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## Working Paper

# A comprehensive economic analysis of the coffee value chain in Region X: Advancing sustainability and empowering local communities

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## **A Comprehensive Economic Analysis of the Coffee Value Chain in Region X: Advancing Sustainability and Empowering Local Communities**

*Jerelyn B. Medalla, Glenda T. Orlanes,  
Ereca P. Ampoloquio, and Precious Dane P. Tagas*

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A Comprehensive Economic Analysis of the  
Coffee Value Chain in Region X: Advancing Sustainability  
and Empowering Local Communities

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## Abstract

This study provides a comprehensive examination of the economic, structural, and sustainability dimensions of the coffee value chain in Region X (Northern Mindanao), with emphasis on the provinces of Bukidnon and Misamis Oriental two areas recognized as emerging centers for both Robusta and Arabica production in the Philippines. This research reflects the increasing importance of coffee in the national agenda as highlighted in the Philippine Coffee Industry Roadmap, as well as the growing interest in specialty coffee, value-added processing or post-harvest processing and climate-resilient agricultural livelihoods among upland farmers. A mixed-methods design was employed to capture the multifaceted nature of the value chain and the diverse experiences of industry actors. Quantitative data were gathered from 150 coffee farmers through structured surveys, while qualitative insights were obtained through key informant interviews and focus group discussions with cooperative leaders, traders, processors, and local government representatives. These primary data were complemented by secondary data from the Philippine Statistics Authority (PSA), the Department of Agriculture (DA), and selected studies from the Philippine Institute for Development Studies (PIDS). Porter's Value Chain Framework was used to analyze both primary activities input procurement, farm production, postharvest handling, processing, marketing and support functions such as extension services, financing, training, infrastructure, and governance. Profitability assessments were carried out using standard farm-management indicators, specifically Return on Investment (ROI) and Return on Sales (ROS), to determine the economic viability of various coffee product forms. The findings indicate that value addition is the most decisive driver of farmer profitability. ROI increases substantially when producers engage in drying, hulling, and quality upgrading rather than selling cherries immediately after harvest. Profitability for fresh cherries ranged from 55–60%, whereas dried parchment and hulled beans generated ROI values between 85–95%. Arabica green beans posted the highest overall profitability (ROI 95%, ROS 40%), reflecting the premium potential of high-altitude Arabica from Bukidnon. Robusta, particularly when processed into dried or hulled form, also yielded competitive returns, illustrating its continuing commercial relevance in Region X. However, economic gains are moderated by persistent structural constraints, including limited access to certified seedlings, weak and inconsistent drying infrastructure, inadequate mechanization, low cooperative participation, and the continuing dominance of trader-driven markets with limited transparency. SWOT and TOWS analyses reveal several opportunities for upgrading, including regional branding initiatives, digital traceability systems, farmer clustering, and cooperative consolidation. At the same time, risks remain, particularly climate variability, aging and unproductive trees, and price volatility in both domestic and international markets. The study concludes that improving postharvest systems, strengthening extension and technical services, and establishing unified regional governance mechanisms are essential to enhancing the competitiveness and sustainability of the Region X coffee value chain. These recommendations align closely with the Philippine Coffee Roadmap's objectives of improving productivity, quality, and long-term resilience across the sector.

**Keywords:** coffee value chain, economic analysis, smallholder farmers, sustainability, value-addition

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# **A Comprehensive Economic Analysis of the Coffee Value Chain in Region X: Advancing Sustainability and Empowering Local Communities**

***Jerelyn B. Medalla\**, *Glenda T. Orlanes\*\**, *Ereca P. Ampoloquio\*\*\**, and *Precious Dane P. Tagas\*\*\*\****

## **1. Introduction**

Coffee is one of the world's most valuable agricultural commodities, playing a vital role in local economies, particularly in agricultural regions like Region X. In this region, coffee farming is a key source of livelihood for smallholder farmers and their communities, providing essential income and employment. Region X is recognized as a significant contributor to the Philippines' coffee production (Department of Agriculture, 2020). However, despite its importance, the coffee industry faces numerous challenges, including fluctuating market prices, supply chain inefficiencies, and the adverse effects of climate change (Food and Agriculture Organization, 2019). These factors threaten the long-term sustainability of coffee production.

As global demand for coffee rises, understanding the supply and value chains is crucial for ensuring sustainable growth and competitiveness in the industry (International Coffee Organization, 2021). The coffee supply chain involves the entire process of moving coffee from the farm to the consumer, including production, processing, distribution, and retail. Each stage presents opportunities for adding value, but inefficiencies can limit profitability, particularly for small-scale farmers. A value chain analysis offers deeper insights into how value is created and distributed across these stages, helping identify who benefits most and who bears the most risks (Kaplinsky & Morris, 2001). In the coffee industry, farmers often receive a small fraction of the final retail price, while intermediaries and retailers capture much of the value (Ponte, 2002). This study aims to assess the coffee supply and value chains in selected areas of Region X, identifying key processes, challenges, and opportunities for improvement. By examining the flow of coffee from production to consumption, this research seeks to highlight areas where efficiency can be enhanced, and value can be added to benefit farmers, processors, and consumers. Furthermore, the study will explore how sustainable practices can be integrated into the coffee industry to promote long-term economic and environmental viability for all stakeholders.

Sustainability has emerged as a critical concern in the global coffee industry due to increasing environmental, social, and economic pressures. Sustainable coffee production not only benefits the environment but also enhances the resilience of farming communities by improving market access and income stability (Bacon et al., 2008). Programs such as Fair Trade and Rainforest Alliance have been developed to promote these principles, though their effectiveness remains debated (Raynolds et al., 2007). Through this assessment, the study aspires to contribute to a more sustainable future for the coffee industry in Region X, supporting the creation of a more equitable and resilient supply chain that benefits all stakeholders, from farmers to consumers.

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## 1.1. Objectives

This study was conducted to contribute to the development of more efficient coffee value chains in Northern Mindanao, with the goal of enhancing overall competitiveness and maximizing the benefits accruing to small farmers, distributors/retailers, and consumers.

Specifically, the study aimed to:

1. Evaluate the economic performance of each stage in the coffee value chain, from production to market distribution, within Region X.
2. Identify and analyze key challenges and opportunities affecting sustainability in the coffee value chain.
3. Assess the social and economic impact of the coffee value chain on local communities, focusing on empowerment and equitable benefits.
4. Propose strategies and policy recommendations for enhancing the sustainability and competitiveness of the coffee industry in Region X.

## 1.2. Significance of the study

The study on “A Comprehensive Economic Analysis of the Coffee Value Chain in Region X: Advancing Sustainability and Empowering Local Communities” holds significant relevance for multiple stakeholders, including farmers, coffee processors, traders, policymakers, and consumers. Understanding the value chain of coffee in this region provides critical insights into how each stage of production, processing, and distribution contributes to the overall sustainability of the coffee industry.

**For Coffee Farmers.** This study helps coffee farmers identify areas where efficiency can be improved, leading to increased productivity and profitability. By analyzing the gaps and opportunities in the coffee value chain, farmers can adopt more sustainable agricultural practices, reduce waste, and enhance product quality. This, in turn, supports long-term livelihoods and contributes to the resilience of farming communities in Region X.

**For Coffee Processors and Traders.** This can give benefit from understanding how sustainable practices can be integrated into their operations. The findings will guide them in adopting strategies that reduce environmental impact, such as minimizing resource use and enhancing eco-friendly processing techniques. The value chain assessment may also reveal market opportunities for fair trade or organic coffee, providing access to new markets and premium prices.

**For Policymakers and Government Agencies.** This study is valuable in shaping policies that support a sustainable coffee sector. The research can inform decision-making around resource management, environmental conservation, and economic incentives, ultimately contributing to a more robust and sustainable regional economy.

Finally, consumers increasingly demand transparency and sustainability in the products they purchase. This study can highlight the efforts being made to improve the sustainability of coffee production in Region X, offering consumers choices that align with their values and contribute to a sustainable future.

### *1.3. Survey of past and current research on the subject area*

The coffee industry in Region X of the Philippines has significant potential to contribute to sustainable development and the empowerment of local communities. Past research on the coffee value chain in Region X has examined various critical aspects of the industry. Studies on the economic contributions of coffee farming have explored its role in the livelihoods of smallholder farmers, particularly in Bukidnon and Misamis Oriental. Coffee has been highlighted as a primary source of income; however, challenges such as low productivity and limited market access persist. Research on coffee processing and quality improvement has focused on post-harvest processes, revealing that inadequate drying, fermentation, and storage practices remain significant bottlenecks in achieving higher quality standards.

On the other hand, current research efforts are building on these foundational studies, with a strong focus on sustainability and innovation. Ongoing investigations into sustainability initiatives, such as the adoption of certifications like Fair Trade and Rainforest Alliance, aim to enhance farmer income and environmental conservation. Research on climate resilience is examining adaptive practices, such as planting climate-resilient coffee varieties and implementing water conservation techniques, to address the impacts of climate variability. Another area of focus is the integration of digital tools into the coffee value chain, which is emerging as a promising innovation. Researchers are exploring the use of mobile applications and blockchain technologies to improve traceability, transparency, and efficiency throughout the value chain. These technologies offer opportunities to connect farmers directly with buyers and reduce inefficiencies in the supply chain. Gender and social inclusion have also gained prominence in recent studies. Research highlights the pivotal role of women and marginalized groups in the coffee value chain, examining targeted interventions to promote equity and inclusivity. Efforts to enhance participation and representation among these groups aim to create a more equitable distribution of benefits.

Despite the progress in understanding the coffee value chain in Region X, several research gaps persist. These gaps include a need for comprehensive economic analyses that encompass all stages of the coffee value chain, from production to consumption. Longitudinal studies are also required to assess the socio-economic and environmental impacts of sustainability initiatives over time. Moreover, comparative analyses of traditional marketing approaches versus innovative platforms, such as e-commerce, are lacking and could provide valuable insights. Holistic evaluations of the broader socio-economic benefits of value chain improvements for local communities remain underexplored. Finally, there is a need for in-depth exploration of policy frameworks that effectively integrate farmer support with market-oriented strategies to foster long-term growth and resilience.

## **2. Review of Related Literature**

This chapter reviews related literature and studies relevant to the coffee value chain, with particular emphasis on value-added processing, sustainability, and economic performance. The review synthesizes global, national, and regional perspectives to establish the theoretical and empirical foundations of the study and to identify gaps that the present research seeks to address.

## *2.1 The Concept of Agricultural Value Chains*

The concept of the value chain was formalized by Porter (1985), who described it as a sequence of interrelated activities through which value is created and delivered to consumers. In the agricultural context, value chain analysis extends this concept to include all activities involved in bringing an agricultural product from production to final consumption, encompassing input provision, farm production, postharvest handling, processing, marketing, and distribution. Kaplinsky and Morris (2001) expanded the value chain framework by emphasizing how value is distributed among actors and how power relations influence who captures economic gains. Their work highlights that value chains are not merely technical processes but are shaped by institutional arrangements, market access, and governance structures. In agricultural commodities such as coffee, value chain analysis is particularly useful in identifying points where value is added and determining which actors benefit most. Empirical studies show that upstream actors, especially smallholder farmers tend to capture a disproportionately small share of total value compared with downstream actors such as processors, traders, and retailers (Ponte, 2002). This structural imbalance underscores the need for value chain upgrading strategies that allow farmers to participate in higher-value segments beyond raw production.

## *2.2 Overview of the Global Coffee Value Chain*

### *i. Global Trends: Coffee Industry Value Chain 2025-2035*

Figure 2 below showed that the Coffee Value Chain Analysis Market is projected to experience significant growth from 2019 to 2035 (Market Research Future 2025). The report indicates that the market value is expected to rise steadily from USD 279.0 billion in 2024 to approximately USD 427.7 billion by 2035, representing a compound annual growth rate (CAGR) of around 3.96% during the forecast period (2025–2035).

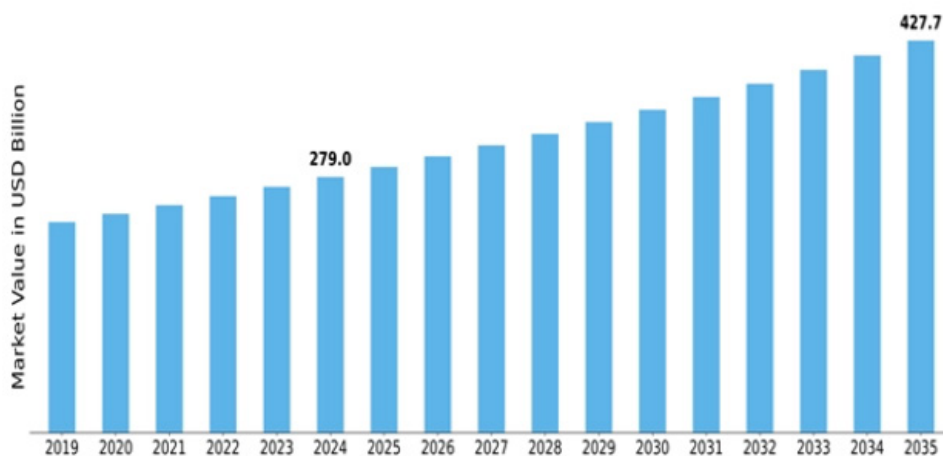
This consistent upward trajectory reflects a robust and expanding global coffee industry, driven by several interrelated factors. First, the rising global demand for coffee, particularly specialty and premium varieties, continue to propel value chain activities from production to retail. According to the International Coffee Organization (ICO, 2023), global coffee consumption has grown at an average annual rate of 1.7%, reaching over 178 million 60-kg bags in 2023, indicating strong and sustained consumer demand.

Second, the growing adoption of sustainable and ethical sourcing practices has become a major trend, as consumers increasingly prefer environmentally responsible brands. The Food and Agriculture Organization (FAO, 2024) emphasized that sustainable coffee initiatives, such as Rainforest Alliance and Fairtrade certifications, are now key drivers of value chain competitiveness, particularly in Latin America and Southeast Asia. These programs enhance farmers' income stability and encourage climate-resilient coffee production.

Third, technological innovations in coffee processing, packaging, and distribution have improved efficiency across the value chain, fostering growth even in emerging markets. Advanced digital traceability systems, blockchain-based trading platforms, and precision agriculture techniques have strengthened transparency and productivity. As reported by the US International Trade Commission (USITC, 2023), the integration of technology and sustainability is redefining global trade flows, enabling producers and cooperatives to capture more value from farm to cup.

The projection further implies that the coffee industry is transitioning from traditional production systems toward integrated, sustainability-oriented models, where digital traceability, fair-trade certification, and climate-smart farming play central roles. Overall, the steady rise in market value underscores that stakeholders ranging from smallholder farmers and cooperatives to multinational coffee corporations stand to benefit from greater efficiency, innovation, and inclusive market participation. This aligns with ICO’s (2023) conclusion that the future of the coffee value chain lies in balancing economic viability, social equity, and environmental stewardship.

**Figure 2. Coffee value chain market**



Source: Market Research Future (2025)

ii. Global Distribution Estimates in Terms of Variety

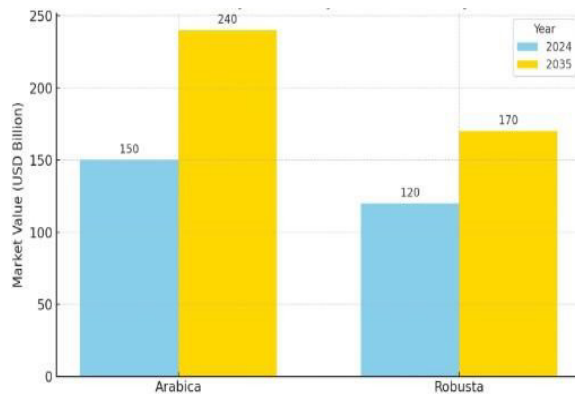
As shown in Figure 3: Coffee Value Chain Analysis Market by Coffee Bean Variety (2024–2035), the market demonstrates a significant projected growth in value for both Arabica and Robusta coffee varieties over the forecast period. Based on the data, Arabica coffee is expected to increase from USD 150 billion in 2024 to USD 240 billion by 2035, while Robusta coffee is projected to rise from USD 120 billion to USD 170 billion within the same period. This upward trend reflects the sustained global expansion of the coffee industry and highlights both varieties’ growing economic contribution to the global value chain. According to Market Research Future (2025), the global Coffee Value Chain Analysis Market is expected to grow from USD 293.84 billion in 2024 to USD 444.38 billion by 2035, with a compound annual growth rate (CAGR) of 3.96% during the forecast period (2025–2035). This projection aligns with the trends illustrated in the figure, emphasizing steady demand growth for both Arabica and Robusta coffees worldwide.

Furthermore, the International Coffee Organization (ICO, 2023) reported that Arabica coffee accounts for approximately 55.9% of global production, while Robusta makes up around 44.1%. Arabica remains dominant due to its superior flavor profile, balanced acidity, and aroma, which appeal to specialty and premium markets. Its cultivation at higher altitudes, particularly in Latin America and East Africa, allows for better cup quality and price premiums, contributing to greater value addition along the supply chain.

Meanwhile, Robusta coffee is known for its higher caffeine content, disease resistance, and lower production costs are gaining increasing relevance in the instant coffee and commercial blend

segments. The U.S. International Trade Commission (2023) notes that rising consumption in emerging markets such as Vietnam, Indonesia, and India is driving demand for Robusta due to its affordability and strong flavor characteristics. Similarly, FAO (2024) highlights that sustainability programs and improved cultivation techniques in Asia and Africa are enabling farmers to enhance Robusta yields and export competitiveness. This trend signifies a balanced diversification in the global coffee value chain, where Arabica maintains its lead in the premium market segment, while Robusta continues to expand its share in mass-market and industrial applications. As global coffee demand is projected to grow by 1.5–2.0% annually (ICO, 2023), both varieties will remain essential in meeting the evolving preferences of consumers worldwide.

**Figure 3. Global Distribution Estimates in Terms of Variety**



Source: Market Research Future (2025)

### iii. Coffee Value Chain Market Drivers

The global Coffee Value Chain Analysis Market is projected to grow significantly over the next decade. According to Market Research Future (2025), the market was valued at USD 279.0 billion in 2024 and is expected to reach USD 427.7 billion by 2035, reflecting a compound annual growth rate (CAGR) of 3.96%. Similarly, Grand View Research (2024) estimates the broader coffee market at USD 269.27 billion in 2024, projected to reach USD 369.46 billion by 2030 with a 5.3% CAGR.

This growth reflects a structural shift in consumer preferences toward specialty and premium coffee products, driven by rising incomes, global café culture, and expanding middle-class consumption in developing nations. The increasing number of coffee shops and the “third wave” coffee movement underscore a growing appreciation for origin, quality, and sustainability, all of which reinforce the long-term expansion of the coffee value chain (ICO, 2023). In terms of global demand coffee consumption continues to climb steadily. The International Coffee Organization (ICO, 2023) reported that total world coffee consumption reached 178 million 60-kg bags, growing at an annual rate of 1.7%. This expansion is most pronounced in emerging economies such as China, India, Vietnam, and Indonesia, where coffee culture is evolving rapidly. Consumers in both mature and emerging markets are increasingly drawn to high-quality, single-origin, and artisanal coffee. This preference has driven demand across every segment of the value chain from farm-level specialty production to premium roasting and retail experiences.

The growing demand for Arabica coffee, prized for its superior flavor profile, and the rising popularity of Robusta, used in espresso blends and instant coffee, together underscore a diversified and resilient global market (Mordor Intelligence, 2024). On the other hand, sustainability has become one of the most critical drivers of the global coffee value chain.

Certifications such as Fairtrade, Rainforest Alliance, and Organic are gaining traction, signaling corporate commitments to environmental and social responsibility (FAO, 2024). According to the Food and Agriculture Organization (2024), certified sustainable coffee now accounts for more than 25% of global exports. This reflects growing awareness of fair farmer compensation, biodiversity conservation, and carbon reduction in the coffee sector. Brands that invest in sustainable sourcing not only enhance consumer loyalty but also reduce long-term risk exposure to climate change and supply disruptions securing competitive advantages in global markets. The expansion of the global coffee market is closely tied to macroeconomic growth. As global GDP rises, so does disposable income and urban consumption, driving demand for premium beverages. Market Research Future (2025) projects that the coffee market will maintain steady growth through 2035, in line with global economic recovery and the expansion of the middle class. In developing regions, particularly Southeast Asia, Sub-Saharan Africa, and Latin America coffee is increasingly seen not only as a staple beverage but also as a lifestyle product, boosting demand across all price tiers. The CAGR of 3.96% from 2025–2035 suggests a stable and sustainable industry trajectory, strongly influenced by economic growth and demographic transitions (Market Research Future, 2025).

The emergence of E-commerce in coffee distribution has transformed the distribution structure of the coffee value chain. Online platforms provide consumers with access to diverse coffee products while enabling small and medium-sized roasters to compete globally. According to Strategic Revenue Insights (2024), online sales of coffee are expanding at an average annual rate of 7–9%, driven by convenience, subscription models, and digital marketing. The COVID- 19 pandemic accelerated this digital transition, and by 2024, e-commerce accounted for nearly 15% of total coffee retail sales globally. E-commerce not only facilitates direct-to-consumer marketing but also supports the growth of niche and specialty brands, reshaping traditional supply chains and improving price transparency.

Lastly, the Coffee Product Type segment comprises Green Coffee Beans, Roasted Beans, Ground Coffee, Instant Coffee, and Coffee Capsules. Green beans continue to dominate trade due to their critical role in global roasting operations. However, instant coffee and capsules are the fastest-growing product categories, driven by convenience and lifestyle changes (Grand View Research, 2024). In terms of distribution, retail stores hold the largest share, followed by supermarkets, hypermarkets, and specialty cafés. The rise of online channels has created new opportunities for small brands to penetrate international markets.

#### iv. APEC Coffee Exporters within a Global Value Chain Framework

In the broader Asia-Pacific Economic Cooperation (APEC) region, several member economies have established strong and resilient positions within the global coffee value chain (GVC). Among these, Vietnam and Indonesia remain the dominant Asian exporters, while Peru continues to be a major specialty Arabica supplier in Latin America. Recent market reports (ICO 2023/24; USDA FAS 2024) show that Vietnam is the world's second-largest coffee exporter, with export volumes reaching approximately 1.72 million metric tons in 2023/24 and export values exceeding USD 3.3 billion in 2023, driven by its high-yielding Robusta clusters, vertically integrated supply chains, and strong public– private institutional coordination. These characteristics are well documented in GVC and competitiveness studies highlighting Vietnam's robust farm-to-export ecosystem and high-volume Robusta advantage. Indonesia, likewise, retains a strong foothold in the global market, contributing over 370,000 metric tons of exports in 2023/24, supported by diversified Robusta and niche Arabica production across its major islands. Although output fluctuates due to climatic effects, literature consistently describes Indonesia as a stable exporter with strengthening cooperative systems and rising specialty-coffee participation.

In Latin America, Peru has consolidated its position as a competitive specialty Arabica exporter, sending approximately 228,000 metric tons to world markets in 2023/24 and earning close to USD 829 million in export value in 2023. Producer cooperatives, organic certifications, and quality-differentiation strategies underpin Peru's distinctive GVC upgrading pathway, enabling it to access premium and sustainability-driven markets.

In contrast, the Philippines remains a net importer of coffee, despite its agroecological suitability. ICO and ITC data show that the Philippines exported only 161 metric tons in 2023/24, compared with substantial and rising imports of green beans, soluble coffee, and coffee extracts to meet domestic consumption needs (PSA Trade Statistics, 2023–2025). These patterns reflect persistent structural constraints: low productivity, aging coffee trees, inconsistent adoption of good agricultural practices (GAP), limited access to high-quality planting materials, and underdeveloped postharvest and processing systems. National policy documents including the Bukidnon Coffee Roadmap 2025–2035 underscore these weaknesses, describing fragmented market linkages and insufficient value-adding operations that restrict the country's participation in higher-value GVC segments.

Given these realities, benchmarking the Philippine coffee sector particularly in Northern Mindanao and Bukidnon against leading APEC exporters provides a more rigorous analytical foundation for understanding opportunities and strategic gaps. Vietnam's model demonstrates how cluster-based production, cooperative consolidation, and large-scale postharvest investments can drive high-volume competitiveness, while Peru's trajectory illustrates how quality upgrading, certification, and producer-cooperative strengthening can generate export premiums even without large production volumes. Both cases offer relevant lessons for Bukidnon's aspirations to position itself as the "Arabica Capital of the Philippines."

The Bukidnon Coffee Roadmap reveals stagnation in area expansion and production between 2019 and 2023, emphasizing the urgency of interventions aligned with international GVC upgrading strategies such as strengthening farmer organizations, improving traceability systems, enhancing quality control, and building structured market-linkage models that connect smallholders to reliable buyers.

### *2.3 Porter's Value Chain Framework*

Michael Porter's Value Chain Framework has been widely used in agricultural and agri-food research to analyze how value is created, distributed, and captured across different stages of production and marketing. Porter (1985) conceptualized the value chain as a sequence of primary and support activities that collectively contribute to a firm's competitive advantage. In the context of agriculture, this framework has been adapted to examine how farm-level activities, postharvest processes, logistics, and institutional support systems interact to influence productivity, profitability, and sustainability (Kaplinsky & Morris, 2001).

In the Philippine coffee sector, particularly in Mindanao, Porter's framework provides a useful analytical lens because coffee production is characterized by fragmented smallholder systems, weak postharvest infrastructure, and trader-dominated marketing arrangements. Studies by the Department of Agriculture, (2017) and the Philippine Institute for Development Studies (PIDS) emphasize that inefficiencies across multiple stages of the coffee value chain contribute to low farmer incomes and limited competitiveness, despite favorable agroecological conditions.

## Primary Activities in the Coffee Value Chain

### Inbound Logistics

Inbound logistics in coffee production involve the sourcing and handling of inputs such as planting materials, fertilizers, farm tools, and labor. In Mindanao, particularly in upland areas of Bukidnon and Misamis Oriental, access to quality planting materials remains a persistent constraint. The Philippine Coffee Industry Roadmap notes that many farmers rely on uncertified seedlings obtained from informal sources, leading to inconsistent yields and susceptibility to pests and diseases (DA-DTI, 2017). PIDS studies further highlight that limited access to affordable credit restricts farmers' ability to invest in improved inputs, thereby weakening the foundation of the value chain (Briones & Antonio, 2019). Within Porter's framework, inefficiencies at the inbound logistics stage reduce the overall value that can be generated downstream. In Mindanao, poor farm-to-market roads and high transport costs further exacerbate these challenges, increasing production costs and reducing net returns to farmers (Mendoza et al., 2022).

### Operations (Production and Postharvest Handling)

Operations constitute the core value-creating activities in coffee farming, including land preparation, planting, crop maintenance, harvesting, and initial postharvest handling. Empirical studies in Mindanao reveal that coffee production remains largely traditional, with limited mechanization and irregular application of good agricultural practices (GAP) (Laurena et al., 2019). While selective harvesting is practiced in some highland Arabica areas, postharvest handling particularly drying and fermentation often relies on rudimentary methods that compromise bean quality. Porter (1985) emphasized that operational efficiency is central to competitive advantage. In the Philippine coffee context, weak operational practices translate into inconsistent quality, limiting access to premium and specialty markets. PIDS (2021) reports that inadequate drying facilities are among the weakest links in Mindanao's coffee value chain, resulting in high moisture variability and quality defects that depress farmgate prices.

### Outbound Logistics

Outbound logistics refer to storage, handling, and transportation of coffee from farms to buyers. In Mindanao, most smallholder farmers sell coffee either as fresh cherries or dried parchment shortly after harvesting due to cash flow constraints and limited storage capacity. This practice aligns with findings by Pabuayon and Quilloy (2020), who observed that immediate selling exposes farmers to unfavorable prices and reinforces dependence on local traders. Under Porter's framework, weak outbound logistics reduces value capture by upstream actors. The dominance of trader-controlled logistics in Mindanao limits farmers' bargaining power and restricts traceability, which is increasingly required in specialty and sustainability-oriented markets (PhilCAFE Project, 2021).

### Marketing and Sales

Marketing and sales activities determine how products are positioned and priced in the market. In the Philippine coffee industry, marketing remains largely informal, with prices often dictated by buyers rather than determined through transparent grading systems. Studies show that only a small proportion of Mindanao coffee farmers participate in cooperative or direct marketing arrangements that offer better price discovery and quality-based incentives (PIDS, 2022). Porter's framework underscores that value creation is incomplete without effective marketing. In

Mindanao, the absence of branding, quality certification, and market differentiation prevents farmers from capturing the higher margins associated with Arabica and specialty-grade coffee, despite growing domestic demand (DA, 2017).

## Services

Service activities include technical support, training, financial services, and after-sales relationships. Limited extension coverage in Mindanao has constrained the adoption of improved production and postharvest technologies. According to USAID's PhilCAFE Project (2021), gaps in training and advisory services contribute to low productivity and slow upgrading within the coffee value chain. This weak service environment undermines long-term competitiveness and farmer resilience.

## Support Activities in the Coffee Value Chain

Supporting activities such as infrastructure development, human resource management, technology development, and institutional governance play a critical role in enabling value creation. In Mindanao, uneven infrastructure development, particularly in upland coffee-producing areas, raises transaction costs and limits market integration (Mendoza et al., 2022). Human resource constraints, including an aging farmer population and low youth participation, further threaten sustainability. PIDS studies emphasize that regions with stronger coordination among local governments, cooperatives, and national agencies demonstrate better value chain performance (Seráfica, 2021). In this regard, Mindanao's inclusion as a priority area in national coffee roadmaps presents opportunities for value chain upgrading through targeted investments in postharvest facilities, cooperative strengthening, and market linkage development.

## *2.4 Sustainability in the Coffee Value Chain*

Sustainability has become a central concern in the global coffee industry due to increasing environmental pressures, climate variability, and persistent social inequities. Sustainable coffee value chains aim to balance economic viability, environmental protection, and social equity across all stages of production and marketing. According to the Food and Agriculture Organization (FAO, 2019), sustainability initiatives in coffee focus on climate-resilient farming practices, biodiversity conservation, fair compensation for farmers, and improved labor conditions. Certification schemes such as Fairtrade and Rainforest Alliance have been promoted as mechanisms to improve sustainability outcomes. Bacon et al. (2008) found that participation in certified coffee markets can enhance income stability and encourage environmentally responsible practices. However, Reynolds, Murray, and Taylor (2007) cautioned that certification alone does not automatically translate into higher incomes unless farmers are able to meet quality standards and access markets that pay price premiums. More recent studies emphasize that sustainability outcomes are stronger when certification and good agricultural practices are complemented by value-added processing. Processing activities improve quality consistency and traceability, both of which are essential for accessing specialty and sustainability-oriented markets. As such, value-added processing is increasingly viewed as a pathway toward achieving both economic sustainability and environmental resilience within coffee value chains.

## *2.5 The Philippine Coffee Industry and Value Addition*

The Philippine coffee industry is predominantly smallholder-based and is characterized by low

productivity, aging trees, and limited postharvest infrastructure. Despite favorable agroecological conditions, domestic coffee production remains insufficient to meet national demand, resulting in continued reliance on imports (Department of Agriculture, 2017). National policy frameworks identify value chain upgrading as a critical strategy for revitalizing the sector. Studies by the Philippine Institute for Development Studies (PIDS) indicate that most Filipino coffee farmers sell their produce as fresh cherries or dried parchment, capturing minimal value (Briones & Antonio, 2019). In contrast, farmers who engage in value-added activities such as drying, hulling, and quality grading achieve significantly higher returns. These findings are reinforced by the Philippine Coffee Industry Roadmap, which emphasizes that improving postharvest systems is essential for enhancing bean quality, reducing losses, and increasing farmer income. Limited access to processing facilities often forces farmers to sell immediately after harvest, typically at lower prices determined by traders. Consequently, strengthening postharvest infrastructure and farmer organizations is widely viewed as essential for improving competitiveness, stabilizing incomes, and reducing market vulnerability.

### **3. Methodology**

This chapter presented the research methodology that was applied to collect and analyze data for the study. It covered research design, research environment, respondents and sampling design, research instruments, validity and reliability, procedures for data collection, statistical treatment, data analysis, and ethical considerations. Furthermore, the study sought to assess the current condition of coffee farming and examine the various factors that influence the value chain, profitability, and overall sustainability of the industry.

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#### *3.1 Study site*

The study was conducted in selected areas of Region X, specifically in the provinces of Bukidnon and Misamis Oriental. These provinces are in Northern Mindanao, Philippines, and are known for their rich agricultural landscapes, diverse ecosystems, and significant contributions to the region's economy. Bukidnon is a landlocked province characterized by its mountainous terrain, fertile soil, and cool climate. It is often referred to as the "food basket" of Mindanao due to its extensive agricultural activities, particularly in crops like corn, rice, pineapple, and coffee. Coffee production is a vital industry in Bukidnon, with its highlands providing the ideal climate and soil conditions for growing high-quality coffee beans. The province is a key player in the Philippine coffee value chain, particularly for arabica and robusta varieties, which are cultivated by both small-scale and commercial farmers. Bukidnon is also home to indigenous communities and is rich in natural resources, including forests and watersheds that play a crucial role in local and regional water supply. The municipalities within Bukidnon are diverse, with rural areas showcasing a mix of subsistence and commercial farming.

On the other hand, Misamis Oriental is a coastal province with a mix of urban and rural landscapes. It features a range of agricultural, industrial, and tourism activities. The province has fertile lowlands and uplands suitable for crop production, including coffee. Several upland areas in Misamis Oriental are increasingly engaged in coffee farming, contributing to local livelihoods and the growing regional coffee industry. Its capital, Cagayan de Oro City, serves as a commercial and economic hub for the region, offering opportunities for value addition and marketing of agricultural products, including coffee. Misamis Oriental is also known for its agro-

industrial developments and vibrant farming communities.

These two provinces offer a variety of settings and contexts, from the highland agricultural zones of Bukidnon, known for its significant coffee production, to the coastal and urban- influenced farming areas of Misamis Oriental, which are gradually becoming part of the regional coffee value chain. The study's focus on these provinces will provide insights into diverse agricultural practices, economic activities, and socio-environmental conditions in Region X, particularly within the context of coffee production and its value chain.

### *3.2 Data collection methods*

The study used descriptive and quantitative research methodology to comprehensively investigate the research problem. Descriptive research will focus on understanding the features and dynamics of the coffee value chain. The quantitative component involved structured surveys with closed-ended questions, following the principles of survey research. According to Accounting Nest, this combined approach aims to provide insights into the various components and aspects of the coffee value chain, offering a holistic understanding of its features, challenges, and opportunities.

In addition, Focused Group Discussions (FGDs) and Key Informant Interviews (KIIs) were integrated into the study to discern the perspectives, experiences, and opinions of key stakeholders, including coffee farmers, processors, distributors, retailers, and industry experts. These qualitative methods provide a platform for stakeholders to express their viewpoints in detail. Specifically, the study assessed the current condition of the coffee value chain, examining its primary and support activities based on Porter's value chain framework, as well as the strengths, weaknesses, opportunities, and threats identified by the participants involved in the value chain.

### *3.3 Target population and sampling method*

Purposive sampling was employed in the study. This non-probability sampling technique involved the deliberate selection of participants based on specific characteristics or criteria relevant to the research objectives. Approximately 150 respondents were interviewed.

In this study, a deliberate selection was made for respondents on survey questionnaire, FGD and KII.

**Table 1. Criteria for selection of respondents**

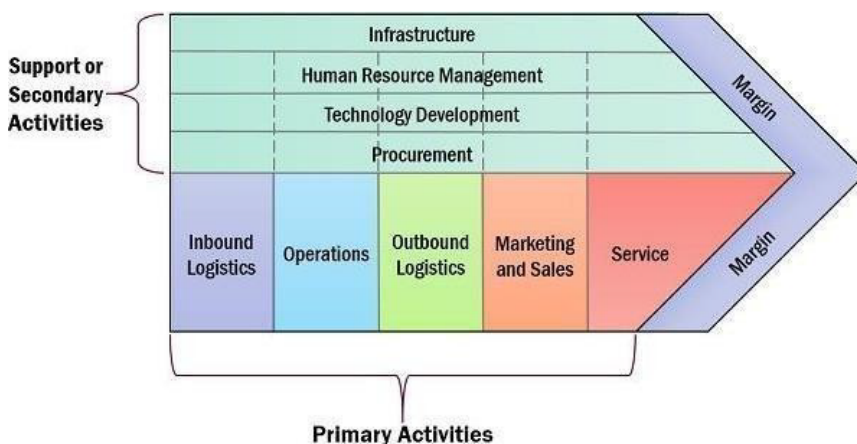
RESPONDENTS	CRITERIA
<b>Questionnaire</b> <ul style="list-style-type: none"> <li>Coffee farmer producers</li> </ul>	<p><b>Experience:</b> Minimum one-year hands-on experience in coffee farming</p> <p><b>Expertise:</b> Knowledge and skills coffee production and management and sustainable practices</p> <p><b>Geography:</b> Located within Region X</p>
<b>Focused Group Discussion</b> <ul style="list-style-type: none"> <li>Participants will consist of a mix of stakeholders, including coffee farmers,</li> </ul>	<p><b>Experience:</b> Direct participation in coffee related endeavors, including farming, processing, trading, or consumption, highlighting firsthand involvement in various stages of the coffee value chain.</p>

Source: Authors' design

*a. Conceptual framework of the study*

Porter's value chain framework provides a systematic approach to analyzing and optimizing each stage of the coffee value chain, including production, processing, and distribution. By identifying the strengths, weaknesses, opportunities, and threats associated with each activity, the framework helps stakeholders in the coffee sector create value at every stage. Gaining a competitive advantage may involve strategies such as streamlining production processes, improving supply chain efficiency, leveraging technology, and refining market approaches. Addressing challenges like high production costs and unstable coffee supply requires a thorough understanding of how each value chain activity contributes to these issues. Porter's value chain model serves as a valuable tool for designing targeted interventions and sustainable strategies in coffee farming.

**Figure 1. Main actor's value chain analysis according to porter's theory**



Source: Porter (1985)

### *b. Sources of data*

The study collected data from both primary and secondary sources. Primary data obtained through surveys, interviews, and focus group discussions with purposively selected respondents who meet the criteria relevant to the research objectives. These methods provided firsthand insights into the respondents' perceptions, behaviors, and experiences related to the study's focus. Secondary data was gathered from existing literature, reports, and statistical records from reliable institutions to supplement and validate the findings. The combination of these sources ensures a comprehensive understanding of the research problem and enhances the overall reliability and validity of the study.

### *c. Analytical methodologies and tools*

Descriptive statistics were utilized to analyze the primary and support activities in the coffee value chain. Data was collated and analyzed using Microsoft Excel and SPSS software. Information gathered through surveys, focus group discussions (FGDs), and key informant interviews (KIIs) underwent thematic analysis to identify patterns and themes. This process included reviewing transcriptions and notes to extract recurring ideas related to the coffee value chain. The analysis began with familiarization, followed by the generation of initial codes and their organization into potential themes, with iterative refinement to ensure accuracy. The finalized themes guided qualitative data analysis, providing in-depth insights into the challenges, opportunities, and dynamics of the coffee value chain as perceived by participants.

## **4. Results and Discussion**

This chapter presents and discusses the results of the study on the coffee value chain in Region X. To provide context for the findings, a short overview of the coffee value chain is first presented to explain how the different stages are linked to one another. The discussion follows Porter's Value Chain Framework, which was adopted as the basis for organizing the analysis. In line with this framework, the coffee value chain starts with inbound logistics, covering the sourcing of inputs, and proceeds to farm production and postharvest handling under operations. This is followed by outbound logistics, which include processing, storage, and distribution, as well as marketing and sales and related services. These core activities are supported by broader support functions that cut across the entire chain. These stages shape how value is created and distributed, influencing product quality, production costs, and income outcomes for the different actors involved.

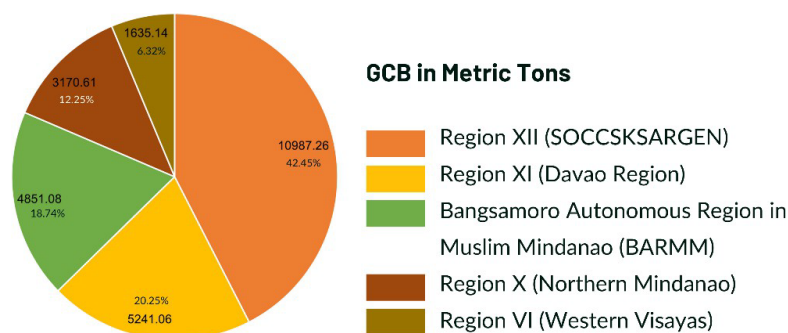
a. *Economic performance of each stage in the coffee value chain, from production to market distribution, within Region X*

i. Current condition of the Coffee Value Chain in Region X based on Primary Activities

Profile of the Philippine Coffee Industry

The Philippine coffee industry remains a smallholder-dominated subsector cultivating four commercial species: Robusta, Arabica, Excelsa, and Liberica. Despite its wide geographic cultivation, national production remains insufficient to meet domestic demand, resulting in a structurally import-dependent coffee economy, particularly for industrial-grade Robusta is used by major processors and soluble manufacturers. National planning documents including the Bukidnon Coffee Roadmap 2025–2035 and the PCIP 2023 highlight persisting structural constraints: low productivity, aging coffee trees, limited access to quality planting materials, inadequate postharvest facilities, and weak market integration. These challenges contribute to fragmented supply chains and inconsistent bean quality, mirroring trends reported in PSA and DA studies. This national condition is reflected in regional production patterns, with Mindanao consistently contributing the majority of the country’s green coffee bean (GCB) output. Figure 4 shows that Region XII (SOCCSKSARGEN) leads production with 10,987.26 MT (42.45%), followed by Region XI (5,241.06 MT or 20.25%), BARMM (18.74%), and Region X Northern Mindanao (12.25%). These regional disparities reinforce the dominance of Mindanao as the heart of Philippine coffee production and highlight the strategic importance of Northern Mindanao, particularly Bukidnon, in shaping national production. At the provincial level, the distribution becomes even clearer.

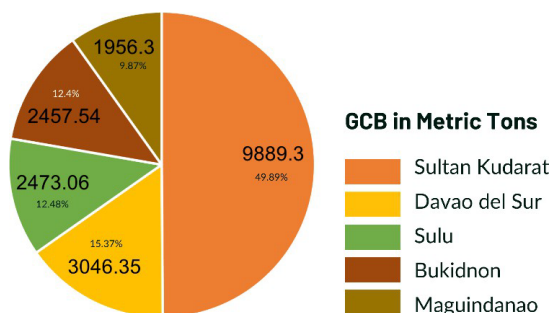
**Figure 4. Volume of Production, Top 5 Regions, 2023**



Source: Bukidnon Coffee Roadmap 2025–2035, p. 13

Figure 5 shows that Sultan Kudarat alone contributes nearly half (49.89%) of total provincial-level production, while Bukidnon ranks among the top five, contributing 12.48% of total national GCB output. Despite its smaller share relative to SOCCSKSARGEN and Davao del Sur, Bukidnon remains one of the few provinces positioned for high-quality Arabica production, supported by its elevation, microclimates, and farmer traditions. However, this potential is constrained by production stagnation between 2019–2023, attributed to: limited replanting and rejuvenation; weak extension systems; limited access to certified planting materials; fragmented farmer organizations; and inconsistent postharvest practices. These province-level constraints are further reflected in the crop-type distribution.

**Figure 5. Volume of Production, Top 5 Provinces, 2025**

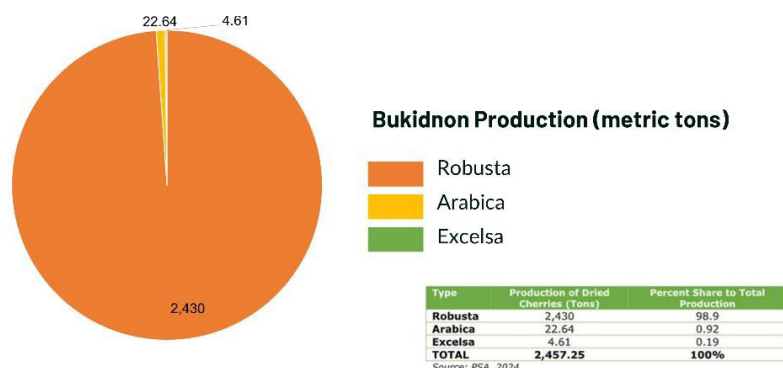


Source: Bukidnon Coffee Roadmap 2025–2035, p. 13

Figure 6 shows that Robusta overwhelmingly dominates Bukidnon’s production (98.9%), with Arabica constituting less than 1% of total output and Excelsa almost negligible. This reveals a severe mismatch between Bukidnon’s potential for specialty Arabica and its current production structure. The dominance of Robusta in Bukidnon is rooted in legacy planting choices and the reliance of many cooperatives on Robusta consolidation programs such as those under Nestlé Philippines. Yet, enterprise-level evidence shows both opportunities and challenges in specialty upgrading.

For example, the Kaatuan Farmers Association in Lantapan, known for award-winning Arabica, faces persistent issues involving low volumes, limited capital for farm inputs, and postharvest inconsistencies. Similarly, the Bayanihan Millennium Multipurpose Cooperative at Lake Napalit continues to struggle with yields below 1 MT/ha, weak GAP compliance, and insufficient nursery and drying facilities, despite having stable Robusta buyers. Taken together, these cases illustrate the dual reality of Northern Mindanao’s coffee sector: high potential for quality-driven Arabica and improved Robusta, but deep structural weaknesses that must be addressed through coordinated intervention.

**Figure 6. Volume of Production by Coffee Type, 2023**



Source: PSA, 2024

Overall, the Philippine coffee industry sits at a critical juncture, balancing strong domestic demand against chronic supply deficits. Bukidnon exemplifies both the challenges and the

avenues for reform from productivity enhancement and rejuvenation programs to cooperative strengthening, quality upgrading, and market integration. Through harmonized implementation of the PCIP (2023) and the Bukidnon Coffee Roadmap (2025–2035), supported by public–private partnerships, Bukidnon is poised to become a national leader in specialty Arabica and improved-quality Robusta, contributing significantly to the long-term competitiveness of the Philippine coffee sector.

## Inbound Logistics

In the context of the coffee value chain, production begins with the acquisition of key inputs specifically seedlings, fertilizers, tools, and labor. For farmers in Bukidnon, however, Porter’s concept of 'inbound logistics' is far from abstract. It represents the tangible, daily difficulty of sourcing and hauling these resources over unpaved roads. These activities serve as the foundation of farm operations, where the efficiency of receiving and handling inputs directly impacts the crop's viability. The effectiveness of this stage is critical, as the quality and management of these initial inputs determines the efficiency of the harvest and sets the baseline for all subsequent processing and distribution efforts.

Table 2 presents the *input sourcing* and farm management practices among 150 coffee farmers across Impasugong, Miarayon, and Claveria. The results reveal that the majority (64.7%) of farmers acquire their coffee seedlings from informal sources such as neighbors, wildlings, their own propagated stock, or planting materials inherited from elders. This finding aligns with the Philippine Coffee Industry Roadmap (DA–DTI, 2017–2022), which highlights that the limited access to certified planting materials remains a bottleneck to productivity and quality assurance in the local coffee sector. Only 10% of respondents used verified clonal or NSIC-certified materials, underscoring the need to strengthen seed distribution systems and nursery accreditation. In terms of *fertilizer use*, 60% of farmers apply fertilizers irregularly or only when affordable, while 22.7% follow recommended nutrient schedules. This pattern is consistent with the findings of Laurena et al. (2019), who reported that smallholders often prioritize immediate household needs over farm inputs, leading to nutrient imbalances and lower yields. The limited use of chicken dung and organic fertilizers also suggests that integrated nutrient management practices are not yet fully adopted. Regarding *credit and procurement*, 73.3% of farmers rely exclusively on cash purchases, indicating weak cooperative or institutional linkages. Studies by Calub et al. (2020) and PIDS (2021) emphasize that limited access to affordable financing and cooperative support constrains input acquisition and reduces economies of scale in coffee production. Only about one-fourth of the respondents’ access credit or benefit from bulk input procurement, a situation that calls for capacity-building and cooperative strengthening. Most farmers *source input* from local agri-supply stores (65.3%), reflecting the dominance of private dealers in distribution input. This mirrors the observations of Pabuayon and Quillooy (2020), who noted that smallholder coffee producers depend heavily on local traders for both inputs and marketing, often at less favorable terms. Furthermore, in terms of *varietal distribution*, Robusta remains the dominant variety (60.7%), particularly in low- to mid-elevation areas of Claveria and Impasugong, while Arabica (32%) is concentrated in higher-elevation barangays like Miarayon. The presence of Excelsa and Liberica (7.3%) reflects localized or heritage cultivation, consistent with the regional patterns reported by PCBI (2023) and PhilCAFE Project (USAID, 2021). This varietal composition aligns with climatic suitability and market orientation: Robusta for bulk commercial markets and Arabica for specialty niches. For *the input storage and transportation*, 77.3% store inputs at home or in small sheds, and 72% personally transport inputs via motorbikes or manual means. This limited logistics capacity increases postharvest losses and labor burden, especially in upland barangays with poor road access. According to Mendoza et al. (2022), such logistical inefficiencies contribute to high farm-to-market transaction costs in Mindanao’s coffee

value chains. The findings highlight critical weaknesses in the inbound logistics of the coffee value chain in Region X, specifically in seedling sourcing, input management, and access to credit. These limitations translate to reduced productivity, inconsistent bean quality, and missed opportunities for scaling high-value varieties. Strengthening nursery networks, cooperative-based procurement, and financial inclusion should therefore be prioritized. Expanding infrastructure support and extension services can help transition farmers from traditional to more sustainable and competitive coffee production systems.

**Table 2. Distribution of Respondents Based on Inbound Logistics of the Coffee Value Chain, Region X (n = 150)**

Indicator	Category / Source	Frequency	Percentage (%)
Source of Seedlings	Informal (own stock, neighbor, wildlings, inherited from elders)	97	64.7
	Municipal / Cooperative or DTI-DA-supported nurseries	28	25.3
	Certified / Traceable seedlings (NSIC or verified clonal material)	15	10
Use of Fertilizers	Regular (follows recommended nutrient schedule)	34	22.7
	Use of Chicken dung	90	60
	Rare / none	26	17.3
Access to Credit / Cooperative Bulk Procurement	Has access to some credit or coop bulk procurement	40	26.7
	Relies exclusively on cash purchases	110	73.3
Sources of Input Supply	Local Agri-supply stores / dealers	98	65.3
	Cooperative or association procurement	34	22.7
	Government distributions (DA, LGU projects)	18	12
Variety of Coffee Cultivated	Robusta	91	60.7
	Arabica	48	32
	Excelsa / Liberica	11	7.3
Storage of Inputs	Stored at home / small shed	116	77.3
	Cooperative / shared storage facility	25	16.7
	None / direct application upon purchase	9	6
Transportation of Inputs	Personally transported by farmers (motorcycle, animal-drawn, manual)	108	72
	Delivered by suppliers or cooperatives	30	20
	Shared transport within farmer members	12	8

Source: Authors

## Operations

As shown in table 3, the results show that most farmers (100%) conduct *manual land preparation*, mainly through land clearing and minimal tillage. This indicates the continued reliance on traditional, labor-intensive methods with limited mechanization, consistent with findings by Laurena et al. (2019), who noted that smallholder coffee production in Mindanao remains largely dependent on manual operations due to farm size and limited access to farm machinery. In terms of *seedling establishment*, 64.7% of farmers rely on informal sources such as neighbors, wildlings, or inherited stock/inherited from elders, while only 10% use certified or nursery-propagated seedlings. This mirrors national trends described in the Philippine Coffee Industry Roadmap (DA–DTI, 2017–2022), which identifies limited access to quality planting materials as a persistent constraint affecting productivity and quality consistency. The dominance of informal sources implies genetic variability and potential susceptibility to pests and diseases, reducing long-term farm efficiency. For *planting density and spacing*, more than half (56.7%) of farmers practice irregular spacing or intercropping with crops like banana or corn.

Although intercropping provides income diversification, Pabuayon and Quilloy (2020) emphasize that irregular spacing often leads to competition for nutrients and inconsistent bean size, limiting value addition at the operational level. Only 43.3% adhere to proper spacing, usually in cooperatively supported farms. Regarding *farm maintenance*, a majority (78.7%) conduct regular weeding and mulching, indicating awareness of basic crop care. However, only 28% perform annual pruning and rejuvenation, while 72% do it irregularly every two to three years. The low pruning rate thus reflects a gap in technical knowledge and extension support. Meanwhile, in terms of fertilizer and nutrient management, only 22.7% follow a recommended schedule, while 60% apply fertilizers irregularly and 17.3% rely on organic sources such as chicken dung or compost. Mendoza et al. (2022) noted that irregular fertilization contributes to nutrient imbalance and soil fertility decline, reducing bean yield and quality. This highlights the economic barrier to adopting science-based nutrient management. In pest and disease management, 67.3% of farmers rely on manual or organic control, while 32.7% use chemical pesticides. Manual pest management aligns with sustainable practices but also indicates limited access to technical guidance or inputs for integrated pest management (IPM). *Harvesting practices* vary by altitude and variety: 63.3% practice selective handpicking, mainly in high-elevation Arabica farms in Miarrayon, while 36.7% adopt strip-picking for Robusta in Claveria and Impasugong. The prevalence of selective harvesting supports quality-focused operations but also requires more labor, affecting scalability. *Postharvest handling* is dominated by sun drying on mats, pavements, or tarpaulins (85.3%), while only 14.7% use solar dryers. The dependence on traditional drying surfaces exposes beans to contamination and moisture variability. PIDS (2021) reports that limited drying infrastructure remains one of the weakest links in Mindanao's coffee postharvest system, contributing to inconsistent cupping scores. Finally, *family labor* constitutes 70% of farm work, while 30% employ hired labor during harvest. This underscores the smallholder and subsistence character of coffee farming, consistent with PhilCAFE (2021) findings. The average years in coffee production (10–15 years for 44% of respondents) indicate an experienced yet aging farmer population and the prevalence of mature or declining coffee stands, which require rejuvenation and replanting. The results imply that coffee operations in Region X remain largely traditional, characterized by low input use and irregular maintenance practices that limit productivity and bean quality.

Weak extension delivery has resulted in limited adoption of pruning, fertilizer management, and access to certified nurseries, underscoring the need to scale up Good Agricultural Practices (GAP) training. The absence of mechanization, credit facilities, and adequate drying infrastructure highlights the need for stronger institutional support from the DA, LGUs, and cooperatives to enhance operational efficiency. The reliance on family labor exposes the sector to sustainability and generational transition challenges, emphasizing the importance of engaging the youth in coffee production. Strengthening operational activities particularly pruning, replanting, and postharvest handling can significantly improve yields, product quality, and the overall competitiveness of Arabica in Miarayon and Robusta in Claveria within the regional coffee value chain.

**Table 3. Distribution of respondents in terms of Operational Activities of Coffee, Region x (n=150)**

Operational Activity	Specific Practices / Parameters	Frequency	Percentage (%)
Land Preparation	Land clearing, slashing, and minimal tillage prior to planting	150	100
Seedling Establishment	Use of informal sources (own stock, wildlings, neighbors, inherited from elders)	97	64.7
	Use of certified or nursery-propagated seedlings	15	10.0
Planting Density and Spacing	Proper spacing (2m x 3m or 2m x 2m) observed	65	43.3
	No proper spacing / intercropped with banana or corn	85	56.7
Weeding and Mulching	Regular weeding and mulching	118	78.7
	Occasional weeding and mulching	32	21.3
Pruning / Rejuvenation	Regular annual pruning and rejuvenation	42	28.0
	Occasional or irregular pruning (every 2-3 years)	108	72.0
Fertilizer and Nutrient Management	Regular fertilizer use following schedule	34	22.7
	Irregular or minimal fertilizer use	26	17.3
	Organic fertilizer (chicken dung / compost)	90	60
Pest and Disease Management	Manual pest control (removal, traps, organic sprays)	101	67.3
	Use of chemical control (insecticides/fungicides)	49	32.7
Harvesting Method	Selective handpicking (ripe cherries only)	95	63.3
	Strip-picking (all cherries at once)	55	36.7
Postharvest Handling	Sun drying on mats/pavements/trapal	128	85.3
	Use of solar dryers	22	14.7
Labor Source	Family labor	105	70.0
	Hired labor	45	30.0
Years in Coffee Production	Less than 5 years	21	14.0
	5-10 years	63	42.0
	More than 10 years	66	44.0

Source: Authors

## Outbound Logistics

After coffee is harvested and initially processed, the value chain moves to outbound logistics, which covers how the product is transferred from the farm to buyers. In line with Porter's framework, this stage connects production with the market and includes activities such as storage, handling orders, and transportation. The next section discusses how farmers in the study area carry out these activities, focusing on their storage practices and how coffee is delivered to traders or end consumers.

The data below (table 4) reveal that more than half (55.3%) of farmers sell *dried coffee cherries* (parchment), while 34.7% market *hulled green beans* and only 10% sell fresh red cherries. This indicates that most farmers engage in limited postharvest processing, aligning with findings from PhilCAFE (USAID, 2021) and the Philippine Coffee Industry Roadmap (DA-DTI, 2017–2022), which emphasize that most smallholders in Mindanao operate at the lower end of the value chain, selling semi-processed coffee with minimal value addition. Access to hulling and drying facilities remains a key constraint, reducing opportunities for quality improvement and premium pricing. Regarding *monthly production volume*, 40.7% of respondents produce below 50 kg per month, 35.3% produce 50–100 kg, and only 24% produce above 100 kg, reflecting small-scale production typical of fragmented farms in upland areas. This limited output restricts farmers' ability to meet bulk buyer requirements and maintain consistent supply, a challenge also noted by Calub et al. (2020) in their assessment of coffee cluster enterprises. In terms of *market demand*, 48% report having stable buyers, while 42% experience fluctuating demand depending on the harvest season. The remaining 10% lack regular buyers, underscoring market instability and the seasonal nature of coffee marketing. According to Pabuayon and Quilloy (2020), such market irregularity exposes farmers to price volatility and limits their bargaining power. For *market destination*, 44.7% sell to local traders or middlemen, 39.3% to municipal markets, and only 12.7% and 3.3% to cooperatives and direct buyers, respectively. This reflects the predominance of informal trade channels and the weak role of organized marketing systems. PIDS (2022) observed that middlemen remain dominant due to their accessibility and provision of cash payment, despite offering lower farm-gate prices. Transportation is *largely manual* or motorcycle-based (59.3%), with only 24.7% using hired vehicles and 16% accessing shared or cooperative transport. The lack of efficient transport infrastructure contributes to high logistics costs and quality deterioration during transit, especially in upland barangays a trend consistent with Mendoza et al. (2022). *Postharvest practices* show that 68% store produce at home, 18.7% use cooperative warehouses, and 13.3% sell immediately after drying.

This means limited storage capacity and a tendency toward immediate selling, often due to cash flow constraints. Similarly, PhilCAFE (2021) highlighted inadequate storage facilities as a major factor affecting moisture consistency and bean quality. In terms of *quality grading or sorting*, 52% conduct basic sorting, 20.7% apply moisture or size grading, while 27.3% do no sorting at all. This further implies that most coffee entering the market lacks standardized quality control, reducing access to specialty markets. As supported by Cortez et al. (2023), establishing consistent grading practices and training farmers in postharvest quality assessment are critical steps for improving competitiveness in the coffee value chain. The results highlight that coffee outbound logistics in Region X remain traditional, fragmented, and volume-driven, with most farmers dependent on traders and limited by inadequate storage, transport, and quality control systems.

These weaknesses constrain value addition, income potential, and traceability within the supply chain. Strengthening cooperative marketing systems, establishing community-level postharvest hubs, and providing training on quality grading and logistics management can enhance efficiency and market participation. Institutional support from DA, DTI, and LGUs is crucial to develop integrated coffee value chain infrastructure and transition smallholders from low-value to quality-driven, competitive production systems.

**Table 4. Distribution of Respondents in terms of Outbound Logistics Activities of Coffee Farmers in Region X (n = 150)**

Activity	Parameters	Frequency	Percentage (%)
Type of Beans Sold	Dried coffee cherries (parchment)	83	55.3
	Green coffee beans (hulled)	52	34.7
	Fresh red cherries	15	10.0
Monthly Production Volume (Average Supply)	Below 50 kg per month	61	40.7
	50–100 kg per month	53	35.3
	Above 100 kg per month	36	24.0
Monthly Market Demand (Buyers' Purchase Volume)	Stable (consistent buyer every month)	72	48.0
	Fluctuating (depends on harvest season)	63	42.0
	No regular buyer	15	10.0
Market Destination	Local municipal markets (Claveria, Impasugong, Miarayon)	59	39.3
	Local traders / middlemen	67	44.7
	Cooperatives / associations	19	12.7
	Direct buyers / roasters / processors	5	3.3
Transportation Used for Delivery	Motorcycle / habal-habal	89	59.3
	Jeep / multicab / hired vehicle	37	24.7
	Cooperative vehicle / shared transport	24	16.0
Postharvest Storage before Sale	Stored at home / small shed	102	68.0
	Stored in cooperative warehouse	28	18.7
	Sold immediately after drying	20	13.3
Quality Grading / Sorting	Basic sorting (removal of defects, stones, and unripe beans)	78	52.0
	Quality grading by moisture or bean size	31	20.7
	No sorting / bulk sale	41	27.3

Source: Authors

## Marketing and Sales

Results in table 5 shows that a majority (56%) of farmers sell their produce to local traders or middlemen, while only 22% transact through cooperatives and 12% through direct buyers or processors. This indicates a trader-dominated marketing system, a structure that limits farmers' bargaining power and income potential. Similar findings were reported by Pabuayon and Quilloy (2020), who observed that smallholder coffee farmers in Mindanao remain dependent on traders due to immediate cash needs and weak cooperative networks. In terms of *type of beans sold*, more than half of the respondents (55.3%) sell dried coffee cherries (parchment), indicating that most farmers engage only in basic postharvest processing such as drying before selling to traders. About 34.7% sell green coffee beans (hulled), often through cooperatives or organized groups with access to hulling machines, while only 10% sell fresh red cherries, typically from lowland farms in Claveria where buyers prefer bulk and immediate delivery. This pattern reflects limited value addition at the farm level and highlights the farmers constrained access to processing facilities. According to PhilCAFE (USAID, 2021) and the Philippine Coffee Industry Roadmap (DA–DTI, 2017–2022), processing coffee to green or roasted form significantly increases income potential and market competitiveness. Therefore, improving access to postharvest technologies and training on quality-based processing can enhance profitability and strengthen the value chain participation of smallholder farmers. Regarding *means of selling*, 45.3% rely on on-farm pick-up by traders, which provides convenience but reinforces trade control over pricing and logistics. Only 17.3% sell through cooperatives or contract arrangements that typically provide better price transparency and market access. *Pricing* remains largely buyer-determined (62%), with just 23.3% of farmers receiving cooperative-based prices linked to quality grading. This buyer dominance reflects asymmetric market information, consistent with the observations of PIDS (2022) that farmers often lack access to current price data, leaving them vulnerable to market exploitation. *Sales* are concentrated during the main harvest season (October–February) for 69.3% of respondents, when market supply peaks and prices tend to drop. A smaller portion (30.7%) sell during the lean months, usually those with drying and storage capacity. This seasonal concentration contributes to price volatility and cash-flow constraints. Most farmers (86%) *receive spot cash payments*, while deferred payments (14%) are limited to cooperative or contract-based transactions. The dominant *marketing channel* remains the Farmer → Trader → Roaster/Retail route (55.3%), while only 17.4% of farmers participate in direct sales to buyers or cafés an emerging model in Miarayon where Arabica is grown. *Marketing promotion* remains weak: 77.3% sell unbranded raw coffee, and only 8.7% market products under their own brand or label. As noted by DA–DTI (2017–2022) and Cortez et al. (2023), branding and traceability are critical for premium and export coffee markets, yet these remain underdeveloped in region X. Finally, record-keeping practices are poor, 72% of farmers have no formal sales records, limiting their ability to monitor profitability or access financing.

**Table 5. Distribution of respondents in terms of Marketing and Sales Activities of Coffee Farmers in Region X (n = 150)**

Marketing & Sales Activity	Parameters	Frequency	Percentage (%)
Main Buyer Type	Local traders / middlemen	84	56.0
	Cooperative / association	33	22.0
	Direct buyers / roasters / processors	18	12.0
	Local market / retail customers	15	10.0
Type of Beans Sold	Dried coffee cherries (parchment)	83	55.3
	Green coffee beans (hulled)	52	34.7
	Fresh red cherries	15	10.0
Means of Selling	On-farm pick-up by traders	68	45.3
	Delivered to buying station / market	56	37.3
	Through cooperative / contract marketing	26	17.3
Basis for Pricing Products	Trader-determined price	93	62.0
	Cooperative-set price (based on quality grade)	35	23.3
	Negotiated / contract-based price	22	14.7
Most Active Sales Periods in a Year	Main harvest (October–February)	104	69.3
	Lean season (March–September)	46	30.7
Mode of Payment	Spot cash	129	86.0
	Deferred / installment payment	21	14.0
Marketing Channel Type	Farmer → Trader → Roaster / Retail	83	55.3
	Farmer → Cooperative → Buyer	41	27.3
	Farmer → Direct Buyer / Café / Retailer	26	17.4
Marketing Promotion / Branding	No brand (sold raw)	116	77.3
	Local cooperative brand	21	14.0
	Own brand / label	13	8.7
Record-Keeping and Market Data Awareness	No formal sales record	108	72.0
	Keeps simple manual record	30	20.0
	Uses cooperative record system	12	8.0

Source: Authors

## Services

Table 6 presents the service-related activities of coffee farmers under Porter’s Value Chain in Region X. Results show that nearly half (47.3%) of the farmers have *not received any formal technical training*, while only 34.7% attended DA/LGU programs and 18% benefited from cooperative or NGO-led training. This indicates limited extension reach, consistent with PhilCAFE (USAID, 2021), which emphasized that gaps in technical assistance hinder productivity and quality improvement among smallholder coffee farmers. *Institutional participation* is also weak, with only 25.3% belonging to cooperatives. This low organizational membership limits access to postharvest support and collective marketing. Similar patterns were reported by Pabuayon and Quillooy (2020), who found that fragmented farmer organizations reduce bargaining power and impede value chain upgrading. Moreover, 61.3% of respondents reported no access to government or NGO input support, reflecting uneven distribution of assistance programs across coffee areas. In terms of market engagement, 80.7% of farmers receive no feedback from buyers, while over half (51.3%) depend on traders for market information further reinforcing asymmetric market relationships. This lack of communication prevents continuous quality improvement and limits access to specialty markets (PIDS, 2022).

Additionally, most farmers (85.3%) *receive no branding or packaging support*, and 78% lack access to formal financial services. Only 12.7% provide direct delivery or 7.3% offer custom packaging, suggesting minimal customer-oriented services. Likewise, 84% have not participated in trade fairs, restricting their exposure to new buyers and markets.

**Table 6. Distribution of Respondents in Terms of Services Accessed by Coffee Farmers in Region X (n = 150)**

Service Activity	Parameters	Frequency	Percentage (%)
Access to Technical Assistance	Attended DA/LGU training on coffee production, pruning, or postharvest	52	34.7
	Received cooperative-led or NGO training	27	18.0
	No formal technical training received	71	47.3
Participation in Cooperative or Association Services	Member of cooperative with access to marketing and postharvest support	38	25.3
	Not a member of any organization	112	74.7
Access to Input Subsidies and Support Projects	Benefited from DA/LGU input distributions (seedlings, fertilizers)	58	38.7
	No access to government or NGO support	92	61.3
After-Sales or Buyer Feedback Mechanism	Buyers/cooperatives provide quality feedback on beans	29	19.3
	No feedback received from buyers	121	80.7
Access to Market Information and Price Updates	Regularly informed through cooperative or LGU bulletins	46	30.7
	Informed only by traders	77	51.3
	No regular source of market information	27	18.0
Product Promotion and Branding Support	Received support for packaging or branding (from DTI/DA)	22	14.7
	No support for branding or marketing	128	85.3
Access to Credit and Financial Services	Accessed microfinance, cooperative credit, or CARD programs	33	22.0
	No access to formal financial services	117	78.0
Additional Customer-Oriented Services	Offers direct delivery to buyer or café	19	12.7
	Provides custom roasting or packaging for clients	11	7.3
	No added customer services beyond sale	120	80.0
Participation in Trade Fairs / Exhibits	Participated in local or regional coffee trade fairs	24	16.0
	No participation in trade fairs or exhibitions	126	84.0

Source: Authors

### Current condition of the Coffee Value Chain in Region X based on Support Activities

Table 7 shows the distribution of coffee farmers in Region X based on the support activities of the value chain, specifically procurement, human resource management, technology development, and firm infrastructure. The data reveal that most farmers (65.3%) *procure inputs individually*, while only 18.7% participate in group or cooperative procurement, and 16% receive inputs from DA or LGU programs. This indicates a weak collective procurement system that increases costs and limits access to quality inputs. According to PhilCAFE (USAID, 2021)

and the Philippine Coffee Industry Roadmap (DA–DTI, 2017–2022), the absence of organized input systems remains a key constraint to coffee farm productivity and efficiency. In terms of *human resource management*, only 34.7% have attended DA or PhilCAFE training, while nearly half (47.3%) rely on traditional knowledge. This reflects limited extension coverage and capacity development among smallholders, consistent with Calub et al. (2020), who noted that the lack of structured training hinders technology adoption and rejuvenation practices. Moreover, only 18% involve youth or hired labor, indicating an aging farmer population and low generational transfer, which poses long-term sustainability concerns. For *technology development*, the majority (74.7%) still use manual drying methods such as tarpaulins and mats, while only 16.7% utilize improved dryers or hulling machines, and 8.6% plant certified varieties. This demonstrates the slow adoption of modern postharvest and production technologies, which affects quality and value addition. As highlighted by Mendoza et al. (2022), low mechanization and limited access to improved technologies contribute to inconsistent coffee quality and reduced market competitiveness. Regarding *infrastructure*, 40.7% reported access to good farm-to-market roads, while 34.6% lack formal infrastructure, relying on home-based facilities. Only 24.7% have access to cooperative storage or drying facilities, and 20% are supported by active LGU or coffee organizations. This indicates uneven infrastructure support across municipalities, particularly in upland barangays. According to Pabuayon and Quillooy (2020), infrastructure deficiencies, especially in logistics and storage, significantly raise transaction costs and limit farmers’ ability to access premium markets.

**Table 7. Distribution of respondents in terms of Support Activities of coffee value chain in region x (n=150)**

Support Activity Parameters		Frequency	Percentage (%)
<b>Procurement</b>	Purchases farm inputs individually (no collective buying)	98	65.3
	Participates in cooperative or group procurement	28	18.7
	Receives DA/LGU-distributed inputs (seedlings/fertilizer)	24	16.0
<b>Human Resource Management</b>	Has attended DA/LGU or PhilCAFE training (GAP, pruning, postharvest)	52	34.7
	Relies on traditional/inherited knowledge	71	47.3
	Engages youth or hired workers in coffee farming	27	18.0
<b>Technology Development</b>	Uses manual drying (trapal, mat, open pavement)	112	74.7
	Uses improved or solar dryers, moisture meters, or hulling machines	25	16.7
	Adopts improved varieties or certified seedlings	13	8.6
<b>Infrastructure</b>	Access to good farm-to-market roads	61	40.7
	Access to storage or cooperative facilities (drying, grading, warehouse)	37	24.7
	No access to formal infrastructure (uses home-based facilities)	52	34.6
	Supported by active local coffee organization or LGU program	30	20.0

Source: Authors

ii. Economic Analysis of Coffee Production in Region X in terms of Return on Investment (ROI) and Return on Sales (ROS)

The profitability analysis of Region X's coffee value chain shows (table 8) clear differences across varieties and product forms, highlighting the economic advantage of moving up the value chain through drying, hulling, and quality upgrading. The table indicates that Arabica green beans deliver the strongest financial performance with ROI of 95% and ROS of 40%, resulting in an estimated profit of ~₱190/kg. This aligns with national evidence that Arabica from high-altitude farms such as those in Bukidnon tends to command higher farmgate prices and market premiums due to quality differentiation and specialty demand (DA, 2017; PCAARRD, 2020).

For Robusta, dried parchment and hulled beans achieve ROI values of 80–88%, outperforming fresh cherries (55% ROI). This is consistent with national value-chain studies showing that each post-harvest step particularly drying and hulling adds measurable economic value for farmers by improving shelf life, reducing transport losses, and opening access to traders and processors offering higher prices (DA, 2017; PIDS Briones & Antonio, 2019).

Excelsa/Liberica (Barako) demonstrates lower profitability relative to Arabica and Robusta, with ROI of 50–75% and notably higher break-even prices (~₱233–₱260/kg). This reflects the structural challenges documented in Barako-producing regions, including lower yield potential, aging trees, and weaker market linkages (PCAARRD, 2019). The higher cost-to-revenue ratios (29–33%) for Barako confirm the crop's declining competitiveness, echoing broader national trends of reduced Liberica production in CALABARZON (PSA, 2020).

Across all varieties, value addition significantly improves financial returns. For instance, converting Robusta fresh cherries to hulled beans increases ROI from 55% to 88%, while Arabica increases from 60% to 95%. This pattern supports PIDS findings that upgrading post-harvest capabilities such as access to dryers, hullers, and cooperative-led processing substantially enhances farmer margins and strengthens regional competitiveness (Seráfica, PIDS 2021). The profitability structure presented in the table reinforces the need for processing investments, farmer training, and cooperative consolidation, especially in Region X where both Arabica and Robusta show strong upgrading potential. The consistently favorable ROI and ROS values demonstrate that coffee remains a high-value crop in Northern Mindanao, especially when farmers participate in higher-value nodes of the chain.

**Table 8. Economic Analysis of Coffee Production in Region X Using ROI and ROS**

Coffee Variety	Product Form	Average Annual Gross Sales (₱)	Operating Expenses (₱)	ROI (%)	ROS (%)	Net Income (₱)	Cost-to-Revenue Ratio (%)	Estimated Profit per kg (₱)	Break-even Price per kg (₱/kg)
Robusta	Fresh Red Cherries	250,000	78,000	55	22	55,000	31%	~92/kg	~130/kg
	Dried Cherries (Parchment)	266,667	70,000	80	30	80,000	26%	~133/kg	~117/kg
	Green Beans (Hulled)	251,429	65,000	88	35	88,000	26%	~147/kg	~108/kg
Arabica	Fresh Red Cherries	240,000	75,000	60	25	60,000	31%	~120/kg	~150/kg
	Dried Cherries (Parchment)	265,625	68,000	85	32	84,000	26%	~168/kg	~136/kg
	Green Beans (Hulled)	237,500	60,000	95	40	95,000	25%	~190/kg	~120/kg
Excelsa / Liberica (Barako)	Fresh Red Cherries	250,000	78,000	50	22	55,000	31%	~183/kg	~260/kg
	Dried Cherries (Parchment)	250,000	72,000	70	28	70,000	29%	~233/kg	~240/kg
	Green Beans (Hulled)	212,500	70,000	75	30	64,000	33%	~213/kg	~233/kg

Source: Authors

### iii. Comparative Matrix on Philippine Regional Coffee Value Chains

As shown in table 9, the coffee value chain in Northern Mindanao particularly in the provinces of Bukidnon and Misamis Oriental differs significantly from the chains found in Batangas, Benguet, and Sultan Kudarat in terms of variety mix, production structure, institutional support, sustainability, and market orientation. These distinctions shape the region's competitive position and its potential pathways for upgrading.

Northern Mindanao's value chain is characterized by a dual-variety advantage, producing both Arabica in highland zones and Robusta in lowland areas. This reflects Mindanao's broader production profile, where multiple varieties thrive due to diverse agroecological conditions. In comparison, Batangas are predominantly associated with Liberica or Kapeng Barako, a heritage variety whose production has significantly declined due to the aging of trees and limited replanting. Benguet remains rooted in high-altitude Arabica production while Sultan Kudarat, part of SOCCSKSARGEN, is the country's leading Robusta supplier, accounting for about 37 percent of national green coffee bean output in 2015 (Department of Agriculture, 2017). The presence of both Arabica and Robusta gives Northern Mindanao a unique flexibility to cater to both commercial and specialty markets.

In terms of production scale and farm structure, DA data show that Northern Mindanao had approximately 11,709 hectares planted to coffee and produced about 2,718 metric tons of green coffee beans in 2015, largely through smallholder systems (DA, 2017). Similar smallholder dominance appears in Benguet, though its production remains small lot and specialty oriented.

Batangas faces structural decline due to the difficulty of replanting Liberica and the limited scalability of Barako orchards. Sultan Kudarat, by contrast, benefits from a long-standing bulk production structure that supports high national output levels (DA, 2017). Northern Mindanao's mix of smallholders, cooperatives, and emerging processors positions it between Benguet's specialty focus and Sultan Kudarat's volume-driven model.

Institutionally, Northern Mindanao benefits from strong national support through the Philippine Coffee Industry Roadmap 2017–2022, which identifies Mindanao as a priority for rehabilitation, expansion, and value-chain upgrading (DA, 2017). Government programs have also provided seedlings, training, and farm support across Mindanao, strengthening regional capacity (Philippine News Agency, 2018). Benguet has received its own share of institutional support through shared-service facilities for Arabica quality improvement (Wikipedia, 2023), while Batangas has struggled with revitalization issues for Barako. Sultan Kudarat benefits from national investment because of its volume contribution. These institutional conditions align with the findings of the Philippine Institute for Development Studies (PIDS), which highlight that regions with stronger coordination among local governments, extension services, and market institutions exhibit better agricultural value-chain performance (Briones & Antonio, 2019; Serafica, 2021). This suggests that Northern Mindanao is structurally positioned for more rapid upgrading compared to regions with weaker institutional linkages.

Sustainability and agroecology further differentiate the regions. The Vancouver PCG's coffee industry primer emphasizes that Mindanao's climatic and geographic characteristics make it highly suitable for both Robusta and highland Arabica (Vancouver PCG, 2020). In contrast, Batangas' Liberica plantations face sustainability issues stemming from aging trees, while Benguet's cooler highland environment continues to favor agroforestry-compatible Arabica production. Sultan Kudarat's Robusta systems tend toward monocropping with less emphasis on environmental sustainability. The ecological potential of Northern Mindanao supports the development of climate-resilient, shade-grown, and higher-quality coffee production, aligning with PIDS findings on the growing importance of climate-adaptive agricultural systems (Bordey et al., 2022).

In terms of quality and market positioning, Northern Mindanao's average yields mirror national productivity challenges only about 0.32 metric tons per hectare as of 2015 (DA, 2017). Like other Mindanao regions, issues such as aging trees, limited post-harvest facilities, and inconsistent processing practices persist. Benguet Arabica remains the benchmark for local specialty coffee quality, while Batangas Barako holds strong heritage value but limited supply. Sultan Kudarat remains dominant in bulk Robusta markets, with less focus on quality differentiation. Despite these challenges, Northern Mindanao is recognized for emerging specialty potential, especially with Bukidnon Arabica gaining national recognition in recent years, which highlights opportunities for quality upgrading and value addition

**Table 9: Comparative Matrix-Philippine Regional Coffee Value Chains**

<b>Feature</b>	<b>Northern Mindanao (Bukidnon / Misamis Oriental)</b>	<b>Batangas</b>	<b>Benguet / Cordillera</b>	<b>Sultan Kudarat (SOCCSKSARGEN)</b>
Variety Mix / Dual-Variety Strength	Region falls under Mindanao, which produces mostly Robusta but also Arabica. Common coffee varieties as part of national mix.	Historically known for Liberica/Barako a heritage variety.	Known for specialty Arabica (high-altitude, Typica variety).	Predominantly Robusta and other commercial varieties, contributing to the bulk production in Mindanao.
Production Scale, Farm Structure (Smallholders, Estates, Cooperatives, Processors)	According to PSA/DA data: In 2015, Northern Mindanao had ~11,709 ha planted, producing ~2,718 mt green coffee beans (GCB). Coffee production in Mindanao (including this region) remains dominated by smallholder farms.	Batangas/Barako production has declined significantly. Barako trees are large and difficult to replant limiting production scalability.	Coffee production in Benguet remains small-scale, mostly backyard or small farms; specialty Arabica produced in limited lots.	SOCCSKSARGEN (which includes Sultan Kudarat) historically contributes the largest share of national coffee output. In 2015 it accounted for ~37% of national green coffee bean output.
Institutional Support & Value-Chain Infrastructure	The national Philippine Coffee Industry Roadmap 2017-2022 identifies Mindanao (which includes Northern Mindanao) among “key production areas” for rehabilitation and expansion. National-level programs (DA / trade / development) aim to support coffee farmers across Mindanao, including provision of inputs, extension, and value-chain support.	Batangas’ coffee (Barako) is considered a heritage variety but has experienced decline, aging plantations, and weak modernization or revitalization efforts.	Benguet has had recent institutional support: example shared-service facilities and a processing/cupping lab established for Arabica coffee, supporting quality production.	As part of SOCCSKSARGEN, Sultan Kudarat benefits from the same national roadmap support for bulk producers.
Sustainability / Agroecology / Environmental Suitability	Mindanao coffee areas are among those described by industry sources to have the climatic and geographic potential for coffee production. The national primer notes that the Philippines is among the few countries producing multiple coffee varieties suited to different ecological zones.	Barako (Liberica) uses older generations of coffee orchards; production decline and old trees pose sustainability challenges.	Highland Arabica (Benguet) benefits from cooler climate, elevation, and terroir conducive to specialty coffee quality and agroforestry compatibility.	Robusta production in bulk areas tends to prioritize volume over environmental or specialty-oriented practices.
Quality Consistency, Value-Addition, Market Positioning	National data indicate that coffee output and area in the Philippines have been declining; average yield per hectare remains low (~0.32 mt/ha in 2015). Challenges for coffee in Mindanao include aging trees and low productivity referring to national level trends.	Barako has strong heritage/heritage-variety branding, but production scale and consistency are constrained.	Benguet Arabica is widely regarded as the top-quality domestic Arabica origin small-lot, high-quality specialty coffee with consistent demand for quality beans.	Sultan Kudarat / SOCCSKSARGEN focuses on volume bulk Robusta or commercial beans with lower emphasis on specialty or high-quality differentiation.

Source: Department of Agriculture (2017)

## 4.2 Key Challenges and Opportunities affecting Sustainability in the Coffee Value Chain

### SWOT Analysis

The coffee value chain in Region X comprising the provinces of Bukidnon and Misamis Oriental presents a complex yet promising landscape of agricultural development, institutional collaboration, and emerging market opportunities. The SWOT analysis reveals that Region X possesses several intrinsic strengths that position it as a major player in the Philippine coffee industry, while also facing notable weaknesses and external threats that could affect its sustainability and competitiveness if not addressed strategically.

#### Strengths

The foremost strength of Region X lies in its favorable agro-climatic and geographic conditions, particularly in Bukidnon, which has long been recognized as the country's leading Arabica-producing province. The province's elevation range of 1,200–1,800 meters above sea level and fertile volcanic soils create ideal conditions for producing high-quality Arabica beans. The Bukidnon Coffee Roadmap (2025–2035) formalizes this advantage, setting an ambitious goal to expand 10,000 hectares of coffee plantations through coordinated government and private sector initiatives (Inquirer.net, 2024).

The roadmap's implementation is supported by multiple institutions including the Department of Agriculture (DA), Department of Trade and Industry (DTI), Mindanao Development Authority (MinDA), and Local Government Units (LGUs) demonstrating strong multistakeholder coordination (DA Region X, 2025). Complementing this production strength is the region's growing recognition for coffee quality. Bukidnon's coffee consistently dominates the Philippine Coffee Quality Competition, with local farms such as Finca de Garces receiving top awards in 2025 for specialty-grade beans (PIA, 2025). This has reinforced Bukidnon's branding as a center of excellence for specialty coffee, while also inspiring farmers in Misamis Oriental to engage in similar quality-focused production. The rising farmgate prices averaging ₱290.97 per kilogram for Arabica in the first quarter of 2025 (PSA, 2025) further enhance profitability and attract new entrants into coffee farming. Meanwhile, Misamis Oriental contributes valuable expansion potential, with Claveria, Gingoog, and Medina identified by SunStar (2023) as having ideal elevation and soil conditions for coffee and cacao cultivation. The presence of multiple ongoing training programs under the RAPID Growth and PRDP initiatives (BusinessMirror, 2025) strengthens farmer capacity, while the establishment of post-harvest hubs and processing facilities underlines the institutional commitment to scaling up the value chain.

#### Weaknesses

Despite these strengths, Region X's coffee sector continues to face persistent structural and operational weaknesses. First, there exists an imbalance in development between Bukidnon and Misamis Oriental. While Bukidnon has established cooperatives, nursery systems, and government-supported extension networks, Misamis Oriental's coffee industry remains underdeveloped and fragmented. Smallholder farmers in the province have limited access to capital, production technology, and organized marketing systems. The adoption of Good Agricultural Practices (GAP) also remains uneven, with many upland farmers still relying on traditional and low-input production systems (Bukidnon Coffee Roadmap, 2025–2035). The

absence of mechanization, limited irrigation, and inadequate pest management contribute to relatively low yields compared to potential. A second weakness concerns post-harvest and processing capacity, which remains a bottleneck in both provinces. Although donor-funded processing hubs are being established, current facilities cannot yet handle projected production volumes. This constraint is particularly acute during peak harvest seasons, resulting in post-harvest losses and inconsistent quality. Financial limitations compound these issues, as many smallholders lack collateral for loans and have limited financial literacy. Moreover, the high cost of certification and compliance with regulatory standards (FDA, Fairtrade, or BAFS) limits small producers' access to premium markets. Infrastructure challenges especially poor road networks, long transport routes, and rising fuel costs further constrain efficiency and raise logistical costs. These weaknesses highlight the need for systemic interventions in both physical and institutional infrastructure.

### Opportunities

Despite these constraints, Region X's coffee industry is positioned to capitalize on several significant opportunities. The first lies in the expansion of both Arabica and Robusta production areas under climate-suitable zones. Bukidnon's ongoing 10,000-hectare expansion, combined with the untapped lands of Misamis Oriental, provides a strong foundation for scaling up the regional supply base. The development of certified nurseries and private-public seedling supply chains can support this growth while maintaining quality assurance. The second major opportunity is in value addition and market differentiation.

With national recognition for quality, Region X can develop its own regional coffee brand "Northern Mindanao Arabica" or "Region x Specialty Coffee" to enhance traceability, promote tourism, and attract buyers seeking single-origin products. Cooperative marketing and e-commerce platforms can help farmers bypass intermediaries and directly access consumers and roasters. At the same time, both provinces are well-suited for coffee agritourism development, with attractions such as Lake Napalit in Maramag, Bukidnon, and scenic coffee farms in Claveria and Gingoog, Misamis Oriental, offering potential for experiential tourism and direct farm-to-cup experiences. Finally, the ongoing integration of research and innovation through partnerships with DOST, CMU, and DA-PRDP provides opportunities for varietal improvement, climate adaptation, and digital extension systems (DA Region X, 2025). These initiatives, combined with the increasing participation of youth and women in value-added enterprises, create pathways toward a more inclusive and resilient coffee value chain.

### Threats

However, the coffee industry in Region X remains vulnerable to several external threats that could undermine progress if not managed proactively. Climate variability including irregular rainfall, drought, and pest outbreaks poses one of the most serious risks to long-term sustainability (Bukidnon Coffee Roadmap, 2025–2035). A rapid increase in planted areas without corresponding quality control and pest management systems could result in quality dilution and production inefficiencies. Moreover, the current price surge in 2025, while beneficial in the short term, exposes farmers to the risk of future price corrections in the global market (Philstar, 2025). Overreliance on a few large buyers, such as Nestlé or private roasters, also limits farmer bargaining power and could lead to income instability. Institutional and governance-related threats also loom. The lack of a unified Region X Coffee Council could

result in duplication of efforts or policy misalignment between provinces. If Misamis Oriental fails to match Bukidnon’s pace in capacity building, it risks becoming a secondary player rather than an equal partner in regional development. External shocks such as inflation, rising fuel prices, and delays in infrastructure projects could further erode competitiveness. Additionally, the coffee sector faces competition from both domestic and international producers offering certified specialty coffees, which could divert buyers and limit Region X’s market share if quality assurance is not consistently maintained.

**Table 10. SWOT analysis of coffee value chain in Region X**

Theme / Area	Strengths	Weaknesses	Opportunities	Threats
Production & Agronomy	<p>Bukidnon remains the top Arabica-producing province in Mindanao, with agro-climatic advantages at 1,200–1,800 masl ideal for high-quality beans.</p> <p>Misamis Oriental has available highland areas (Claveria, Gingoog, and Medina) suitable for expansion and diversification.</p> <p>Political commitment to develop 10,000 ha of coffee under the Bukidnon Coffee Roadmap (2025–2035) (Inquirer.net, 2024). Consistent farmer training through PRDP, RAPID Growth, and ATI.</p>	<p>Misamis Oriental’s coffee area and farmer organizations are still underdeveloped and lack strong cooperative organization.</p> <p>Outdated farm practices, low mechanization, and dependence on manual labor persist in many upland areas.</p> <p>Fragmented seedling supply and low access to certified planting materials.</p>	<p>Expansion of Arabica and Robusta in both provinces under climate-suitable zones.</p> <p>Potential for intercropping coffee with fruit and cacao to maximize land productivity.</p> <p>Use of climate-resilient and high-yield varieties promoted by DA and DOST research stations.</p>	<p>Climate variability (droughts, erratic rainfall) may reduce yields. Quality deterioration from rapid scaling without technical control. Rising input costs (fertilizer, labor) limit profitability</p>
Planting Materials & Nurseries	<p>Active nursery development programs in Bukidnon supported by DA–DTI–Nestlé partnerships.</p> <p>High potential to replicate nursery systems in Misamis Oriental with LGU support.</p>	<p>Regional shortage of accredited nurseries; current capacity cannot meet expansion targets.</p> <p>Weak monitoring and quality control of distributed seedlings.</p>	<p>Strong opportunity to establish private–public nursery networks for certified seedlings.</p> <p>Donor and GFI interest in funding nursery upgrades (RAPID, PRDP).</p>	<p>Spread of low-quality or disease-susceptible seedlings risks productivity decline.</p> <p>Mismanagement in seedling distribution could delay expansion goals.</p>
Post-Harvest & Processing	<p>Increasing institutional attention to building processing hubs in Malaybalay, Pangantucan, and Claveria.</p> <p>Donor-supported plans for shared roasting and drying facilities.</p>	<p>Processing bottlenecks remain; small processors lack capacity and technology.</p> <p>High post-harvest losses during peak harvest due to limited storage.</p>	<p>Incentives for investors to establish shared roasting and milling hubs.</p> <p>Emerging demand for traceable, locally processed coffee in regional and export markets.</p>	<p>Equipment cost and maintenance remain high.</p> <p>Delays in infrastructure and power reliability issues affect continuous operations.</p>

Marketing & Market Access	Bukidnon coffees continue to win national quality awards (PIA, 2025).	Weak aggregation and limited cooperative marketing in Misamis Oriental.	Growing specialty coffee market both locally and internationally.	Price volatility may trigger speculative buying or contract risks.
	DTI-RAPID Growth links cooperatives to specialty buyers and roasters.	Volatile farmgate prices and dependence on middlemen.	Export potential under "Region X Arabica" branding. E-commerce and digital traceability expanding access to direct buyers.	Overreliance on few anchor buyers (Nestlé, Linear Coffee) may reduce bargaining power.
Institutional Capacity & Governance	Bukidnon and Misamis Oriental both have emerging coffee festivals that build branding.	Institutional gaps between provinces, Bukidnon is well-organized, while Misamis lacks a unified structure.	Opportunity to create a Region X Coffee Council to align provincial and national programs.	Political turnover and funding fatigue may stall implementation.
	Strong coordination among DTI, DA, MinDA, LGUs, and cooperatives.	Existence of Bukidnon Coffee Council; potential replication in Misamis Oriental.	Support from MinDA and DOST for cluster-based coordination.	Duplicated or misaligned programs reduce efficiency.
Finance & Investment	High farmgate prices (₱290.97/kg for Arabica, Q1 2025) attract private investment.	Misamis Oriental smallholders have limited credit access and financial literacy.	Potential for blended finance (grants + loans) for coffee rehabilitation and equipment investment.	Price corrections could expose borrowers to repayment risk.
	Bukidnon cooperatives already accessing blended finance through DTI and DA programs.	Collateral requirements and long gestation discourage lenders.	Availability of microfinance and crop insurance through Landbank and CARD MRI.	Inflation and input costs may offset profitability gains.
Quality, Standards & Certification	Bukidnon's national award-winning coffees set high standards.	Certification costs (organic, Fairtrade) are high and beyond smallholder capacity.	Strong demand for traceable, single-origin coffee from Region X.	Inconsistent grading and certification could erode trust with buyers.
	Institutional drive for quality control under the roadmap 2025–2035.	Misamis Oriental producers lack exposure to certification processes.	Government and donor interest in pilot certification projects.	Failure to comply with standards (FDA, BAFS) risks losing premium markets.
Infrastructure & Logistics	Roadmap-aligned infrastructure investments improving farm-to-market roads in Bukidnon.	Many farm communities in Misamis Oriental still have poor connectivity and high logistics costs.	Integration of logistics projects in regional development plans.	Rising fuel and transport costs could erode margins.
	PRDP funding for post-harvest roads and storage hubs.	Transport and fuel cost inflation affects competitiveness.	Potential to link to seaports (Gingoog, Balingasag) for export logistics.	Extreme weather may disrupt transport and delivery.
Value Addition, Tourism & Diversification	Bukidnon's Lake Napalit and Claveria's coffee tourism farms serve as models for agritourism integration.	Tourism-based value addition is seasonal and vulnerable to shocks.	Potential to create Region X Coffee Tourism Circuits combining Bukidnon and Misamis attractions.	Economic downturns or travel restrictions may reduce tourist inflows.
	High tourist foot traffic through Dahilayan, Malaybalay, and Misamis Oriental's eco-destinations.	Limited product development and retail experience among farmers.	Growing domestic tourism post-pandemic.	Security or environmental issues could affect visitor confidence.
Research, R&D & Extension	Active collaborations between DOST, CMU, DA, and LGUs for varietal improvement and farmer training.	Extension outreach still limited in remote or smaller coffee zones.	Digitization of R&D outputs and mobile extension tools (GeoCoffee, PRDP MIS).	Without scaled extension, improved varieties and technologies may not reach smallholders.
	Established R&D base in Bukidnon; potential for extension to Misamis Oriental.	Lack of unified regional database on coffee farms and yields.	Potential for regional knowledge hub under DOST or CMU.	Research funding volatility due to shifting priorities.

Source: Authors

## TOWS Analysis Results

The TOWS matrix translates the SWOT analysis into strategic, action-oriented responses, enabling Region X to align its coffee value chain development with sustainability, resilience, and inclusive growth goals. It integrates internal strengths and weaknesses with external opportunities and threats to produce concrete policy and program directions for the region.

### S-O Strategies: Leveraging Strengths to Seize Opportunities

The SO quadrant highlights how Region X can capitalize on its internal advantages such as favorable agro-climatic conditions, institutional coordination, and established quality reputation

to maximize external opportunities in markets, financing, and tourism. The most significant strategy is the creation of a unified “Region X Specialty Coffee” brand, leveraging Bukidnon’s nationally recognized specialty Arabica and Misamis Oriental’s expanding production zones. This branding approach, supported by origin traceability and quality certification, would elevate the region’s profile in both domestic and export markets (Bukidnon News, 2024). Similarly, Region X’s strong institutional networks involving the Department of Agriculture (DA), Department of Trade and Industry (DTI), Mindanao Development Authority (MinDA), and Central Mindanao University (CMU) provide the backbone for collaborative initiatives in research, post-harvest processing, and farmer training (DA Region X, 2025). These alliances can standardize quality assurance and streamline services. Moreover, by linking coffee production to agro-ecotourism, through destinations such as Lake Napalit (Bukidnon) and Claveria Highlands (Misamis Oriental), the region can diversify income streams for coffee farmers, foster local entrepreneurship, and integrate sustainability into its branding narrative.

#### WO Strategies: Overcoming Weaknesses through Opportunities

The WO quadrant focuses on using external opportunities to overcome persistent weaknesses in farm productivity, processing, and governance. A central strategy here is the modernization of farming practices through large-scale retraining programs under the Philippine Rural Development Project (PRDP) and RAPID Growth initiatives (BusinessMirror, 2025). These programs can bridge the skill and knowledge gap among smallholders, particularly in Misamis Oriental, where traditional practices remain prevalent. Another crucial area is post-harvest infrastructure. The establishment of shared roasting, milling, and drying hubs, financed through public–private partnerships, will address the region’s processing bottleneck and reduce post-harvest losses. These facilities, when strategically located in both provinces, will ensure equitable access and enable cooperatives to scale operations efficiently. Additionally, nursery accreditation and certified seedling production remain high-impact opportunities. By expanding DA- and DTI-accredited nurseries, Region X can ensure the genetic quality and resilience of planting materials (Kaatuan BP, 2024). Financial inclusion initiatives such as blended finance models combining grants, loans, and crop insurance (Landbank, CARD MRI, DBP) can simultaneously enhance capital access and protect smallholders from credit risk (Philstar, 2025). Finally, the establishment of a Region X Coffee Council is essential to harmonize programs between Bukidnon and Misamis Oriental, prevent redundancy, and institutionalize accountability.

#### ST Strategies: Using Strengths to Counter Threats

The ST quadrant leverages Region X’s institutional and technical strengths to counteract external risks such as climate variability, price volatility, and pest outbreaks. Bukidnon’s established research and extension ecosystem anchored by DOST, CMU, and DA provides a strong base for promoting climate-smart agriculture, including shade-grown coffee systems, soil conservation, and agroforestry integration. These practices enhance both productivity and environmental sustainability (Bukidnon Coffee Roadmap, 2025–2035). Enforcing regional quality standards through a unified grading and cupping system is another strategic measure to safeguard market reputation. Such systems ensure consistent bean quality across both provinces and prevent the entry of substandard coffee that could harm the “Region X Specialty” brand. At the same time, the diversification of market linkages encouraging partnerships with local roasters, exporters, and corporate buyers reduces dependency on a few dominant buyers like

Nestlé. This broadens farmers’ bargaining power and mitigates risks from contract volatility. Meanwhile, continuous R&D-led monitoring and early-warning systems for pest and disease management (e.g., coffee rust, berry borer) further protect production stability. Finally, through PRDP and LGU infrastructure support, improved farm-to-market roads and logistics facilities can reduce costs and ensure efficient product delivery even under fluctuating fuel prices.

### WT Strategies: Minimizing Weaknesses and Avoiding Threats

The WT quadrant presents defensive or preventive strategies that protect the region from potential setbacks arising from internal limitations and external risks. First, the phased expansion of coffee plantations under the 10,000-hectare program coupled with the mandatory use of certified seedlings prevents the uncontrolled spread of low-quality planting materials and ensures that expansion does not compromise bean quality (Bukidnon Coffee Roadmap, 2025–2035). Institutionalizing monitoring and evaluation (M&E) systems across both provinces safeguards against duplication, corruption, and inefficiency, while establishing transparency and program continuity (Kaatuan BP, 2024). Long-term offtake contracts and price information platforms managed by the Philippine Statistics Authority (PSA) can stabilize farmer incomes, reducing exposure to market volatility. Furthermore, developing climate adaptation and disaster contingency plans is crucial given the increasing frequency of droughts and storms affecting Northern Mindanao’s upland areas. Finally, ensuring balanced investment distribution between Bukidnon and Misamis Oriental avoids regional disparity, enabling Misamis Oriental to catch up through improved nursery development, training, and processing access. This fosters inclusive growth, ensuring both provinces benefit equitably from regional initiatives.

**Table 11. TOWS Matrix of Coffee Value Chain in Region X**

TOWS Quadrant	Strategic Actions	Expected Outcomes / Impacts
SO Strategies	Develop a unified “Region X Specialty Coffee” brand leveraging Bukidnon’s specialty coffee reputation and Misamis Oriental’s emerging production areas.	Enhances brand visibility and market recognition.
	Expand plantations across climate-suitable zones under the 10,000-ha Arabica plan ensuring sustainability and quality control.	Creates price premiums for producers through traceable origin labeling.
	Strengthen institutional collaboration among DA–DTI–DOST–CMU–MinDA for R&D, processing, and farmer training.	Improves inter-provincial cooperation for innovation and marketing.
	Promote integrated coffee tourism circuits connecting Bukidnon’s Lake Napalit and Misamis Oriental’s Claveria highlands as model coffee destinations.	Diversifies farmer income through coffee tourism and value-added activities.
	Implement GAP retraining programs under PRDP and RAPID Growth to modernize farm management.	Improves farm productivity and bean quality.
WO Strategies	Mobilize donor and private investments to establish shared roasting and milling hubs across both provinces.	Reduces post-harvest losses through upgraded processing facilities.
	Expand certified nursery networks under DTI-RAPID and DA accreditation programs.	Enhances access to affordable finance and credit literacy.
	Combine blended financing schemes (Landbank, DBP, CARD MRI) with cooperative-based financial literacy programs.	Strengthens governance, accountability, and inter-agency alignment.
	Form a Region X Coffee Council to harmonize Bukidnon–Misamis policies and development targets.	
	Apply climate-smart agriculture practices (shade-grown systems, agroforestry, soil and water conservation).	Builds resilience against climate variability and price volatility.
ST Strategies	Enforce a unified regional grading, cupping, and certification system to maintain quality consistency.	Maintains regional coffee quality reputation in local and export markets.
	Diversify market outlets by linking cooperatives with multiple buyers, exporters, and local roasters.	Expands market reach and reduces dependence on single buyers.
	Utilize R&D-driven pest and disease management systems developed by CMU and DOST.	Improves production stability and reduces logistical costs.
	Strengthen logistics efficiency through PRDP-funded road and storage infrastructure.	

WT Strategies	Phase the 10,000-ha expansion with certified nurseries to prevent overproduction of low-grade beans.	Prevents loss of quality and ensures sustainable expansion.
	Institutionalize monitoring and evaluation (M&E) systems to ensure transparency and avoid program duplication.	Improves governance and program accountability.
	Establish long-term offtake contracts and PSA-backed pricing platforms to stabilize farmer incomes.	Shields farmers from market and climatic shocks.
	Develop climate adaptation and disaster contingency plans for coffee-growing communities.	Promotes inclusive growth and balanced regional development.
	Ensure balanced investment and support between Bukidnon and Misamis Oriental to avoid development disparities.	

Source: Authors

## Key Challenges Affecting Sustainability

As shown in table 11, climate variability poses one of the most critical threats to the sustainability of Region X's coffee value chain. Rising temperatures, erratic rainfall, and prolonged dry periods have disrupted coffee flowering, fruit development, and bean quality, particularly in upland municipalities such as Impasugong, Miarayan–Talakag, and Claveria. These conditions heighten pest infestations and fungal diseases, causing a notable decline in yield and quality consistency. According to the Food and Agriculture Organization (FAO, 2022), coffee productivity could decline by up to 25% in tropical regions if adaptive measures are not implemented. Similarly, Bunn et al. (2015) emphasized that temperature increases beyond the optimal range (18–23°C for Arabica) lead to lower cup quality and accelerated plant stress. To mitigate this, Region X must scale up climate-smart agriculture (CSA) approaches such as shade management, agroforestry integration, and soil moisture conservation, already piloted in Miarayan and Lantapan. There is limited mechanization and post-harvest infrastructure in the region, as smallholder farmers across Bukidnon and Misamis Oriental largely rely on manual processing methods and outdated post-harvest equipment and other production areas still lack efficient pulping, drying, and milling systems. This technological gap increases labor costs, slows processing time, and results in post-harvest losses of 10–15% due to spoilage and inconsistent drying. Studies by Ahumada and Villalobos (2020) and Giovannucci and Koekoek (2021) confirm that underinvestment in post-harvest infrastructure and mechanization limits smallholder competitiveness, leading to lower margins and missed export opportunities. The Bukidnon Coffee Roadmap (2025–2035) identifies this as a critical bottleneck, suggesting Public–Private Partnership (PPP) models to co-finance shared processing facilities and improve logistics connectivity. Meanwhile, the coffee industry in Region X involves multiple agencies, DA, DTI, MinDA, and LGUs that independently implement programs without a unified regional coordinating body. This institutional fragmentation leads to overlapping projects, inefficient resource allocation, and weak integration between production and marketing initiatives. For example, while DTI–RAPID Growth supports MSME development, DA–PRDP focuses on farm-level infrastructure with minimal synchronization. According to Kaplinsky and Morris (2001), fragmented governance structures reduce the coherence of value chain upgrading strategies, preventing consistent policy execution. Similarly, Giovannucci et al. (2020) highlight that collaborative governance frameworks such as regional coffee councils are essential for aligning standards, scaling training, and attracting sustainable investment. Establishing a Region X Coffee Council could harmonize institutional roles and strengthen public–private linkages for long-term sustainability.

Financing and market barriers for smallholders persist. Access to finance and premium markets remains a major constraint, as many smallholder farmers in Bukidnon and Misamis Oriental lack collateral for formal loans and face high certification costs for GAP, Organic, or Fairtrade compliance. Consequently, they are excluded from specialty coffee markets that offer higher price premiums. Moreover, limited access to crop insurance increases their vulnerability to climate and price shocks, further discouraging investment in quality enhancement and farm productivity. Giovannucci and Koekoek (2021) and Donnet et al. (2011) both affirm that financial inclusion and certification support directly influence smallholder participation in high-value chains. Cooperatives with better credit access (e.g., Kaatuan MPC) exhibit higher profitability and resilience. To address this, Region X could promote blended financing models combining grants, microloans, and cooperative revolving funds ensuring smallholders gain equitable market access and protection.

Lastly, the coffee industry faces an aging farmer population and a decline in youth participation, primarily due to outmigration and the perception that farming offers low-income potential. This demographic challenge leads to labor shortages during peak harvest seasons and a weakening transfer of technical knowledge from experienced farmers to the next generation. Barham and Weber (2012) identify youth disengagement as a long-term risk to agricultural sustainability, emphasizing that without generational renewal, value chain innovation stagnates. In Region X, only a few youth-led cooperatives such as those in Claveria and Miarayon are active in marketing and roasting. Integrating young people through Agri-entrepreneurship training, coffee tourism enterprises, and digital marketing platforms can reinvigorate the sector and ensure knowledge continuity.

**Table 12. Key Challenges Affecting Sustainability in the Coffee Value Chain of Region X**

<b>Challenge</b>	<b>Description / Evidence</b>	<b>Impact on Sustainability</b>
Climate Variability and Environmental Stress	Increasing temperature and irregular rainfall patterns affect coffee flowering and bean quality, especially in Upland Bukidnon and Claveria.	Reduced yields, pest outbreaks, and declining bean quality threaten long-term viability.
Limited Mechanization and Post-Harvest Infrastructure	Smallholders rely on manual labor and outdated equipment; processing hubs are unevenly distributed.	Higher production cost, lower efficiency, and increased post-harvest loss (10–15%).
Fragmented Governance and Institutional Coordination	Multiple agencies (DA, DTI, MinDA, LGUs) implement projects without a unified Region X Coffee Council.	Duplication of efforts, underutilized resources, and inconsistent market linkages.

Financing and Market Barriers for Smallholders	Farmers face limited access to credit, insurance, and premium markets, high certification costs.	Excludes smallholders from specialty and export markets, reducing income potential.
Labor Shortages and Low Youth Participation	Migration and aging farmers limit labor supply; youth disengagement in agriculture persists.	Declining productivity and knowledge transfer gaps threaten long-term sustainability.

Source: Authors

### Key Opportunities for Sustainability

Table 12 presents the key opportunities that enhance the sustainability of the coffee value chain in Region X. These opportunities focus on strengthening climate resilience, promoting inclusive participation, improving infrastructure through public–private partnerships, and advancing branding and research initiatives. Collectively, these factors support the region’s transition toward a more competitive, innovative, and environmentally sustainable coffee industry. The adoption of climate-smart and organic farming systems in upland areas such as Miarrayon and Lantapan represents a major sustainability opportunity for Region X. Farmers are increasingly integrating shade-grown systems, contour planting, and organic composting, which enhance soil fertility and reduce erosion. These practices strengthen ecological resilience while maintaining long-term productivity.

According to the FAO (2022), climate-smart agriculture improves coffee yield stability by 20–30% and contributes to carbon sequestration and biodiversity conservation key indicators of sustainable coffee production. The DA–PRDP and DTI–RAPID Growth initiatives promote PPP-based processing hubs in Claveria, Gingoog, and Pangantucan, providing a collaborative model for infrastructure development. Under this setup, government agencies provide capital and policy support, while private cooperatives and roasters contribute technology and management expertise. Such partnerships improve post-harvest efficiency, create local employment, and reduce logistics costs. The World Bank (2023) highlights PPPs as sustainable investment models that strengthen value chain competitiveness and enhance public resource efficiency in agricultural sectors. Region X holds strong branding potential due to its nationally awarded coffees from Impasugong and Miarrayon, which can be unified under a single “Region X Coffee” identity. Implementing a traceability system ensures transparency, quality assurance, and market trust. As Ponte (2020) and Donnet et al. (2011) note, regional branding and traceability systems enable producers to capture higher value through premium pricing and improved export competitiveness, particularly in the specialty coffee market segment.

The growing involvement of women’s cooperatives in Miarrayon and youth-led cafés in Claveria highlights emerging inclusivity in the coffee sector. Women’s groups are increasingly active in roasting and retail, while youth cooperatives engage in marketing and digital branding. Inclusive participation strengthens human capital, fosters innovation, and supports intergenerational continuity. According to Giovannucci and Koekoek (2021), empowering women and youth not only promotes equity but also enhances long-term value chain resilience and adaptability. These initiatives are further strengthened through the Agroenterprise Clustering Approach, which promotes collective marketing, shared resource management, and stronger linkages among smallholder farmers, processors, and local enterprises. By organizing producers and MSMEs into

functional clusters, the approach enhances economies of scale, improves bargaining power, and facilitates access to finance and technology. Inclusive participation through clustering not only strengthens human capital and intergenerational continuity but also fosters innovation and community ownership of the value chain. According to Giovannucci and Koekoek (2021), empowering women and youth within clustered agroenterprises promotes equity and long-term value chain resilience. Similarly, FAO (2022) emphasizes that Agroenterprise clustering enables smallholders to compete more effectively in high-value markets while sustaining social and environmental inclusivity in local coffee systems.

**Table 13. Key opportunities affecting sustainability in the coffee value chain of Region X**

<b>Opportunity</b>	<b>Description / Evidence</b>	<b>Potential Impact</b>
Expansion of Climate-Smart and Organic Coffee Practices	Miarayon and Lantapan integrate shade-grown, contour farming, and organic composting.	Enhances resilience, soil health, and long-term productivity.
Development of Public-Private Partnerships (PPPs)	DA-PRDP and DTI-RAPID Growth promotes PPP-based processing hubs in Claveria, Gingoog, and Pangantucan.	Improves infrastructure, post-harvest efficiency, and local employment.
Branding and Traceability for “Region X Coffee”	Nationally awarded coffees (Impasugong, Miarayon) can be unified under a single brand identity.	Enhance market recognition, premium pricing, and export potential.
Inclusive Participation of Women and Youth	Emerging women’s cooperatives (Miarayon, Claveria) and youth-led cafés foster inclusiveness.	Strengthens human capital and innovation capacity in local enterprises.
Strengthened Research, R&D, and Technological Innovation	DOST-CMU varietal trials and QR traceability pilots in Impasugong and Claveria.	Promotes quality consistency, transparency, and competitiveness.

Source: Authors

### 4.3 The Social and Economic Impact of the Coffee Value Chain on Local Communities

#### 4.3.1 Social Impacts

Table 13 reflects the uneven social impacts of the coffee value chain on rural households. Food security remains fragile, with 20–40% of households experiencing seasonal hunger during lean months as coffee income alone cannot stabilize consumption. This aligns with PIDS findings that smallholders rely on crop diversification and off-farm work because agricultural income is highly seasonal and insufficient to ensure year-round food access (PIDS, 2021). School attendance remains high (85–95%), consistent with rural education patterns, but financial strain affects low-yield households. Meanwhile, health expenditures remain below 10%, yet vulnerability to medical shocks persists due to low insurance coverage, a pattern similarly observed by Deluna & Rola (2018).

Gender disparities are evident despite women's significant labor contribution. While women perform 40–60% of post-harvest tasks, decision-making involvement remains limited (30–50%) as marketing and financial control are typically male-dominated. This mirrors findings from coffee studies in Mindanao and CALABARZON, where women are central to production but underrepresented in leadership and economic decision-making (Nemenzo-Calica et al., 2024; Castillo et al., 2024). Women's limited access to training (20–35%) and finance (<15%) reflects systemic constraints such as land ownership requirements and low cooperative representation issues repeatedly highlighted in PIDS rural finance analyses (PIDS, 2004; 2021).

Youth indicators also reflect national concerns. Only 15–30% of young people participate meaningfully in coffee farming, and training access is low (10–20%). Studies on farm succession indicate that youth are more likely to leave agriculture due to unstable farm income and more attractive urban opportunities (Deluna, 2023). Consequently, migration intent remains high (40–60%), consistent with national reports showing declining youth interest in agriculture (ICMC, 2021; PIDS, 2022).

Access to services remains a major constraint. Credit access below 20% corresponds with PIDS findings that collateral and documentation barriers push most smallholders toward informal lenders (PIDS, 2021). Extension service reach (30–50% trained) varies widely by locality, with inconsistent LGU-led delivery and limited technical support in remote areas a challenge documented in the PIDS review of the agricultural extension system (PIDS, 2020). These patterns indicate that the coffee value chain alone cannot deliver stable wellbeing or equitable opportunities without complementary institutional support. Limited credit and extension access constrain productivity upgrades, while gender and youth disparities weaken long-term sector resilience. Strengthening cooperatives, expanding inclusive extension programs, improving women's access to finance, and creating youth-focused livelihood pathways (e.g., roasting, barista training, Agripreneurship) are critical for ensuring that value chain gains translate into improved household welfare and community sustainability.

**Table 14. Social Impacts of the Coffee Value Chain on Local Communities**

<b>Indicator</b>	<b>Sub-components</b>	<b>Estimated %</b>	<b>Current Condition</b>
Social Impact & Wellbeing	Food security	20–40% (lean months)	Coffee income alone cannot stabilize food access. Households often rely on multiple crops and off-farm work. Seasonal hunger is common during pre-harvest months.
	School attendance	85–95%	Education is generally prioritized. School expenses are supported during harvest seasons, but financial strain persists in low-yield households.
	Health expenditures	<10%	Households spend more after good harvests but remain vulnerable to medical shocks without insurance.
Women's Participation	Decision-making involvement	30–50%	Women actively manage post-harvest work, but men dominate marketing, financial decisions, and contract negotiations. Leadership

Indicator	Sub-components	Estimated %	Current Condition
	Women's share of labor (time use)	40–60%	and ownership roles remain limited. Women shoulder extensive roles in sorting, drying, and processing. Their time burden increases during peak harvest months.
	Access to training Finance	20–35% <15%	Women have limited access to trainings and even less to financing due to collateral requirements, land ownership issues, and low cooperative representation.
Youth Participation	Youth involvement in coffee work	15–30%	Youth participate mainly in harvest labor but are less engaged in long-term farming. Many prefer urban jobs or non-farm work.
	Youth receiving training	10–20%	Youth inclusion is low unless targeted by LGU, NGO, or cooperative-led programs. Interest increases when exposed to roasting, barista skills, and entrepreneurship.
	Youth migration intention	40–60%	High migration intent due to limited rural employment opportunities, unstable farm income, and attraction to city-based jobs.
Access to Services	Credit access	<20%	Farmers rely mostly on informal lenders. Collateral and documentation requirements prevent widespread access to formal credit.
	Extension services	30–50% trained within last 3 years	Extension delivery is inconsistent; areas active in provincial programs receive more support, while others rely on irregular LGU visits.

### 3.3.1 Economic Impact

Table 14 shows that coffee production in the region remains constrained by low yields and limited value addition patterns consistent with national assessments of the Philippine coffee sector. Current yields of 250–350 kg/ha closely mirror the national average for smallholder coffee, which PIDS identifies as significantly below global standards due to aging trees, poor farm management, and limited access to inputs (PIDS, 2019; PCA-DTI Philippine Coffee Roadmap). Although rehabilitation and improved practices can raise yields to 450–1,200 kg/ha, only project-assisted farms or organized cooperatives typically achieve these gains, reflecting the uneven adoption of good agricultural practices (Nemenzo-Calica et al., 2024). Most farmers 60–85% continue selling coffee as raw cherries. Studies show that the lack

of pulpers, dryers, and processing hubs forces farmers to sell early in the value chain where returns are lowest (Castillo et al., 2024). This limited access to post-harvest facilities also explains why only 15–40% of coffee is sold in processed forms such as parchment or hulled beans. While some cooperatives in Bukidnon have expanded processing capacity, smallholders in Misamis Oriental still rely on traditional practices or third-party buyers, limiting opportunities for quality improvement and value capture.

Income dependence patterns also align with national findings. For most households, coffee contributes only 10–25% of annual income because of small farm sizes, inconsistent yields, and price volatility. Like PIDS rural livelihood profiles, farmers diversify into corn, banana, cacao, or off-farm labor to stabilize income (PIDS, 2021). Higher coffee dependence, reaching 40–60%, is observed only among larger or semi-commercial farms, especially those producing specialty Arabica in Bukidnon or participating in organized value chains with cooperatives and NGOs (Deluna, 2023).

These economic patterns indicate that smallholders capture only a small portion of the coffee value chain’s potential income due to structural constraints: low productivity, inadequate processing capacity, and limited market power. Improving yields through systematic farm rehabilitation, expanding processing infrastructure, and strengthening cooperatives could substantially increase farmer incomes. Moreover, enabling farmers to shift from cherry-selling to processed or specialty-grade production would allow households especially in Bukidnon and Misamis Oriental to capture higher value, reduce income volatility, and enhance resilience against market fluctuations.

**Table 15. Economic Impacts of the Coffee Value Chain on Local Communities**

Indicator	Estimated %	Current Condition
Yield (kg/ha)	250–350kg/ha baseline  450–1,200kg/ha achievable with rehabilitation	Yields remain generally low across the region due to aging trees and limited agronomic inputs. Project-supported areas show improvements. Bukidnon, as the main Arabica area, records slightly better gains, while Misamis Oriental maintains yields similar to the regional baseline.
% sold as raw cherries	60–85%	Majority of farmers still sell coffee as cherries, largely because of insufficient access to pulpers, dryers, and milling equipment. This pattern is consistent in all provinces.
% sold as processed (pulped, parchment, hulled)	15–40%	Value addition remains limited. Some Bukidnon cooperatives have increased processing activities, but overall capacity is insufficient. Misamis Oriental has small processing hubs, but they do not serve the majority of farmers.
Share of	10–25% for most	Coffee contributes a supplemental income

household income from coffee	households. 40–60% for coffee-dependent farms	for most households and rarely serve as the sole livelihood.  Only larger or more commercialized farms (>1 ha or those engaged in specialty markets) report higher income dependence. Coffee income remains volatile, pushing farmers to rely on multiple crops (corn, banana, cacao) and off-farm work across all three areas.
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#### 4.4 Recommendations for enhancing the sustainability and competitiveness of the coffee industry in Region X.

The findings of this study reveal that the coffee value chain in Region X possesses exceptional potential for economic growth, sustainability, and social inclusion. However, persistent challenges including inadequate postharvest infrastructure, weak institutional coordination, limited access to quality planting materials, low cooperative participation, and vulnerability to climate risks continue to restrict the industry’s overall competitiveness. This chapter outlines strategic directions and actionable policies that align with the Philippine Coffee Industry Roadmap, PIDS governance diagnostics, and the broader goals of regional agricultural modernization.

*Strengthening Production Competitiveness*, improving productivity begins with a robust, science-based coffee seed system. Region X must establish accredited nurseries and implement a systematic rejuvenation program targeting aging Arabica and Robusta plantations. This aligns with DA’s High-Value Crops Development Program (HVCDP), which prioritizes the distribution of certified planting materials and training on Good Agricultural Practices (GAP). Mechanization support through shared service facilities and cooperative-based equipment grants should be expanded to address labor shortages and improve production efficiency.

*Improving Postharvest Systems and Value-Added Processing*, the study’s profitability analysis underscores the importance of value addition, pointing to the need for municipal-level processing hubs equipped with dryers, moisture meters, hullers, and cupping laboratories. These hubs can be funded through PRDP’s I-REAP subprojects or DTI’s shared service facilities. Standardizing quality grading and implementing a quality-based pricing system will incentivize farmers to improve postharvest practices and align Region X with international standards. Micro-roasting enterprises, honey-processing, and direct-selling platforms can further unlock specialty market opportunities.

*Enhancing Market Access and Regional Branding*, market competitiveness requires a unified branding approach. A “Northern Mindanao Coffee” brand supported by traceability systems and QR-based digital profiles can position the region as a premium producer both domestically and internationally. This aligns with DTI’s industry clustering strategies and PIDS recommendations on strengthening agricultural market institutions. Developing a digital coffee marketplace and facilitating direct trade between farmers and roasters will reduce trader dependency and improve income distribution across the value chain.

*Institutional Governance and Multi-Stakeholder Coordination*, to integrate scattered efforts, Region X needs a formal governance structure such as a Regional Coffee Council. The Council should harmonize the Bukidnon Coffee Roadmap, municipal coffee development plans, DA–DTI national programs, and PRDP initiatives. This governance platform aligns with PIDS findings that fragmented institutional arrangements hinder value chain upgrading. Capacity

building for cooperatives in accounting, quality control, marketing, and enterprise leadership is equally essential to improving governance efficiency.

*Climate-Resilient and Sustainable Coffee Systems*, sustainability requires widespread adoption of agroforestry-based coffee systems, climate-smart practices, and environmentally friendly postharvest technologies. Region X is well-positioned to promote shade-grown coffee and diversified agroforestry models that improve soil health, resilience, and quality. Weather advisory services, crop insurance products, and training on climate adaptation should be integrated into LGU extension programs, in line with FAO and DA adaptation frameworks.

*Social Inclusion and Community Empowerment*, given the coffee sector's strong socio-economic role, policies must promote inclusive participation, particularly for women and youth. Women-led microenterprises in roasting, packaging, and quality control can expand household income sources. Youth engagement through barista programs, entrepreneurial training, and digital agribusiness incubation can help address the sector's demographic challenges. Region X already demonstrates emerging models of youth-led cafés, roasters, and e-commerce platforms in Claveria and Malaybalay. Integrating these initiatives within the Agroenterprise Clustering Approach can enhance collaboration among producers, roasters, and consumers while fostering innovation and digital market participation. Over time, this will ensure knowledge transfer, market adaptability, and community continuity. Expanding access to finance through cooperative-based lending, microcredit, and value chain financing will support marginalized groups and enhance equity.

A *strong sustainability focus* is equally important for ensuring long-term viability. Promoting agroforestry, organic certification, and climate-smart agriculture should be embedded in regional programs. These practices will enhance resilience to climate variability, preserve soil fertility, and meet growing market demand for ethically produced coffee. By integrating sustainable practices into production systems, Region X can align with the global movement toward low-carbon and environmentally responsible coffee value chains.

In addition, *market diversification* should be pursued to lessen dependency on traders and middlemen. Developing QR-based traceability systems can increase market transparency and buyer confidence. *Traceability* connects farm-level data such as location, variety, and processing method to consumer-facing labels, ensuring accountability and quality assurance. This initiative not only enhances consumer trust but also enables the region to access premium export markets aligned with international sustainability standards. The unified brand can also integrate coffee tourism and local retail, showcasing award-winning coffees from Impasugong and Miarayan alongside experiential tourism in Malaybalay and Claveria. Such a strategy links coffee culture, landscape, and community livelihood, fostering a strong regional identity and tourism-based value addition.

## 5. Conclusion

This study sets out to evaluate the economic performance of the coffee value chain in Region X, assess the key challenges and opportunities that shape its sustainability, and analyze its social and economic contributions to local communities. The results demonstrate that Region X particularly the provinces of Bukidnon and Misamis Oriental possesses significant potential to develop a competitive and resilient coffee industry. This potential, however, is moderated by structural constraints that limit the full realization of economic and social gains.

In terms of economic performance, profitability differs considerably across coffee varieties and stages of processing. The analysis shows that value addition is the strongest driver of improved returns. Transitioning from fresh cherries to dried parchment and hulled green beans consistently increases farmer profitability, with Arabica green beans posting the highest ROI and ROS among all product forms. These findings confirm that investments in postharvest processing, quality upgrading, and improved market linkages can substantially enhance farmer incomes and strengthen the economic viability of the sector.

Sustainability assessment presents both strengths and challenges. Region X benefits from favorable agro-climatic conditions, active provincial and municipal support programs, and the growing visibility of specialty coffee markets. Nonetheless, the industry continues to face limitations in seedling availability, mechanization, drying infrastructure, and extension services. Climate variability, aging plantations, and a marketing system dominated by intermediaries further constrain productivity and long-term resilience. Despite these challenges, opportunities for upgrading remain strong, particularly in cooperative consolidation, product differentiation, agroforestry expansion, and the development of traceability and regional branding initiatives.

The social and economic impact analysis affirms that coffee plays an important role in the livelihoods of upland households and indigenous communities. The value chain supports employment, strengthens local identity, and provides a vital supplementary income source. However, benefits are not evenly distributed. Youth engagement, gender inclusion, and farmer participation in cooperatives remain low, while dependence on traders and limited access to training and finance reduce equitable participation in higher-value segments of the chain.

Overall, the findings emphasize that improvements in profitability, sustainability, and social equity must proceed in an integrated manner for the Region X coffee sector to reach its full potential. Strengthening postharvest systems, expanding extension and financial services, improving governance coordination, and enhancing cooperative and market structures are essential steps toward building a more competitive, inclusive, and sustainable coffee value chain. These interventions will be critical to positioning Region X as a leading model for coffee development in the Philippines.

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