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## Cost-Benefit Analysis of Num-Mango Distribution Channels in Vinh Long, Vietnam

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### Abstract

*The research analyzes Vinh Long's Num-mango value chain's cost-benefit distribution and marketing efficiency. Stakeholder cost-benefits and marketing efficiency were analyzed using a global value chain methodology. 228 farmer households, 20 collectors, 15 wholesalers, 30 retailers, 6 companies, 8 supermarkets/fruit shops, and 10 supporters (5 transporters, 3 agro-input dealers, 1 central market, and 1 phytosanitary inspection 2 for import and export) were sampling observations. The research found 5 market channels, in which 2 export channels, and 3 domestic channels in the Num-mango value chain. Approximately 95.4% of Num-mango volume is consumed domestically, 20 times more than export volume. In particular, the Bac Lien center market consumes 66.2% which is the most important market for Nu-mango consumption. The Num-mango value chain generates USD 11,238.3 million in profit and USD 74,351.8 million in revenue. Num-mango farmers are the most vulnerable actors in the chain whole. Num-mango farmers should join in scenario 2 (market channels 1, 3, and 5) to increase their profit. Farmers must carefully examine channel 1 and 3 marketing expenditures. In summary, farmers are the most vulnerable actor of all the market channels in the Num-mango value chain. Farmers are encouraged to participate in case 2 for better profit (market channels 1, 3, and 5). However, when farmers participate in case 2, it is necessary to pay attention to the marketing costs of channels 1 and 3. Managing marketing costs is essential not only to help channels 1 and 3 operate more efficiently but also to help farmers improve their profits significantly. This contributes to the channel's more efficient operation and the more sustainable Num-mango value chain.*

**Keywords:** Cost-benefit, distribution channel, num-mango.

### 1. Introduction

Bilateral and multilateral development organizations employ Value Chain Analysis (VCA) in research and policy-making. Value chain analysis contains many complex factors (input materials, outputs, national and international markets, public and private sectors, environment, and natural resources). In agricultural product studies, it may assist policymakers in redistributing benefits and maintaining the chain. VCA connects organizations that effectively manufacture and distribute items from farmers to consumers to meet clients' quantity, quality, and pricing demands. Manage horizontal, vertical, and firm-to-firm collaborations. Rural-urban linkages promote rural life. Most rural and urban households depend on each other financially (Rauch et al., 2001). Entrepreneurs that actively promote rural-urban ties may assist rural economies in growing and accessing national and global markets (Heike et al., 2016).

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FAO policy analysis papers employ VCA (Bockel & Tallec, 2005). VCA for policymakers included public and private agents, local and international markets, inputs-outputs, production factors, institutions, environment, natural resources, etc. It included a socio-economic backdrop, value chain output demand, institutional setup, input and output markets, functional analysis, and economic analysis. VCA may assist governments in sustaining agricultural product chains and provide disadvantaged players benefits. Agri-supply chains have pros and cons. Supply chains share information, timetables, product quality assurances, and transaction volume requirements to achieve production and delivery deadlines. According to Balyan et al. (2013), WTO inclusion has changed fresh mango export. India violated international export limits. Sustainable export needs safe export rules. Indian exporters have trouble meeting importing nation safety standards. Food safety guidelines must be founded on scientific research and linked to global legislation. Roehlano & Jesus (2013) present vertical linkages guarantee mango supply fulfills export market quality and quantity norms. Private sector vertical linkage expansion may increase mango supply chain value. The horizontal market structure seems to impact exports. Size and risk-taking help marketing and processing. They include shipping volume requirements, destination market authorities rejecting sales, and substantial fixed expenditures (treatment facility or processing plant). The research examines the Num-mango value chain's production cost structure and cost-benefit distribution. Importantly, the paper helps us determine the current production and consumption collaboration of stakeholders of the Num-mango value chain in Vinh Long province, Vietnam to recommend efficiency solutions that increase profit for vulnerable actors and sustain the chain.

## **2. Methodology**

### **2.1. Sampling technique**

Information was gathered in several stages. The study started by having a roundtable discussion (four groups, four persons in each) with agricultural extension workers from the province and the districts to choose which mango village to investigate in Vinh Long province, Vietnam. In addition, four six-person farmer discussion groups were organized across four areas to assess key aspects of mango production before the survey was developed. At long last, a pilot survey with a sample size of 20 was conducted. Finally, 317 observations from the Num mango value chain analysis were selected at random for examination (main actors and supporters). Twenty collectors, fifteen wholesalers, thirty local retailers, six companies, and eight supermarkets/fruit shops were among the eighty-one participants seen in 2022 as part of the research's 228 sample observations of farmer actors (in-depth interviews). Ten supporters were also included in the poll (5 transporters, 3 agro-input dealers, 1 central market, and 1 agency of phytosanitary inspection 2 for import and export).

### **2.2. Literature Review**

Porter (1985, p.36) developed the value chain—as “a collection of activities that are performed to design, produce, market, deliver, and support products”. Porter (1985, p.34) described value systems as a firm's value chains, from raw material to consumer, coordinated to create consumer value. Scientists used value chain definitions in numerous disciplines. Porter's value chain resembles Morris (2000); Kaplinsky & Morris (2001); Ponte & Gibbon (2005); and Schmitz (2005). Researchers used value chain analysis. Since one industrial process activity affects others, Hergert and Morris (1989) highlighted cost objectives. Ramirez (1999) assessed the value of co-productions' economic, managerial, and organizational potential. value chains. Mau's process chain analysis showed ABC resource allocation with input and output. Dekker (2003) thought value chain coordination and optimization required expertise.

Stakeholders in vertical alliances and horizontal collaboration of the same agents build delivery value networks. The value chain outlines this process. This study highlights value chain marketing channels,

integrated economic efficiency, international competitiveness, and regulatory options. Value Chain Analysis (VCA), developed in 1985 in response to Porter's theory (Porter, 1985), was considered revolutionary in the 1990s. It's a systematic methodology to evaluate a company's competitive advantage in globalization and international trade. The value chain includes profit from selling products and services over manufacturing expenses. Each action creates costs and linkages. Scholars and politicians based Strategies on Porter's premise. Globalization makes it a diagnostic tool for chain participant connections (Trienekens, 2011). Value chain analysis helps identify key chain participants by mapping, assessing institutional structures (governance), addressing value-adding techniques (chain upgrading), and analyzing stakeholder benefits (Kaplinsky & Morris, 2003).

Value chain analysis—qualitative or quantitative (Rich et al., 2009). Several qualitative studies (FAO, 2003; Van Melle et al., 2007; Hanemann et al., 2008; Krain et al., 2008; Huang et al., 2009; Xayavong & Islam, 2009) showed added value of its different plays from material input to final output in the chain and highlighted possibilities and dangers. Van Melle et al. (2007) promoted value chain analysis. Value chain analysis researchers employed gross margin analysis (Mitiambo, 2008; Tu, 2008). Porter's idea influenced VCA. It examines chain stakeholder interactions, particularly in globalization impact scenarios. Value chain analysis maps stakeholders, governance, chain value, and stakeholder benefits (Kaplinsky & Morris, 2001).

Some studies employed VCA. Michael & Deigan (1989) recommended cost objectives since the price of one production step might affect others. Ramirez (1999) understood the market potential, management tactics, and institutionalized norms by concentrating on value co-production. Kaplinsky & Morris (2003) enhanced the value chain. Mau (2002) examined inputs and outputs using value chain analysis to demonstrate how Activity-Based Costing (ABC) allocates resources. Information provision in the value chain facilitates cross-company cooperation and process optimization, according to Dekker (2003). Coordination and cooperation with value chain participants enhance final products and services (Douglas et al., 2016). The map shows stakeholders, profit and cost structure, and channel flows (Dominic et al., 2020). Value chain analysis, beneficial in academia and government, is increasingly being utilized by bilateral and multilateral aid organizations to guide development initiatives (Henriksen et al., 2010). Lorenzo (2013) stated that VCA helps distribute marketing channel expenses and earnings. VCA, a non-econometric model, is used to determine stakeholders' economic efficiency, especially in social concerns. VCA also struggles to quantify policy trade-offs and effects (Rich et al., 2011).

VCA evaluates collaboration's availability, accessibility, quality, and sustainability (De Brauw et al., 2015; Hawkes & Popkin, 2015). Wholesale, retail, and delivery link. It may recommend helping the chain's weakest market failures. Vietnamese and Pakistani fruit and vegetable growers get less than 30% of retail pricing (ADB, 2019). Fresh mango exporters must improve post-harvest, farm management, and market linkages. Tanzania should improve mango collection, quality, and contractual wholesalers and merchants in critical locations. Processors and transporters save farmers money. Value chain analysis finds competitive and efficient market signals.

Another Myanmar study discovered five local and one export mango value chains. Mangoes export 2%. Mango prices. 200 exporters, 150 urban businesses, and 80 wholesalers (Naing, 2015). Karina et al. (2017) examined the Philippine mango value chain. The Philippines exported 4% of mangoes. 98% mango. Startups, manufacturing. 73% of mango exporters cultivate under 3 hectares. The Philippines exports processed mangoes to the U.S., Hong Kong, South Korea, Japan, China, and Canada. Indian Chittoor is 70% Tothapuri/Alphonso pulp. Processors cooperate with mango farmers. Delhi, Raipur, and Kolkata consume 90% of Vizianagaram's mangoes unrefrigerated (FAO, 2018). William (2014) discovered that the Chu mango value chain exports 63% (mainly to China through border crossings) while the Hoa Loc chain sells 77% in Vietnam. 150 Vietnamese enterprises process 10% mangoes (San et al., 2020).

Romo & Bokelmann (2016) say small-scale Dong Thap growers only sell mangoes. Farmers collaborate.

They provide market data, resources, and guidance. Mango value chains include growers, cooperatives, distributors, processors, retailers, exporters, and consumers. Few exporters and processors store and chill. Processors dry, freeze, bar, and ice cream mangoes, while exporters sell fresh. Chinese fresh mango exports are 74.5% Chu-mango, according to Truong et al. (2015). China bought most Vietnamese mangoes. One market impacts Vietnamese mango cultivation. Quality information—especially on targeted markets, competitiveness, and market connections—is little understood. Vietnam prioritizes mango production and consumption, making smallholder mango producers and value chain partners more competitive and efficient. Alam (2018) examines the old mango supply chain, its merits and drawbacks, and the farm-to-market mango value chain. Mango farmers, dealers, and merchants share gains and expenses. The study indicated farmers could cultivate mangoes despite post-harvest loss and middlemen. Value chains favor merchants. Pakistanis liked mangoes. Conclusion: Mango consumers in Pakistan were not only interested in the intrinsic qualities of mangoes (search and experience) but also valued extrinsic qualities like safety and marketing-related qualities (Badar et al., 2015). Mango cultivation in the Embu district is particularly profitable (Krain et al., 2008). According to a study by Badar et al. (2019), export mango value networks servicing consumers from various socioeconomic groups operate alongside traditional, contemporary, and value chains. The mainstay of mango customers is carried through conventional value chains, which is what propels economic development. The tremendous growth of contemporary retail formats, however, is also drawing customers to current value chains. Modern value chains are more effective than conventional chains, and they are working to create links with growers (reverse integration) to improve quality. The dynamics among farmers must be altered. By progressively transitioning from a conventional value chain to a contemporary value chain, the mango sector may maximize its potential to support the socioeconomic development of the nation.

### 2.3. Empirical model

Value chain analysis's visualization of party contributions is fascinating. Stakeholders, profit and cost structures, product flows, and changes are detailed. Worker pay and living circumstances rise with supply chain efficiency, competitiveness, and value generation. This information aids economists and policymakers. This study uses Andreas's (2018) value chain framework. Production stages, stakeholders, end users, and supporters comprised this structure. Manufacturing involves input dealers, producers, collectors, processors, traders, and consumers. Fertilizers, agrochemicals, labor, soil preparation, crop care, harvesting, collecting and transport (collector), processing (packing and labeling), merchandising and business (trade), and internal and international commerce are all part of each step (consumption). The value creation process involves raw material suppliers, farmers and cooperatives, intermediaries, processors, wholesalers, retailers, exporters, and local and worldwide clients. Regional governments, NGOs, banks, agricultural extensions, universities and other academic organizations, and transporters also help the value chain.

#### ***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.

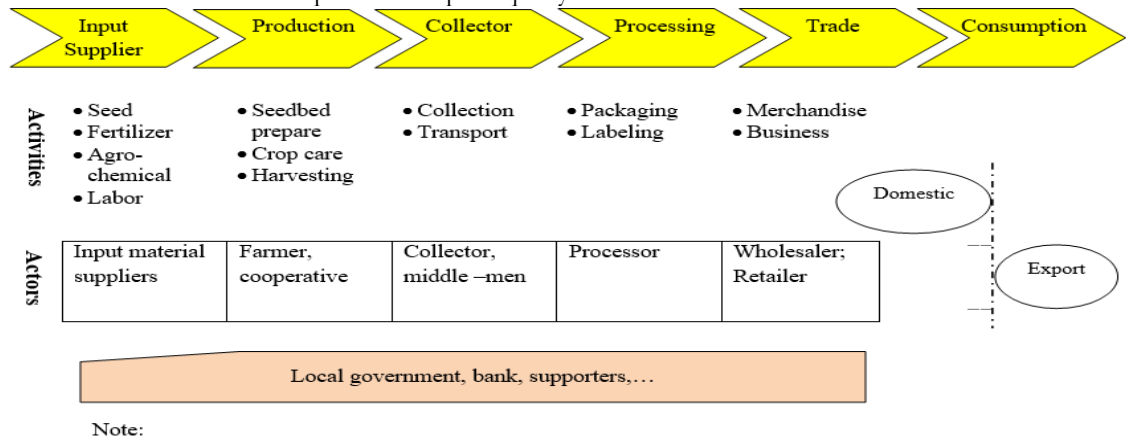


Figure 1. Conceptual framework of value chain (Andreas, 2018)

### 3. Result and Discussion

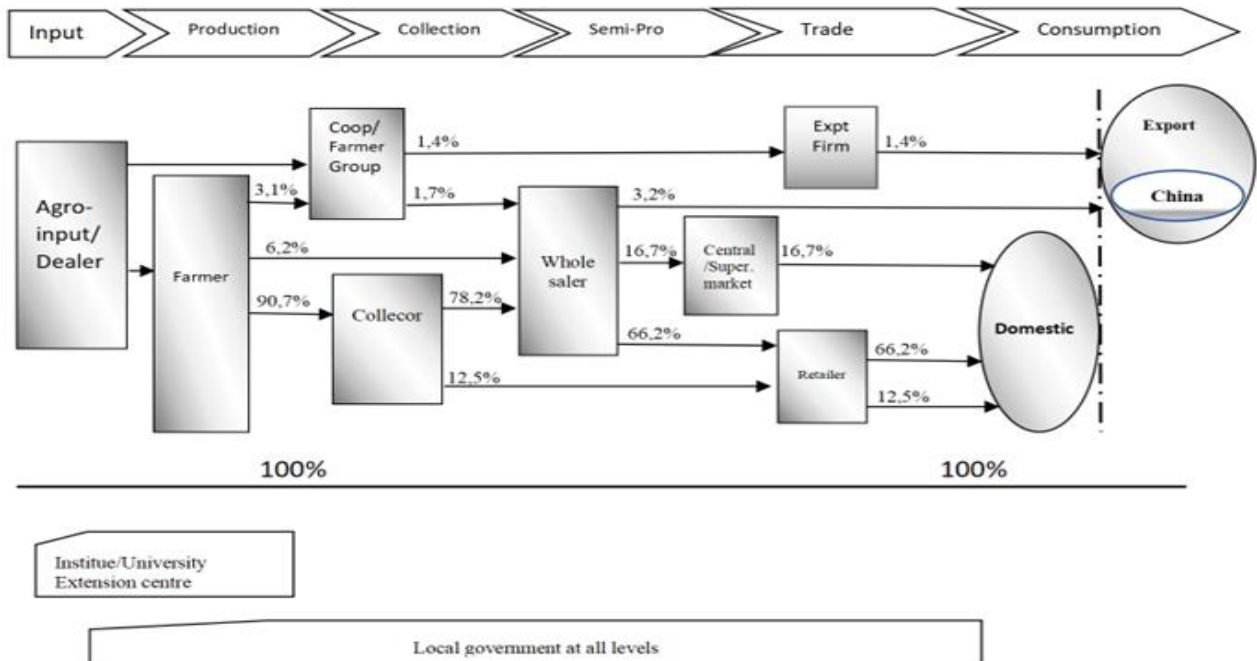


Figure 2. Diagram of Num-mango marketing channels

Figure 2 demonstrates that Num-mango is mostly consumed locally. About 95.4% goes domestic market, 20 times the 4.6% that goes abroad market. There are various marketing channels in the Num-mango value chain (three domestic and two export channels). Fresh mango shipments to Japan, South Korea, Singapore, and others are low proportion (1.4%), and 3.2% are transported to the Chinese market through the border gate. Num-mango is not processed. Traditional markets consume 12.5% of Num-mango volume, while supermarkets and fruit stores consume 16.7%. The central market in Bac Lieu accounts for 66.2% of the total Num-mango volume.

The costs and benefits of each actor's participation in the export market channel are detailed in Table 1. The finding has shown that the net profit of farmers in channels 1 and 2 is higher than that of other actors in the export value chain of Num mango. Farmers, on the other hand, have the lowest annual net profit average. Particularly, in channel 1, farmers earn 683.6 USD/ton in net profit, which is 2.5 times more than the net profit of the cooperative and 1.5 times higher than the net profit of the mango exporter. The farmers' net profit in channel 2 is 482.7 USD/ton, which is 3.4 times greater than the collector's net profit and 4.2 times higher than the wholesaler's net profit. Yet, compared to other actors, farmers in channels 1 and 2 have the lowest net profit average per year. A major contributing aspect is the fact that farmers' production scale is substantially lower than that of other traders. The majority of those who cultivate Num-mango are subsistence farmers whose plots are less than 1 hectare. According to the data collected, the average annual mango output of farmers involved in channel 1 is 0.8 tons (88.7 tons for cooperatives and 88.4 tons for exporting firms), and the output of farmers involved in channel 2 is 2.6 tons (85.6 tons for collectors and 415.8 tons for wholesalers). The results of this study contribute to affirming the role of scale economy in creating profit advantages in production and business. Therefore, farmers in channels 1 and 2 are considered the weakest actors in the export market channel. Table 2 shows stakeholders' cost-benefit distribution in Num-mango domestic marketing. Farmers go on making the most net profit in channels 3, 4, and 5, excluding retailers. The farmer earns 482.7 USD/ton in channel 3. This figure is 3.6 times more than collectors, 4.0 times more than wholesalers, and 2.0 times more than supermarkets and fruit stores. In channel 4, farmers earn 295.6 USD/ton, 2.7 times more than collectors and 2.5 times more than wholesalers. Channel 5 farmers' agents earn 274.9 USD/ton, 3.2 times more than collectors. Farmers still make the least net profit per year across all channels. The farmer's modest one-year manufacturing scale is compared to others in the value chain. It means that economies of scale affect corporate performance. In channel 3, the average volume of Num-mango growers is 2.6 tons/year, whereas collectors, wholesalers, and supermarkets/malls' average volumes are 218.3, 628.9, and 206.5 tons, respectively. This takes place similarly in channels 4 and 5

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

Indicators	Farmer	Cooperat ive	Collecto r	Wholes aler	Export Enterpr ise	Processi ng Firm	Total
<b>Marketing channel 1</b>							
Selling price (USD/ton)	1834.5	2281.5			7191.2		
Input cost (USD/ton)	611.6	1834.5			2281.5		
Marketing cost (USD/ton)	539.4	170.8			4451.6		
Net profit (USD/ton)	683.6	276.2			458.1		
Avg. volume/year (ton)	0.8	88.7			88.4		
Net profit/year (USD)	546.9	24498.9			40496.0		
<b>Marketing channel 2</b>							
Selling price (USD/ton)	1290.8		1524.4	1873.3			
Input cost (USD/ton)	429.4		1290.8	1524.4			
Marketing cost (USD/ton)	378.7		90.8	234.6			
Net profit (USD/ton)	482.7		142.8	114.3			

Avg. volume/year (ton)	2.6	85.6	415.8			
Net profit/year (USD)	1255.0	12223.7	47525.9			
<b>The integrated economic efficiency of export channels</b>						
Volume (ton)	38,643.7	10,644.4	6,247.8	29,272.0	3,933.8	25,569.6
Selling price (USD/ton)	695.4	1,133.1	1,156.8	929.5	7,268.6	1,295.6
Net profit (USD/ton)	193.6	136.7	88.7	80.0	393.4	27.4
Total revenue (Thous. USD)	26,871.8	12,060.9	7,227.7	27,208.4	28,593.1	33,129.0
Total net profit (Thous. USD)	7,483.1	1,455.3	554.2	2,343.1	1,547.6	700.8
% Total revenue	19.9	8.9	5.4	20.1	21.2	24.5
% Total net profit	53.1	10.3	3.9	16.6	11.0	5.0

Source: Field survey data in 2022

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

Indicators	Farmer	Collector	Wholesaler	Central Market /Supermarket	Local Retailer	Total
<b>The Marketing Channel 3</b>						
Selling price (USD/ton)	1290.8	1500.2	1771.9	2567.7		
Input cost (USD/ton)	429.4	1290.8	1500.2	1771.9		
Marketing cost (USD/ton)	378.7	90.8	166.1	593.4		
Net profit (USD/ton)	482.7	118.6	105.6	202.4		
Avg. volume/year (ton)	2.6	218.3	628.9	206.5		
Net profit/year (USD)	1255.0	25890.4	66411.8	41795.6		
<b>The Marketing Channel 4</b>						
Selling price (USD/ton)	817.8	975.8	1151.7		1516.9	
Input cost (USD/ton)	325.3	817.8	975.8		1151.7	
Marketing cost (USD/ton)	286.9	81.8	92.3		59.4	
Net profit (USD/ton)	205.6	76.2	83.6		305.8	
Avg. volume/year (ton)	8.4	93.6	628.9		21.4	
Net profit/year (USD)	1727.04	7132.3	52576.0		6544.1	
<b>The Marketing Channel 5</b>						
Selling price (USD/ton)	764.7	931.8			1285.4	
Input cost (USD/ton)	260.2	764.7			931.8	
Marketing cost (USD/ton)	229.5	81.8			59.4	
Net profit (USD/ton)	274.9	85.3			294.2	
Avg. volume/year (ton)	5.0	93.6			21.4	
Net profit/year (USD)	1374.7	7984.1			6295.9	
<b>The integrated economic efficiency of domestic channel</b>						
Volume (ton)	14581.9	13374.38	12671.265	2552.595	12029.3	
Selling price (USD/ton)	893.6	1032.4	1276.6	2567.7	1480.1	
Profit (USD/ton)	263.2	82.6	88.0	202.4	304.0	
Total revenue (Thous. USD)	13031.0	13808.3	16176.6	6554.3	17804.9	<b>67,375.1</b>
Total net profit (Thous. USD)	3837.8	1104.6	1115.5	516.6	3656.4	<b>10,230.9</b>
% Revenue	19.3	20.5	24.0	9.7	26.4	<b>100.0</b>

% Net profit	37.5	10.8	10.9	5.0	35.7	<b>100.0</b>
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Source: Field survey data in 2022

According to the findings of the research presented in Tables 1 and 2, the primary channel that constitutes the Num-mango value chain in Vinh Long is the domestic market channel. The domestic channel brought in a total of 69,490 million USD in revenue, and it made a profit of 10,552 million USD over the same period. This number is 14 and 15 times greater than the total revenue and profit of the export channel. The total revenue generated by the whole Num-mango value chain is USD 74,351.8 million, while the total profit generated is USD 11,238.3 million.

The results showed that farmers are the most vulnerable actors in the value chain. Hence, the research provides cases that aid in determining how to increase the profit of farmer actors by active participation in appropriate marketing channels.

Case 1: The farmer is only involved in marketing channel 4 with the farmer, collector, wholesaler, and retailer. This channel is 3rd-grade mango. Channel 4 found that Num-mango households produce 8.4 tons/year on 0.4 hectares. Consequently, farmers in channel 4 obtain the lowest profit, 1,727 USD/year. Retail actor earns 6,544.1 USD/year with a business size of 21.4 tons. With 93.6 tons, the collector earns 7,132.3 USD/year. The wholesaler makes 52,576 USD/year with 628.9 tons of business. The wholesaler's profit is just 83.6 USD/ton, smaller than farmers and collectors, but its yield is the largest annual profit.

Case 2: Farmers participate in channel 1 of about 0.8 tons, channel 2 or channel 3 approximately 2.6 tons, and channel 5 is about 5.0 tons. The total output of farmers participating in this field is still 8.4 tons with a profit of 3,176.6 USD/year. The profit achieved by farmers, in this case, is 1.7 times higher than in case 1. Thus, farmers participating in case 2 will significantly improve their profits.

#### ***Solution suggestions for improving Num-mango distribution channels***

To effectively meet market quality standards and legal requirements, as well as facilitate the sharing of market information, organize large-scale and secure production, and enhance cooperation among stakeholders, it is crucial to enhance both vertical and horizontal linkages within the Num-mango value chain. Furthermore, this would aid in the facilitation of information dissemination about the market. The identification of the vulnerability of the supply chain has heightened the significance of this issue. This paper encompasses the recommended policies that align with the aforementioned themes.

#### ***Quality management***

*Production organization* (horizontal linking): The use of a horizontal production system across the whole of the manufacturing process. It is advisable for farmers aspiring to cultivate large-scale mango plantations in accordance with proper agricultural methods to engage in collaborative business ventures with other farmers or join a farmer's organization. The collective endeavors described may serve as a foundation for the implementation of appropriate agricultural methodologies, resulting in the attainment of safety certifications and adherence to traceability regulations. Cooperatives play a crucial role in facilitating the formation of robust relationships between producers and various stakeholders and networks. In order to effectively address the need for educational reform, it is essential to include ecologically sustainable farming practices, efficient harvesting techniques, effective postharvest management strategies, comprehensive market knowledge, and the expertise of agricultural business experts. As a result, individuals possess a heightened level of agency in shaping their financial prospects and the enterprises they establish as a direct consequence of their exertions.

*Collaboration* (vertical linking): The primary goal of trade agreements should be to foster heightened commercial activity among farmers, cooperatives, and processing firms. This approach will facilitate the equitable and impartial allocation of costs, benefits, and limitations. The spatial closeness between processing firms and farms has the potential to enhance the output of farmers and augment their bargaining power. This is achieved via the increased accessibility of mangoes that exhibit larger sizes and



superior quality grades. Theoretically, this might potentially facilitate stakeholders' comprehension and recognition of the significance of quality standards, compliance obligations, and supply-demand limitations.

*Commercial support:* Offering financial or other types of support for business purposes. The Vietnamese government is actively engaged in endeavors to establish free trade agreements (FTAs), both domestically and globally. Vietnam has effectively achieved Free Trade Agreements (FTAs) with thirteen nations and is now engaged in discussions with three other countries. Vietnam's agricultural exporters might potentially engage in global value chains and attract foreign investment by capitalizing on the existing possibilities at their disposal. The international mango trade is significantly impacted by 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). Based on the findings of Brian et al. (2021) and Thang (2018), it has been observed that countries having free trade agreements (FTAs) do not impose import taxes on fresh mangoes and mango-related goods originating from Vietnam, as per the provisions of these accords. One recommendation to be taken into account is that the Department of Industry and Trade should organize conferences, seminars, and dialogues as a means of disseminating knowledge pertaining to Free Trade Agreements (FTAs) and related matters, including taxation, standards, quality assurance, competition, and trade legislation. In order to disseminate information on Free Trade Agreements (FTAs) and associated topics, it is necessary to organize and conduct these events. Exporters get several advantages from this phenomenon, including an augmentation in export volume, an extension of their market penetration, and a mitigation of costs related to market analysis. In order to effectively cater to importers' expectations and ensure adherence to international regulations, merchants must possess a comprehensive comprehension of the many constituents of the value chain. The facilitation of enhanced mango yield of exportable premium grade might potentially be simplified by the implementation of a quality management system. This will facilitate the sale of mangoes at elevated rates in the market. As a result of this phenomenon, it is plausible that there may be a positive impact on the financial gains experienced by all parties involved in the supply chain, with a specific emphasis on agricultural producers.

### ***Technology investment***

*Production organization* (horizontal linking): In the realm of production organization, the term "horizontal connecting" refers to the process of harmonizing and consolidating several organizations or departments that exist at a comparable hierarchical level. The interconnection of individuals facilitates enhanced communication and facilitates the exchange of information, products, and services. The proposition suggests that the government should provide an enticing financial package to cooperatives and farmer groups as a means to incentivize the adoption of novel technology. Several examples of such technology are drip irrigation systems, integrated water and fertilizer solutions, and drone applications for pesticide spraying. The objective of this advice is to enhance the use of such technology.

*Collaboration* (vertical linking): The establishment of collaborative vertical connections is of utmost importance for mango processing enterprises aiming to fully use the advantages of shifting their manufacturing facilities to regions renowned for mango cultivation. In the course of migration, it is essential to get specialized financial resources to facilitate the required expenditures in state-of-the-art manufacturing technology. The completion of the procedure necessitates the allocation of these investments. Various technological advancements and equipment play a crucial role in fruit production. These include categorization systems, state-of-the-art cold storage facilities, vapor thermal treatment factories, standardized packaging facilities, and innovative processing processes. The facilitation and advancement of the mango sector might potentially be enhanced via the use of macroeconomic methods, such as the utilization of loan packages. This approach demonstrates a significant level of effectiveness in enhancing productivity, facilitating the production of high-value goods, and enabling

the incorporation of novel product offers. The increased prominence of Vietnam in the mango industry has resulted in heightened rivalry in both local and international mango markets. The proliferation of employment prospects facilitated by technological advancements is advantageous for both the industrial and service sectors. The proposed technique is expected to attract investors to the firm, so facilitating the improvement of both commercial and production capacity. The use of this technology has the potential to significantly enhance mango production and introduce novel mango varieties, hence augmenting accessibility and fostering dynamism within the mango market.

### ***The reallocation of benefit***

Farmers, being the most susceptible component within the supply chain, assume a pivotal function in supplying inputs to other entities. In order to boost the efficiency of the supply chain and improve the quality of products, it is essential to reallocate advantages to the producers. Enhanced farmer engagement in cooperatives or farmer associations may be crucial, since these entities may serve as proponents for farmers during talks and agreements, therefore fostering a more equal allocation of benefits.

- The decline in commodity prices has resulted in cost savings for consumers.
- Improving Contractual Negotiations
- Enhancing training tactics to optimize mango production operations and improve product quality.
- Getting quality certification, processing businesses are required to ensure that they provide enough assistance.
- Encouraging food-processing enterprises to make investments in state-of-the-art equipment might perhaps mitigate the substantial labor expenses prevalent in the agriculture industry.
- Investing in e-commerce and digital marketing has the potential to reduce operational costs associated with activities such as shipping and intermediary services.

## **4. Conclusion**

Research results show that the Num-mango value chain has 5 market channels, including 2 export channels and 3 domestic channels. The domestic channel is the main consumption channel, accounting for 95.4% of the total output of the whole chain, 20 times higher than the export channel. The domestic market that consumes the most mangoes is the Bac Lieu central market, accounting for 66.2% of the total mango output of the whole chain. The whole Num-mango value chain generates USD 74,351.8 million in revenue and USD 11,238.3 million in profit annually. There are a number of factors that make farmers the weakest link in the Num-mango value chain. Most farmers work on a small scale, which presents challenges in a variety of areas, including technology adoption (production models, post-harvest technology, modern cool storing systems), production organization, quality management, negotiating farming contracts over the phone, gaining access to market data, and fulfilling export requirements (certifications in good agricultural practice, traceability codes, pesticide residue control). The quality of the fresh fruit is really low. It's not enough to satisfy importers' needs. Channel 1 of export marketing's fresh mango was insignificant (1.4%). In addition, nothing is processed, and only a tiny percentage of production is exported. This requires capital investment to produce products with a high added value in cutting-edge technologies. The tropical fruit value chain is an important sector of agricultural production in the Mekong Delta, Vietnam, and this research contributes by expanding the capabilities of value chain analysis in the agri-food sector. Opportunity costs (such as land rent, family labor expenses, depreciation costs, etc.) were included in the value chain study's cost-benefit analysis. To achieve economic efficiency beyond traditional financial efficiency, it provides a comprehensive analysis of the value chain in agricultural sectors. This opens the door for further study of the value chain analysis of tropical fruits and vegetables. How to use a tool for researching agri-food chains by locating the production-trading

account and the consolidated account for the chain.

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