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Supply Chain Map of Lemongrass in Key Areas in the Philippines

Abstract
Lemongrass (*Cymbopogon citratus*) has gained increasing importance as a high-value crop in the Philippines because of its expanding use in the food, pharmaceutical, cosmetic, and essential oil industries. However, limited information on its supply chain structure and market dynamics has constrained the design of interventions that could strengthen the industry. This study mapped the lemongrass supply chain in the major producing areas of Regions 7 (Central Visayas), 8 (Eastern Visayas), and 10 (Northern Mindanao) using interviews with producers, processors, traders, and key informants, supported by secondary data from government agencies and industry sources. The results showed that Region 10, particularly Bukidnon, is the country's leading production hub, with 15.80 ha under cultivation and an average monthly production of 15,814 kg, while production in Regions 7 and 8 remains small-scale and is largely oriented toward value-added processing. Five supply chain configurations were identified in Region 10, four in Region 7, and two in Region 8, involving farmers, farmer-processors, processors, consolidators, wholesalers, retailers, government agencies, and non-government organizations. Product movement was largely confined within production areas, with limited interregional trade, indicating that the industry remains primarily driven by local production and demand. Marketing channels consisted mainly of nearby processors, wholesalers, retailers, and direct sales through local markets, online platforms, and trade fairs. Transactions were predominantly cash-based, although delayed payments between processors and farmers occurred in some processing-oriented chains. Key challenges included limited technical knowledge, inadequate processing facilities, weak transport and digital infrastructure, rising production and marketing costs, fluctuating prices, and limited market information. Despite these constraints, government and development organizations played an important role in improving production technologies, processing capacity, product development, and market promotion. The findings highlight the strong potential of lemongrass as a profitable rural enterprise and underscore the need to strengthen extension services, farmer organizations, processing infrastructure, logistics, market linkages, and value-added product development to enhance supply chain efficiency, increase farmer incomes, and improve the competitiveness of the Philippine lemongrass industry.

Introduction

Lemongrass (*Cymbopogon citratus*) has emerged as one of the most promising high-value aromatic crops in the Philippines because of its wide range of applications in the food, pharmaceutical, cosmetic, nutraceutical, and essential oil industries. The plant is valued primarily for its essential oil, which is rich in citral, a bioactive compound extensively used in food preservation, pharmaceuticals, fragrances, cosmetics, aromatherapy, and natural health products (Majewska et al., 2019; Mukarram et al., 2022). As global consumer demand shifts toward natural, plant-based, and sustainably sourced products, the commercial importance of lemongrass continues to increase, creating expanding market opportunities for fresh leaves, herbal teas, hydrosols, essential oils, and other value-added products. In the Philippines, commercial production has gradually expanded, with Region X, particularly Bukidnon, emerging as a major production and processing hub due to the presence of organized farmer groups, processing enterprises, and favorable agro-climatic conditions. By comparison, production in Regions VII and VIII remains predominantly small-scale, where lemongrass is cultivated as a supplemental enterprise integrated into diversified farming systems. Moreover, the heightened demand for herbal and wellness products during the COVID-19 pandemic stimulated greater community participation, encouraged enterprise development, and accelerated the adoption of digital and innovative marketing strategies for lemongrass-based products (Balanay & Guinancias, 2025).

Despite its considerable economic potential, the Philippine lemongrass industry continues to face numerous production, postharvest, and marketing constraints that limit its productivity, competitiveness, and capacity to participate in higher-value markets. Farmers frequently encounter inadequate access to quality planting materials, inconsistent adoption of Good Agricultural Practices (GAP), insufficient technical knowledge on pest and disease management, limited mechanization, and high postharvest losses resulting from poor handling and transportation. Downstream actors similarly face inadequate processing facilities, limited investments in value addition, fragmented marketing systems, and weak institutional linkages that constrain access to premium domestic and export markets. These challenges reduce operational efficiency, increase transaction costs, and weaken value creation throughout the supply chain (Kumoro et al., 2021; Mukarram et al., 2022). Although government agencies, local government units, state universities and colleges, and development organizations have implemented initiatives on technology dissemination, enterprise development, and market promotion, these interventions have largely focused on production enhancement and product development rather than improving coordination among supply chain actors (Balanay & Guinancias, 2025).

Supply chain analysis has increasingly been recognized as an effective analytical framework for understanding how agricultural commodities move from producers to final consumers while identifying inefficiencies, governance structures, value distribution, and opportunities for upgrading. Unlike traditional production or marketing studies, supply chain analysis examines the interactions among input suppliers, producers, processors, traders, wholesalers, retailers, and consumers, together with the accompanying flows of products, information, and financial resources (Lambert & Cooper, 2000; Mentzer et al., 2001). In agricultural systems, supply chain analysis provides critical insights into coordination mechanisms, transaction costs, market integration, logistics performance, and value creation, thereby supporting evidence-based interventions that improve competitiveness, resilience, and inclusiveness (FAO, 2014; Gereffi et al., 2005). A fundamental component of supply chain analysis is supply chain mapping, which visually identifies the actors involved, the sequence of activities, marketing channels, product transformations, and the flow of products, information, and payments throughout the chain. Supply chain maps enable researchers and policymakers to identify bottlenecks, redundancies, market concentration, governance relationships, and opportunities for process improvement and value addition.

Despite the growing commercial importance of lemongrass, a significant research gap remains in the Philippine context. Existing studies have primarily concentrated on agronomic practices, essential oil extraction technologies, phytochemical properties, product development, and profitability at the farm or enterprise level. Very limited empirical research has examined the entire supply chain of lemongrass, particularly the interrelationships among producers, processors, consolidators, wholesalers, retailers, and consumers. Furthermore, there is a lack of comprehensive information on product flows, marketing channels, governance structures, information exchange, financial flows, transaction costs, value distribution, and supply chain performance across major production regions. Without such information, policy interventions and investment decisions are often based on fragmented evidence, making it difficult to identify critical bottlenecks, improve coordination among actors, enhance market efficiency, and ensure equitable distribution of benefits throughout the chain. This knowledge gap underscores the need for a systematic supply chain analysis supported by detailed supply chain mapping to provide a holistic understanding of how lemongrass moves from production areas to end markets and where strategic interventions can generate the greatest impact.

Against this backdrop, this study conducts a supply chain analysis of lemongrass in key production areas in the Philippines through the development of a detailed supply chain map. Specifically, the study identifies the key participants, product, information, and financial flows, marketing channels, governance relationships, value-adding activities, production and marketing costs, margins, and profitability across the supply chain. By integrating supply chain mapping with profitability analysis, the study provides a comprehensive assessment of the industry's operational structure and performance. The findings are expected to generate evidence-based recommendations for strengthening production systems,

improving processing infrastructure, enhancing market coordination, expanding value addition, promoting product diversification, and formulating policies that improve supply chain efficiency, increase farmers' incomes, and enhance the competitiveness of the Philippine lemongrass industry in domestic and international markets.

Methodology

Study Area and Sampling Procedure

The study was conducted in three major lemongrass-producing regions of the Philippines: Region 7 (Central Visayas), Region 8 (Eastern Visayas), and Region 10 (Northern Mindanao). These regions were selected based on production statistics from the Philippine Statistics Authority (PSA), findings from previous studies, and recommendations made by the project evaluators during the inception meeting.

Among the selected regions, Region 10 is one of the country's leading producers of lemongrass, with Bukidnon (481.53 MT) and Misamis Oriental (332.65 MT) as major production areas. Region 7, particularly Cebu Province (394.91 MT), also contributes substantially to national production. Although Region 13 (Caraga), particularly Surigao del Norte (including Dinagat Islands, Mabini, and Siargao), is recognized as a significant citronella-producing area, it was excluded from the present study because it had already been covered by a separate research project.

A complete enumeration approach was employed in all identified study sites. The sampling frame was developed using lists of producers, processors, traders, and other industry stakeholders obtained from the Provincial and Municipal Agriculture Offices and relevant government agencies and organizations. All identified active value chain actors within the selected areas during the data collection period were included in the study to ensure comprehensive representation of the existing lemongrass supply chains.

Respondents of the Study

The respondents consisted of four groups of key value chain actors: (1) producers, (2) traders, (3) processors, and (4) key informants. Both male and female participants were included to capture the diversity of roles within the industry.

A value chain tracing approach was adopted to identify respondents and map the flow of products. The process began by identifying major markets and institutional buyers of lemongrass. Backward tracing was then conducted from buyers to traders and processors, and subsequently from traders and processors to producers. This approach enabled the identification of existing supply chains and the relationships among actors. Complete enumeration was applied to all identified respondents, and the number of supply chains documented reflected those that were active during the period of data collection.

Data Collection Procedures

Primary data were collected using a semi-structured questionnaire designed to generate both quantitative and qualitative information aligned with the study objectives. Prior to the actual survey, the instrument underwent pilot testing to assess its clarity, relevance, and completeness, and the necessary revisions were incorporated.

Data collection was carried out through a combination of face-to-face interviews, telephone interviews, online interviews, and key informant interviews (KIIs), depending on the accessibility and availability of respondents. Site visits to processing facilities also allowed the researchers to conduct direct observations of production processes, processing practices, and facility operations, providing contextual information that complemented the interview data.

Secondary data were gathered to establish a comprehensive understanding of the lemongrass industry in the study areas. These included information on production volume, production value, yield, prices, market trends, and other relevant industry statistics obtained from government agencies, published reports, and related literature.

Before field data collection, the research team formally coordinated with the regional and provincial agriculture offices by sending official requests for information on lemongrass and citronella production, processing, and marketing. The information obtained served as the basis for conducting reconnaissance visits to the identified production areas and facilitated the validation of respondent lists and stakeholder networks prior to the actual survey.

Analysis of Data

Descriptive statistics was used in the analysis. The qualitative information was synthesized into narratives substantiating the information analyzed in descriptive statistics.

The local supply chain of lemongrass was mapped. The supply chain analysis includes the following:

(a) Key Customers and Product Requirements.

For each supply chain, key customers, their locations, and their product requirements were identified. Product requirements regarding quality, volume requirements, and schedule and delivery mode preferences were tracked.

(b) Product, Information, and Payment Flow

This section includes the temporal and spatial flow of the product and payment and the mode of information flow along the chain.

(c) Activities and Services along the Chain

The activities and services carried out along the supply chain were documented. The description of the different activities and services were discussed.

(d) Key Players and Their Roles

The identification of key participants and their roles within a supply chain is critical, as it helps determine the

optimal number of actors needed and the importance of each in carrying out supply chain processes. These actors such as suppliers, manufacturers, distributors, and retailers play interconnected roles that influence the overall performance and efficiency of the supply chain.

(e) Critical Logistic Issues and Concerns.
Logistics is managing the flow of goods and information from the point of production to the consumption by which the consumers are supplied with the desired product. Logistics entails integrating information, transportation, inventory, storage, and packaging. It is one crucial aspect of the supply chain that attaches to the value of time and place utility. Several principles (www.dtic.mil/doctrine/jrm/logist.pdf) in logistics will serve as a guide for analytical assessment of the logistics involved in a particular supply chain: (1) simplicity, (2) responsiveness, (3) flexibility, (4) economic, and (5) sustainability.

(f) External Influences
Every supply chain operates within a given environment (Figure 1), as cited in DOST-PCAARRD (2011). External environment factors influence, to a considerable extent, the performance of a supply chain. Such factors may be technical, economic, cultural, and even political. These factors must be fully understood so that the supply chain analysis and the corresponding measure for the improvement can be placed in the proper context

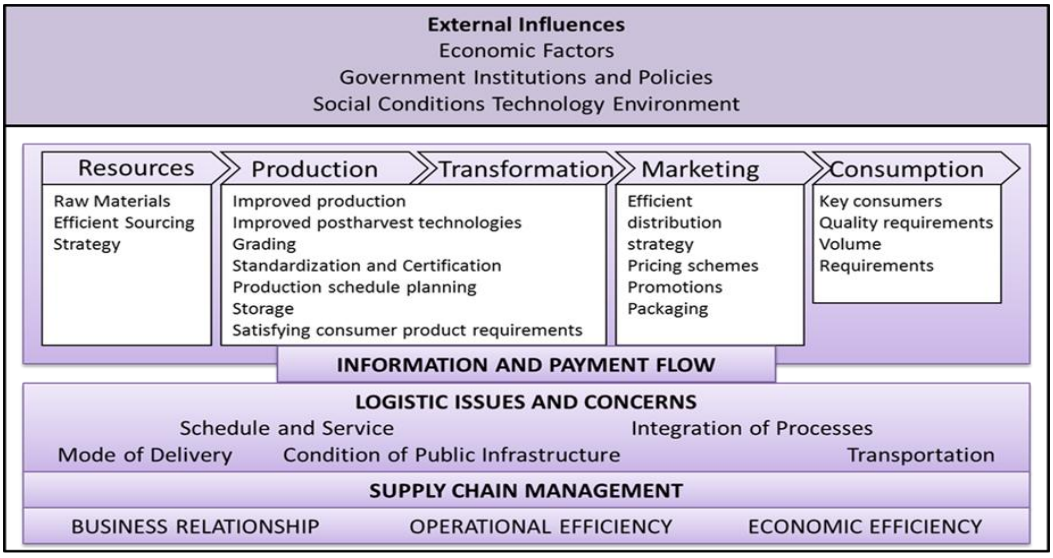

Figure 1. Agri-food Supply Chain Mapping Model

RESULTS AND DISCUSSION

Area Planted and Respondents of the Study

Lemongrass (*Cymbopogon* spp.) is a tropical herb widely used for culinary, medicinal, and cosmetic purposes because of its distinctive citrus aroma (Riyanto et al., 2013; Syukur, 2022). Despite its economic potential, lemongrass is not considered a priority crop in Regions 7, 8 , and 10, resulting in limited production data and monitoring by local government units.

Table 1 shows that Region 10, particularly Bukidnon, recorded the largest lemongrass production area (15.47 ha), where production is primarily intended for the fresh culinary market. In contrast, farmers' associations in Misamis Oriental cultivated 0.33 ha mainly for essential oil and hydrosol production. In Region 7, lemongrass is predominantly grown in backyard farms for processing into tea and hydrosol, while Region 8 recorded 3.08 ha devoted to processed lemongrass products. One notable producer in La Paz, Leyte manages a 3-ha plantation and awaits the establishment of processing facilities for essential oil and hydrosol production.

Farmers in Region 10 cultivated an average of 0.18 ha, producing approximately 119.29 kg of lemongrass per month. In Region 7, backyard farms averaged 0.075 ha (about 300 hills) and produced around 75 kg per month, which was sold at approximately Php 10 per kilogram for processing. Respondents noted that lemongrass provides a regular source of supplementary income while waiting for seasonal crops to mature.

Table 1. Documented Production Volume of lemongrass per month in Region 7, 8, and 10					
Provinces	**Actual Area planted (ha)**	**Avg. Area/ Farm (ha)**	**Total Vol. of Production per month (kg)**	**Avg. Vol. of Production per month (kg)**	**% Share of Total Production**
Region 7	0.015	0.0075	150	75	100
Bohol	0.0075	0.0075	50	50	33.33
Cebu	0.0075	0.0075	100	100	66.67
Region 8					
Leyte	3.08	1.54	2,050	1,025	100
Region 10	15.80	0.18	15,814	119.29	100
Bukidnon	15.47	0.18	15,644	181.91	98.93
Misamis Oriental	0.33	0.11	170	56.67	1.07

Profile of the Respondents

The respondents were identified through recommendations and field visits due to the limited availability of official records from government agencies. They were classified into four groups: producers, processors, producer-processors, and traders (Table 2).

In Region 7, 11 respondents were interviewed, comprising one producer, one producer-processor, and nine traders. The respondent in Calape, Bohol performed both production and processing activities.

In Region 8, nine respondents participated in the study, including one producer, one producer-processor, and seven traders. Jose Rizal National High School in Dulag, Leyte served as both a producer and processor, integrating lemongrass production into its Technical and Livelihood Education (TLE) program as a practical learning initiative rather than an income-generating activity. Traders were primarily located in the public markets of Tacloban City and Kananga, Leyte.

Region 10 exhibited the largest and most diverse respondent group, with 89 producers and 20 traders. Most producers (89%) were concentrated in Talakag, Bukidnon, while traders were mainly located in the public markets of Cagayan de Oro City, Misamis Oriental, a major trading hub ("bagsakan") for lemongrass.

Table 2. Distribution of respondents according to their role in Region 7, 8, and 10						
	Type of Respondents					
Provinces and Municipalities	**FARMERS**		**FARMERS/ PROCESSOR**		**TRADERS**	
	F	%	F	%	F	%
REGION 7						
Bohol						
Tagbilaran					4	44%
Calape			1	100%		
Cebu						
Bogo	1	100%				
Carcar					5	56%
Total	1	100%	1	100%	9	100%
REGION 8						
Leyte						
Tacloban					3	43%
Kananga					4	57%
La Paz	1	100%				
Dulag			1	100%		
Total	1	100%	1	100%	7	100%
REGION 10						
Bukidnon						
Kadingilan	1	1%				
Quezon	2	2%				
Maramag					2	10%
Valencia					2	10%
Malaybalay	4	4%			5	25%
Talakag	79	89%			1	5%

Misamis Oriental						
Cagayan de Oro					10	50%
Balingasag	3	3%				
Total	89	100%			20	100%

Supply Chain Map of Lemongrass

1.1 Key Customers and Product Requirements

The key customers identified in Region 7, Region 8, and Region 10 include processors, wholesaler-retailers, and retailers (Table 3). Two lemongrass species were identified across the study areas: *Cymbopogon citratus* and *Cymbopogon flexuosus*. While both species are used for culinary, medicinal, and essential oil production, *C. citratus* has a milder, sweeter lemon aroma and is commonly used in food and tea, whereas *C. flexuosus* has a stronger citral-rich aroma preferred for perfumes and aromatherapy (Verma et al., 2019).

Most processors, wholesaler-retailers, and retailers preferred *C. citratus* because it is the most abundant species in the study areas. Respondents generally distinguished the species by aroma rather than appearance and were largely unaware of varietal differences as long as the lemongrass was fresh. An exception was the PAMALIHI CADT processor in Balingasag, Misamis Oriental (Region 10), which preferred *C. flexuosus* (citronella) introduced through the support of SAMDHANA for citronella production and processing.

The average procurement volume of processors was 90 kg/month in Region 7 and 60 kg/month in Region 10. Wholesaler-retailers procured an average of 9 kg/week in Region 7 and Region 8, while those in Region 10 averaged 121 kg/week, ranging from 8 kg/week in Malaybalay, Bukidnon to 1,400 kg/week in Cagayan de Oro. Most wholesalers in Region 10 sourced lemongrass from Talakag, Bukidnon due to its proximity. Retailers purchased smaller quantities, averaging 5 kg/week, which were sold at Php 3–5 per bundle ("bugkos").

Table 3. Lemongrass key customers and their product requirements

Product Characteristics	Region 7				Region 8		Region 10					
	PROCESSOR		WHOLESALE-RETAILER		WHOLESALER-RETAILER		PROCESSOR		WHOLESALER-RETAILER		RETAILER	
	F	%	F	%	F	%	F	%	F	%	F	%
Species												
Cymbopogon citratus	2	100 %	9	100 %	7	100%			19	100 %	1	100 %
Cymbopogon flexuosus							1	100 %				
Volume per transaction (kg,packs)												
Average	75		9		9		60		121		5	
Minimum	50		5		5		30		8		5	
Maximum	100		20		15		100		1,400		5	
Quality/ Freshness of lemongrass												
Newly harvested	2	100 %					1	100 %				
Newly harvested & cleaned			9	100 %	7	100%			19	100 %	1	100 %
Air-dried												
Cleaned												

Table 4 summarizes the customer profiles and marketing practices of lemongrass enterprises in Region 7, Region 8, and Region 10. In Region 7, the processor in Calape, Bohol sources lemongrass from its own farm, eliminating the need for external procurement. In contrast, processors in Bogo, Cebu and Balingasag, Misamis Oriental procure lemongrass from local farmers and determine the buying price.

Payment practices vary across regions. The processor in Bogo operates on a cash basis, while the processor in Balingasag extends credit, with payment made after the processed products are sold. Wholesaler-retailers in both regions procure lemongrass weekly through trusted consolidators ("suki"), pay in cash upon delivery, and generally accept prices set by the consolidators, indicating supplier influence in price determination.

Retailers also purchase lemongrass weekly, collect it directly from suppliers, and pay in cash. Suppliers determine the selling price, while packaging

varies according to transaction volume, with sacks used for bulk deliveries and plastic bags for smaller retail purchases.

Table 4. Lemongrass key customers and their marketing practices

Product Characteristics	Region 7				Region 8		Region 10					
	PROCESSOR		WHOLESALER-RETAILER		WHOLESALER-RETAILER		PROCESSOR		WHOLESALER-RETAILER		RETAILER	
	F	%	F	%	F	%	F	%	F	%	F	%
Frequency of Procurement												
per week			9	100 %	7	100%			19	100%	1	100%
per month												
depends on the availability	1	100%					1	100%				
Mode of payment												
Cash	1	100%	9	100 %	7	100%			19	100%	1	100%
Credit							1	100%				
Manner of procurement												
Deliver	1	100%	9	100 %	7	100%	1	100%	19	100%		
Pick-up											1	100%
Packaging material												
Sack	1	100%	9		7	100%	1	100%	19	100%		
Plastic bag											1	100%
Who Decides on the Buying Price												
Supplier			9	100 %	7	100%			19	100%	1	100%
Me as buyer	1	100%					1	100%				
Negotiated												

1.2 Product and Payment Flows

This section presents the flows of how lemongrass moves from one stage to another in its supply chain. These flows are products, payments, and information. Each of these things is crucial in making sure lemongrass is delivered on time and performs well in the supply chain.

1.2.1 Product Flows

The lemongrass supply chain maps for Region 7, Region 8, and Region 10 illustrate the movement of products from producers to end markets and the relationships among key value chain actors (Figure 2).

In Region 7, four supply chains were identified. Two involve a farmer-processor in Calape, Bohol, who markets processed lemongrass products directly to consumers through online platforms and retail outlets. Another chain consists of wholesaler-retailers in Tagbilaran Public Market sourcing lemongrass from consolidators, although the upstream links could not be fully traced. The fourth chain involves the Arapal Livelihood Center in Bogo, Cebu, where farmers supply raw lemongrass to processors for packaging and distribution in Lapu-Lapu City.

In Region 8, three supply chains were documented. One resembles the market-based chain in Region 7, with wholesaler-retailers in Kananga Public Market and Tacloban City sourcing lemongrass from consolidators, although complete upstream mapping was constrained by limited access to producers and traders. Another chain is managed by Jose Rizal National High School in Dulag, Leyte, where processed products such as lemongrass juice and cookies are produced and marketed through local fairs and exhibitions.

The product flow of lemongrass across the three study regions shows that most products are marketed within the same areas where they are produced, with very little movement to other regions. Farmers generally sell fresh lemongrass to nearby processors, wholesalers, retailers, or directly to consumers through local markets, retail outlets, online platforms, and trade fairs. This indicates that the industry is largely driven by local supply and demand, with marketing activities centered within the production communities.

The limited movement of products across regions suggests that interregional trade is still underdeveloped. Most processors and traders prefer sourcing from nearby producers because it reduces transportation costs, ensures a steady supply of fresh raw materials, and allows for closer coordination with suppliers. As a result, the supply chains remain relatively short, and the benefits of expanding into larger regional or national markets have yet to be fully realized.

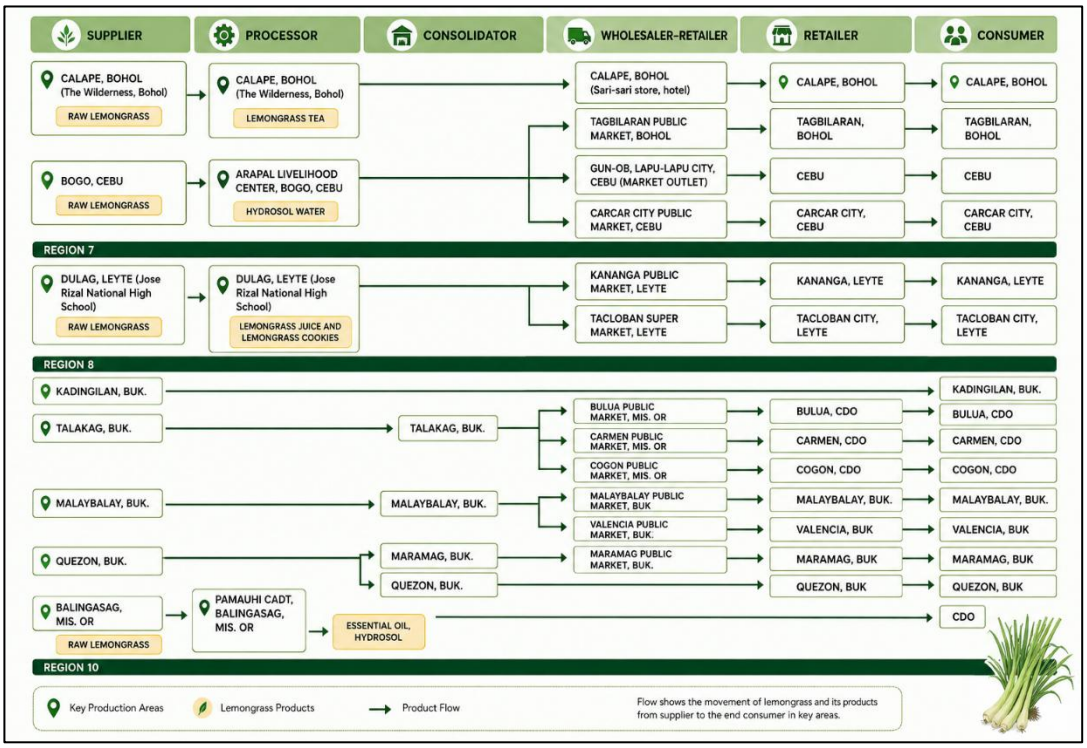

Figure 2. Geographical flow of lemongrass in Region 7, Region 8, and Region 10

1.2.2 Payment Flow

The supply chain 1 presented in Figure 3 starts with the farmer/processor from Calape, Bohol, who processes 50.00 kgs of raw lemongrass into tea. This player is the most unique among others since he possesses a dual role in the supply chain. In terms of estimated losses, 20 units or 40.00% of the raw lemongrass are lost during processing. Subsequently, a total of 20.00 kilograms of processed lemongrass is distributed through local retailers, becoming accessible to consumers at an affordable price of Php 69.00 for a dozen 2-gram packets. Retailers further market these lemongrass products at a price point of Php 119 per dozen or Php 15 per pack. Moreover, payment flow indicates that both the retailer and the consumer engage in cash transactions with the farmer/processor.

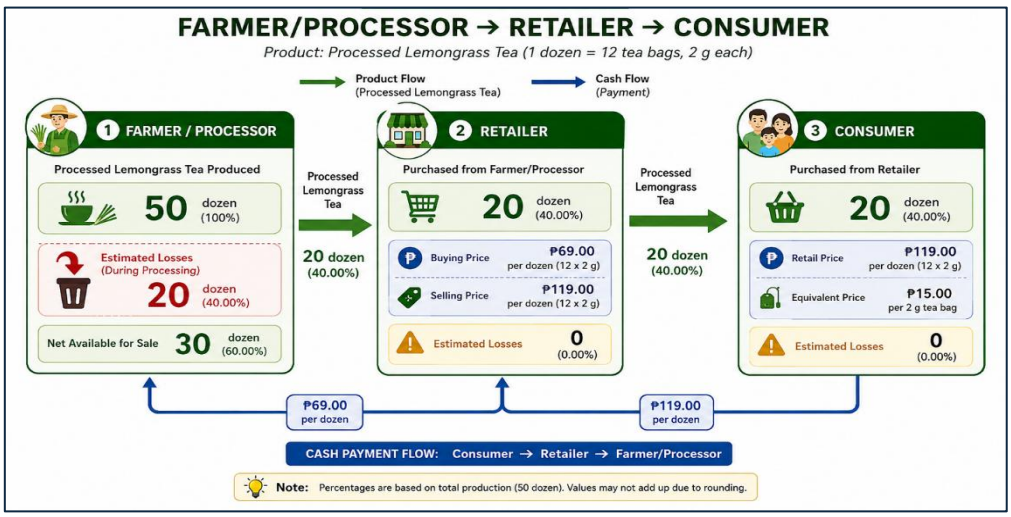

Figure 3. Product and Payment Flows of Supply Chain 1 in Region 7

The origin of the supply chain 2 (Figure 4) comes from the supply chain 1. The only difference is Supply Chain 2, the farmer/processor is directly connected to the consumer, omitting the involvement of retailers and paying the full retail price for those items. However, only 10 kilograms of processed lemongrass are made available

to consumers, representing 20% of the total processed product.

The buying price for the lemongrass tea in this chain is Php 129.00 for 25 pieces of 2-gram packets. In terms of payment flow, the Supply Chain 2 indicates a cash-based payment, with the producer/processor receiving payments directly from the consumer. This straightforward payment method could potentially offer advantages in terms of financial transparency and reduced complexity.

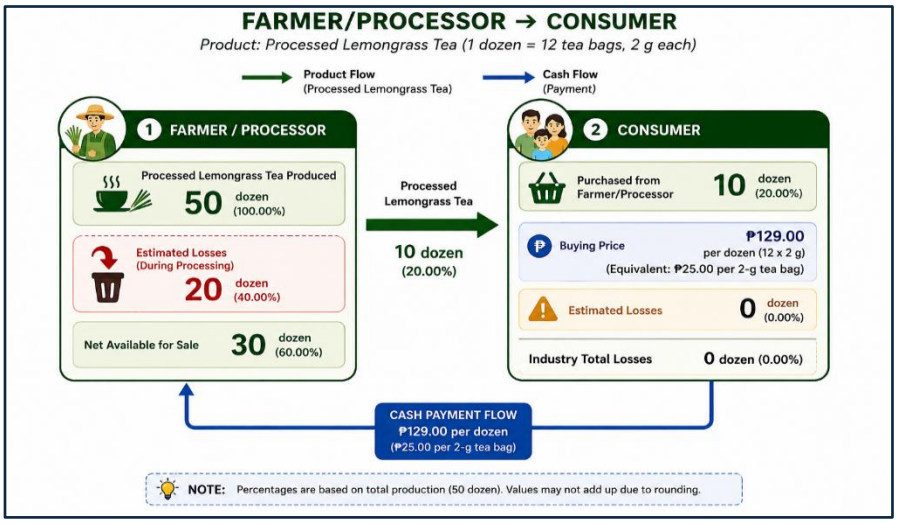

Figure 4. Product and Payment Flows of Supply Chain 2 in Region 7

Supply chain 3 presents the interaction between wholesalers, retailers, and consumers in two different areas, Tagbilaran, Bohol, and Carcar, Cebu in Region 7 (Figure 5). Moreover, the research team was not able to locate the producers which means the wholesaler-retailers in the region have no information on where the supplier procured the lemongrass. Hence, it is not appropriate to compare the efficiency of this chain with others that start from producers, as product losses could potentially begin at the farm level.

In terms of product flow, it's evident that there is a significant difference in the volume of raw lemongrass sold between Tagbilaran, Bohol and Carcar, Cebu. Cebu contributes to a majority (62.35%) of the total volume sold, while Bohol accounts for the remaining 37.65%. This suggests that Cebu has a stronger presence in the lemongrass market. The estimated losses in Bohol (15.63% of the volume) are relatively higher than Cebu (5.66%). This implies that there is low demand for raw lemongrass in the market. This low demand may be attributed to several factors, including the high price of the commodity. According to some traders, consumers preferred to grow lemongrass in their own backyards since it is easy to grow, rather than purchasing it from the market.

The average buying price for raw lemongrass in Region 7 accounts for Php 29 and the average selling price is Php 63. In terms of payment flow, consumers generally make cash payments directly to the wholesaler-retailer at the point of purchase. This cash transaction model is a common practice in retail, where consumers pay for their chosen products immediately, which facilitates a straightforward and immediate exchange of goods for money

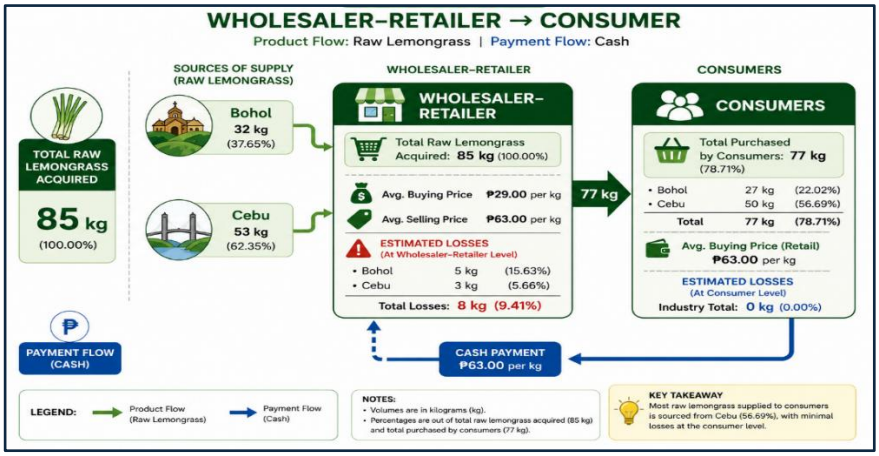

Figure 5. Product and Payment Flows of Supply Chain 3 in Region 7

Supply Chain 4 comprises four essential entities: the farmer, processor, retailer, and consumer (Figure 6). The farmer, located in Bogo, Cebu, sells a total of 100 kg of raw lemongrass products, which represents 95.24% of the produced quantity, at a price of Php 10 per kilogram. The ALC processor then transforms this raw lemongrass into hydrosol, yielding a total of 160 liters of hydrosol, which is subsequently packaged into bottles and gallons by the processor. The hydrosol is priced at Php 50.00 for a 200 ml unit and Php 600 for a gallon containing 4 liters. The ALC association showcases these hydrosol products at their market outlet in Gun-ob, Lapu-Lapu City, Cebu City, and occasionally features them in seasonal displays at the Provincial Capitol.

The payment flow section indicates that payments are made in cash and flow from consumer to retailer, retailer to processor, and processor to producer. This reflects the standard financial transactions that occur within a supply chain.

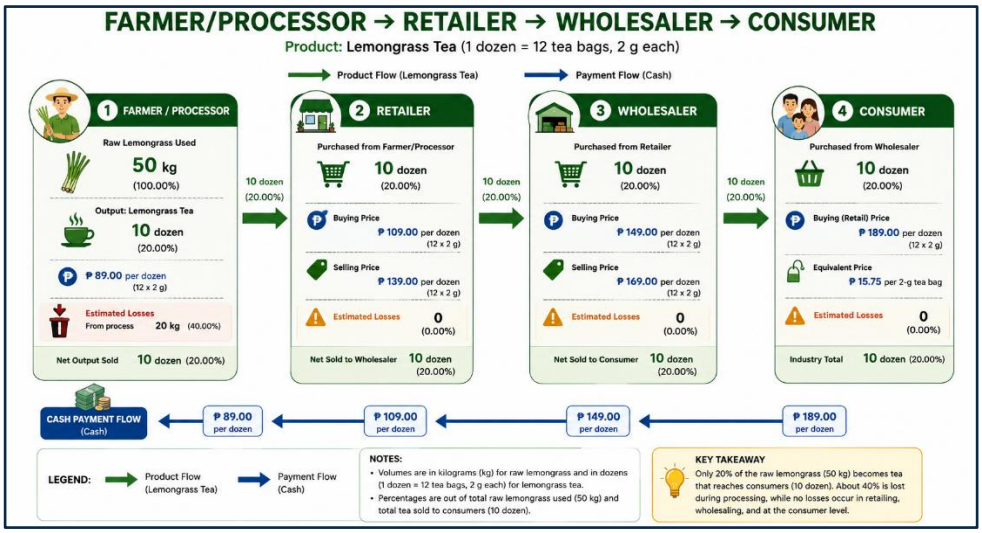

Figure 6. Product and Payment Flows of Supply Chain 4 in Region 7

In Region 8, Figure 7 illustrates supply chain 1, which commences with the farmer/processor at Jose Rizal National High School in Dulag, Leyte. The TLE initiative processes 50.00 kilograms of raw lemongrass, converting it into juice and cookies. The transformation of the raw lemongrass yields a total of 250 bottles of juice and 20 jars of cookies. The lemongrass juice is priced at Php 40.00 per 330 ml unit, while the cookies are priced at Php 70 per jar. Additionally, the Payment flow indicates that both the retailer and the consumer engage in cash transactions with the Producer/Processor.

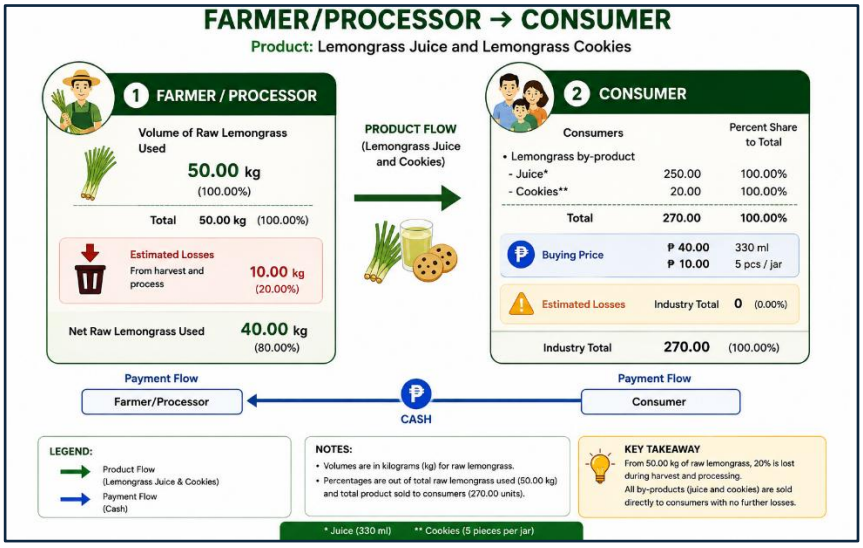

Figure 7. Product and Payment Flows of Supply Chain 1 in Region 8

Supply Chain 2 delineates the dynamic between wholesalers-retailers, and consumers across two distinct locales: Kananga and Tacloban City in Leyte, Region 8 (as depicted in Figure 8). Similar to SC3 of Region 7, the research team did not trace back to the farmers, leaving wholesaler-retailers unaware of the lemongrass's origin. In terms of product flow, Kananga contributes to a

majority (55.56%) of the total volume sold, while Tacloban City accounts for the remaining 44.44%.

The average buying price for raw lemongrass in Region 8 accounts for Php 20 and the average selling price is Php 30. In terms of payment flow, consumers generally make cash payments directly to the wholesaler-retailer at the point of purchase.

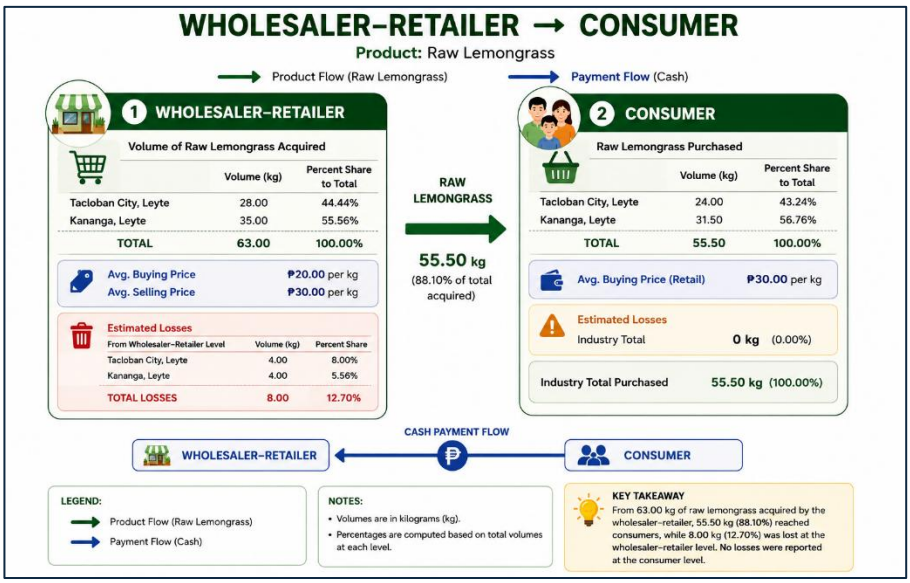

Figure 8. Product and Payment Flows of Supply Chain 2 in Region 8

In Region 10, five types of supply chains are identified. Supply chain 1 presented in Figure 9 involves two primary actors located in Kadingilan, Bukidnon: the farmer and the consumer. The producer supplies raw lemongrass, with a total volume of 81.00 kgs. However, the producer incurs a minimal loss of 1.23% during the production process. This suggests a relatively efficient production process with minimal waste.

The raw material is then transferred to the consumer (98.77%) such as lechon houses with a selling price of Php 20 per kilogram for further processing. This is considered the most concise and direct lemongrass supply chain identified in the region.

The payment flow section indicates that payments are made in cash, and the flow of funds moves from the consumer back to the producer. This arrangement highlights that the consumer pays the producer for the raw lemongrass received, demonstrating a standard payment practice within the supply chain.

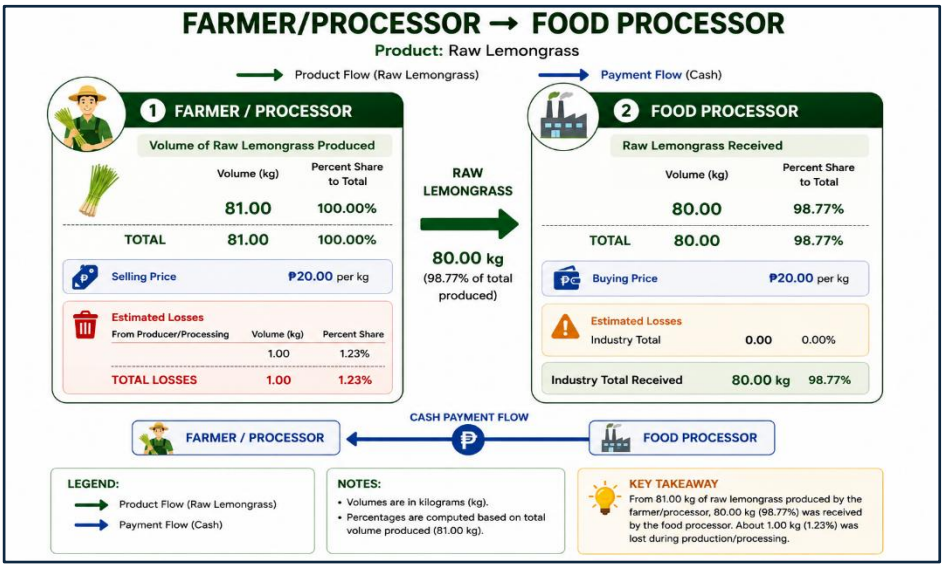

Figure 9. Product and Payment Flows of Supply Chain 1 in Region 10

Supply chain 2 in Region 10 identified a certain player who acts as middleman operating as a consolidator in the supply chain (Figure 10). These consolidators from Talakag, Bukidnon move the product from producers directly to the public markets in Cagayan de Oro where wholesaler-retailers are located.

Starting with the farmer, an initial production of 14,936 kilograms per month of raw lemongrass is collected and subsequently sold at an average rate of Php 10 per kilogram. A minor loss of 0.23% is experienced by wholesaler-retailers during lemongrass production, primarily attributed to factors such as damage incurred during harvesting and initial handling. The consolidator handles 97.04% of the overall volume, which is subsequently delivered and sold to wholesaler-retailers at an average price of Php 26 per kilogram.
Wholesaler retailers then offer lemongrass at an average wholesale price of Php 34 per kilogram and a retail price of Php 40 per kilogram. A 0.23% estimated loss incurred by the wholesaler-retailers due to the low demand for lemongrass in the market. A small portion, amounting to 50 kilograms, is sold by the retailer, with an estimated product loss of 10%.

Retailers acquire their lemongrass inventory from wholesaler-retailers in the market and subsequently resell it in bundles to end consumers, with prices ranging from Php 3 to Php 5 per bundle.
Further, the payment flow section reveals that transactions occur in cash, and the movement of funds goes from the consumer back to the farmer. It is noteworthy that the consolidator does not make immediate payments at the time of delivery; instead, they will settle their payment after completing the delivery of the lemongrass in the area within the same day.

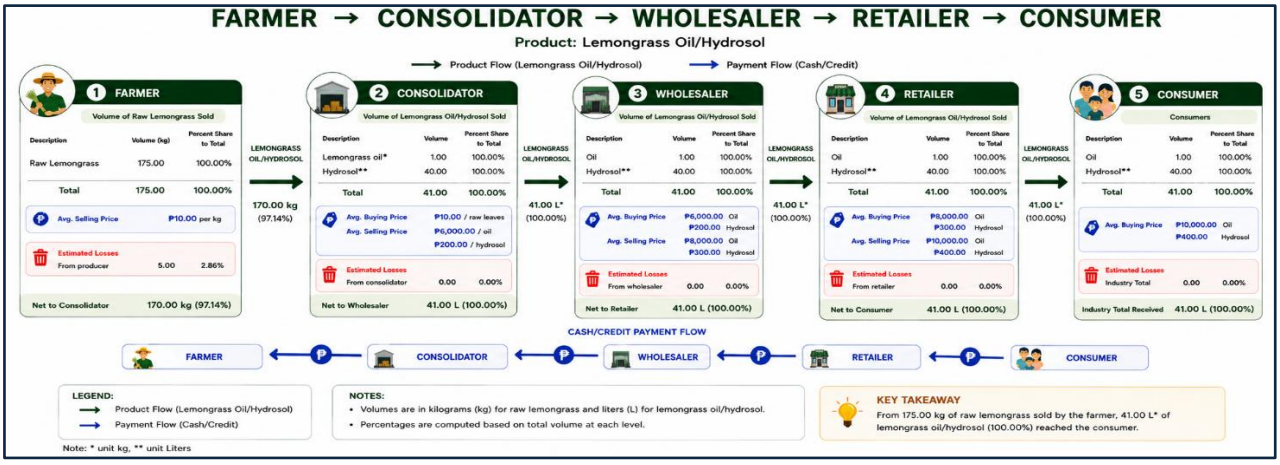

Figure 10. Product and Payment Flows of Supply Chain 2 in REGION 10

Figure 11 represents another observed supply chain in Region 10 (Supply Chain 3), where a consolidator acquires lemongrass directly from farmers and conveys it to wholesaler-retailers. In this chain, the food processors such as lechon houses and food chains would directly purchase lemongrass from wholesaler-retailers.

Beginning with the farmer, we observe that the volume of raw lemongrass sold is divided among different locations, including Talakag, Quezon, and Malaybalay, each with varying percentages of the total with an average selling price of Php 16 per kilogram. This distribution reflects the geographical reach and production capabilities of the farmer, with the majority of lemongrass coming from Talakag, accounting for 95.79% of the total volume. Quezon (0.65%) and Malaybalay (3.58%) contribute smaller percentages, indicating regional variations in production.
Additionally, the figure outlines estimated losses at different stages of the supply chain, with percentages indicating the extent of these losses. Talakag experiences significant losses at the producer level (as presented in Supply Chain 2). Quezon (4.90%) and Malaybalay (2.70%) also faces losses, especially at the production stage.

Moving through the supply chain, the consolidator handles a significant portion of the raw lemongrass from various locations (15,208 kgs). The percentages at this stage show a high level of consolidation, emphasizing the role of this intermediary in streamlining the distribution process. The transition to the wholesaler-retailer further centralizes the distribution, with a consistent 98.11% volume share for the location of CDO.

In terms of pricing dynamics, as the lemongrass reaches the wholesaler-retailer (average buying price at Php 23 per kilogram) and consumer stages (average buying price at Php 32 per kilogram), there is a notable increase in buying and selling prices, indicating added value and costs associated with processing and retailing.

The payment flow section highlights that transactions are conducted in cash, with payments flowing from the food processor back to the farmer. It's notable that the consolidator does not make immediate payments but rather settles their payment after completing the delivery of raw materials within the same day. This payment arrangement emphasizes trust and flexibility within the

business relationships, which is significant in supply chain operations.

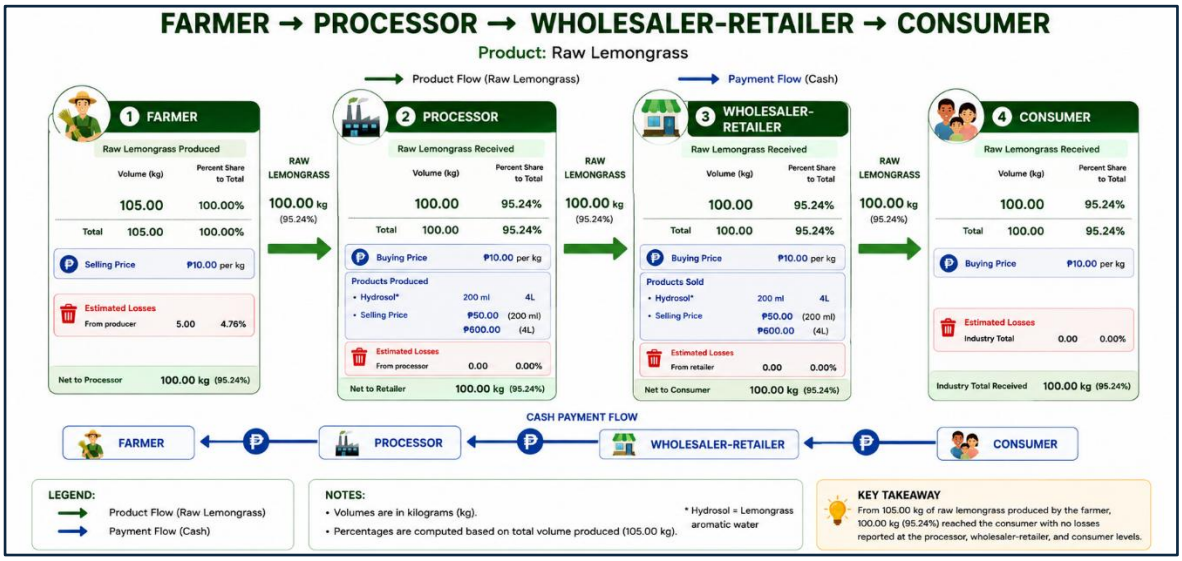

Figure 11. Product and Payment Flows of Supply Chain 3 in Region 10

The supply chain 4 presented in Figure 12 comprises three primary players: the farmer, consolidator, and food processor such as lechon houses and food chains, each playing a distinct role in the distribution process.

Commencing with the farmer, the volume of raw lemongrass sold is divided between two locations, Quezon and Malaybalay with an average selling price of Php 13 per kilogram. This distribution reflects the regional sources of raw lemongrass production. Malaybalay dominates the production with 84.47% of the total volume, while Quezon contributes the remaining 15.53%. This indicates the significant contribution of Malaybalay to the overall supply of raw lemongrass. An estimated loss of 4.90% in Quezon and 2.70% in Malaybalay is recorded in production during harvesting and product handling, while no losses are reported at the consolidator level.

As the lemongrass moves through the supply chain, the consolidator plays an important role in handling the product. A total of 14.29% of lemongrass is transported within the area of Quezon and Maramag since it is a neighboring municipality, while 85.71% is handled by a consolidator in Malaybalay. Subsequently, as it reaches the consumer, the consolidator elevates the selling price to Php 30 per kilogram, reflecting added value and processing costs. The payment flow section indicates that transactions are conducted in cash, with payments flowing from the farmer to the consolidator and further to the food processor. This straightforward cash payment process simplifies financial transactions within the supply chain.

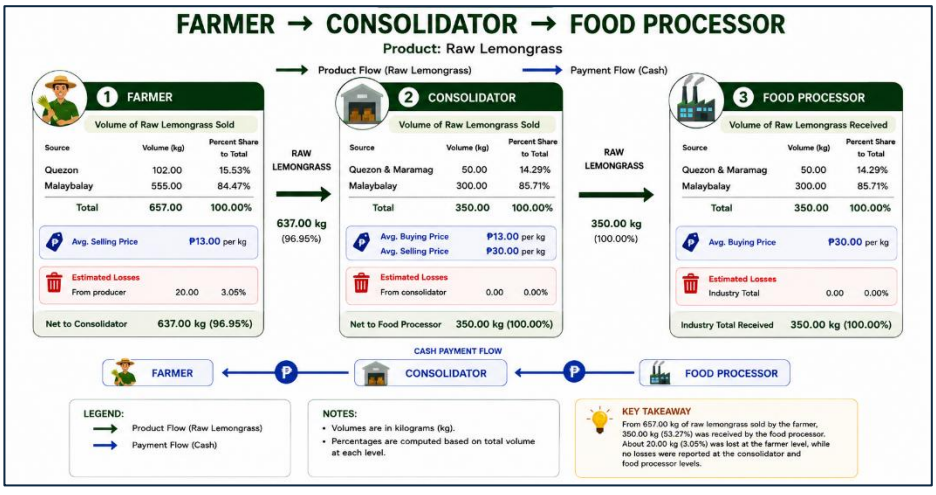

Figure 12. Product and Payment Flows of Supply Chain 4 in Region 10

Furthermore, the last supply chain (Supply Chain 5) involves farmers and processor from Misamis Oriental operating as an association (PAMALIHI CADT). In this setup, farmers vend their lemongrass to the association for subsequent processing. The association then processes the lemongrass into essential oil and hydrosol, packaging these products in bottles for sale to their end customers in Cagayan de Oro. Working as an association significantly aids the community in promoting and selling their product to consumers.

Starting with the producer, 175 kgs of raw lemongrass are sold at Php 10 per kilogram. This raw material is processed to produce two primary products: lemongrass oil and hydrosol. Lemongrass oil accounts for 1 kg, while hydrosol amounts to 40 liters. This data indicates that the producer is primarily engaged in the supply of raw lemongrass, which is subsequently processed into these two products. In contrast, lemongrass oil is sold at a significantly higher average price of Php 6,000.00 per kilogram, while hydrosol is sold at Php 200.00 liter. This significant price difference highlights the value added during the processing of raw lemongrass into higher-value products. The payment flow within this supply chain involves cash or credit transactions between the farmer and the processor. The association pays the farmer in cash if there is an available money intended for lemongrass production.

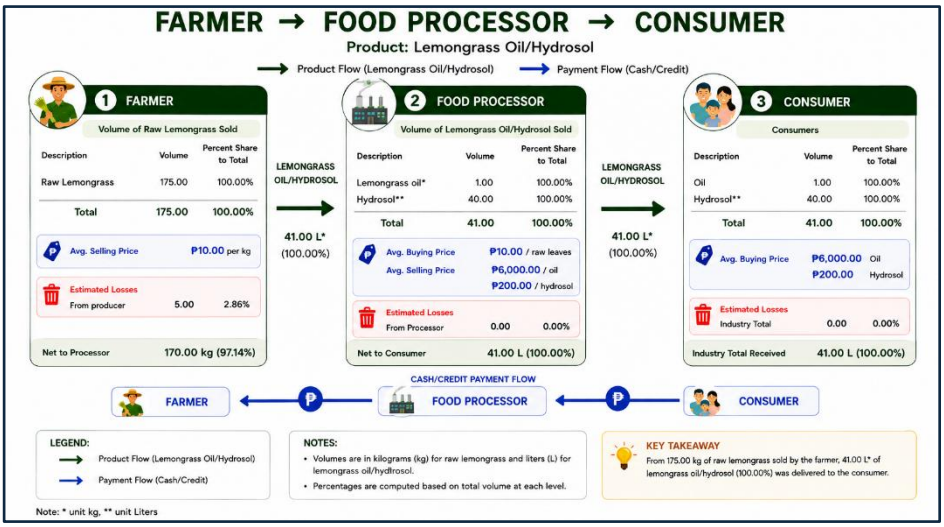

Figure 13. Product and Payment Flows of Supply Chain 5 in Region 10

The supply chains observed in Region 7 and Region 10 predominantly utilize a cash-based payment system. Consolidators settle payments for the lemongrass product once they have delivered it to the designated location. Additionally, the processor in Region 7 provides immediate payment if producers bring lemongrass to the area. However, it's worth noting that the processor in Misamis Oriental payment options is either in cash or credit, with payment made shortly after the processor sells the products.

1.2.3. Information Flow

Information plays a crucial role for all key players involved in the supply chain, serving as a vital tool for enhancing effectiveness and making valuable contributions to overall performance. The interactions among these key players are guided by information, ensuring optimized operations. Table 5 presents the information flow of the lemongrass supply chain in Region 7, Region 8, and Region 10.

Farmers, as the primary producers of lemongrass, solely depend on their personal experiences since they do not have proper training on how to cultivate lemongrass. Although planting materials are generally accessible in most parts of both regions, the lemongrass farmers of PAMALIHI CADT in Balingasag, Misamis Oriental, receive a distinct C. *flexousus* species from Indonesia through SAMDHANA Incorporated. Moreover, farmers have access to their own sourcing information, indicating a high level of information symmetry in this aspect. Moreover, it is the buyers (consolidators) who initiate contact with the farmers and negotiate for the supply. Processors have knowledge in sourcing lemongrass since farmers and processors were formed as an association. However, when it comes to wholesaler-retailers and retailers, they primarily depend on suppliers for sourcing information on lemongrass, as they may not have direct control or knowledge of the origin of the lemongrass they work with.

On the other hand, the pricing information for farmers is often determined by buyers (processors and consolidators), indicating a degree of information asymmetry. This creates a potential disadvantage in negotiations as they may not have full control over pricing. Despite consolidators and processors relying on demand for pricing information, they retain control over setting prices of the lemongrass product, whereas wholesaler-retailers and retailers lack the authority to make buying price decisions.

In terms of technical information, most of the farmers rely on their own experience, whereas farmers and processors that were formed as an association engaged with government or non-government agencies for technical support such as DOST, DTI, AMAD, LGU's, VSU-Tacloban, DepEd, and SAMDHANA Incorporated, while

some of the information are based on their research of the good benefits of lemongrass. Some players have technical information, which suggests a potential information advantage for those who possess it.

Table 5. Source of Information of Key Players along the Lemongrass Supply Chain in Region 7, 8, and 10

Kind of Information	Supply Chain Players				
	FARMER	PROCESSOR	CONSOLIDATOR	WHOLESALER-RETAILER	RETAILER
Sourcing of Lemongrass	-	Farmer, Owned	-	-	-
Pricing	Farmer, Processor, Consolidator	Own	Depends on the demand in the market	-	-
Marketing	Farmer, Processor, Consolidator	Own	-	-	-
Transporting	-	Own	Owned	-	Owned
Technical Information	Experience	Government agency, non-government agency, Owned	-	-	-

1.3 Key Players and their Roles

Lemongrass production in Region 6, Region 8, and Region 10 is made possible through different activities performed by the different key players (Table 7). The key players include the farmer, processor, farmer/processor, consolidator, wholesaler-retailer, retailer, government, and non-government agencies.

Farmers are responsible for the establishment and maintenance of lemongrass farms employing different cultural practices. They are the ones who harvest and sort the harvested lemongrass. Moreover, farmers sell their lemongrass which would be ready for pick up by consolidators or personally delivered to processors. Some farmers of both Region 7 and Region 10 deliver their harvested lemongrass directly to processors.

The processors procure the lemongrass from farmers to process it into essential oil and hydrosol. These by-products of lemongrass could be used in medicine and cosmetics. The processors are also responsible for the marketing of the product to direct consumers. On the other hand, food processors refer to intermediate user of lemongrass as part of ingredients in food preparation of roasted chicken and pig, restaurant, etc.

Farmer/Processor role encompasses a multifaceted responsibility, which includes not only the cultivation and maintenance of the lemongrass farm but also extends to the processing of lemongrass into various by-products (lemongrass juice and cookies). Their responsibilities encompass the establishment and upkeep of lemongrass farm, which involve various cultural activities like sourcing of planting materials, land preparation, replanting, farm maintenance, and implemention of other production practices. Additionally, they undertake the crucial task of marketing these products through diverse channels such as online platforms, trade fairs, and exhibits. This multifaceted approach underscores their integral role in the entire value chain of lemongrass production, from cultivation to marketing.

On the other hand, the consolidators are the ones who search for lemongrass farms. They play an important role in transactions and distribution of lemongrass to wholesaler-retailers and food processors such as lechon houses, restaurants, etc. Consolidators also play the role of price, market information, and logistics provider to farmers as observed in R7 and Region 10.

Wholesaler-retailers are the other players who procure lemongrass to consolidators and sell it to retailers or food processors. However, retailers sell their lemongrass to direct consumers and pick up the product from a wholesaler-retailer.

In addition, government and non-government agencies also plays an important role in the lemongrass industry. In Region 7, the Arapal Livelihood Center, a non-governmental organization, collaborates with the Agribusiness and Marketing Assistance Division R7 (AMAD) to provide support to local farmers. They aim to educate the community about lemongrass farming and its associated benefits. Moreover, in collaboration with the Department of Science and Technology R8 (DOST) and Visayas State University – Tacloban, Jose Rizal National High School TLE teachers are being assisted in acquiring shared service facilities for the production of lemongrass juice and cookies. This partnership aims to provide modern equipment to enhance the processing capabilities of the teachers, thereby enabling them to impart practical knowledge and skills to their students effectively. Through this initiative, the school is not only advancing its educational offerings but also fostering innovation and entrepreneurship within the local community. The Department of Trade and Industry REGION 10 (DTI), a government agency, and SAMDHANA Inc., a private organization, are both offering support services to the PAMALIHI CADT processor. This assistance includes helping them obtain a distillation facility and packaging

materials through the shared service facility program in REGION 10. SAMDHANA Inc. facilitated the introduction of the lemongrass processing to the association

Table 6. Lemongrass key players and their roles in Region 7, 8, and 10			
Players/Roles	**Region 7**	**Region 8**	**Region 10**
Farmer			
Producer of lemongrass	✓		✓
Farm maintener	✓	✓	✓
Seller of the raw lemongrass	✓		✓
Processor/Food Processor			
Quality controller	✓	✓	✓
Seller of lemongrass oil	✓		✓
Processed the raw lemongrass	✓	✓	✓
Farmer/Processor			
Harvest and sort the raw lemongrass	✓	✓	
Processed raw lemongrass into by-products (tea, juice, and cookies)	✓	✓	
Sells the lemongrass by-products	✓	✓	
Consolidator			
Collector of raw lemongrass from individual farmers			✓
Purchaser of raw lemongrass	✓		✓
Carrier of raw lemongrass to market	✓		✓
Wholesaler-retailer			
Seller of raw lemongrass to retailers and consumers	✓	✓	✓
Retailer			
Purchaser of raw lemongrass			✓
Government (LGU's, DTI, AMAD, DepEd, VSU-Tacloban), NGO'S (SAMDHANA, ALC)			
Information provider on lemongrass processing	✓	✓	✓
Information provider to processors on product handling	✓	✓	
Information provider on farm implements and supplies	✓	✓	✓

1.4 Activities and Services along the Supply Chain

The lemongrass supply chain involves three major activities: production, processing, and retailing (Table 7). Lemongrass is utilized for both food and non-food products, including essential oil, hydrosol, tea, juice, cookies, and fresh culinary ingredients.

Production. Lemongrass is propagated mainly through suckers and cultivated in well-drained tropical environments. Land preparation includes clearing, plowing, and planting at a spacing of 0.60 × 0.60 m. Plantations remain productive for 5–6 years with proper management. Farmers predominantly apply organic fertilizers such as chicken and goat manure, while some in Region 10 use synthetic fertilizer (14-14-14) to accelerate growth. Weed control is critical during the first 3–4 months after planting, and pest management is primarily based on field monitoring and removal of infected plants.

The first harvest is conducted about six months after planting, with each hill producing approximately 2 kg per harvest and allowing up to three harvests annually.

Processing. Major value-added products include essential oil, hydrosol, tea, juice, and cookies. Fresh lemongrass is harvested in the morning to maintain quality. For essential oil and hydrosol production, processors purchase fresh leaves at approximately Php 10/kg and process them through steam distillation using either fresh or air-dried leaves. Distillation typically requires 2–6 hours and produces an oil recovery of about 0.6–1%, depending on raw material quality and growing conditions. Tea production involves cleaning, sun-drying, grinding, sieving, and packaging the dried leaves into 2-g tea bags. Juice production consists of sorting, washing, sanitizing, extracting lemongrass floral water, pasteurization, and bottling, with each batch yielding approximately 20 L or 250 bottles (330 mL each).

Retailing. Fresh lemongrass is marketed by consolidators, wholesaler-retailers, retailers, and food processors. Consolidators procure produce directly from farmers, negotiate prices, and distribute it to public markets, restaurants, and other food establishments. Processed products are marketed through retail outlets, trade fairs, exhibitions, and other local marketing channels.

Table 7. Activities and Services along the Lemongrass Chain in Region 7, 8, and 10	
Activities	**Description**
Production	
	Land preparation and planting
	Maintenance (weeding)
	Harvesting of the raw lemongrass
Processing	
	Process lemongrass into oil, hydrosol, and other value-added products
	Product packaging and labelling
Retailing	
	Retail raw lemongrass in public market and food processor
	Product packaging and labelling

1.5 Critical Logistic Issues and Concerns

There are several logistics issues and concerns across Region 7, Region 8, and Region 10 related to the lemongrass industry from farmers, processors, and traders. These logistics issues include a lack of technical knowledge, lack of network for cellphone/ internet, poor road conditions, lack of operational facilities, high cost of wood fuel, and unsold products due to low demand (Table 9).

The majority of the lemongrass farmers in Region 7 (100%) and Region 10 (88%) claimed that they had no training about family farming and problems in production or lack of technical knowledge. The most reported issue is pest and disease infestation which affect the the production of lemongrass in supply chain operations in the lemongrass industry (Region 10). Due to their limited understanding of lemongrass pests and diseases, farmers often struggle to effectively combat these problems and tend to rely on methods derived from their personal experiences.

An additional concern pertains to the lack of cellphone and internet connectivity in certain lemongrass production areas in Region 10. It hinders effective communication, coordination, and the accessibility of crucial information for all players involved in the lemongrass supply chain. As a consequence of this limitation, farmers often find themselves dependent on scheduled visits by buyers as their primary means of interaction and information exchange. This dependency on physical visits can lead to delays, inefficiencies, and reduced flexibility in responding to market dynamics.

Poor road conditions from the farm to the nearest barangay road are also a problem in lemongrass production in R10 (52%). As a result, higher transportation costs due to poor market road burdens the farmers. Farmers often find it necessary to hire additional labor to assist in the transportation activity. This labor requirement stems from the need to overcome the logistical barriers posed by road conditions. Extra labor cost, which arises due to poor road conditions, can increase the operational expenses for farmers and affect the overall profitability of their lemongrass production activities.

Processors from R7 (50%), R8 (100%), and Region 10 (100%) have some issues in the processing of lemongrass in terms of lack of operational facilities such as building for processing area and air-drying facility. This lack of infrastructure results in delays in the production process and has a negative influence on the overall quality of the lemongrass products. Moreover, it can lead to difficulties in maintaining hygiene standards, quality control, and process efficiency.

In addition, the high cost of gasoline/wood fuel is a concern in the processors of R8 (100%) and REGION 10 (100%). In Region 8, the process of distilling raw lemongrass and pasteurizing it with other ingredients relies heavily on gasoline fuel. In effect, the increasing price of gasoline fuel in today's market pose a high cost to their production operations. In Region 10, processors rely on wood fuel, thus, takes up to several bundles of wood to process essential oil. Although the processing area is nearby forest and might seem like a readily accessible source of fuel, the government's prohibition against tree cutting hinders their ability to use this resource. Consequently, processors are left with the burden of procuring wood fuel through other means, which can be costly and environmentally unsustainable.

Furthermore, some of the wholesaler-retailers in R7 (25%), R8 (29%), and Region 10 (25%) have an issue on the wilting of their displayed lemongrass or unsold product due to the low demand in the market. Lemongrass, being a perishable product, is highly susceptible to deterioration if not sold quickly or adequately preserved. The wilting not only affects the quality and appearance of the product but also reduces its market value. Typically, the financial loss for unsold lemongrass falls on the wholesaler-retailers themselves. Suppliers often do not bear any obligation to compensate for unsold or wilted inventory since the transaction between them is done by the time that the wholesaler-retailer accepts the lemongrass product

Table 8. Critical Logistic Issues and Concerns of Lemongrass in Region 7, 8, and 10

Critical Logistic Issues/ Concerns	Region 7		Region 8		Region 10	
	F	%	F	%	F	%
Lack of technical knowledge	1	100%			78	88%
Lack of network for cellphone /internet					57	64%
Poor road condition					46	52%
Lack of operational facility	1	50%	1	100%	1	100%
High cost of gasoline/wood fuel			1	100%	1	100%
Unsold product due to low demand	4	25%	2	29%	5	25%
Note: Multiple response						

1.6 External Influences Affecting Supply Chain

The performance of the supply chain players is affected by certain factors such as extreme weather conditions, not enough market outlets, pests and diseases, price fluctuation, lack of financial capital, and lack of market prospects/outlets (Table 9).

Extreme weather conditions in Region 7 and Region 10 disrupt the flow of lemongrass production throughout the entire supply chain, accounting for 100% and 31% of the respondents, respectively. The extended periods of drought and rainy season damaged the crop resulting in loss of production. Furthermore, these adverse weather patterns have also led to a decrease in the overall volume of essential oil that can be extracted from the lemongrass plants.

Because there isn't enough market information, buyers have more power, and this leads to farmers getting lower prices. Farmers have to take what the buyers offer because they don't have enough information.

Moreover, the presence of pests and diseases in lemongrass cultivation is a prevalent concern in region Region 10, with 68% of respondents acknowledging this issue. These infestations pose a significant threat to the lemongrass crops, resulting in a cascade of negative consequences. They can lead to extensive damage to the plants, which, in turn, reduces overall crop yields and increases the costs associated with production. According to the farmers in Region 10, damages brought by particular larvae known as "ingag" or "batod" as well as issues related to leaf rust and white blight are common in this region. The team was unable to document this pest since the majority of the farms are located in remote areas of the community. These pest and disease problems not only cause direct harm to the lemongrass plants but can also require costly measures to mitigate their impact.

Additionally, it is observed that price fluctuations are a significant challenge in the supply chain of the lemongrass industry, affecting 52% of respondents in R7, 100% in R8, and 47% in Region 10. It can lead to unpredictable income for farmers and processors, making it challenging to allocate resources and invest in their operations.

Another external influence cited by the farmers and processors is the lack of financial capital in operations. A total of 50% of the respondents in Region 7 and 8% in Region 10 expressed concerns about a lack of financial capital. This issue can hinder investments in facilities by creating uncertainty and risk for investors, as they may be hesitant to commit resources to projects that could be impacted by the issue. Similarly, the adoption of new technology may be slowed down because farmers may be reluctant to invest in innovative solutions if there is uncertainty surrounding the issue such as market.

Furthermore, external influences such as lack of market prospects/outlets significantly affect the movement of products within the supply chain for both processors in Region 7, Region 8, and Region 10. This is particularly felt downstream of all processors in these regions. Limited distribution networks or market outlets and lack of partnerships with retailers hinder the accessibility of lemongrass products to potential consumers.

Community transfers represent an external factor influencing the chain's dynamics. For instance, in Region 8 at Jose Rizal National High School in Dulag, Leyte, there was an initiative to educate the local community on lemongrass processing, to create valuable by-products and provide livelihood opportunities. However, despite the school's efforts, the community exhibited reluctance to participate in this endeavor.

Finally, one of the enabling influences identified is the support of government and non-government organizations to lemongrass processor. This widens the opportunity available for commodity beyond selling it raw by enabling its use in various value-added products such as essential oils, herbal teas, culinary seasonings, and skincare formulations.

Table 9. External Influences Affecting Lemongrass Supply Chain in Region 7, 8, and 10

Influence	Region 7		Region 8		Region 10	
	F	%	F	%	F	%
Extreme weather condition	2	100%			28	31%
Not enough sources of information in the market	1	50%	1	100%	19	10%
Pest and diseases					68	76%
Price fluctuation			1	100%	47	52%
Lack of financial capital	1	50%			7	8%
Lack of market prospects/outlets	2	100%	1	100%	1	100%
Community transfer			1	100%		
Government and NGO support	1	50%	1	100%		
Note: Multiple response						

SUMMARY

The lemongrass industry in the Philippines, particularly in regions R7, R8, and Region 10, presents both opportunities and challenges. Lemongrass, with its diverse applications in culinary, essential oil extraction, and other value-added products, has seen concentrated farming in Region 10, particularly in Bukidnon, while smaller-scale farming for extra income is common in Region 7 and Region 8. However, there are challenges such as limited technical knowledge in pest and disease control, logistical issues, and market constraints.

Key players in the industry, including farmers, processors, consolidators, and retailers, each have distinct roles. Despite challenges, there are initiatives aimed at enhancing efficiency and resilience, such as improved processing techniques and collaboration between stakeholders and support organizations.

To transition into a developed state and tap into export potential, efforts must focus on enhancing production through collaborations, adoption of advanced technologies, and upgrading processing facilities. Market development, research into by-product utilization, and policy support are crucial for industry development. Collaboration among farmers' associations and financial support for farmers are also essential for meeting export volume demands.

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