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# Strengthening the supply chain of bamboo resources in Bukidnon, Philippines

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## ABSTRACT

This research note focuses on strengthening the supply chain of bamboo resources in Bukidnon, emphasizing the identified key players and their respective roles. Bamboo is a valuable and sustainable resource with significant economic, social, and environmental benefits. However, the existing supply chain in Bukidnon faces challenges such as inadequate infrastructure, limited value addition, and a lack of market linkages. This study outlines key strategies and interventions to address these challenges and promote a vibrant bamboo industry. The methods involve a comprehensive analysis of the current state of the bamboo supply chain in Bukidnon, including a review of existing literature, consultations with industry experts, and case studies from successful bamboo industries in other provinces. The study recommends several strategies for strengthening the bamboo supply chain. First, enhancing bamboo production through sustainable cultivation practices, providing technical assistance to farmers, and adopting modern techniques are crucial. Second, promoting responsible harvesting practices and regrowth management through training programs can ensure the long-term sustainability of bamboo resources. Third, improving processing and value addition by investing in modern facilities and equipment can enhance competitiveness and quality. Lastly, establishing effective market linkages through trade fairs, networking events, and online marketplaces will connect producers with buyers, foster collaboration, and open up new market opportunities. The study concludes that a strengthened supply chain will contribute to economic growth, enhance the competitiveness of Bukidnon's bamboo industry, and generate higher economic returns. Moreover, establishing effective market linkages will facilitate knowledge sharing and collaboration, leading to domestic and international market expansion.

*Keywords:* Bamboo, Bukidnon, Philippines, policy brief, supply chain

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## INTRODUCTION

There has been a growing global awareness of the need for sustainable and renewable resources to address the pressing environmental challenges posed by deforestation, climate change, and diminishing traditional timber supplies. Bamboo, often called 'green gold' due to its rapid growth, resilience, and eco-friendliness, has emerged as a promising solution. Bamboo is renowned for its versatility and sustainability and has emerged as a valuable resource with significant economic, social, and environmental benefits. Bamboo is an ecologically substantial plant due to its rapid growth and capacity to sequester carbon. Studies have demonstrated its potential to mitigate climate change by absorbing significant amounts of $CO_2$. Additionally, its extensive root system aids in soil erosion control and watershed management. The economic potential of bamboo is evident in its diverse applications. It plays a crucial role in sustainable energy production and modern construction. Despite its ecological and financial benefits, bamboo supply chain faces numerous challenges. Farrugia and Goutham (2021) noted the importance of overcoming regulatory hurdles and ensuring responsible harvesting practices to maximize its potential. Dolom et al. (2019) discussed how limited knowledge dissemination and insufficient investment hinder the development of bamboo supply chains. These previous studies underscore the economic opportunities in bamboo-related industries. As a rapidly renewable and environmentally friendly material, bamboo has gained global attention for its potential in various sectors, including construction, furniture, textiles, and renewable energy. Bukidnon's bamboo supply chain faces several challenges that hinder realizing its full potential. Current challenges faced by the industry include the need for more adequate infrastructure. More transportation networks, harvesting and transportation permit issuance, storage facilities, and processing units are needed to move bamboo resources efficiently.

Moreover, the lack of value addition along the supply chain limits the profitability of bamboo products. Limited processing facilities and technologies restrict the transformation of raw bamboo into higher-value products, reducing the competitiveness of Bukidnon's bamboo industry. Furthermore, a significant obstacle is the need for market linkages. Despite the high demand for bamboo products, proper marketing channels and connections to domestic and international potential buyers still need to be improved. This restricts the market reach of Bukidnon's bamboo

**Table 1.** Detected bamboo stands and percentage distribution in Bukidnon.

| Province | Municipality/City | Land area (ha) | Classified bamboo (ha) | % Distribution |
|---|---|---|---|---|
| Bukidnon | Talakag | 97,909.87 | 3,731.76 | 20.54 |
| | Malaybalay City | 100,460.63 | 2,056.25 | 11.32 |
| | Libona | 27,042.11 | 1,618.58 | 8.91 |
| | Baungon | 42,149.82 | 1,539.29 | 8.47 |
| | San Fernando | 60,579.46 | 1,109.28 | 6.11 |
| | Impasug-Ong | 95,507.74 | 1,003.27 | 5.52 |
| | Manolo Fortich | 43,665.20 | 973.43 | 5.36 |
| | Malitbog | 38,176.44 | 847.10 | 4.66 |
| | Valencia City | 66,813.82 | 843.47 | 4.64 |
| | Pangantucan | 43,073.74 | 832.77 | 4.58 |
| | Lantapan | 35,588.14 | 815.86 | 4.49 |
| | Kalilangan | 21,762.85 | 629.47 | 3.46 |
| | Sumilao | 16,856.70 | 580.40 | 3.19 |
| | Cabanglasan | 30,698.82 | 448.31 | 2.47 |
| | Quezon | 64,756.03 | 361.14 | 1.99 |
| | Maramag | 32,060.02 | 188.06 | 1.04 |
| | Don Carlos | 21,664.37 | 141.92 | 0.78 |
| | Kadingilan | 16,683.55 | 123.82 | 0.68 |
| | Kibawe | 17,426.67 | 104.69 | 0.58 |
| | Kitaotao | 38,682.96 | 87.57 | 0.48 |
| | Damulog | 17,252.33 | 83.42 | 0.46 |
| | Dangcagan | 7,333.85 | 49.48 | 0.27 |
| | **Total** | **936,145.14** | **18,169.34** | **100.00** |


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industry and diminishes the economic opportunities for local communities. Thus, this study focused on Bukidnon, known for its abundant bamboo resources, and aims to provide recommendations for strengthening the bamboo supply chain. The Province of Bukidnon, located in the northern part of Mindanao, boasts vast bamboo forests, making it an ideal province to harness the potential of this resource. Out of the 936,145.14 ha of land area of the province, classified bamboo covers 18,169.34 ha (Table 1). Table 1 presents the detected bamboo stands and percentage distribution in Bukidnon, with the municipalities of Talakag, Malaybalay City, Libona, Baungon, and San Fernando as top bamboo producers. Table 2 shows the species of bamboo found throughout the province.

**Table 2.** Species of bamboo cultivated for food and lumber in Bukidnon.

| | |
|---|---|
| **Bamboo for food** | |
| *Bambusa vulgaris* (yellow bamboo) | Commonly known as the common bamboo or yellow bamboo which is often used for shoots in Filipino cuisine. |
| *Dendrocalamus asper* (giant bamboo) | Known for its large edible shoots that are popularin the culinary context. |
| **Bamboo for lumber and construction** | |
| *Bambusa blumeana* (kawayan tinik) | Known as Bambusa vulgaris var. striata which is a versatile bamboo used for construction and crafts. |
| *Dendrocalamus asper* (giant bamboo) | Often used for construction and furniture making due to its strength. |
| *Bambusa spinosa* (bayog) | Used for building bamboo houses and furniture. |

## APPROACH AND RESULTS

Comprehensive supply chain mapping was conducted in the province of Bukidnon; the bamboo supply chain typically includes essential key players like nursery operators, pole producers/harvesters, processors, traders, pole producers/harvesters/processors, and pole producers/harvesters/traders. This supply chain map illustrates each key player's monthly production and demand rate in Bukidnon. The smallest number represents the minimum quantity of poles, slats, planting materials, or bamboo products supplied and demanded by each key player. In contrast, the largest number reflects the maximum supplied and demanded, as depicted in Figure 1 (Soliven et al., 2024).

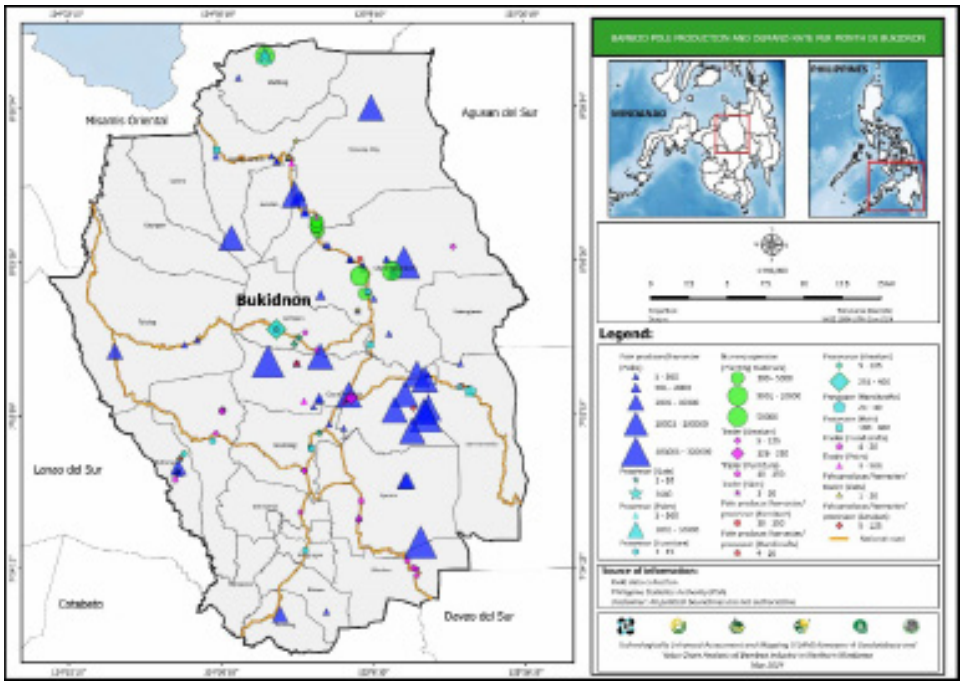


**Figure 1.** Supply chain map of Bukidnon.

**Bamboo key players and their roles**

A. Bamboo nursery operators

Nursery operators grow young bamboo propagules (Figures 2A and B). They purchase the bamboo propagules from the farmer, but some nursery operators have their bamboo plants in their backyards, where they can get their planting materials. They hire laborers to bag bamboo propagules. They sell them directly to buyers from Imbayao, Dalwangan, Pat-pat, Impalutao, or anywhere within Bukidnon.


**Figure 2.** Different nurseries operate in Bukidnon: Dominao nursery (A), Impasug-ong, Roadside nursery, Impasug-ong (B), Interviews with some bamboo pole producers/harvesters in Mt. Kitanglad Agro-Eco Farm, Malaybalay (C), Farmer being interviewed in San Vicente, Sumilao (D), Other pole producers/harvesters/traders interviewed in San Vicente, Sumilao (E), RS Lumber, Hardware & Mini Sawmill, Valencia (F).


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B. Bamboo pole producers/harvesters

Bamboo pole producers/harvesters planted bamboo in their farmland, but most grew bamboo in boundaries, along the riverbanks, and sometimes at the back of their houses. One of the interviewed pole producers/ harvesters, a member of an organization, pointed out that the bamboo was planted just to put boundaries on his farm and not for commercial purposes. Further, bamboo is used to build a fence and a "kubo," which he used as walls and sticks for his garden. One of the reasons they plant bamboo along the creek is to avoid soil erosion. They planted different varieties of bamboo, including giant bamboo, laak, and Chinese bamboo, on their 5-ha of land. Those 5 ha are just part of the total 22 ha of the farm. They also have a bamboo nursery, which they deliver to customers who request delivery, including government agencies, especially the DENR. However, some pole producers/harvesters plant bamboo for economic purposes as a source of income—Figures 2C and D show some of the interviewed bamboo pole producers /harvesters in the province of Bukidnon.


**Figure 3.** Interviewed pole producers/harvesters/processors in the province of Bukidnon Nigo Maker in Mt. Nebo, Valencia: Bamboo furniture maker in Little Baguio, San Fernando (A), Furniture samples (B), Different traders of bamboo poles, slats, amakan, coco lumber, and barbeque sticks in San Vicente, Sumilao (C), AZE Resources Lumber Hardware, Valencia (D), Different handicrafts being sold in Sinuda, Kitaotao (E and F).

C. Bamboo pole producers/harvesters/ Traders

Figures 2E and F show the interviewed pole producers/harvesters/traders in the province of Bukidnon. Pole producers/ harvesters/traders within the province have their bamboo planted for economic purposes and use it to make trellises for vegetables, cages for pigs, etc. They also sell bamboo poles, slats, furniture, and other items. Pole producers/harvesters/ traders in Bukidnon sell slats ranging from Php 4.00–7.00 per slat and Php 45.00–70.00 per bundle of slats, and poles ranging from Php 50.00–200.00 per pole.

D. Bamboo pole producers/harvesters/ processors

Pole producers/harvesters/processors have their bamboo, which they planted for economic purposes and used to make a mushroom house, furniture, box containers for bananas, and nigo, which they sell to customers. Pole producers/harvesters/ processors in Bukidnon sell Php 4,000.00 to Php 5,000.00 per furniture set, with a 4-seater chair, 2 (2-seater) chairs, and 1 table; Php 60.00 per banana box container; and Php300.00 per nigo. Their key customers are just within Bukidnon; others are from Manila. Figure 3A and B show some of the interviewed pole producers/ harvesters/processors in the province of Bukidnon.

E. Bamboo traders

Bamboo traders often purchase bamboo directly from bamboo pole producers/ harvesters. Traders are usually retailers, consolidators, and contractors. They sell bamboo poles/slats directly to end customers. A trade contractor beside the road in Impalutao, Impasug-ong, Bukidnon, has a contract with a poultry farm in Impasug-ong and even outside Bukidnon. The selling price of the bamboo slats is Php 4.00, each containing a service charge of Php 1.00. Before the delivery, the contractor and the buyer transacted through phone calls and set the hauling schedule. The contractor does not haul the bamboo slats without prior checking by the buyer on the volume of the slats because maybe the buyer might think that those slats were lacking or not from the bunches of bamboo clumps being "pakyaw" and bamboo slats are picked up by the buyer. The laborer's compensation is Php 250.00 per harvest – Figure 3C and D show different traders of bamboo poles, slats, amakan, coco lumber, and barbeque sticks in the province of Bukidnon.

F. Bamboo processors

Processors in Bukidnon buy the raw materials from traders. Processors sell bamboo handicrafts, furniture, amakan, banana boxes, personalized bamboo huts, chicken cages, building materials, and function halls. Handicrafts, such as bamboo helicopters, bag organizers, speakers, lampshades, mug holders/trays, giveaways, tokens, or truck exhibits, were sold directly and sometimes displayed in the mall (Figure 3E and F). The primary market for handicrafts was employees in the LGUs of San Fernando, Lantapan, Cabanglasan, Malaybalay City, Bukidnon. Set or individual items sold the furniture, and the price per set depended on its cost (Figure 4A and B). Some sets contain two single chairs, two 4-seater chairs, one table, and individual items such as a bamboo hammock, a single chair, a four- or five-seater chair, and a table. Amakan has two styles: the decorative (the one with holes) and the one without holes, ranging from Php 90.00 to Php 200.00. They display it on the side road, but other amakan is made to order, which means they only make amakan when someone makes an order (Figure 4C and D). The personalized bamboo hut was sold directly to customers such as restaurant and subdivision owners and government employees and sometimes sold outside Bukidnon, such as in Tawi-Tawi (Figure 4E). Some walk-in buyers are just within the barangay. A personalized bamboo hut's standard price is a minimum of Php 45,000 and a maximum of Php 85,000.00.


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**Figure 4.** Bamboo furniture in the province of Bukidnon: Malaybalay City (A), Valencia different styles of amakan in the province of Bukidnon (B), Alanib, Lantapan (C), Pangantucan (D), Different bamboo huts by hut makers in Maramag, Bukidnon (E), Poles and short/long slats of bamboo from San Miguel, Manolo Fortich, Bukidnon (F).

Figure 4F shows the poles and short/long slats of bamboo from San Miguel, Manolo Fortich, Bukidnon. Those bamboo poles/slats came from San Miguel, Manolo Fortich, Bukidnon. Bamboo poles (6 in. long) were bought at Php 30.00 per pole and sold at Php 50.00 per pole at San Miguel with a 66.67% margin per pole. While bamboo slats (6 in. & 8 in.) were bought at Php 30.00 per bundle and Php 80.00 per bundle, respectively, and sold at Php 50.00 per bundle and Php 120.00 per bundle, each bundle contained 50 pieces of slats. Meanwhile, in Impasug-ong, Bukidnon, the bamboo slats were sold at Php 2.00 per slat.

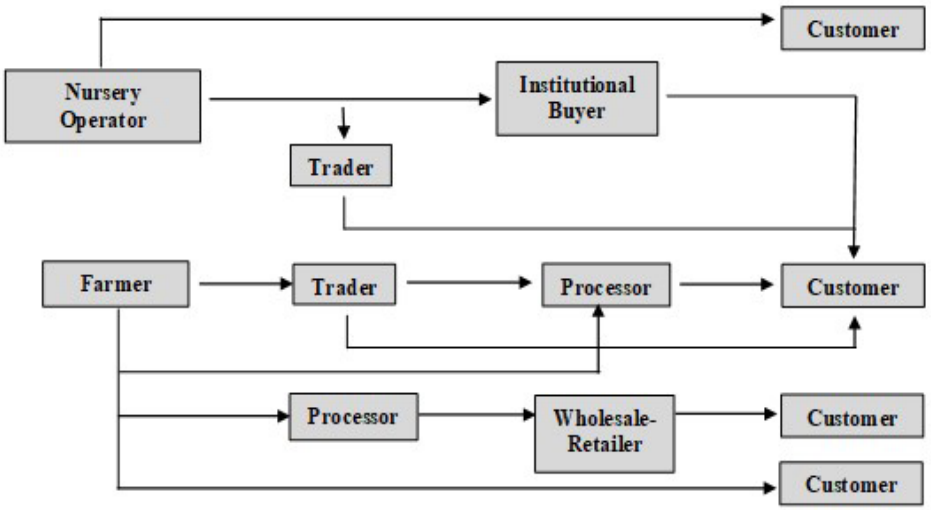
G. Customers

Customers could include local customers. Bamboo poles and slats are traded and processed to make bamboo products such as handicrafts and furniture. These products are sold to customers who own restaurants and subdivisions like Chukoohills Café and Resto, Lantapan, Bukidnon, Kambingan sa Batangan,

Valencia City, Grand Meadows, Valencia City, government agencies like DENR, and LGUs in the Bukidnon area. There are also customers outside Bukidnon, such as the distributor in Sulu.

**Bamboo product flow**

A total of eight (8) chains were traced for the general product flow of bamboo in the province of Bukidnon, of which the longest chain starts from the farmer to the trader, then to the processor, and lastly to the customer; another is from the farmer to the processor to the wholesale retailer, and lastly to the customer. In contrast, the shortest supply chain starts from the farmer directly to the customer or from the nursery operator to the customer (Figure 5; Soliven et al., 2024).




Channel 1: Nursery Operator-Institution buyer-Customer
Channel 2: Nursery Operator-Trader-Customer
Channel 3: Nursery Operator-Customer
Channel 4: Farmer-Trader-Processor-Customer
Channel 5: Farmer-Trader-Customer
Channel 6: Farmer-Processor-Custoemr
Channel 7: Farmer-Processor-Wholesale-Retailer-Customer
Channel 8: Farmer-Customer

**Figure 5.** General product flow of bamboo in the Province of Bukidnon (Soliven, et al. 2024)

## CONCLUSION

The bamboo industry in Bukidnon has excellent potential for growth and development. To capitalize on this potential, a multi-faceted approach is needed. Enhancing bamboo production, promoting sustainable harvesting and management practices, improving processing and value addition, and establishing effective market linkages are vital areas that require attention and investment. By focusing on these areas, Bukidnon can strengthen its bamboo supply chain, ensure the long-term sustainability of bamboo resources, enhance the competitiveness of its bamboo industry, and create new market opportunities.

## IMPLICATIONS AND RECOMMENDATIONS

- Educate bamboo farmers on modern cultivation techniques to improve productivity;
- Provide easy access to high-quality planting materials like certified bamboo seedlings and saplings is crucial;
- Invest in modern processing facilities and equipment to make the industry more competitive;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- Provide for processing equipment will play a significant role in improving the overall value chain of the bamboo industry;
- Promote bamboo furniture, handicrafts, and construction materials by providing incentives to local artisans and entrepreneurs for innovative applications of bamboo;
- Create digital platforms that connect bamboo producers to potential customers can facilitate the growth and expansion of the bamboo industry
- Create of more bamboo cooperatives or associations can enable the collective marketing of bamboo products, providing better market access and visibility for producers
- Allocate resources for research and development for species improvement, product innovation, and sustainable cultivation techniques;
- Develop comprehensive policy and regulatory framework so that the bamboo industry can thrive.

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