

A Look at the Supply Chain Management of Citrus Wine in Nueva Vizcaya: The Citrus Capital of the Philippines

Duran, Edleya Graceille N., Bag-ay, Mysiadel S., Hilario, Mary Ann T., Aniwer, Andrian A., Favila, Vanessa Mylle B., and Dr. Harrison T. Villanueva

Saint Mary's University, Philippines

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ABSTRACT

This study aimed to document the supply chain management activities of citrus wine, the challenges faced by key players in the supply chain of Malabing Literacy Organization, Inc. (MALOI), and to provide recommendations for addressing these challenges. Using a qualitative descriptive design and a case study approach, the researchers found that effective fertilizer application, pest and disease control, and using quality seeds significantly enhance the value of citrus fruits. MALOI's citrus wine is crafted from an exclusive, all-natural recipe without chemical additives and adheres to fair trade and global market safety regulations. Processors handle bottling, corking, and labeling, utilizing freezers for citrus fruit storage and wine racks for the finished products. Middlemen deliver the wines using Capitol's service car or minibuses, distributing to sub-consignment stores, government entities, and directly to clients in the Bayombong, Kasibu, and Solano areas. Promotion occurs through Facebook, referrals, and trade events. Currently, the primary challenge for key players is the fermentation process of citrus wine, which is exacerbated by a lack of cooperation among members in various supply chain aspects. The researchers emphasize the importance of fostering teamwork and a positive work environment, along with thoroughly examining fermentation conditions to enhance the production of high-quality citrus wines for the market.

Keywords: citrus, citrus wine, farming, marketing, processing, testing, packaging, warehousing, transportation, distribution, supply chain management (SCM)

INTRODUCTION

A supply chain is a collection of individuals and enterprises responsible for generating and delivering a product to the consumer (Hayes, 2022). Supply chain management oversees the entire manufacturing process of a product or service, from the procurement of raw materials to the delivery of finished goods to clients. A company establishes a network of suppliers (or "links" in the chain) to transmit products from raw material suppliers to firms that interact directly with customers (IBM, 2019). Supply chain management systems aim to minimize costs, waste, and manufacturing cycle time (IBM, 2019). The supply chain encompasses every step necessary to deliver a finished commodity or service to the consumer. Once the raw materials are sourced, processed, and transported, the final items may be delivered to clients at a distribution facility or retail site. The supply chain includes various businesses, such as producers, vendors, warehouses, transportation companies, distribution hubs, and retailers (Hayes, 2022).

Producing crops for food and fiber is the area of agriculture to which this discussion relates. Many farmers worldwide regularly use this science to manage their crops better. This process involves thoroughly understanding all the resources needed to care for and grow crops. To boost our food production through better crop management, this particular field of study teaches us how to farm more effectively (Collegedunia Team, 2022). The variables affecting crop production include preparing the soil, planting seeds, irrigation, and the application of insecticides, fertilizers, and manure. Crop harvesting and storage are carried out with the utmost care to prevent unintended crop loss (Collegedunia Team, 2022).

According to Mason-D'Croz (2019), a shift toward healthier and more sustainable diets must include increasing the intake of fruits and vegetables. This would necessitate various investments and interventions

emphasizing the boosting of fruit and vegetable production, creating technologies and methods to reduce waste without raising consumer costs, and stepping up current initiatives to inform consumers about healthy eating. One of gardening's most satisfying aspects is gathering fresh fruit that you have cultivated. Tasting the fruit that has just been plucked from the tree or gathering a platter of fresh produce for your family to eat brings straightforward joy. To enjoy your fruits in optimal condition, you must understand when to harvest them (Trees.com Staff, 2021). Crivelli (2019) stated that three different harvesting techniques are used to gather fruits and vegetables: manual, hand-tooled, and machine-assisted. It is significant to note that there can be considerable overlap, making it challenging to classify the various types of harvesting.

Citrus is a group of fruit species that contain an outstanding list of essential nutrients, are highly diverse in many ways, and have been utilized since ancient times to prevent and cure many diseases of the human body. Citrus has a higher concentration of flavonoids, terpenes, phytonutrients, phenolic compounds, vitamin C, carotenoids, and bioactive chemicals (Ahmed & Azmat, 2019). Citrus fruits such as oranges, grapefruits, lemons, limes, tangerines, and mandarins are among the most popular fruits grown worldwide, with output increasing yearly due to rising consumer demand (Khan et al., 2021). Citrus is the world's most economically important fruit crop (Abouzar & Nafiseh, 2016). Apart from physical characteristics and dietary components, fruit quality in citrus includes several other aspects intimately related to human health (Abouzar & Nafiseh, 2016).

According to Inglese and Sortino (2019), citrus spread from Southeast Asia's original tropical and subtropical regions to the Mediterranean countries of Europe and North Africa, and after 1492, to the Americas, including South Africa and Australia, where they continue to play an important role. Citrus species have quickly become the protagonists of literature, art, markets, and gastronomy. They can even be found in religious ceremonies, such as the Feast of Tabernacles (Sukkot).

Nueva Vizcaya, the homeland of the Isinays in the Philippines, is located in the north-central region of the island of Luzon, in Region 2. It is often called the gateway to the vast Cagayan Valley Region. It is bounded to the north by Ifugao, to the northeast by Isabela, to the east by Quirino, to the west by Benguet, and to the south by Nueva Ecija. Only a few prominent mountain ranges surround it, including the Sierra Madre to the east, Caraballo to the south, and Cordillera to the west. The province has several major rivers, including the Magat, Matuno, Marang, Santa Fe, and Santa Cruz. Given its location within the watersheds of the Caraballo and Cordillera Mountain ranges and its distinction as the region's primary producer of fruits and vegetables, Nueva Vizcaya is hailed as a "Watershed Haven and Agro-Forestry" (Nueva Vizcaya | RDC2, n.d.).

The province's economy is primarily agricultural, with trade, industry, and commerce all playing important roles in its growth and development. Raising cattle, pigs, and other livestock is one of the main economic activities. Both palm and corn are major crops, while vegetables, fruits, and root crops are considered minor crops. Many of the vegetables and onions sold in Metro Manila come from this area. A major crop now shipped fresh to Asian nations is oranges, followed by mangoes. Kasibu citrus producers from Nueva Vizcaya stand to make good money. They produce Parante, seedless Satsuma, Honeydew, oranges, red Chandler pomelo, sweet ponkan, and other citrus varieties.

The citrus sector in Kasibu is an important economic driver for the municipality (Antonio et al., 2011). It is a promising industry with gaps in the supply chain that can be filled. Satsuma, also known as "satsuma mandarin," has the highest value addition for traders and is second only to ponkan regarding value addition for farmers. Each player in Kasibu's citrus value chain can improve their performance by implementing supply chain management strategies that benefit the entire chain rather than just a few players, in terms of production capacity, variety mix, market reach expansion, active information exchange, and alliance formation (Antonio et al., 2011).

Fruits are placed in large wooden or plastic containers, and traders and farmer-traders in Solano, particularly at the MVAT Center, are immediately brought there in jeepneys. The majority of the produce provided for sale to wholesalers is purchased by traders, farmer-traders, and MVMPC in places other than Nueva Vizcaya, such as Baguio, Tarlac, Pampanga, Divisoria, Quezon City, and Cagayan (Antonio et al., 2011).

In the Malabing Valley in the Municipality of Kasibu, where citrus is abundant, Padilla stated that the citrus sector has benefited the standard of living for farmers and provided employment opportunities, continuing to make Nueva Vizcaya the region's citrus capital. Nueva Vizcaya also manufactures processed citrus goods such as wine, cider, soap, and spreads. Due to the Malabing Valley, 5-7 barangays feature citrus plantings (Gutierrez, 2018). Farmers in the Kasibu area have requested financial support from local government organizations to establish their projected citrus wine-processing enterprise. The DOLE visited the operation's proponents in Barangay Malabing in the Kasibu area to explore and further investigate the citrus growers' wine production project, according to Engineer Henry Balangatan, district head of the DOLE. "There is a chance that Kasibu's citrus wine-processing enterprise may receive financial support," he claimed. By accepting funds and technological training in this manner, the project's supporters could benefit more from it. According to Balangatan, the initiative is a substitute plan to deal with the excess supply of citrus fruits during peak season (GOVPH, 2022).

At least 15 women from the villages of Solano recently received wine processing and production training. According to Mayor Eufemia Dacayo (DTI), the trainees acquired their skills through the recently built Fruit Processing and Development Center Shared Service Facility (FPDCS-SSF) project of the LGU and the Department of Trade and Industry. The training was offered and financed by the national government's "Balik-Probinsiya, Bagong Pag-asa" program. According to Henry Conel Jr., the DTI provincial director, the project aims to develop the industry by building a food processing facility that ensures the quality and market potential of commodities, thereby increasing sales. The trainees were tutored by women winemakers Mary Culhi and Mary Dulnuan from the Malabing Literacy Organization, Inc. (MALOI), an SSF cooperator with headquarters in the highland town of Kasibu. MALOI has been making wine since the Citrus Processing SSF was originally founded by the DTI and LGU in the municipality in 2013 (Ebreo, 2021).

A women's organization called Malabing Literacy Organization, Inc. (MALOI) in Malabing, Kasibu, was founded in 2013 and is currently headed by Mrs. Fe Banay. Members of the organization are responsible for processing various citrus fruits to produce citrus wine. Satsuma and passion fruit wines make up the majority of their offerings.

The study will benefit the Malabing Literacy Organization, Inc. (MALOI) and firms that produce citrus wine, including key supply chain management players, by allowing them to identify citrus wine supply chain management activities as well as challenges, increasing their knowledge and sharpening their ability to use supply chain management efficiently and apply the recommendations to improve their activities and address the challenges.

Given that there are few studies and literature on the supply chain management of citrus fruit products, the researchers aim to document the supply chain management activities and challenges of key players in the supply chain of Malabing Literacy Organization, Inc. (MALOI).

METHODOLOGY

The study employed a qualitative descriptive design using a case study approach to document the supply chain management activities of citrus wine in Kasibu, Nueva Vizcaya. Key informants, including citrus farmers, processors, middlemen, and end customers associated with the Malabing Literacy Organization Inc. (MALOI), were interviewed to identify their supply chain activities, challenges, and recommendations for improvement. A total of 14 key informants participated, comprising two farmers, two processors, two middlemen, three major customers, and one representative each from various government agencies, including the Department of Agrarian Reform (DAR), Office of the Provincial Agriculture (OPAG), Department of Science and Technology (DOST), Provincial Cooperative and Enterprise Development Office (PCEDO), and Department of Trade and Industry (DTI). During the interviews, relevant documents, such as the operations manual, were requested, and photo documentation was conducted to support the informants' responses. The data collected were transcribed and analyzed in consultation with the University Research Director to ensure accurate interpretation.

RESULTS AND DISCUSSION

Section 1. Supply chain management activities of citrus wine produced by Malabing Literacy Organization, Inc. (MALOI)

According to Routroy and Behera (2017), the essential supply chain activities—which occur via the various processes' upstream and downstream connections and actions taken in the making and providing of a good or service in the hand of the final consumer—include farming, processing, testing, packaging, warehousing, transportation, distribution, and marketing.

Farming

Farming encompasses a wide range of agricultural activities, including raising livestock, planting seeds, cultivating crops, and growing edible plants. Within this context, citrus farming involves several critical steps: preparing the land, purchasing seedlings, determining optimal seed spacing, digging the soil, planting citrus seeds, applying fertilizers, watering, spraying pesticides, budding, and nurturing the plants until they bear fruit. Farmers in the region typically cultivate varieties such as navel oranges, ponkan, mandarin, and seedless satsuma, primarily sourcing their seedlings from the Malabing Valley Multipurpose Cooperative (MVMPC) nursery. According to the farmers, black soil or clay loam enriched with fertilizers provides the best conditions for citrus growth, with optimal planting occurring from May to June, coinciding with the onset of the wet season.

Citrus trees generally take 3 to 5 years to mature and can live for over 30 years with proper care. To safeguard against plant diseases, farmers regularly apply pesticides, fungicides, and fertilizers, while also prioritizing the use of high-quality seeds and soil. In recent years, many citrus farmers have adopted both organic and conventional farming practices. Traditionally, citrus is harvested between June and October; however, this timeframe has occasionally shifted to July through December due to the impacts of climate change. A well-maintained citrus tree can yield an average of 15-20 kg of fruit per season, with potential harvests reaching up to 40 kg under optimal conditions, as reported by the farmers.

Processing

Processing encompasses a wide range of activities that improve, maintain, or modify the physical or chemical properties of a substance, ultimately adding value. In the context of citrus wine production, processing involves a series of carefully orchestrated steps. First, the citrus fruits, primarily satsuma and passion fruit varieties, are peeled and sliced. The fruit is then squeezed to extract the juice, which serves as the foundation for the wine. The extracted juice undergoes fermentation, a crucial step that transforms the sugars into alcohol. Following fermentation, the wine is clarified to remove any sediment or impurities, ensuring a clear and refined final product. The last stages of citrus wine processing involve bottling the wine and allowing it to age, developing its unique flavor profile and aroma. Throughout this process, the processors meticulously monitor and control the various parameters to ensure the production of high-quality, consistent citrus wines that meet the expectations of discerning consumers.

The primary ingredients used by citrus wine processors are citrus fruits, particularly satsuma and passion fruit varieties, along with yeast and sugar. The role of yeast in winemaking is crucial, as these microorganisms possess the ability to convert the sugars present in the fruit juice into alcohol through fermentation. This process typically takes around three weeks to complete. To stabilize the wine and prevent re-fermentation, processors add additional sugar to sweeten the final product.

As Middleman 2 explains, the process of transferring the wine from one vessel to another, known as racking, serves to remove any sediment that may have accumulated during fermentation. This step, combined with filtering, significantly impacts the color of the citrus wine, transforming it into a clear, white wine. Finally, the wine is aged in a carboy (a large glass or plastic bottle) before being transferred into individual bottles for further maturation. This aging process allows the wine to develop its unique flavor profile and aroma, enhancing the overall quality and enjoyment of the final product.

Testing

Testing is essential for ensuring compliance with quality standards as outlined by FDA recommendations. In the context of citrus wine production, testing involves a comprehensive analysis of several key parameters, including acidity levels, sweetness levels, alcohol content, methanol concentration, and overall chemical composition. Processors must also ensure adherence to good manufacturing practices (GMP), as well as comply with mandatory labeling and packaging requirements, and obtain the necessary permits, clearances, and certifications for production.

Citrus wine processors emphasize the importance of accurately measuring acidity, sweetness, and alcohol content, while also monitoring methanol levels to ensure they fall within acceptable limits for fruit wines. The chemical composition is thoroughly tested to guarantee product quality. To maintain consistency and uniformity, processors utilize specialized measuring devices during testing. Additionally, the DOST-Nueva Vizcaya office plays a crucial role in ensuring that citrus wines meet GMP standards by enforcing strict cleanliness and organizational protocols in all areas of the facility, including the production floor, wine laboratory, and ventilation systems. This rigorous approach to testing and quality assurance helps to uphold the integrity of citrus wine products.

Packaging

Packaging serves as the protective covering for consumer products, enhancing their appeal by confining, identifying, classifying, and advertising while keeping them clean. In the context of citrus wine, packaging activities primarily involve bottling, corking, and labeling. Citrus wine processors typically engage in these essential steps to ensure their products are presented attractively and securely.

For their packaging, MALOI utilizes long-neck wine bottles paired with custom-made sticker labels, which not only identify the product but also contribute to its marketability. The bottles are securely sealed with corks, ensuring the wine remains fresh and protected from contamination. This thoughtful approach to packaging not only preserves the quality of the citrus wine but also enhances its visual appeal, making it more desirable to consumers. By focusing on both functionality and aesthetics in their packaging, processors can effectively promote their citrus wines in a competitive market.

Warehousing

Warehousing involves the storage of physical items prior to sale or distribution. In the context of citrus wine production, the organization utilizes a warehouse that includes a freezer for storing citrus fruits and a wine rack for finished products.

Processors indicate that because citrus fruits are seasonal, they do not typically store them for long periods. Instead, they convert the harvested fruit into wine immediately. However, when essential ingredients, such as yeast, are unavailable or in short supply, the citrus fruits may be temporarily stored in the freezer. Once the wine is produced, it is placed on wine racks until purchased by customers. To maintain the quality of the wine, bottles are stored horizontally, ensuring that the cork remains moist to prevent drying out and cracking. For any long-term storage, it is crucial to keep the wines in a secure environment, and investing in a proper wine rack is essential for safe and effective storage. This approach not only preserves the integrity of the wine but also facilitates efficient inventory management.

Transportation

Transportation involves the use of vehicles and arrangements to carry or deliver goods from one location to another, ensuring that products reach the end user safely and efficiently. In the case of citrus wine, transportation includes carefully packaging the products in boxes, arranging them securely within the vehicle, and utilizing appropriate transport methods, such as the Capitol service car or public transit options like minibuses and pickup trucks.

According to the middlemen, citrus wines are often transported from Kasibu to Bayombong using these various modes of transport. To maintain the quality of the wine during transit, they take special care to arrange the bottles properly and may use an electric fan or air conditioning to prevent evaporation. The middlemen emphasize that, given the high quality of the wine, it is essential to store it in a cool, dry place, away from heat and direct sunlight, to preserve its integrity throughout the transportation process. This meticulous approach ensures that the citrus wine arrives at its destination in optimal condition, ready for sale to customers.

Distribution

Distribution refers to the process of making goods widely available in the market, allowing a broad audience to purchase them. In the context of citrus wine, distribution activities encompass preparing and fulfilling orders received via Messenger or SMS, as well as delivering products to sub-consignment stores and government agencies.

Citrus wine distribution includes efficiently preparing and dispatching orders to customers in Kasibu, Bayombong, and Solano, along with supplying government agencies such as the Department of Trade and Industry (DTI), the Department of Science and Technology (DOST), and the Department of Agrarian Reform (DAR). While buyers typically bear the cost of shipping, the One Town, One Product (OTOP) initiative occasionally waives shipping fees when deliveries are made within the same areas served by the Capitol vehicle. This flexible approach helps ensure that citrus wines are readily accessible to customers while optimizing distribution efficiency.

Marketing

Marketing encompasses the promotion of products or services, understanding customer needs, and fostering relationships with consumers. For citrus wine middlemen, marketing activities include leveraging social media platforms like Facebook and utilizing online shopping sites such as Shopee, which was launched by the DTI. Middleman 2 noted that they participate in annual trade fairs, where they conduct taste tests to engage potential customers. They also capitalize on festive occasions like Christmas, birthdays, and weddings to promote their products. Middleman 1 highlighted that referrals from family, friends, and loyal clients are key to their promotional strategies. To incentivize purchases, they occasionally offer discounts for bulk orders. Additionally, the Malabing Valley Multipurpose Cooperative (MVMPC) focuses on eye-catching packaging design to attract customers and ensure that all products comply with FDA labeling standards, emphasizing the unique attributes of their citrus wines.

The marketing approach of these middlemen combines traditional and digital strategies to enhance visibility and sales. By actively engaging with customers through social media and direct promotions, they create a strong brand presence. The use of taste tests at trade fairs not only showcases the quality of their citrus wines but also builds a personal connection with consumers. Furthermore, the emphasis on attractive packaging and compliance with regulatory standards not only enhances product appeal but also instills consumer confidence. This multifaceted marketing strategy enables the middlemen to effectively reach their target audience, foster loyalty, and ultimately drive sales in a competitive market.

Section 2. Challenges of key players in the supply chain of Malabing Literacy Organization, Inc. (MALOI)

Table 2.1

Farming-Related Challenges

Farming-related challenges of citrus farmers	Frequency (n=5)	Percentage
Pests and diseases like pink disease	4	80%

Extreme weather conditions	1	20%
Insufficient agricultural funds	1	20%
Fewer citrus farmers are working	2	50%
Decreasing harvest of citrus fruits	2	50%

Citrus farmers face significant challenges, as highlighted in Table 2.1. Approximately 80% of them struggle with pesticide-resistant pests and diseases, such as pink disease caused by the bacterium *Erythricium salmonicolor*, which can severely impact yield and quality. Additionally, 20% report that extreme weather conditions, exacerbated by climate change, lead to crop failures, while another 20% cite insufficient agricultural funding as a barrier to adopting new technologies. Furthermore, half of the farmers are not fully committed to citrus farming, with many opting for more lucrative jobs in mining, reflecting a broader decline in agricultural employment. This trend, coupled with a lack of care for aging citrus trees, has resulted in decreased harvests and a diminishing supply of citrus fruits, which can affect production, such as citrus wines.

Table 2.2

Processing-related challenges

Processing-related challenges of citrus wine processors	Frequency (n=4)	Percentage
Few members work at the winery	2	50%
Poor wine fermentation	2	50%
The majority of citrus wine processors are elderly	1	25%
Lacking wine processing expertise and training	1	25%

Table 2.2 outlines the challenges faced by citrus wine processors, with 50% of respondents noting a lack of active participation among winery staff, as many are preoccupied with other commitments, leading to inefficiencies. Additionally, 50% highlighted fermentation issues that result in poor-quality wine, often due to residual citrus residues turning into vinegar or exposure to heat, which can cause unpleasant acidity. Factors such as temperature and pH levels further complicate fermentation processes. Moreover, 25% of respondents indicated that most processors are elderly, with younger generations pursuing careers outside agriculture, making it difficult to attract new talent. Finally, another 25% reported a lack of expertise following the sudden death of a key processor, creating a "knowledge trap" that hinders the sharing of essential winemaking techniques.

Table 2.3

Testing-related Challenges

Testing-related challenges of citrus wine processors	Frequency (n=4)	Percentage
Problematic wine fermentation trials	2	50%
Lack of production manual	2	50%
Unfamiliarity with wine testing tools and equipment	1	25%

Table 2.3 highlights the challenges citrus wine processors face during testing, with 50% of issues arising from difficulties in perfecting the fermentation process. Processors are conducting multiple trials to identify the best methods for producing high-quality citrus wine, but the unpredictable nature of fermentation complicates this effort, often leading to problems that are only recognized after they occur. Additionally, 50% of respondents cited a lack of a production manual, which contributes to inconsistencies in winemaking and quality control. As noted by DOST-Nueva Vizcaya, without a standardized process, maintaining product quality becomes challenging. Furthermore, 25% of respondents reported difficulties in properly using testing equipment, such as alcohol content analyzers, due to insufficient training, which poses safety risks and can negatively impact both production and worker safety.

Table 2.4

Packaging-related Challenges

Packaging-related challenges of citrus wine processors	Frequency (n=3)	Percentage
Inability to bottle wines due to poor wine fermentation	2	66.67%
Delayed packaging of citrus wines	2	66.67%
Difficulties of clients in recalling their brand name and tagline	1	33.33%

Table 2.4 outlines the packaging challenges faced by citrus wine processors, with 66.67% of respondents citing poor fermentation leading to low-quality wine that cannot be bottled. Manufacturers often struggle to meet anticipated quality and production targets, which impacts the entire operation. Additionally, 66.67% of respondents mentioned delays in packaging due to a lack of wine bottles and corks, as suppliers are located far away, resulting in unpredictable replenishment times. Furthermore, 33.33% of respondents noted that clients have difficulty recalling their brand name and tagline, which may not be particularly appealing or memorable, making it challenging to stand out in a crowded market.

Table 2.5

Warehousing-related Challenges

Warehousing-related challenges of citrus wine processors	Frequency (n=2)	Percentage
Inadequate storage space	1	50%
Few tools and equipment are available for storing citrus wines	1	50%

Table 2.5 highlights the warehousing challenges faced by citrus wine processors, with inadequate storage space accounting for 50% of their issues. The processors reported that their winery lacks sufficient room to accommodate the necessary machinery for both citrus wine and fruit juice production, leading to cramped working conditions and disorganized equipment storage. According to Chalmers (2022), such space shortages can result in significant operational inefficiencies and unmet consumer demand. Additionally, another 50% of the challenges stem from limited tools and equipment; processors have only one freezer for storing citrus fruits and minimal space for finished products. As noted by AE (n.d.), a lack of appropriate tools can hinder employee performance and lead to inefficiencies, ultimately reducing profit potential.

Table 2.6

Transportation-related challenges

Transportation-related challenges of citrus wine middlemen	Frequency (n=2)	Percentage
MALOI (the supplier) does not have a personal car	2	100%
No direct contact with the MALOI president	1	50%

Table 2.6 reveals the transportation challenges faced by citrus wine middlemen, with 100% of issues stemming from their supplier MALOI's lack of a personal vehicle, which often leads to delayed deliveries, especially for urgent orders. Middleman 2 noted that without their own transportation, they must wait for the delivery person's next trip when stock is low, complicating timely order fulfillment. Additionally, 50% of middlemen reported difficulties due to the absence of direct communication with MALOI's president, making transactions and updates challenging. As highlighted by Simpplr (2023), poor communication and leadership can lead to confusion and frustration among staff, ultimately affecting performance.

Table 2.7

Distribution-related Challenges

Distribution-related challenges of citrus wine middlemen	Frequency (n=2)	Percentage
Difficulty in replacing wine bottles since these are delicate	1	50%
Difficulty in establishing an extensive customer base	2	100%

Table 2.7 outlines the distribution challenges faced by citrus wine middlemen, with 100% of their issues stemming from difficulties in establishing a broad customer base, as locals perceive the product as expensive. Middleman 2 noted that customers often opt for cheaper alternatives, like gin, which hampers the winery's efforts to attract and retain a positive image among consumers. Additionally, 50% of the challenges are attributed to the fragility of wine bottles, requiring careful handling during distribution. As Logmore (2022) explains, fragile products necessitate extra care during shipping, and middlemen aim to minimize the risk of breakage while transporting wines from one location to another.

Table 2.8

Marketing-related Challenges

Marketing-related challenges of citrus wine middlemen	Frequency (n=3)	Percentage
Citrus wine is perceived to be pricey by the mass market	2	66.67%
Limited signal and slow internet connection in Malabing	2	66.67%
Inability to provide free samples for a taste test	1	33.33%
MALOI is not active on Facebook	1	33.33%

Table 2.8 outlines the marketing challenges faced by citrus wine middlemen, with 66.67% of issues arising from the mass market's perception of citrus wine as expensive, typically priced around P300, which is similar to well-known brands. This perception affects their ability to establish a broad customer base, as many consumers prefer cheaper alternatives. Additionally, 66.67% of respondents noted that limited internet connectivity in Malabing hinders effective communication with the organization, leading to difficulties in marketing efforts. Furthermore, 33.33% of middlemen reported challenges in providing free samples for taste testing, as they often run out of stock, which can deter potential customers. Lastly, the inactivity of their supplier, MALOI, on social media limits their advertising reach, making it harder to compete with other wineries that are actively engaging in digital marketing strategies.

Section 3. Recommendations to address the challenges encountered by the key players in the supply chain management activities of citrus wine

Table 3.1

Recommendations for the Citrus Farming Activities

Recommendations for the citrus farming activities	Frequency (n=5)	Percentage
Proper care must be given to plants.	2	40%
Find new ways of farming citrus to increase productivity.	1	20%
Purchase seeds from accredited nurseries only	1	20%
Full support of government agencies	1	20%
Financial support	1	20%
Offer some tools and free fertilizers	1	20%

Table 3.1 provides recommendations for improving citrus farming activities, with 40% of respondents emphasizing the importance of proper plant care to ensure longevity and increased fruit production, which helps prevent pests and diseases. Additionally, 20% suggested exploring new farming methods like planting new trees or adopting organic practices to boost productivity, while another 20% advised purchasing seeds only from accredited nurseries to ensure fruit quality. Furthermore, 20% highlighted the need for full government support and agricultural expertise to enhance citrus farming, and 20% requested financial assistance and donations of equipment and fertilizers to maintain their plantations.

Table 3.2

Recommendations for the Processing Activities

Recommendations for the processing activities of citrus wine	Frequency (n=5)	Percentage
A hands-on worker should be required in the cooperative.	1	20%
Teamwork and a positive mindset	1	20%
Invest in mechanization	1	20%
Increase the amount of processed citrus wine produced while the harvesting season is still in effect.	1	20%
Second-liner processors are a must.	1	20%

Remember to add an enzyme to the product to stop it from fermenting continuously.	1	20%
Additional training is needed on how to use wine kits	1	20%

Table 3.2 presents recommendations for improving citrus wine processing activities, with 20% of processors suggesting the need for hands-on workers actively engaged in production. They also emphasized the importance of teamwork and a positive mindset to enhance workplace effectiveness. Additionally, 20% recommended investing in mechanization to streamline the winemaking process, while another 20% urged processors to maximize production during the citrus harvesting season to avoid shortages. The need for younger, innovative second-line processors was also highlighted, along with the importance of adding enzymes to enhance the wine's aroma and color. Lastly, PCEDO-Nueva Vizcaya suggested that additional training on operating wine kits is essential to improve overall competence and reduce injury risks.

Table 3.3

Recommendations for the Testing Activities

Recommendations for the testing activities of citrus wine	Frequency (n=4)	Percentage
To ensure the consistency of citrus wines' quality, a manual of production must be created	2	50%
Wine quality and raw materials standardization	1	25%
Carefully monitor the fermentation test process	1	25%
All members have to be active for them to be educated on how to use the wine-testing devices properly	1	25%
Wine quality testing	1	25%

Table 3.3 outlines processors' recommendations for improving citrus wine testing activities, with 50% of respondents emphasizing the need for a production manual to ensure consistent quality. DOST-Nueva Vizcaya highlighted that adherence to this manual is crucial for maintaining product standards. Additionally, 25% suggested standardizing the quality of raw materials and process flows to ensure uniform taste and quality across batches. Continuous monitoring of the fermentation process was also recommended by 25% of respondents to identify issues early. Furthermore, 25% stressed the importance of active participation from all members to ensure proper use of wine testing devices. Lastly, 25% proposed inviting a wine specialist to taste-test local wines in Nueva Vizcaya, as this proficiency testing could enhance the quality and competitive edge of their citrus wines.

Table 3.4

Recommendations for the Packaging Activities

Recommendations for the packaging activities of citrus wine	Frequency (n=3)	Percentage
Alternative supplier of wine bottles and corks that are less expensive yet high-quality.	3	100%
Provide catchy names for wine and taglines as well.	1	33.33%
Produce a more affordable citrus wine packaging for the low-end markets	1	33.33%

Table 3.4 presents recommendations for improving citrus wine packaging activities, with all respondents suggesting the need for a nearby supplier of high-quality, low-cost wine bottles and corks to reduce packaging delays. Additionally, 33.33% of respondents emphasized the importance of creating catchy brand names and taglines for the wine to enhance product recognition and memorability among customers. Meanwhile, 33.33% of the respondents suggested more affordable citrus wine packaging for the low-end markets. For instance, offering refillable wine bottles and smaller wine bottle packaging. This implies that there is a need for the processors to produce more affordable citrus wine packaging for low-end markets in response to growing client demand.

Table 3.5

Recommendations for the Warehousing Activities

Recommendations for the warehousing activities of citrus wine	Frequency (n=2)	Percentage
Improve the building/warehouse facility	2	100%
Additional freezer	1	50%

Table 3.5 outlines recommendations for improving citrus wine warehousing activities, with all respondents highlighting the need to enhance their warehouse facilities to ensure smooth operations and secure storage of citrus wine products. Additionally, 50% of respondents suggested acquiring an extra freezer to store more citrus fruits, which would help preserve quality and prevent spoilage.

Table 3.6

Recommendations for the Transportation Activities

Recommendations for the transportation activities of citrus wine	Frequency (n=2)	Percentage
There should be contact with MALOI's president to speed up the delivery of products	1	50%
MALOI (the supplier) should have its vehicle	1	50%
Set a minimum quantity of wine orders to be delivered to clients	1	50%

Table 3.6 outlines recommendations for improving citrus wine transportation activities, with 50% of respondents emphasizing the need for direct contact with MALOI's president to expedite product delivery. Additionally, half of the respondents suggested that MALOI should have its own vehicle to prevent order delays. Furthermore, 50% recommended establishing a minimum quantity for wine orders to be transported, as delivering small orders can incur losses and waste time and delivery costs.

Table 3.7

Recommendations for the Distribution Activities

Recommendations for the distribution activities of citrus wine	Frequency (n=2)	Percentage
Wine bottles should always be handled with care.	1	50%

Establish a stable market in which a predetermined amount of citrus wine is provided monthly to a specific shop	1	50%
Needs to be an SEC-registered business to connect with other middlemen effectively.	1	50%

Table 3.7 provides recommendations for improving citrus wine distribution activities, with 50% of middlemen emphasizing the need for careful handling of wine bottles due to their delicate nature during transit. Additionally, 50% suggested establishing a stable market by delivering a fixed quantity of citrus wine monthly to specific stores, which would help target customers and predict production needs. Furthermore, 50% of respondents highlighted the importance of registering the business with the Securities and Exchange Commission (SEC) to enhance opportunities for dealing with other intermediaries effectively.

Table 3.8

Recommendations for the Marketing Activities

Recommendations for the marketing activities of citrus wine	Frequency (n=3)	Percentage
Offer free taste to customers	1	33.33%
MALOI needs to be active on social media, especially on Facebook	1	33.33%
Creation of a new citrus wine brand for the mass market	2	66.67%

Table 3.8 presents recommendations from middlemen for improving marketing, with 33.33% suggesting that offering free taste samples would effectively introduce customers to the flavor of citrus wine. Additionally, 33.33% emphasized the need for MALOI (the supplier) to be active on social media, particularly Facebook, to connect with clients and enhance brand recognition. Furthermore, 66.67% of respondents proposed creating a new, budget-friendly citrus wine brand for the mass market. This indicates that a different branding strategy could help attract more customers while maintaining the same manufacturer.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Enhancing the value of citrus fruits through effective fertilizer application, pest and disease control, and using quality seeds is crucial for the success of MALOI’s citrus wine production. The all-natural wine, crafted from an exclusive recipe without chemical additives, adheres to fair trade standards and global market safety regulations. Despite facing significant challenges such as poor wine fermentation, inadequate resources, and limited market perception, MALOI's members are encouraged to foster a positive and cooperative approach. By thoroughly examining fermentation conditions and optimizing processes, they can produce high-quality citrus wines that meet market demands. Additionally, the ongoing digitization of their distribution process and proactive marketing strategies through social media and trade events will help expand their customer base and enhance the visibility of their products. With continued support from government organizations and a commitment to collaboration, MALOI can overcome existing obstacles and solidify its position in the citrus wine industry, ultimately contributing to the economic growth of the region. This conclusion summarizes the key points, emphasizes the importance of collaboration and improvement, and provides a forward-looking perspective on the potential for success in the citrus wine industry.

Recommendations

The researchers recommend the following:

For Farmers

Farmers can reduce pest and disease resistance by minimizing nutrition sources like plant stubble, timing chemical applications to coincide with pests' peak vulnerability, and collaborating with local researchers on organic pest management and soil nutrition studies. Establishing disease indexing laboratories, prioritizing research and development for new citrus production technologies, and adopting climate-smart techniques like hand weeding, contour planting, and consistent composting can enhance soil quality and climate resilience. Collaborating with Kasibu's LGU to provide financing or subsidies for farm supplies, ensuring harmonious coexistence between mining operations and citrus farming, and exploring innovative methods like regenerative farming can further improve citrus yields and sustainability.

For Processing Challenges

Citrus wine processors must thoroughly examine fermentation conditions and profiles to identify problematic fermentations early, add enzymes to stop continuous fermentation, and collaborate with nearby high schools to provide internships and employment opportunities for skilled and motivated students. Consistent seminars, training sessions, and investments in mechanization can improve processors' skills, efficiency, and wine processing quality. Considering schedules, payment strategies, and business management, as well as encouraging an additional workforce through growth and development, can further enhance the citrus wine processing business.

For Testing Challenges

To ensure consistency in citrus wine quality, a production manual must be created and strictly followed by processors, with standardized raw material usage to maintain product quality. Additionally, processors should engage in further training on fruit wine standardization and conduct proficiency testing to ensure safety and quality, thereby gaining a competitive advantage in the wine industry.

For Packaging Challenges

Processors should consider enticing names and improved taglines for their wines while seeking nearby suppliers for affordable, high-quality bottles and corks. Offering citrus wines in smaller, more affordable packaging can attract the mass market. They might also explore aluminum foil wine bags, which provide advantages in transport convenience, safety, and freshness due to their strong sealing and light-proof properties. Custom-made packaging can help processors stand out and foster customer loyalty, potentially adapting Franzia's innovative wine-in-box design to create cost-effective citrus wine packaging that is both practical and environmentally friendly.

For Warehousing Challenges

The building needs to be enhanced to provide them with more room in the facility for newly added tools and equipment for citrus goods. The researchers also propose adding another freezer to preserve all citrus products.

Additionally, invest in dependable organizers and storage containers. The work tools will remain organized and accessible owing to this investment. Furthermore, citrus wines should always be stored with the ambient temperature maintained. By storing wine at the proper temperature, processors may extend its shelf life and avoid any negative effects on one's health from exposure to extreme heat or cold.

For Transportation Challenges

Malabing Literacy Organization, Inc. (MALOI) should have its vehicle to prevent unnecessary delays and maintain regular deliveries of the goods to its middlemen.

Direct contact with the middlemen is also necessary for much simpler and faster business dealings. Another MALOI must offer lower-priced citrus wines for low-end markets.

For Distribution Challenges

The researchers recommend that the middlemen always handle the wine bottles carefully while transporting and distributing the goods to various locations. Another requirement is that regular product deliveries must be made to a certain market so that anytime someone buys, the product is available immediately. The middlemen must also be registered with the Securities and Exchange Commission (SEC) agency to connect with other middlemen effectively.

In Bayombong or Solano, the middlemen may set up a wine shop or stockroom. With a wine showroom, businesses can give customers a special and tailored experience and access to a wide range of wines in Nueva Vizcaya. With the help of DTI, middlemen may link to malls nationwide and use them as wine showrooms. The wines should be visible and accessible in all locations, including stores and other places.

For Marketing Challenges

MALOI needs to be active on social media, particularly Facebook, to reach larger audiences and considerably boost revenue figures. Another MALOI must offer lower-priced citrus wines for low-end markets. Also, try new fruit wine products like dragon fruit that can be turned into wines. The organization can also tap Kasibu's LGU to work on establishing internet connections in its far-flung areas, noting that access to the web has become a post-pandemic must-have specifically for expanding its business transactions to grow its citrus wine industry. Furthermore, giving potential customers a free sample for a limited time would significantly enhance their likelihood of purchasing.

For the Organization's President

The researchers recommend that MALOI's president require its co-processors to engage in active work as a regular part of their obligations to the organization. In addition, the president should be strict with the processors regarding absences, and she should regularly visit the workplace to encourage everyone to get their work done. If the president continues to supervise them, there is also a great chance that the processors will produce quality work and exhibit greater discipline.

As a president, you must teach others the goals; in other words, you must communicate exactly how any organization member will efficiently execute the citrus wine production. The president might motivate the members to have greater work performance by offering monetary rewards to the members who significantly contribute to the annual revenue growth of citrus wines.

For importation purposes, the president must even obtain a HALAL Certificate. This will imply that the wine is "clean" or "permitted" following Islamic law, making it broadly accessible to Muslim nations like Saudi Arabia.

For the Organization's Members

The members should take an active role in the organization's management. Every member must offer their full cooperation and uphold a pleasant attitude at work to effectively solve the issues in their supply chain and eventually accomplish their shared goals. Being a part of the organization, they may provide the president with some brilliant ideas for its improvement that could increase their revenues and benefits soon.

For the Citrus wine Customers

May you constantly support and promote Nueva Vizcaya's locally produced products, especially its citrus wines, so that more people can taste and experience the region's genuinely unique citrus wines produced by MALOI.

For DA, DAR, and OPAG

For the maintenance of citrus plantations, the researchers recommend providing citrus farmers with full support and financial assistance and free fertilizers/pesticides, and some agricultural tools/equipment. Re-testing of the soil should determine whether it can be treated to restore it to its naturally productive state for citrus cultivation after being overworked or becoming too acidic. Also, assist the farmers in producing organic fertilizers for acidic soil. Furthermore, find a means to make it possible for the entire cycle to run continuously, from planting to harvesting, so that citrus production can continue year-round instead of being seasonal.

For DTI and PCEDO

The researchers advise continuing to support MALOI citrus wine and other small and medium enterprises so they can prosper and improve their operations and contribute to the economy's continued growth. Moreover, constantly help in the promotion and distribution process of citrus wines.

For DOST

The DOST plays a major role in developing the production facilities and the testing and analytical services for MALOI citrus wine. The researchers recommend increasing their support for small businesses in terms of technological advancements and facility enhancements.

For the Academe

The researchers recommend that educational institutions use the research findings as illustrations when teaching the concept of supply chain to students to better instill it in their minds.

For the Future Researchers

The researchers recommend broadening their knowledge of the various supply chain components, increasing the number of respondents, and widening the scope of the study by comparing the responses provided by the various key players in the citrus wine supply chain, not only in Malabing but also across other barangays in Kasibu to ensure sufficient data quality. Also, include the Department of Agriculture (DA) as one of the supporting government agencies under Farming, as it is primarily responsible for promoting the development of the nation's agricultural sector.

REFERENCES

1. Abouzar & Nafiseh (2016). The investigation of citrus fruit quality. Popular Characteristic and Breeding. https://www.researchgate.net/publication/304813181_The_Investigation_of_Citrus_Fruit_Quality_Popular_Characteristic_and_Breeding
2. AE (n.d). A lack of tools means a lack of results. http://www.anonymousemployee.com/cssite/sidelinks/lack_of_tools.php
3. Antonio, Cruz, Madamba, & Williams, (2011). Assessing the performance of the citrus industry in Kasibu, Nueva Vizcaya, Philippines: The case of farmers and traders of the Malabing valley agri-center. <https://www.google.com/url?sa=t&source=web&rct=j&url=https://core.ac.uk/download/pdf/229567513.pdf&ved=2ahUKEwj9h8-1qZv6AhWCxGEKHUokB4YQFnoECBIQAQ&usg=AOvVaw0MaNFVOKvbDFTzLugSTY57>
4. Ahmed & Azmat (2019). Citrus: An ancient fruit of promise for health benefits. https://www.researchgate.net/publication/331383903_Citrus_An_Ancient_Fruits_of_Promise_for_Health_Benefits
5. Chalmers (2022). Warehouse space is the latest thing being hoarded. The New York Times. <https://www.nytimes.com/2022/02/01/business/warehouses-supply-chain.html>

6. Citrus (2022). Stop Food Waste. <https://stopfoodwaste.org/tips/store/citrus#:~:text=To%20prolong%20the%20shelf%20life,add%20to%20dishes%20and%20drinks>.
7. Collegedunia Team (2022). Crop production: Definition, factors, harvesting and storage. Collegedunia.com. <https://collegedunia.com/exams/crop-production-definition-factors-harvesting-storage-science-articleid-1160>
8. Crivelli (2019). Harvesting methods of fruits and vegetables. The Produce Nerd. <https://www.theproducenerd.com/2019/09/harvesting-methods-fruits-vegetables/>
9. DTI R2 Nueva Vizcaya (2022). RD Ocampo visits the citrus capital of the Philippines. <https://www.facebook.com/DTIR2.NuevaVizcaya?mibextid=ZbWKwL>
10. Ebreo (2021). Solano women fruit processors get training from DTI. Philippine Information Agency. <https://pia.gov.ph/news/2021/07/19/solano-women-fruit-processors-get-training-from-dti>
11. FDA (2022). GMP readmore - Food and drug administration. Food and Drug Administration. <https://www.fda.gov/ph/gmp-second-page/>
12. GOVPH (2022). Farmers need funds for push citrus wine making. <http://rdc.rdc2.gov.ph/?p=189>
13. Gutierrez (2018). Nueva Vizcaya gov credits citrus industry in improving the province's quality of life. GOVPH. <http://www.pcaarrd.dost.gov.ph/home/portal/index.php/quick-information-dispatch/3295-nueva-vizcaya-gov-credits-citrus-industry-in-improving-the-province-s-quality-of-life>
14. Hayes (2022). Distribution Management: Definition, how it works, and advantages. Investopedia. <https://www.investopedia.com/terms/d/distribution-management.asp>
15. Hayes (2022). Supply chain. Investopedia. <https://www.investopedia.com/terms/s/supplychain.asp>
16. IBM (2019). What is supply chain management? Ibm.com. <https://www.ibm.com/topics/supply-chain-management>
17. Inglese & Sortino (2019). Citrus history, taxonomy, breeding, and fruit quality summary and keywords. https://www.researchgate.net/publication/331399212_Citrus_History_Taxonomy_Breeding_and_Fruit_Quality_Citrus_History_Taxonomy_Breeding_and_Fruit_Quality_Summary_and_Keywords
18. Khan, Sameen, Aadil, Shahid, Sezen, Zarrabi, Ozdemir, Sevindik, Kaplan, Selamoglu, Ydyrys, Anitha, Kumar, Sharifi-Rad, & Butnariu (2021). Citrus genus and its waste utilization: A review on health-promoting activities and industrial application. Evidence-based complementary and alternative medicine: eCAM, 2021, 2488804. <https://doi.org/10.1155/2021/2488804>
19. Logmore (2022). Handle with care: The ultimate guide to shipping fragile
20. Logmore. <https://www.logmore.com/post/handle-with-care-the-ultimate-guide-to-shipping-fragile-items>
21. Mason-D'Croz, Bogard, Sulser, Cenacchi, Dunston, Herrero, & Wiebe (2019). Gaps between fruit and vegetable production, demand, and recommended consumption at global and national levels: An integrated modelling study. The Lancet Planetary Health, 3(7), e318–e329. [https://doi.org/10.1016/s2542-5196\(19\)30095-6](https://doi.org/10.1016/s2542-5196(19)30095-6)
22. Mayor Dacayo E. (2021). Solano women fruit processors get training from DTI. Philippines Information Agency News. https://pia.gov.ph/news/2021/07/19/solano-women-fruit-processors-get-training-from-dti?fbclid=IwAR3OusTh5bcA6rs8_m1RPPuAv3tJq5V_gE_1JpED78F_ZBo8EXwr6rwe9iQ
23. Nueva Vizcaya Philippines (2022). Physiological features and natural resources. 2.1 Location and boundaries. <https://nuevavizcaya.gov.ph/physiological-features-and-natural-resources/>
24. Nueva Vizcaya | RDC2. (n.d). Nueva Vizcaya geography. <http://rdc.rdc2.gov.ph/?p=74>
25. Nueva Vizcaya Tourism (2018). It's citrus time. https://m.facebook.com/nuevavizcayatourism/posts/1173222692817130/?locale=fr_FR&_rdr
26. Rivard, D., & Rivard, D. (2019). 7 Secrets of wine and women: What every woman should know. The Daily Fruit Wine. <https://www.dailyfruitwine.com/7-secrets-of-wine-and-women/>
27. Routroy & Behera (2017). Agriculture supply chain: A systematic review of literature and implications for future research. Journal of agribusiness in developing and emerging economies. <https://doi.org/10.1108/JADEE-06-2016-0039>
28. Sack (n.d). What does it mean to be a distributor? One distributor's perspective. https://www.ntea.com/NTEA/Member_benefits/Generation_Next/Whatdoesitmeantobeadistributor.aspx

29. Sener, Turemis, & Tanir (2020). Agrochemical usage for sustainable fruit production and human health. Sciencedirect. <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/fruit-production>
30. Shareef, M. A., Mukerji, B., Alryalat, M. A. A., Wright, A., & Dwivedi, Y. K. (2018). Advertisements on Facebook: Identifying the persuasive elements in the development of positive attitudes in consumers. *Journal of Retailing and Consumer Services*, 43, 258-268. <https://doi.org/10.1016/j.jretconser.2018.04.00>
31. Sharma, Kamble, Gunasekaran, Kumar, V., & Kumar, A. (2020). A systematic literature review on machine learning applications for sustainable agriculture supply chain performance. *Computers & Operations Research*, 119, 104926. <https://doi.org/10.1016/j.cor.2020.104926>
32. Simpplr (2023). The causes & effects of poor communication in the workplace. Simpplr. <https://www.simpplr.com/blog/2021/causes-effects-poor-communication-workplace/>
33. Splitful (2023). Consumers and food safety: A food industry perspective. <https://www.fao.org/3/v2890t/v2890t05.htm>
34. Study. com (n.d.). Customer overview & concept. <https://study.com/academy/lesson/what-is-a-customer-definition-overview.html>
35. Sukkot (2019). Citrus history, taxonomy, breeding, and fruit quality citrus history. Academia. https://www.academia.edu/38514704/Citrus_History_Taxonomy_Breeding_and_Fruit_Quality_Citrus_History_Taxonomy_Breeding_and_Fruit_Quality_Summary_and_Keywords
36. White (2019). The importance of product packaging. Printex Transparent Packaging. <https://www.ptpackaging.com/blog/the-importance-of-product-packaging/>