moreover, the study uses more than 20 opened-questions to conduct group discussion and in-dept interview related to production and consumption operation of mango subsector.

3.2. Empirical model

The graphical representation of value chain analysis provides a comprehensive depiction of the many participants involved in executing specific activities aimed at generating and delivering value to consumers. The study provides an overview of the persons involved, the income and expenditure models used, the product cycles observed, and the corresponding changes made. The increase in worker pay and living standards is directly correlated with the enhancement of efficiency, competitiveness, and value creation within the supply chain. This information has potential use for both policymakers and economists alike. The use of the value chain concept proposed by Andreas (2018) is employed in the present investigation (**Figure 1**). The structure featured many stages of production, involvement of numerous stakeholders, inclusion of end users, and integration of advocates. The intricate manufacturing process encompasses several stakeholders, including suppliers, manufacturers, collectors, processors, merchants, and consumers. The process encompasses multiple stages that require the utilization of diverse resources, including labor, soil preparation, crop maintenance, harvesting, collection, transportation (performed by collectors), processing (including packing and labeling), retailing, and commercial activities associated with trade, both domestically and internationally. The generation of economic value include the participation of both local and international producers of raw materials, alongside the ultimate consumers. The value chain encompasses a diverse array of stakeholders beyond the aforementioned firms. The aforementioned entities include local governmental bodies, non-governmental organizations (NGOs), financial establishments, agricultural extension agencies, educational institutions, and transportation corporations.

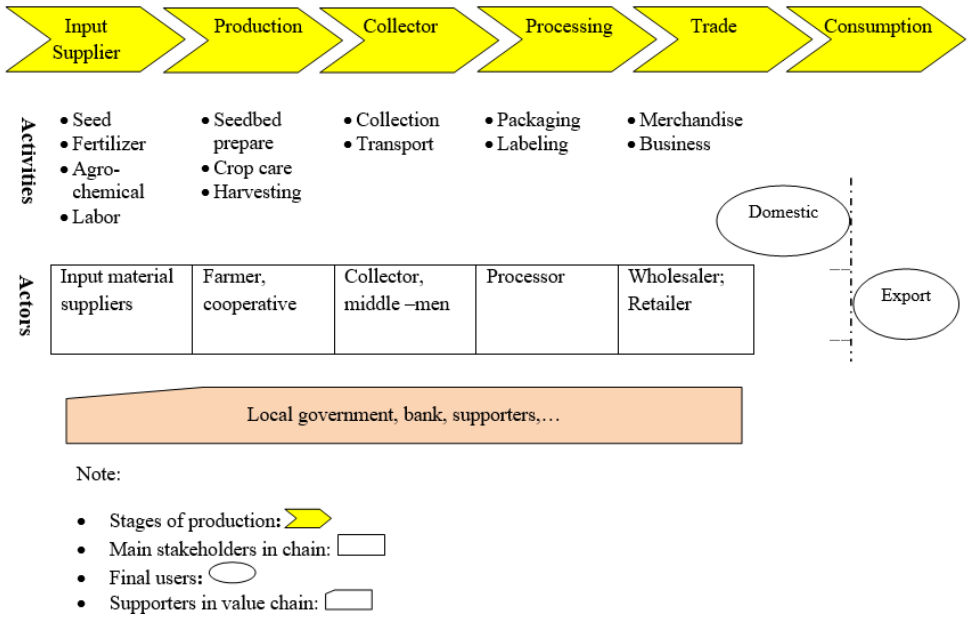

Figure 1. Conceptual framework of value chain (Andreas, 2018).

3.3. Benefit-cost calculation

- Input cost = root fertilizer + leaf fertilizer + paclobutrazol + herbicide + insecticide + fungicide
- Marketing cost = energy + wrapping bag + machine depreciation + transport depreciation + hired labor + family labor + land rent
- Total cost = Input cost + Marketing cost
- Revenue = selling price of a ton of mango
- Added value = Revenue – Input cost
- Net profit = Revenue – Total cost
- The marketing costs of traders and processors include the cost of packing, hired labor, transport, testing, and others.
- The mango ton will be used to compute all indicators.
- 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.

4. Result and discussion

Figure 2 depicts the outcomes of the research conducted on the Tuong-mango value chain. 87.7% of the entire value chain, according to statistical evidence, is comprised of the export channel. The domestic channel, which accounts for only 12.3% of the total, is considerably less significant. This suggests that the export channel is approximately 7.8 times larger than the domestic channel. Mangoes account for a substantial portion of the total export volume, 86.2% to Chinese market. China is primarily the destination of these mango exports. This observation suggests that promoting mango consumption exclusively within the Chinese market entails a high degree of market risk. The commercial hazards associated with mango products have increased as a result of their reliance on a singular market. To provide greater

precision, producers predominantly assume the role of key actors accountable for the supply of products throughout the entire supply chain. In addition, they exhibit a delayed rate of information dissemination and a limited capacity to fathom market index fluctuations. In addition, agricultural practitioners face a variety of threats, such as adverse climatic conditions and the prevalence of pathogenic agents that have the potential to substantially hinder agricultural productivity. The study also demonstrates that the Vietnamese mango value chain consists of five primary pathways (three for export and two for local distribution), each catering to a distinct market segment, adhering to specific quality standards, and involving a variety of stakeholders. This finding of Tuong-mango differs from Kiet (2022) for Chu-mango and Kiet (2023) for HoaLoc-mango. According to Kiet (2022), the Chu-mango domestic channel doubled export channel. Moreover, HoaLoc-mango domestic channel was six folds export channel. Thus, Tuong-mango focuses on export market while HoaLoc-mango and Chu-mango consume mainly in domestic market.

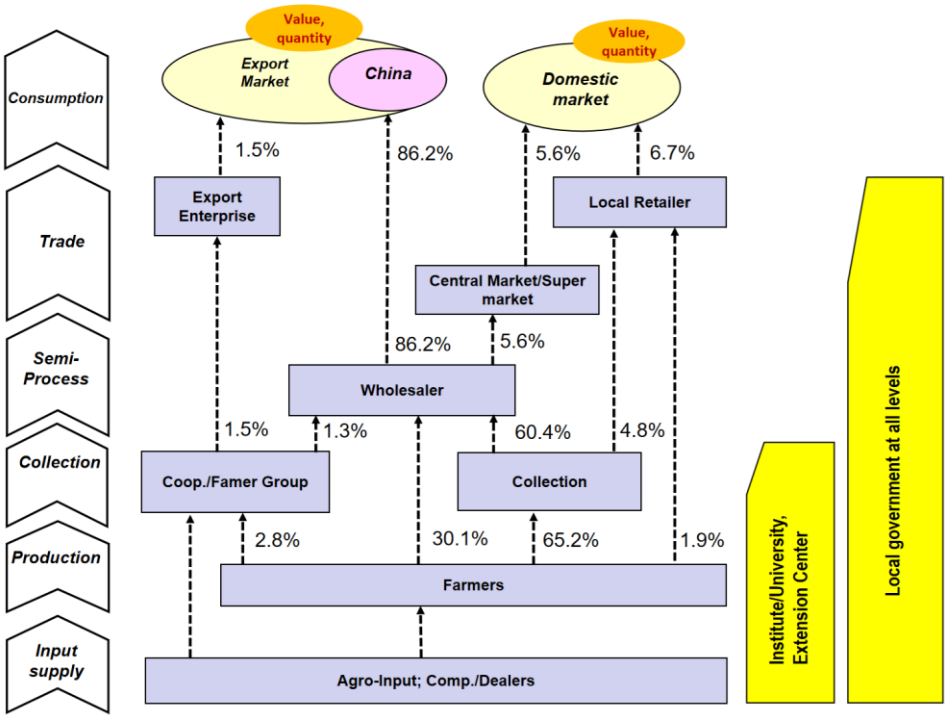

Figure 2. Diagram of Tuong-mango value chain.

Table 1 provides a thorough analysis of the costs and benefits associated with each export market channel participant. Farmers in the Tuong-mango export value chain enjoy substantially greater net profits than other participants. However, it is essential to remember that producers typically have the lowest average annual net profit. Farmers operating within channel 1 report a net profit of 324.3 USD/ton, which is substantially higher than the average. The aforementioned amount surpasses the cooperative's net profit by a factor of 1.53 times and the mango exporter's net profit by a factor of 1.03 times. In channel 2, the producers generate a net profit of 206.3 USD/ton, which is 2.5 times greater than the net profit of the collector and 4.1 times greater than the net profit of the wholesaler. In channel 3, producers earn a net profit of 206.3 USD/ton, which is more than double the net profit garnered by the collector

and more than four times the net profit earned by the wholesaler. It is essential to note, however, that the average annual net profit for producers participating in export channels 1, 2, and 3 is the smallest compared to other market participants. The disparity in output between farmers and other traders is a significant factor in determining outcomes. The majority of those who cultivate Tuong-mango is small-scale producers whose properties are smaller than 1 hectare. The collected data indicates that producers in channel 1 produce an average of 2.6 tons/year, which is significantly less than the respective figures for cooperatives (87.6 tons/year) and exporting enterprises (115.8 tons/year). Farmers in channel 2 generate approximately 5.5 tons of mangoes annually on average, while collectors contribute approximately 85.6 tons and wholesalers contribute 1235.8 tons. The average annual production of mangoes by producers in Channel 3 is 0.9 tons, amounting to a total of 101.4 tons for wholesalers. This study contributes to the growing body of research that highlights the importance of scale economies in generating competitive advantages in the domains of industry and commerce. As a result, farmers involved in export channels 1, 2, and 3 have minimal influence on the export market.

Table 2 displays the cost-benefit analysis for the various parties involved in the Tuong-mango's domestic marketing channels. In channels 4 and 5, producers typically have the highest net profit margins relative to all other participants, excluding retailers. The farmer is compensated a total of 206.3 USD/ton by Channel 4. In contrast to the previously mentioned number, the data pertinent to cooperatives, collectors, wholesalers, grocery stores, and produce stands reveal much lower values. Cooperatives have a magnitude that is 2.2 times smaller, collectors have a magnitude that is 2.3 times smaller, wholesalers have a magnitude that is 3.9 times smaller, and grocery stores and produce stands have a magnitude that is 1.7 times smaller. On channel 5, farmers are compensated 183.9 USD/ton, resulting in a ratio of 2.7 times, which substantially exceeds the compensation received by collectors. The agricultural industry has the lowest annual net profit when compared to other industries. This observation suggests that when a company grows in size, there is the possibility of a rise in productivity. Average annual harvest for Tuong-mango producers affiliated with Channel 4 is 5.5 tons. In contrast, cooperatives, collectors, wholesalers, and retailers manage much larger quantities, averaging 165.7, 418.4, 725.3, and 328.4 tons/year, respectively. Additionally, Channel 5 is also responsible in this regard.

The findings of the study are depicted in **Tables 1** and **2**, which demonstrate the significance of the export market in the Tuong-mango value chain. During the same period, the export channel produced a profit of $81.9 million on sales of $906.1 million. The figures are 5.7 and 5 times greater than the domestic channel's combined revenue and profit. The entire Tuong-mango value chain generates sales exceeding $1 billion and a net profit of approximately $98.2 million. Farmers are the most vulnerable actors along the value chain, according to the findings of this study. Therefore, the research provides valuable examples that can be used to gain insights into the strategic utilization of established marketing channels to maximize the economic benefits for agricultural stakeholders.

Table 1. The cost-benefit analysis of actors in the export channels.

Indicators	Farmer	Cooperative	Collector	Wholesaler	Export Enterprise	Total
The marketing channel 1						
Selling price (USD/ton)	1790.3	2184.7			7383.7	
Input cost (USD/ton)	689.3	1790.3			2184.7	
Marketing cost (USD/ton)	776.7	182.3			4883.7	
Net profit (USD/ton)	324.3	212.1			315.3	
Avg. volume/year (ton)	2.6	87.6			115.8	
Net profit/year (USD)	843.2	18,580.0			36,511.7	
The marketing channel 2						
Selling price (USD/ton)	1136.1		1310.5	1605.8		
Input cost (USD/ton)	437.2		1136.1	1310.5		
Marketing cost (USD/ton)	492.6		90.8	244.6		
Net profit (USD/ton)	206.3		83.6	50.7		
Avg. volume/year (ton)	5.5		85.6	1235.8		
Net profit/year (USD)	1134.4		7156.2	62,655.1		
The marketing channel 3						
Selling price (USD/ton)	1136.1			1482.1		
Input cost (USD/ton)	437.2			1136.1		
Marketing cost (USD/ton)	492.6			244.6		
Net profit (USD/ton)	206.3			101.4		
Avg. volume/year (ton)	0.9			183.2		
Net profit/year (USD)	185.6			18,576.5		
The integrated economic efficiency of export channels						
Volume (ton)	241,289.0	4127.0	166,178.5	237,162.06	4127.0	
Selling price (USD/ton)	1147.3	2184.7	1310.5	1568.8	7383.7	
Net profit (USD/ton)	208.3	212.1	83.6	65.9	315.3	
Total revenue (Thous. USD)	276,828.3	9016.1	217,777.0	372,054.2	30,472.2	**906,147.7**
Total net profit (Thous. USD)	50,253.9	875.3	13,892.5	15,623.0	1301.2	**81,945.9**
% Total revenue	30.6	1.0	24.0	41.1	3.4	**100.0**
% Total net profit	61.3	1.1	17.0	19.1	1.6	**100.0**

Source: Field survey data by authors in 2022.

Table 2. The cost-benefit analysis of actors in domestic channels.

Indicators	Farmer	Cooperative	Collector	Wholesaler	Central Market/Supermarket	Local Retailer	Total
The marketing channel 4							
Selling price (USD/ton)	1136.1	1318.3	1318.3	1527.4	2274.2		
Input cost (USD/ton)	437.2	1136.1	1136.1	1318.3	1527.4		
Marketing cost (USD/ton)	492.6	88.6	90.8	156.8	626.0		

Table 2. (*Continued*).

Indicators	Farmer	Cooperative	Collector	Wholesaler	Central Market/Supermarket	Local Retailer	Total
The marketing channel 4							
Net profit (USD/ton)	206.3	93.6	91.4	52.3	120.8		
Avg. volume/year (ton)	5.5	165.7	418.6	725.3	328.4		
Net profit/year (USD)	1134.4	15,509.5	38,260.0	37,933.2	39,670.7		
The marketing channel 5							
Selling price (USD/ton)	812.9		963.8			1298.8	
Input cost (USD/ton)	284.7		792.9			963.8	
Marketing cost (USD/ton)	344.3		83.2			45.5	
Net profit (USD/ton)	183.9		67.7			289.5	
Avg. volume/year (ton)	9.0		70.5			10.9	
Net profit/year (USD)	1655.1		4772.9			3155.6	
The integrated economic efficiency of domestic channel							
Volume (ton)	33,841.0	3576.7	28,613.52	15,407.28	15,407.28	18,433.71	
Selling price (USD/ton)	1042.2	1318.3	1223.0	1527.4	2274.2	1455.3	
Profit (USD/ton)	162.5	93.6	81.4	52.3	120.8	293.4	
Total revenue (Thous. USD)	35,268.8	4715.2	34,994.1	23,533.1	35,039.2	26,826.6	**160,376.9**
Total net profit (Thous. USD)	5500.4	334.8	2330.0	805.8	1861.2	5408.5	**16,240.7**
% Revenue	22.0	2.9	21.8	14.7	21.8	16.7	**100.0**
% Net profit	33.9	2.1	14.3	5.0	11.5	33.3	**100.0**

Source: Field survey data by authors in 2022.

In case 1: There may be difficulties for mango cultivators in satisfying the stringent quality standards established by international consumers. Thus, 9 tons of normal mango, unclassified mangoes are sold through marketing channel 5, the conventional distribution system. According to data from channel 5, the annual net profit of producers is $1655.1 on average.

In case 2: Mango cultivators arrange their produce prior to selling it to other entities, as is customary. The meticulous application of this technique ensures that the mangoes supplied to local retail outlets and export channels are of superior quality, thereby improving the overall mango supply in these markets. The subsequent analysis provides a detailed breakdown of the annual volume and total profit. Channel 1 has received a total of 2,6 tons of grade 1 mangoes valued at 843.20 USD/year. Channel 3 has received a shipment of grade 2 mangoes weighing 0.9 tons (equivalent to 185.6 USD). Finally, it is important to observe that Channel 4 receives $1134.4 USD for grade 2 mangoes weighing 5.5 tons. In case 2, the cultivator earns a net profit of $2163.2 per year.

In case 3: Mango producers who engage in pre-sale classification are able to produce premium goods that meet international trade requirements. The provided information includes the annual allocations and financial benefits for each channel. Channel 1 has a yearly volume of 2.6 tons and a net profit distribution of 843.2 dollars. Compared to Channel 1, Channel 2 has a greater annual volume of 5.5 tons and a net profit distribution of $1134.4 USD. Lastly, it is important to note that channel 3 has a

net profit distribution of 185.6 USD and an annual volume of 0.9 tons, which is somewhat lower than average. Channel 1 will receive mangoes of grade 1, while channels 2 and 3 will receive mangoes of grade 2. In the third case, the farmer's annual net profit amounts to $2163.2.

In short, enhancing mango quality has the potential to increase farmers' annual net profit. The annual net profit of farmers in cases 2 and 3 increases by $508.1 compared to the annual net profit in case 1. Examining the numerous participants in the Tuong-mango value chain reveals that farmers consistently experience the lowest annual net profit compared to other participants. According to studies, farmers play an essential role as primary contributors to the value chain by providing the initial basic materials to downstream businesses. The optimal use of the five most effective marketing channels increases the distribution of net income. The relatively lower annual net profit of the agricultural actor within the mango value chain may be attributable to a smaller scale of production, as opposed to an unequal distribution of revenues among actors across the five marketing channels.

4.1. Recommendations to promote the growth of Tuong-mango market

For the Tuong-mango value chain to meet the quality standards established by consumers and regulatory bodies, it is crucial to improve the flow of information throughout the chain. In addition, the application of this strategy will facilitate the cultivation of collaborative cooperation, improve the security of mass production processes, and promote effective communication between organizations. One additional benefit of employing this strategy is the enhancement of market information dissemination. The emergence of evidence demonstrating this problem's susceptibility throughout the supply chain has elevated its importance. Several policy proposals have resulted from the subsequent dialogue.

4.2. Augmenting quality

Strategy 1: Attending a global trade event has a dual responsibility: promoting the Vietnamese mango brand and engaging in negotiations for a free trade agreement to expand export opportunities.

Mangoes are Vietnam's second most popular fruit, behind bananas. It often participates in free trade agreements and bilateral commercial negotiations on a worldwide level. Import duties on fresh fruit and mango goods are quite minimal, if not completely absent. Proficient exporters understand how to use this functionality to enhance their market visibility and trade promotional endeavours.

Strategy 2: Promoting the formation of alliances between reputable suppliers of agricultural inputs and cooperatives or farmer organisations.

Collectively, we can effectively oversee and monitor agricultural inputs. Consequently, producers may prevent the use of inadequate quantities of scarce active components and optimise the effectiveness and volume of their agrochemicals and fertilisers.

Strategy 3: Close collaboration between the government, companies, and academic institutions and colleges is necessary for research and development initiatives that focus on market demand and product quality.

Analysing the intrinsic and extrinsic attributes of mangoes based on the preferences of both domestic and international clients. It assists organisations in segmenting the demands of different market segments according to the quality of their products. By using this capability, firms may enhance their marketing and production strategies, hence increasing their overall company performance.

Strategy 4: Training on quality control, market expansion, factory organisation, and product competitiveness.

- Two courses, one on corporate leadership and another on strategic business planning
- Demonstrate proficiency in value chain analysis and market research gathering
- Exhibit experience in export regulations and criteria used by discerning markets
- Guidance on the implementation of cutting-edge technological systems
- Certification for adherence to safety regulations and the supply of counsel on efficient agricultural methods

4.3. Fostering technological advancement

Strategy 5: Improving the connection between production and consumption by rural infrastructure and transportation development.

The new rural programme should provide priority to areas that cultivate mangoes, with the involvement of the government and local authorities. The allocation of funding to the national plan for contemporary rural development may effectively facilitate the construction of transport and infrastructure in rural areas. As a result, small-scale fruit growers have improved access to wholesalers, enterprises, and the primary fruit market. By facilitating the creation of cooperatives and other farmer organisations, it enhances the efficiency of farmers in managing their agricultural product.

Setting higher standards for both the quality of fruit and the efficiency of production. In light of the present condition of the planet, it is imperative that the new production technique places a high priority on enhancing the resistance of mango trees against pests and diseases. The importance of researching improved mango varieties, especially those aimed at enhancing the thickness of the mango skin, should not be overlooked. Consequently, companies may broaden their distribution services to more markets.

4.4. Facilitating the spread of benefits

Strategy 6: Establishing an organization's network of links Cooperative-farmer with an entrepreneurial focus.

The local authorities are promptly suggesting a business collaboration idea to surrounding prominent mango companies. By doing so, the local government demonstrates its concern for firms and corporations, while also facilitating the connection between industries and places rich in raw resources. This has a positive impact on the company's business operations. Open communication on the prioritised policies of local authorities is crucial for promoting the business linkage model. Companies now have the opportunity to make long-term investments in the local economy.

An efficient framework for simplifying administrative procedures in company partnerships. Enterprises are provided with precise information on the basic circumstances and support policies of the business linking model, including specifics on firm premises, taxes, and preferential loans. The staff team is primarily responsible for handling administrative formalities and documents related to assistance policies.

The business link concept will be communicated to district and commune local authorities in the event that factories are situated within their respective jurisdictions. It is advisable for farmers, cooperatives, participating firms, and local authorities to engage in discussions on contract farming at the commune and district levels.

Observing, assessing, and enhancing the organization's connection framework. Stakeholders in the business connection model are advised to routinely schedule an evaluation session after each agricultural season. This will assist them in collecting valuable information that can be used to enhance the model for the next season.

Strategy 7: Regions renowned for their prolific mango production entice prominent corporations to establish operations by implementing favourable investment rules.

Promoting the establishment of export firms in our nation instead of other places. Enhancing support measures, such as tax incentives, favourable financing options, and suitable business facilities, is crucial for attracting foreign companies to establish their presence in the region. This strategy not only stimulates the demand for mangoes, but it also creates job possibilities and boosts income for local people.

5. Conclusion

The Tuong-mango distribution system consists of seven main actors (farmer, cooperative, collector, wholesaler, export enterprise, supermarket/fruit shop, and local retailer) and five main marketing channels (three export channels and two domestic channels) in order to cater to five different market segments with different selling prices and quality standards.

The primary beneficiaries of the net profit generated by each marketing channel are the following entities: retailers in channel 5, export enterprises in channel 1, wholesalers in channels 2 and 3, and supermarkets/fruit shops in channel 4. These entities are considered the key participants in the net profit of each marketing channel.

Farmers play a crucial role in the value chain by supplying raw resources to other players. They get the highest net profit allocation compared to all participants in the five marketing channels. However, the farmer actor's yearly net profit is the lowest compared to all other players in the Chu-mango value chain. The low production scale of the farmer actor, rather than an imbalanced profit allocation across the five marketing channels, is the cause of this situation.

The value chain of Tuong-mango generates a total economic effect of USD 1066.4 million in sales and USD 98.1 million in net profit. The export channels, namely marketing channels 1, 2, and 3, provide a net profit of USD 81.9 million and produce revenue amounting to USD 906.1 million. The domestic marketing channels, namely channels 4 and 5, yielded a total revenue of USD 160.3 million and a net profit of USD 16.2 million.

Two key accomplishments of this research are providing clarification on the use of the analytical tool and highlighting the importance of value chain analysis in the context of policymaking.

- The researchers carefully considered many financial factors throughout their cost-benefit analysis in order to assess the value of the measuring device. One of the primary determinants was the concept of opportunity cost. In contrast to previous research endeavors that mostly concentrated on financial effectiveness, the present study examines the whole value chain, including the agricultural sector. This website provides a comprehensive analysis of the Tuong-mango market, including a detailed matrix illustrating the dispersion of prices. The methodology used for computing the conversion coefficients for inter-group comparison is thoroughly explicated in the paper. Consequently, this significant advancement presents an opportunity for more exploration about the use of value chain analysis in the production of tropical fruits and vegetables. This study investigates the production-trading account and the consolidated account with the aim of assessing the economic worth of the agri-food supply chain.
- The study used rigorous quantitative methodologies to evaluate various stakeholders within a comprehensive cost-benefit analysis of the whole value chain. The aforementioned methodology was used to identify individuals who had the highest susceptibility and to ascertain the fundamental factors contributing to their circumstances. The findings of the research include recommendations for enhancing the caliber of policies, updating technological infrastructure, and distributing advantages in a manner that optimizes the provision of incentives to disadvantaged actors within the supply chain. The study of agricultural goods receives considerable emphasis, serving as a noteworthy illustration of appropriate supply chain management. Agricultural supply chains, characterized by intricate economic networks, provide equitable distribution of incentives and duties among their members. The primary objective of this research is to enhance understanding of the diverse range of opportunities and constraints encountered by small enterprises within these specific conditions. This exemplifies the potential advantages of economies of scale within the realm of business and industry. This study employs a value chain analysis to elucidate the empirical results of several research studies. The present study aims to shed light on areas characterized by limited understanding, expounds upon distinctive challenges and their policy consequences, and delineates the primary goals for forthcoming applied research and evaluation.

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