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### Supply Chain Analysis of Pineapple in Sta. Maria, Laguna, Philippines

<sup>1</sup>Analyn A Cacal, <sup>2</sup>Mark Allan L Flores, <sup>3</sup>Charmyne D Sanglay, <sup>4</sup>Jayson N Olayta  
<sup>1, 2, 3, 4</sup>College of Agriculture, Laguna State Polytechnic University, Philippines

Corresponding Author: Charmyne D Sanglay

#### Abstract

Pineapples are a key crop and top agricultural commodity in the Philippines, with the country ranking second globally in total pineapple production as of 2019. This study focuses on data collection through a survey questionnaire, employing a checklist method as the data collection instrument. The study involved 100 respondents, including 35 farmers/producers, 35 traders (wholesalers and retailers), and 30 consumers, primarily within the age groups of 20-30 and 31-40 years. Among the farmers, 22 were female and 13 were male, while among traders, 31 were female and 4 were male. Primary activities practiced by pineapple farmers include selecting planting material ("suhi")—exclusively the Hawaiian variety of pineapple—land preparation using single-row planting ("tanim isa"), fertilizer and herbicide application, and flower induction to ensure uniform flowering and harvesting, with Ethrel being the common agent used.

The study identifies various problems and constraints within the pineapple supply chain, including pest infestation, poor quality, rotting, and susceptibility to natural calamities. In Sta. Maria, Laguna, farmers face challenges such as low profitability, lack of knowledge and skills in developing value-added products, and limited access to training and seminars. Traders (wholesalers and retailers) add Php5-20.00 as their profit for each pineapple size purchased from farmers/producers. However, the study does not provide information on the current yield of pineapple crops in Sta. Maria, Laguna. To address these challenges, the study recommends that both farmers and traders explore value-added products to increase profitability. It also emphasizes the importance of attending seminars related to pineapple farming and sales, as well as innovating new products to enhance understanding and knowledge of farming and sales.

**Keywords:** Pineapple, Supply Chain, Traders, Value Addition, Profitability

#### Introduction

Pineapple farming is deeply rooted in the agricultural landscape of Sta. Maria, Laguna, serving as the primary livelihood for many of its farmers. The importance of pineapple production in this region cannot be overstated, as it represents the main source of income for a significant portion of the local population. This reliance on pineapple farming means that understanding the intricacies of its supply chain is crucial not only for the economic well-being of the farmers but also for ensuring a steady and profitable flow of this tropical fruit from the fields to the consumers' tables.

Laguna, a province within the Calabarzon region, is recognized for its substantial contribution to the country's pineapple production. As highlighted by the Philippine Rural Development Project (PRDP) Calabarzon in 2022, Laguna ranked second among the five provinces in the region in terms of pineapple production, contributing 15.84 percent of the region's total output. This achievement underscores the significance of the province in the national agricultural landscape, with municipalities like Sta. Maria playing a pivotal role. Among the various municipalities in Laguna, Sta. Maria, along with others such as San Pablo City, Alaminos, Calauan, and Siniloan, stands out as a key player in pineapple production. While San Pablo City boasts the largest average land area dedicated to pineapple farming, with 157.97 hectares, and Calauan leads in pineapple fruit production with an impressive average of 1,755.23 metric tons, Sta. Maria also contributes significantly to the province's overall production. This municipality, though smaller in land area compared to San Pablo City and Calauan, has a robust farming community that depends heavily on pineapple production.

The impetus for this study stems from the need to comprehensively understand the supply chain of pineapples in Sta. Maria, Laguna, and its impact on the market price and availability of the fruit. With the majority of farmers in this area heavily

dependent on pineapple farming, it is vital to identify the factors that influence their ability to meet market demand, minimize post-harvest losses, and maximize their profits. By examining the supply chain, this study aims to uncover the challenges faced by farmers and intermediaries, as well as explore potential opportunities for improvement. Moreover, this study is conducted to provide insights into the roles and relationships of the various key players within the pineapple subsector. By mapping out the supply chain, the research will highlight the interactions between farmers, traders, wholesalers, retailers, and other stakeholders, thus providing a clear understanding of how value is added at each stage and how profits are distributed among the different players.

### Review of Literature

In today's dynamic and competitive business environment, effective supply chain management (SCM) is essential for businesses to thrive. SCM involves the integration of suppliers, partners, and customers through a network of organizations engaged in upstream, operational, and downstream activities, creating value for customers (Christopher *et al.*, 1998; Otchere *et al.*, 2013). The importance of SCM has grown due to global competition and the demand for better customer service, necessitating cooperation, information sharing, and seamless coordination across the supply chain (Monzcka & Morgan, 1997; Faisal & Banwat, 2006<sup>[16]</sup>). In the pineapple industry, SCM plays a crucial role in aligning production with customer satisfaction and sustaining overall competitiveness (Faisal & Banwat, 2006<sup>[16]</sup>; Chopra & Sodhi, 2014). The supply chain for pineapples includes stages from agronomic practices to harvesting, processing, packaging, storage, and distribution, all of which are influenced by IT control, logistics, and food safety standards. Ensuring compliance with certifications like Fair Trade and GLOBALGAP is vital to meeting consumer demands for hygiene and traceability, as failure to meet these standards can result in rejected produce (Loader & Hobbs, 1999).

### Objectives

1. To examine the current supply chain structure of pineapples in Sta. Maria, Laguna, identifying the key players and their respective roles.
2. To determine the primary activities of pineapple key players in Sta. Maria, Laguna.
3. To identify marketing practices of key players in the chain.
4. To identify the major challenges and inefficiencies within the pineapple supply chain that affect production, distribution, and profitability.
5. To evaluate the profit margins of key players involved in the pineapple supply chain and determine how profits are distributed across different stages.

### Materials and Methods

This study employs a descriptive research design using survey questionnaires to collect data from 100 respondents, including pineapple growers, traders, and consumers in Sta. Maria, Laguna. A quota sampling method is used to select participants, and the data was analyzed through descriptive statistics, including frequencies, means, and percentages. The research instrument includes tailored questionnaires for each group, with responses measured on a 5-point Likert scale. Additionally, profitability is assessed through a Net

Profit Margin analysis to evaluate the efficiency of the supply chain in covering costs and generating income. Casual interviews are also conducted to verify and enrich the data collected.

## Results and Discussion

### Current Supply Chain Structure of Pineapples in Sta. Maria, Laguna

The current supply chain structure for pineapples in Sta. Maria, Laguna, involves several key players, each with distinct roles and contributions. The primary producers are local farmers, predominantly females (62.86%), who manage the cultivation of Hawaiian pineapples on their own land. They are responsible for planting, nurturing, and harvesting the crop. The socio-demographic data indicates that most farmers are married (91.43%) and have families of 4-6 members (74.29%), with varying educational backgrounds—primarily primary and secondary education (74.29%). This demographic suggests that while formal education levels may be modest, practical farming skills are essential. The next stage in the supply chain involves market intermediaries, including wholesalers and retailers, who facilitate the transportation, processing, and distribution of the pineapples from the farms to various markets. These intermediaries play a crucial role in connecting the farmers with consumers, managing bulk transportation, and ensuring the products reach retail outlets and markets. Consumers, who are the final players in the chain, influence demand patterns and pricing. The entire supply chain is characterized by a reliance on both direct cultivation by farmers and the essential functions performed by intermediaries to ensure the efficient movement and sale of pineapples. This structure (Fig 1) highlights the interdependence between farmers, intermediaries, and consumers, emphasizing the need for effective coordination and communication across all stages to optimize supply chain performance.

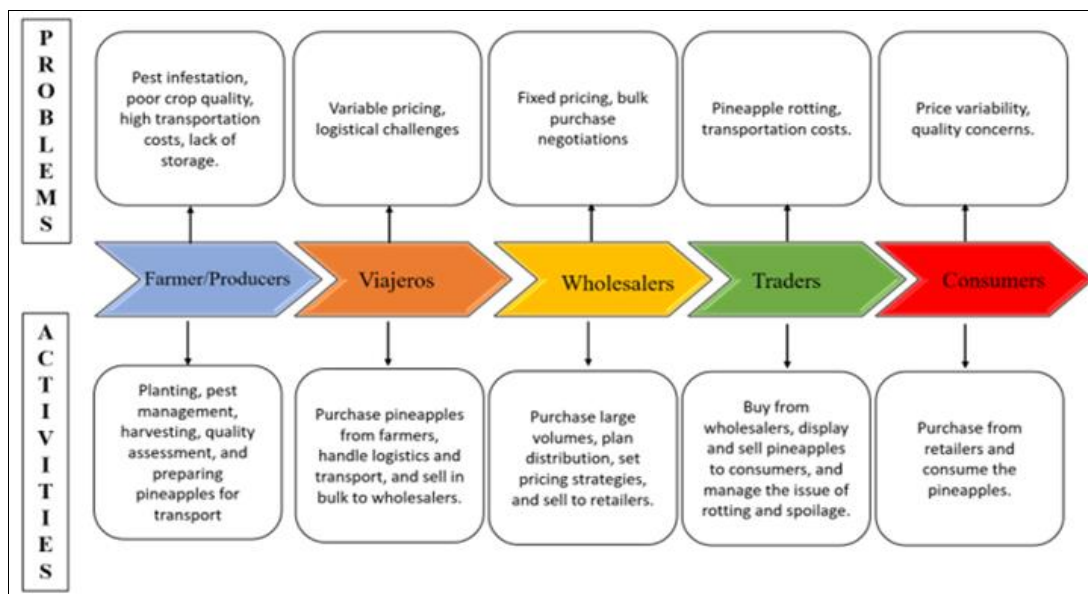
**Table 1:** Key players

Key players	Role
Farmers	Involved in planting, pest management, harvesting, quality assessment, and preparing pineapples for transport.
Viajeros	Act as intermediaries between the farmers and the wholesalers. They purchase pineapples from the farmers, handle the logistics of transporting the pineapples, and then sell them in bulk to wholesalers.
Traders (wholesaler and retailer)	Buy large quantities of pineapples (5,000–10,000 pieces) from viajeros and distribute them to retailers or other buyers.
Retailers	Purchase smaller quantities of pineapples (100–500 pieces) from wholesalers or directly from farmers to sell at local markets or stores.
Consumer	Purchase pineapples from retailers for personal consumption.

Meanwhile, the figure below illustrates the structure of the pineapple supply chain in Sta. Maria, Laguna, detailing the primary activities and challenges faced by each key player. Farmers/producers are responsible for planting, pest management, harvesting, quality assessment, and preparing pineapples for transport. They face significant challenges, including pest infestations, poor crop quality, high transportation costs, and a lack of storage facilities. Viajeros purchase pineapples from farmers, handle logistics, and sell in bulk to wholesalers, but they contend with variable

pricing and logistical challenges. Wholesalers manage large-volume purchases, distribution planning, and pricing strategies, facing the challenge of negotiating fixed prices for bulk purchases. Retailers buy from wholesalers, display and sell pineapples to consumers, and manage issues of rotting and spoilage, which is exacerbated by transportation

costs. Finally, consumers purchase and consume the pineapples, often dealing with price variability and concerns over quality. This supply chain map highlights the interconnected roles and challenges that impact the efficiency and profitability of pineapple production and distribution in the region.



Source: Authors own mapping based on the field survey

Fig 1: Supply Chain of Pineapple In Sta. Maria, Laguna, Philippines

### Primary Activities of Key Players in Sta. Maria's Pineapple Supply Chain

The process begins with the use of self-propagated planting materials, known as "suhí," which are favored over external seeds due to their superior quality and increased yield. Farmers utilize manual land preparation due to the hilly terrain, opting for traditional methods over machinery. Hawaiian pineapples are the predominant variety planted, chosen for their suitability to the local conditions. For planting, farmers employ a single-row spacing technique (14 x 17 inches) to promote healthy growth. Fertilization is critical, with farmers applying a combination of urea, complete fertilizers, and ammonium sulfate, alongside organic options, starting three months after planting and continuing every 3-4 months. Weed control is managed through both herbicides like Diuron and manual weeding to prevent harm to the crops. Flower induction is carried out after 9-14 months to synchronize flowering and ensure uniform maturity, with Ethrel being the most commonly used agent. Harvesting is timed based on visual cues of ripeness, including color and leaf detachment, with the peak season from September to February. These activities collectively reflect a well-coordinated approach to pineapple farming that emphasizes traditional practices, careful management of inputs, and strategic timing to optimize yield and quality. After harvesting, the pineapples are sold to *viajeros* (middlemen or traders), who transport the produce from farms to markets. The *viajeros* are responsible for aggregating the pineapples from various farmers, handling logistics, and ensuring timely delivery to wholesalers. Wholesalers in the supply chain take on the responsibility of bulk purchasing, quality control, and distribution to various retailers. They often store the pineapples in warehouses or cold storage to manage supply according to market demand.

Retailers then purchase the pineapples from wholesalers and are involved in the final selling process, which includes displaying, marketing, and selling the pineapples to consumers. In some cases, retailers also engage in minimal processing or repackaging to appeal to their customer base. Consumers, as the end-users, purchase the pineapples for personal consumption, completing the supply chain. Each key player adds value to the pineapple through these primary activities, contributing to the overall efficiency and profitability of the supply chain.

### Marketing Practices of Key Players in the Pineapple Supply Chain

The marketing practices of key players—farmers, *viajeros*, wholesalers, and retailers—are distinctly characterized by their purchasing volumes, pricing strategies, and selling methods. Farmers primarily engage with three main types of buyers: *Viajeros*, wholesalers, and retailers. *Viajeros* purchase large quantities (1,000-5,000 pieces), while wholesalers buy even larger volumes (5,000-10,000 pieces) and retailers procure smaller amounts (100-500 pieces). Pricing for pineapples is variable and depends on the size of the fruit, which is categorized into five grades: "kwarta" (extra-small), "Tersera" (small), "segunda" (medium), "Primera" (large), and "jumbo" (extra-large). Prices for these sizes range significantly depending on the buyer, with *viajeros* typically paying less per piece compared to wholesalers and retailers. Farmers employ different pricing strategies depending on the buyer, with most selling to *viajeros* at prices starting from Php15 for extra-small to Php55 for extra-large sizes. Wholesalers generally buy at a fixed price range of Php15-20 per piece, regardless of size. Retailers exhibit varied pricing, with prices starting from Php20 for extra-small and reaching Php65 for extra-large

sizes. Payment is predominantly made in cash, though some wholesalers arrange partial payments at the time of negotiation and the remainder at harvest.

Regarding delivery, 54.3% of farmers handle delivery themselves, while the rest rely on buyers to collect the pineapples. Pineapples are distributed not only locally but also to nearby markets in Laguna and Rizal. Selling practices are also influenced by pineapple size, with farmers often selling in bulk or combining wholesale and retail methods. Traders, including both wholesalers and retailers, sell pineapples based on size and variety, with prices to end consumers ranging from Php45 for extra-small to Php100 for extra-large. Traders may add a markup of Php5-20 depending on the size. While most traders sell pineapples as whole fruits, a minority deal with peeled pineapples, often discarding the skins as waste. Traders predominantly sell their produce in cash and distribute it to local markets and nearby towns.

### Major Challenges and Inefficiencies in the Pineapple Supply Chain

**Table 2:** Problems encountered in Pineapple Farming

Problems Encountered by Farmers	Frequency Mean	Verbal Interpretation
Infestation of pest	4.91	Always
Poor quality of crop	3.89	Often
Natural calamities	3.74	Often
Lack of storage facilities	3.54	Often
Transportation is high	3.54	Often
Location is far from the market	3.43	Often
Lack of equipment	3.34	Sometimes
Lack of labourer	3.26	Sometimes
No sustain market	3.2	Sometime
Lack of planting material	2.97	Sometime
No interference of the traders	2.97	Sometime
Lack of funds	2.94	Sometime
Lack of support to government	2.8	Sometimes
High price of planting material	1.46	Never

The pineapple supply chain in Sta. Maria, Laguna, faces several critical challenges and inefficiencies that impact production, distribution, and profitability. For farmers presented in Table 2, the most pressing issue is pest infestation, with a high frequency mean of 4.91, indicating that it is a constant problem affecting their crop yields and quality. Poor crop quality and natural calamities also rank significantly, reflecting recurring issues that compromise the consistency and reliability of production. While high prices for planting materials are not a major concern due to the use of self-sourced planting materials, other factors such as transportation costs, lack of storage facilities, and inadequate labor contribute to the overall inefficiencies in farming operations.

**Table 3:** Problems encountered in Pineapple Trading

Problems Encountered by Traders	Frequency Mean	Verbal Interpretation
Pineapple rotting ( <i>pagkabulok</i> )	4.97	Always
Natural Calamities	4.46	Always
Lack of support from government	4	Often
High price of pineapple	3.71	Often
Poor quality of pineapple	3.6	Often
None consumable goods	3.54	Often
Infestation of pest	3.49	Often
Transportation is high	3.43	Often
Location is far from market	3.34	Sometime
Lack of funding support	3.26	Sometimes
No sustain market	2.66	Sometimes
No interference to consumer	2.49	Rarely
Lack of worker ( <i>manininda</i> )	2.31	Rarely

Traders in Table 3, on the other hand, grapple with pineapple rotting, which has the highest frequency mean of 4.97, signaling a severe issue due to exposure to hot climates and insufficient storage solutions. This problem leads to significant losses and forces traders to diversify their offerings to mitigate financial impacts. Natural calamities, high pineapple prices, and poor pineapple quality are additional challenges faced by traders, affecting their ability to maintain profitability. Issues such as lack of funding support and inefficient market access further exacerbate the difficulties, although problems like lack of worker availability and minimal consumer interference are less frequent concerns. These challenges collectively impact the efficiency of the supply chain, influencing production stability, distribution reliability, and overall profitability. Addressing these issues requires targeted interventions such as improved pest management, better storage solutions, and enhanced support systems for both farmers and traders to stabilize and optimize the pineapple supply chain.

### Profit Margins and Distribution Across Key Players in the Pineapple Supply Chain

The profit margins of key players—farmers and traders—demonstrate a range of financial outcomes and highlight the distribution of profits across different stages of the supply chain. Farmers report an average revenue of Php144,285 per harvesting season, with total operating costs of Php72,500, resulting in a net income of Php71,185 and a net profit margin of 49.34%. This indicates a healthy profitability for farmers, reflecting efficient cost management and successful cultivation practices, despite varied sources of funding, such as personal savings and microfinance. Conversely, traders show an average revenue of Php76,750 with operating costs of Php35,000, yielding a net income of Php41,750 and a net profit margin of 54.40%. The traders, who predominantly fund their businesses through personal savings or other ventures, achieve a higher profit margin compared to farmers. This higher margin is attributed to their ability to mark up prices and manage operating costs effectively, as well as their role in selling pineapples at retail or wholesale levels. Overall, the financial analysis reveals that while both farmers and traders report profitable operations, traders benefit from a higher profit margin. The distribution of profits shows that traders capture a significant portion of the value generated in the supply chain through strategic pricing and efficient management. In contrast, farmers, despite lower margins, also find their operations financially viable due to their lower start-up and operational costs. This distribution underscores the importance of each stage in the supply chain and highlights the need for continued efficiency and market adaptation to sustain profitability across the supply chain.

### Conclusion

The pineapple supply chain in Sta. Maria, Laguna, presents a complex landscape of challenges and inefficiencies affecting both farmers and traders. Farmers struggle primarily with pest infestations and poor crop quality, which undermine their production and financial stability, while traders face issues like pineapple rotting and high transportation costs that impact their profitability. Despite these challenges, both farmers and traders report overall profitability, indicating resilience and adaptive strategies within the supply chain. The disparities in profit margins

between different key players and the varied financial health of each segment underscore the need for systemic improvements to enhance the efficiency and stability of the pineapple supply chain.

### Recommendation

To address the challenges identified in the study, it is recommended that targeted interventions be implemented to improve the pineapple supply chain. For farmers, initiatives such as integrated pest management programs, better quality control measures, and support for infrastructure development (e.g., storage facilities) should be prioritized. For traders, enhancing storage solutions to prevent rotting, optimizing transportation logistics, and providing financial support or subsidies could mitigate losses and improve profitability. Additionally, fostering stronger collaboration between farmers, traders, and government agencies can help address systemic issues and create a more resilient and efficient supply chain.

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