

Mapping the geographical reach of bamboo products: The case of Pangasinan, Philippines

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ABSTRACT. Bamboo is a versatile resource for subsistence, commercial applications, construction, and conservation. Given the economic advantages it offers stakeholders along the value chain, this study focuses on identifying and characterizing the key players in the bamboo industry in Pangasinan, Philippines, while mapping the geographical flow of bamboo products. Fifty-six respondents participated in the research, utilizing a tracking approach to identify marketing channels from production to consumption. Snowball sampling was also employed to identify bamboo processors. Results reveal that the bamboo value chain comprises two main groups of players: upstream (including harvesters of bamboo poles and pole traders/consolidators) and downstream (comprising product processors, product traders/consolidators, wholesalers, exporters, and consumers). Bamboo poles are primarily sourced locally, particularly from Pangasinan and Tarlac. The products produced include nipa huts, various handicrafts (such as winnowing trays, chicken coops, vases, fruit baskets, steamers, and bird feeders), furniture (including *sala* sets), engineered bamboo items like plaques, and other bamboo products such as chicken cages. The processing of these products involves three key stages: pre-processing (cleaning and straightening poles), assembly, and finishing (sanding, polishing, and applying protective coatings). These bamboo products are sold within the province and through market intermediaries, extending as far as Region I, Region III, Metro Manila, Cavite, Batangas, and the United States. Intermediaries are important for enhancing market reach, and online marketing strategies are effective tools for connecting processors with potential buyers.

Keywords: bamboo furniture, bamboo handicraft, geographical flow, nipa hut

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INTRODUCTION

Bamboo, an important family of non-timber forest products, has many uses, including subsistence, commercial, construction, and conservation (The Bamboo Technical Committee, 2009). It is a species of grass characterized by

woody and hollow culms, complex rhizome and branch systems, petiolate leaf blades, and prominent sheathing organs (Roxas, 2012). Because of its uniqueness, it has been known for its many names, including "poor man's timber,"

and has been a valuable income source for rural people in the Philippines (Lapis *et al.*, undated). However, with technological advancements and innovative marketing, bamboo has the potential to become the “material of the future” (Kendra, 2008), inspiring a new wave of creativity and sustainability.

Bamboo can thrive in a variety of climates and is highly adaptive. It can also be propagated according to its intended purpose. Maoyl and Banik (1995) categorized bamboo stands into five end-use types: timber stands (including timber-and-shoot stands), shoot stands, pulp stands, ornamental stands, and water/soil conservation stands.

Although bamboo exists all over the Philippines in government and private lands, either as natural stands or in plantations, bamboo has been neglected as a minor forest product. The bamboo inventory resources are still insufficient. Among the inventory studies cited by the Philippine Industry Roadmap of DTI 2023, the Lanting (2013) report is the most comprehensive because it disaggregates the economically important species. It showed that Region 7 has the highest number of available culms yearly, with 129,820 clumps, followed by Region 3 with 111,314 clumps, and Region 11 with 91,625 clumps. Despite these numbers, the Philippines only ranked fifth out of all the countries that export bamboo, China being the first (Razal *et al.*, 2018).

In the Philippines, the contribution of the bamboo sector is difficult to estimate due to the insufficient data on some micro-scale furniture and handicraft manufacturing that belong to the informal economy, where transactions remain unrecorded. This prompted the government in 2010 to create the Philippine Bamboo Industry Development Council (PBIDC) under Executive Order No. 879 to promote the Bamboo Industry Development program and the formulation of a Bamboo Industry Roadmap to guide its development. In addition, a roundtable discussion among bamboo stakeholders held in PCAARRD in 2016 identified the lack of a central bamboo information network that interested

parties can use to obtain up-to-date data on bamboo availability, sources, demand, and prices (Razal *et al.*, 2018). There is also limited research on the value chain analysis of bamboo, particularly in Pangasinan, which makes it difficult to properly understand the industry’s current state and the advantages it may offer to the local community and the province.

While the local bamboo industry holds promise (Aggangan, 2015), it is crucial to ascertain the sources of bamboo poles and the final destinations of products. This will contribute to a more vibrant industry and ensure the economic benefits it provides to all its players. Thus, this study aimed to identify and characterize the different players in the bamboo value chain and to map the geographical flow of bamboo products. Identifying the geographical flow will improve product development and marketing strategies and provide a roadmap for future growth. The results of this study will also produce an important picture of the geographic distribution of bamboo products from Pangasinan, which can direct early and future initiatives of public and private entities to support the sector. Further mapping studies and surveys could build on this foundation, improve knowledge, and open the door for focused programs and regulations that will support the expansion and sustainability of the province’s bamboo industry.

METHODOLOGY

Site description

The study was conducted in the province of Pangasinan in Region I, which was identified as the region’s highest producer of bamboo culms (DENR-FMB FPS 2013, as cited by the DTI, 2023). The province is dominated by agricultural lands in the central and eastern parts and coastal areas in the western part. Gauli *et al.* (2018) grouped the prioritized bamboo products into three categories based on the intensity of value addition: (i) construction materials with no or minimum addition (bamboo poles); (ii) small-scale enterprise products with moderate-value addition (handicraft and furniture); and (iii)

industrial products with high-value addition (engineered bamboo products, bamboo stick-based products, biomass for energy). The study focused only on the geographical distribution of micro-scale Pangasinan-made nipa hut, furniture, handicrafts, and engineered bamboo products, among other things. **Figure 1** shows the location of the study area.

Sampling strategy and data collection

This case study employed a tracking approach in selecting market players by mapping the marketing channels that bamboo passes through from production to consumption. Several data-gathering methods were employed, including surveys, focus group discussions (FGDs), key informant interviews (KIIs), and photo documentation.

A detailed household survey was conducted in May 2023. Several key informant interviews were held with enablers of the bamboo industry to identify the pathways of bamboo products in the province. Additionally, FGDs were done to validate the research findings. All of these methods were supported by photo documentation. **Table 1** shows the number of

respondents that participated in the study. A list of bamboo product processors was obtained from the Provincial Office of the Department of Trade and Industry (DTI) and the City Environment and Natural Resources Office (CENRO) – Dagupan City. The initial respondents for the household survey were selected from the list using a purposive sampling method. Key players identified by the initial respondents were also interviewed using snowball sampling to employ the tracking approach. This approach ensured a comprehensive representation of the product flow of nipa huts, furniture, handicrafts, engineered bamboo products, and other bamboo products in the Province of Pangasinan. The products, as identified by the respondents, were mapped. The roles and contributions of the different players along the chain were described using quantitative and descriptive analyses.

RESULTS AND DISCUSSIONS

Socio-demographic profile of the survey respondents

The production-to-consumption of bamboo products in Pangasinan was reviewed in this case study. It involved different value chain

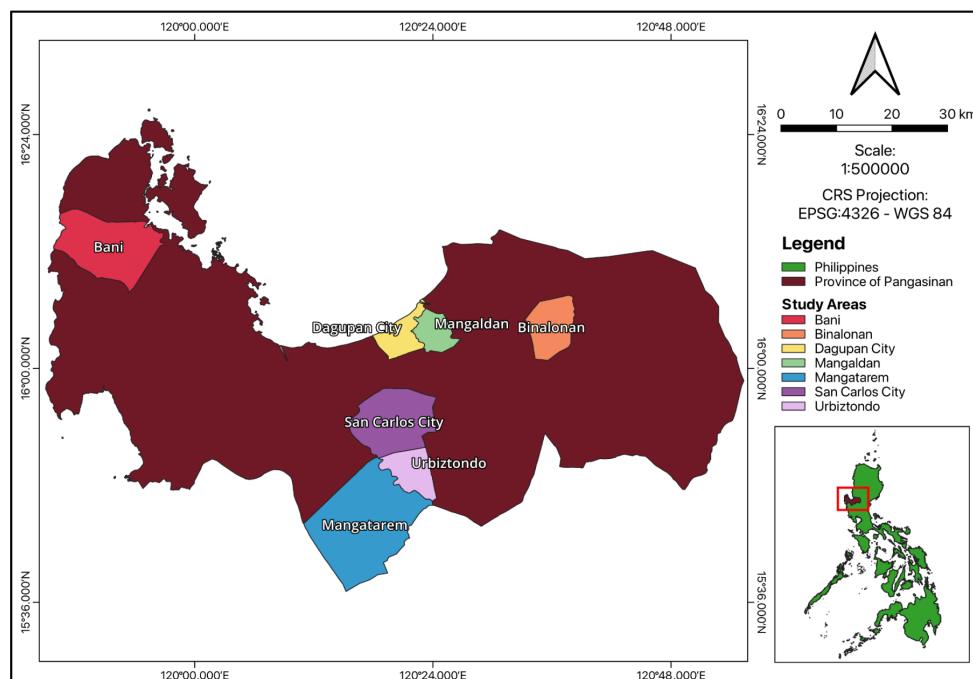


Figure 1. Location map of the seven study areas in Pangasinan, Philippines.

Table 1. Number of actors involved in the bamboo value chain of Pangasinan, Philippines.

Value chain actor	Frequency	Municipality/Province
Harvesters	4	Camiling, Tarlac and San Carlos City, Pangasinan
Pole traders/ consolidators	5	San Carlos City, Pangasinan
Bamboo processor: Nipa hut	10	San Carlos City, Binalonan, and Mangaldan, Pangasinan
Bamboo processor: Furniture	2	San Carlos City and Urbiztondo, Pangasinan
Bamboo processor: Handicraft	19	San Carlos City, Bani, and Urbiztondo, Pangasinan
Bamboo processor: Engineered bamboo	1	Mangatarem, Pangasinan
Bamboo processor: Other bamboo products	4	San Carlos City and Mangaldan, Pangasinan
Product traders/ consolidators	5	San Carlos City, Pangasinan
Consumers	2	Manila and Quezon City, NCR
Enablers	4	San Carlos City and Dagupan City, Pangasinan
Total	56	

actors, each playing a crucial role. These actors include pole harvesters, who are responsible for the initial collection of bamboo poles; pole and product traders/consolidators, who facilitate the distribution of these poles and bamboo products; bamboo processors, who transform the raw material into various products such as nipa huts, furniture, handicrafts, engineered bamboo products, and other bamboo products; and consumers, who drive the demand for these products.

Fifty-six value chain actors participated in the survey, consisting of 4 bamboo pole harvesters, 5 pole traders, 36 processors, 5 product traders, 2 consumers, and 4 enablers. Their involvement is essential to the bamboo industry's growth and the province's economic landscape.

In terms of age, 68% are over 40, with 28% falling within the 41–50 age bracket. The age distribution

may provide insights into the generational dynamics within the bamboo industry. With regard to household size, more or less half (52%) of the respondents belong to a family with 1–5 family members.

The respondents' highest educational attainment was 22% at the elementary level, 54% at the high school level, 20% at the college level, and 4% at the postgraduate level. Regarding the years the respondents have been in business, more than half (58%) have been operating for more than 10 years, with 14% operating for more than 30 years. This long-standing experience highlights the province's bamboo industry's resilience and longevity.

Bamboo production systems

Bamboo clumps in the province can be found in naturally grown stands in public lots and private lands near backyards and rivers (Castillo *et al.*, 2022). Local farmers use bamboo for domestic purposes, such as constructing nipa huts or *bahay kubo*, building fences, making bamboo matting or *sawali*, crafting furniture, and creating handicrafts. Excess bamboo is sold to neighboring municipalities or within their locality.

Tenurial instruments are also given to bamboo growers and/or harvesters. Pangasinan has one Integrated Forest Management Agreement (IFMA) holder. It was given to a large-scale production company, CS First Green Agri-Industrial Development, Inc. IFMA is a production-sharing agreement for industrial bamboo plantations, tree plantations, and nature conservation and protection zones. This IFMA is in five (5) municipalities in the province: Aguilar, Dasol, Bugallon, Infanta, and Mangatarem. A related policy is DENR Administrative Order No. 2021-26, which delineates the regulations governing bamboo establishment, harvesting, and transportation. This order mandates the registration of bamboo plantations and backyard farms for commercial production. Despite being in effect since 2021, most interviewees expressed their lack of awareness regarding this administrative order. According to CENRO-Dagupan City records, no interested parties or individuals have completed the registration process.

Types of bamboo poles harvested

The principal products extracted from bamboo plantations in the study area are bamboo poles and shoots. The bamboo poles harvested vary in species, size, and age. The species of bamboo commonly harvested for use are *kawayan tinik* (*Bambusa spinosa* Roxb.), *bayog* [*Bambusa merilliana* (Elmer) Rojo & Roxas], and *buho* [*Schizostachyum lumampao* (Blanco) Merrill]. The household survey revealed that *kawayan tinik* is the province's most commonly used bamboo species in producing nipa huts, furniture, handicrafts, engineered bamboo products, and other bamboo products. According to the processors, its basal part is ideal for building nipa huts and *sala set* bases due to its thickness, yet it is soft enough to be cut with a handsaw. Handicraft processors added that thick poles make more bamboo strips and are flexible and easy to weave. On the other hand, *buho* produces small bamboo food steamers measuring 4–12 inches in diameter. The processor added that *buho* is easier to bend. **Table 2** summarizes the characteristics and uses of bamboo harvested in the province. Each type is processed into different bamboo products and used domestically for specific purposes. Similarly, the uses of each type of pole can also vary depending on the consumer's intended use. As a result, these poles can have different prices.

Table 2. Characteristics and uses of bamboo poles in Pangasinan, Philippines

Type of bamboo pole	Bamboo pole diameter (cm)	Uses
Small/Pop/Beer	6–8	Roof and floor material in nipa hut construction, handicraft production
Medium/Tersera	9–10	Domestic use like fences, local house construction, engineered bamboo products, and other bamboo products
Large/Big	11 and up	House/nipa hut construction (bases), furniture production

The bamboo harvesting practices in the study area combine traditional local community knowledge and practices taught by extension

service providers such as the Department of Environment and Natural Resources (DENR) through its attached agencies, academe, and private organizations. Bamboo harvesting in the province is concentrated during the dry season, from November/December to May/June of the succeeding year. Razal *et al.* (2013) mentioned that the reasons for this include accessible and passable trails to bamboo stands and the presumption that the starch content of bamboo poles is lowest during the dry season, thereby minimizing the occurrence of powderpost beetles or "*bukbok*." During the wet season, from May/June to October/November, harvesting is minimized as it is the reproduction season when shoots or "*labong*" emerge. The Provincial Government of Pangasinan regulates the harvesting of bamboo shoots through Provincial Ordinance No. 53-96, which bans and penalizes the cutting and selling of bamboo shoots in public and private properties (The Official Website of the Province of Pangasinan, 2023). Micro-scale bamboo processors minimize their production during the wet season due to the difficulty of sun-drying poles, which is an important step in making nipa huts, furniture, handicrafts, engineered bamboo products, and other bamboo products. The harvesting age varies depending on the intended use of consumers. Bamboo poles used for constructing houses, nipa huts, furniture, engineered bamboo products, some crafted products such as bird feeders, and other bamboo products like chicken cages, among others, often need to be more mature, aged 3 to 5 years. In contrast, poles used in handicraft production, such as winnowing trays or *bilaos*, chicken coops or *obong*, vases, fruit baskets or *kaing*, and steamers prefer young culms aged 1 to 2 years due to their flexibility in processing.

Bamboo sources vary between processors. Handicraft and engineered bamboo product processors purchase poles within the province through their neighbors and viajeros or itinerant merchants, often in minimal order or harvested in their backyard. Nipa huts, furniture, and other bamboo products processors source poles in bulk from Camiling, Tarlac, through a pole trader/consolidator. The survey also indicated that 100% of the harvested poles from the sampled

households are sold untreated or without value addition. No pre-treatments or chemicals are applied before selling to the next industry player. Interviews with key players show that the lack of physical infrastructure, such as storage facilities, is among the reasons for selling raw poles.

Value-added products: Nipa huts, bamboo furniture and handicrafts, engineered bamboo products, and other bamboo products

Local artisans and micro-scale enterprises process bamboo poles sourced within the province and from Tarlac into nipa huts, furniture and handicrafts, engineered bamboo products, and other bamboo products. Diverse products made of bamboo from the sampled households include nipa huts or *bahay kubo* (27.78%), furniture products such as *sala* sets (5.56%); different crafts like winnowing trays or *bilaos* (33.33%), chicken coops or *obong* (8.33%), vases (2.78%), fruit baskets or *kaing* (2.78%), bird feeders (2.78%) and steamers (2.78%); engineered bamboo products like plaques (2.78%); and other bamboo products such as chicken cages (11.11%).

Nipa hut, or *bahay kubo*, is a stilt house type with a well-ventilated design (Mariano *et al.*, 2018) and a traditional shelter for indigenous Filipinos (Lee & Nadeau, 2011). Nipa hut is also considered a recreational house construction often seen in beach resorts and other places offering leisure (Teshale *et al.*, 2017). Nipa huts are commonly made from bamboo to form the frame, floor, walls, roof, coco lumber, dried nipa palm, and some add a net to the roof (Figure 2).

Furniture are large, movable items used for sitting or lying down or placing things on or in. Additionally, bamboo furniture is defined as a traditional kind of furniture produced from no to minimally industrialized bamboo poles (Zheng & Zhu, 2021). An example included in this case study was the *sala* set (Figure 2). *Sala* sets are living room furniture meant for sitting and are usually long with back and arm support. Bamboo *sala* sets produced in the province include 1 long chair for 3–4 people, 2 single chairs, and 1 small center table.

Handicrafts are objects made by hand. It usually involves strips of bamboo woven and formed into different crafts for everyday home use or as decorations. Handicraft-making is considered a recreation and an art form (Mariano *et al.*, 2018). Samples of handicrafts identified in the study were winnowing trays or *bilaos*, chicken coops or *obong*, vases, fruit baskets or *kaing*, bird feeders, and steamers (Figures 3 and 4). Winnowing trays or *bilaos* are woven bamboo strips essentially designed for winnowing—a method to separate chaffs from the grains. Chicken coops or *obong* are used for egg-laying hens. It is woven loosely to create an open weave pattern. Vases are decorative pieces resembling vases and can be used as storage containers. Fruit baskets or *kaing* are containers used to hold or carry things such as farm produce, typically made with interwoven strips of bamboo with handles on each side. Bird feeders are containers designed to be filled with bird feed and placed outside to attract birds. It is made from a small bamboo pole with holes



Figure 2. Nipa hut or *bahay kubo* (Photo by Jayvee A. Daleja, 13 May 2023) and bamboo *sala* set (Photo by Rachelle Barcenas, 15 October 2024) made in Pangasinan.

tied with a rattan string. A steamer is a piece of cookware that uses steam from hot water to cook food. It is circular with a flat top and bottom and comes with a cover.



Figure 3. Handcraft products made in Pangasinan – (upper left) Winnowing tray or *bilao* (Photo by Lemuel M. Ventayen, 13 December 2024), (lower left) chicken coop or *obong* (Photo by Marissa De Guzman, 09 October 2024), and (right) bamboo vase (Photo by Ma. Diana DM. Rendon, 13 May 2024).



Figure 4. (Upper left) Fruit basket or *kaing* (Photo by Lemuel M. Ventayen, 13 December 2024), (right) bird feeder (Photo by Graciella Marie A. Zalameda, 03 February 2025), and (lower left) steamer (Photo from fb.com/myrna.delariarte.98, 07 October 2024) made in Pangasinan.

Engineered bamboo products are made by turning raw bamboo culms into a laminated composite (Sharma *et al.*, 2015). Bamboo culms

are then made into slats to form planks. These planks are then turned into different engineered bamboo products, like plaques (Figure 5) that measure 8 x 10 inches with an engraved detail.



Figure 5. Engineered bamboo plaque (Photo from fb.com/CBamboo13, 17 October 2024) and chicken cage (Photo by Ma. Diana DM. Rendon, 16 May 2023) made in Pangasinan.

Other bamboo products include those made from bamboo but are not considered furniture or handcraft products, such as chicken cages. Chicken cages, in this case, are small enclosures that house poultry or other small animals (Figure 5). It can have two or three doors, depending on the customer's needs.

Industry chain of bamboo from Pangasinan

Players and their functions

The production-to-consumption system in Pangasinan is composed of both upstream and downstream players. Chizaryfard and Karakaya (2022) defined upstream players as individuals knowledgeable in extracting and processing raw materials, while downstream players use the raw materials to produce customized products to meet various demands from end customers. In addition, downstream players are also involved in the branding, marketing, and distribution of products. The upstream players in the bamboo value chain in Pangasinan are Harvesters and Pole Traders/Consolidators. Meanwhile, the downstream players are Product Processors, Product Traders/Consolidators, Wholesalers, Exporters, and Consumers. Additionally, key informants were also invited to participate in this case study. They represented different enabling institutions from DTI, CENRO, MAO, and PG-ENR offices.

Upstream players

Harvester. Harvesters are responsible for extracting raw bamboo materials. Four bamboo pole harvesters participated in this study. Three were located in Camiling, Tarlac, where they harvested poles for nipa hut production and some furniture, handicrafts, and other bamboo products. Harvesters from Tarlac market their raw bamboo poles directly to Processors or Pole Traders/Consolidators (Pole TC) from Pangasinan by pick-up method. They own an average of 0.6 ha of bamboo plantations under privately titled lands through the Certificate of Bamboo Plantation Registration granted by the City Environment and Natural Resources Office (CENRO) - Camiling. The harvesting process starts with taking orders from Processors or Pole TC and securing a permit to cut from CENRO-Camiling and a Barangay Permit. Cleaning of the surrounding areas of the clump is done. Then, a selection of poles with dark green to slightly brown and no sheath, indicating three years of age, is cut 3–4 meters from the ground. Poles are sorted according to size and placed in a shaded area before the next industry player picks up the poles. No storage facilities are available; hence, they only cut poles when there is a sure buyer.

On the other hand, one harvester from Pangasinan was identified. Poles were harvested from their area, located 10 min away from their home. These poles were used to produce chicken cages.

No harvesters were identified for the bamboo handicraft industry chain. Handicraft processors purchase only 1 or 2 poles from harvesters/*viajeros* or itinerant merchants whose names and contact information are unknown. Some harvest poles in their backyards. In some cases, such as the production of bamboo vases, poles are sourced through a pole trader/consolidator.

Pole trader/Consolidator (Pole TC). Five pole traders/consolidators participated in the study. They purchase bamboo poles from one to three harvesters and resell them to product processors. Two of them acquire poles from Camiling, Tarlac, where a permit to transport is first secured from the City Environment and Natural Resources

Office. They typically own trucks to haul and transport more than 200 pieces of poles. After collection, poles are separated according to size and displayed in a vacant lot where product processors buy (**Figure 6**). These Pole TCs mostly cater to nipa hut producers and some furniture, handicrafts, and other bamboo product makers. While the other three Pole TCs purchase poles from harvesters within Pangasinan. They usually use a small vehicle like a motorcycle with a sidecar or *garong* that can hold up to 20 poles or a jeepney that can transport up to 80 pieces. Some Pole TCs act as *viajeros* or itinerant merchants to sell their poles.



Figure 6. Poles displayed for sale in Pangasinan (Photo by Jayvee A. Daleja, 15 May 2023).

Downstream players

Product processor. These players process raw bamboo poles into different value-added products. Ten nipa hut processors were identified in the study. Some nipa hut processors have *financiers* or are under a *Pakyaw* Labor system where a client agrees to a fixed rate to complete the job within a specified period. Others own businesses, such as nipa hut making. For furniture and other bamboo product processors, two *sala set* and four chicken cage producers, respectively, participated in the study. They operate on a made-to-order basis or display their products and sell to product TCs. Nineteen handicraft processors participated in the study. These were winnowing trays or *bilaos*, chicken coops or *obong*, vases, fruit baskets or *kaing*, bird feeders, and steamers.

Processors get bamboo poles either directly from harvesters or pole traders/consolidators. Nipa hut, furniture, handicraft, and other bamboo product processors sampled in the study are generally micro-scale enterprises. They are also characterized by low capital investments, rudimentary tools, and few workers who are often family members (DTI, 2023). All of them undergo three (3) major steps: pre-processing of poles (which involves cleaning and straightening the poles), assembling into the specified product, and finishing (which includes sanding, polishing, and applying protective coatings).

On the other hand, the study identified one engineered bamboo product processor. They process their products using equipment from a Shared Service Facility granted by the DTI provincial office. The engineered bamboo product processor produces 8 x 10-inch plaques sold to government agencies.

Product trader/Consolidator (Product TC). The Traders buy bamboo products from processors and resell them to consumers or wholesalers. They are crucial in getting the products to a broader market, especially handicraft products. Pangasinan's winnowing trays reach Metro Manila and Southern Luzon through this player. Product TC also acts as *financiers* of nipa hut processors.

Wholesaler. Wholesalers buy bamboo products in bulk from product TC and sell them in retail through their physical stores, usually in markets or *Pamilihang Bayan*.

Exporter. Exporters sell bamboo products made in the Philippines to buyers in other countries. To qualify for sale internationally, their management must approve the design of a product.

Consumer. Consumers are the final players in the bamboo industry chain, purchasing and using bamboo products for their consumption.

Enablers

Razal *et al.* (2013) defined enablers as individuals and organizations that influence the flow of events in a certain industry chain, where their

actions and decisions determine its outcome. Additionally, enablers further knowledge by assisting and coordinating with different stakeholders (Yeh *et al.*, 2006). In this study, the following are the identified enablers of the bamboo industry interviewed in Pangasinan.

Department of Environment and Natural Resources.

A government agency responsible for conserving, managing, developing, and properly using the country's environment and natural resources. Through PENRO and CENRO, policies and programs are mandated to ensure proper management and utilization of bamboo in the province.

Department of Trade and Industry. A government agency responsible for the advancement, promotion, governance, regulation, management, and growth of industry and trade. In Pangasinan, DTI conducts activities on information dissemination, seminars and training, and product development to support different industries, including bamboo.

Provincial Government Environment and Natural Resources Office (PG-ENRO).

A mandated agency to enforce laws, manage and implement various programs, projects, and activities, and supervise and implement functions devolved to them to protect and manage the environment.

Department of Agriculture through the City Agriculture's

Office of San Carlos City. An agency responsible for the promotion of agriculture and fisheries development and growth. Through them, livelihood projects and training for cooperatives are given to the citizens of San Carlos City.

Geographical flow of bamboo products

The geographical flow of bamboo products identified in this case study shows its trail from production to consumption. It also shows the sources of poles and destinations where bamboo products are produced. The flow also reflects the chain of actors involved in the market of bamboo-based Pangasinan products.

Pangasinan, particularly the municipality of San Carlos City, is the center of the bamboo industry

in the province, where 71 out of 86 barangays are engaged in bamboo furniture and handicraft production (DTI, 2023). Thus, bamboo-based products are their One Town, One Product (OTOP). The sampled households in this study reside in San Carlos City (66.67%), while others are from the municipalities of Urbiztondo (16.67%), Mangaldan (8.33%), Binalonan (2.78%), Mangatarem (2.78%), and Bani (2.78%). For small production, such as in handicraft processing, where processors only need 1 or 2 poles to produce winnowing trays, steamers, and bird feeders, poles are sourced from backyards or purchased within the province, while other chicken coops, vases, fruit basket, and other bamboo products (*e.g.*, chicken cages) processors opt to purchase poles from pole TCs. Likewise, furniture processors (*e.g.*, *sala* sets) and engineered bamboo processors (*e.g.*, plaques) procure poles directly from harvesters within the province. This highlights the strong reliance on nearby sources of raw materials and the advantages of the proximity of the actors to bamboo resources. Such proximity reduces transportation costs and encourages local production chains that capitalize on resource availability. For bigger production like nipa huts, most processors source poles through pole TCs that procure poles from Camiling, Tarlac, reflecting the need for external sourcing to meet the demand for poles.

Bamboo products are used where they are made. Over time, connections and broader markets emerged. Hence, the various bamboo-made products in Pangasinan reach other provinces in Regions I and III, Metro Manila, Cavite, Batangas, and even the US through various market intermediaries. This expanded network underscores the importance of Pangasinan's location, along with its physical accessibility and logistical systems, which enable the movement of goods connecting local producers to regional and international markets. DTI has recognized this potential and is actively working to revitalize the province's One Town, One Product (OTOP) program. This initiative includes market research to identify consumer preferences and trends, aiming to expand the reach of local products to broader markets (Dtiwebteam, 2025).

Moreover, the provincial government projects that forthcoming transportation initiatives will significantly enhance the region's transportation and tourism sectors, improve accessibility to key urban centers and expand economic opportunities (pna.gov.ph). Similarly, the efficient movement of other non-timber forest products (NTFPs) (Greene *et al.*, 2000) and agricultural goods (Bwanbale, 2024) is heavily influenced by accessible transport networks that connect rural production areas to urban centers. Thus, infrastructure developments highlight the strategic importance of Pangasinan's location in facilitating economic growth and strengthening market integration.

The bamboo *sala* set's geographical flow is shown in **Figure 7**. It is concentrated in the province where the source of poles, production, and consumption are only within Pangasinan.

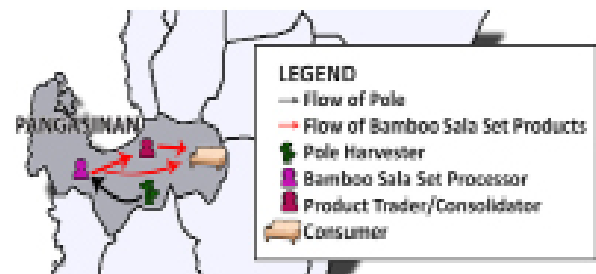


Figure 7. Geographical flow of bamboo *sala* set produced in Pangasinan, Philippines.

The geographical flow of nipa huts produced in the study area is shown in **Figure 8**. Raw bamboo materials are sourced locally or in Camiling, Tarlac, through a pole trader/consolidator TC or by processors. Finished products produced are then marketed directly to consumers locally or in La Union, Zambales, Bataan, and Batangas. Nipa huts can also be sold through product TCs that cater to consumers locally and in Tarlac and Bataan. Processors of nipa huts also market their products by displaying them in their yards or the town plaza, where the city allocated a venue to display and sell bamboo-made products from San Carlos City. As the processors mentioned, most buyers own a place that offers relaxation or leisure activities like beach resorts, restaurants, etc.

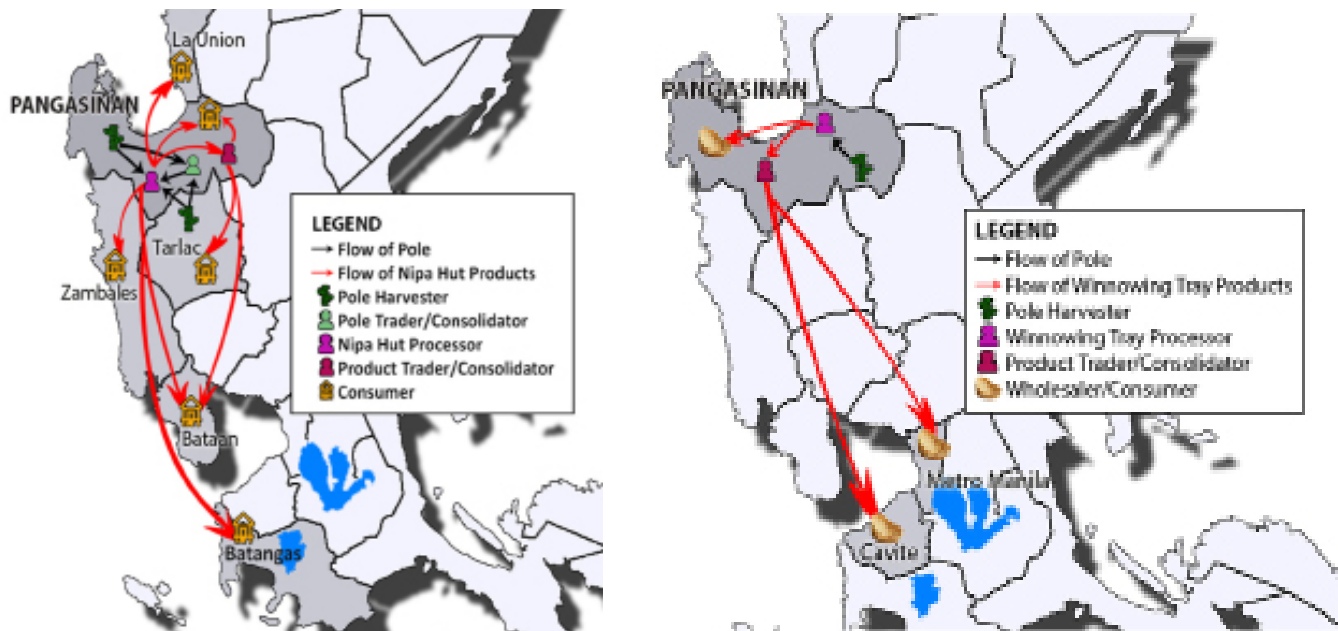


Figure 8. Geographical flow of nipa huts or *bahay kubo* (left) and winnowing trays or *bilao* (right) produced in Pangasinan, Philippines.

Figure 8 shows the geographical flow of winnowing trays. Poles used to craft trays are sourced locally. After processing, *bilaos* are sold directly to consumers in the province or through product TCs. This market intermediary will then sell the Pangasinan-made *bilaos* to wholesalers within town markets in Parañaque City in Metro Manila and Dasmariñas City in Cavite.

Figure 9 illustrates the flow of chicken coops and fruit baskets. The market for these two products is concentrated only in the province. Harvesters sell raw bamboo poles to pole TCs, who then sell them to processors to produce chicken coops. The finished products will be sold to wholesalers

and poultry farming/egg production consumers. Similarly, the production and consumption chain for fruit baskets involves the same actors as chicken coops, except for wholesalers as market intermediaries. Fruit baskets are directly sold to consumers who use them to harvest farm produce, especially mangoes in San Carlos City. Notably, the city celebrates the Mango-Bamboo Festival, an event aimed at promoting local products and expressing appreciation for the essential service rendered by the farmers.

The geographical flow of steamers, bird feeders, and vases is shown in **Figure 10**. The bamboo poles for crafting vases are sourced from Tarlac

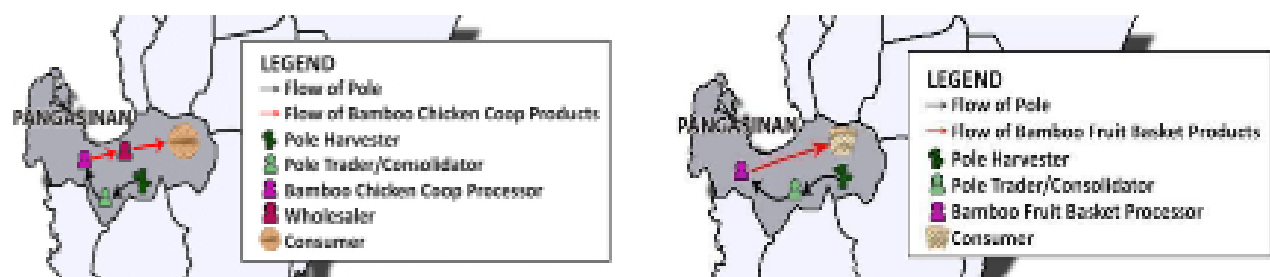


Figure 9. Geographical flow of chicken coops or *obong* (left) and fruit baskets or *kaing* (right) produced in Pangasinan, Philippines.

through a pole TC. The finished vases are sold to product TCs and eventually reach consumers. The poles are locally sourced for bamboo steamers, and the products are manufactured in the province. Consumers of these products include restaurants offering Filipino-Chinese cuisines, such as Ying Ying Tea House, Kowloon House, and Siomai King in Binondo, Manila. The bamboo steamers are also sold in Divisoria and Quiapo, Manila markets. As for bird feeders, they are produced with locally sourced poles and sold to an exporter, the Community Crafts Association of the Philippines (CCAP), through the CCAP Fairtrade located in Quezon City, Metro Manila. The CCAP Fairtrade serves as the intermediary marketing arm of CCAP and specializes in export trading (CCAP & CCAP Fairtrade - Handicrafts Philippines, 2022). Additionally, the CCAP Fairtrade posts various locally made handicraft products for sale on its website. The processor also mentioned that their bamboo bird feeders are sold to the United States.

The engineered bamboo plaque flow of products is shown in **Figure 11**. The poles are sourced locally from Cabaluyan Bamboo Manufacturing and Growers Association harvesters in Mangatarem, Pangasinan. These products are then sold to government and private institutions like the CS First Green AIDI, LGUs, and DENR, among others, in Pangasinan, Ilocos Sur, La Union, and Benguet. As mentioned above, the engineered bamboo plaques are sold in bulk and used as office tokens or awards. These plaques come with engraved details specified by the consumers. The product flow of these plaques suggests the importance of proximity to institutional buyers and building partnerships with them.

The geographical flow of other bamboo products, like chicken cages, produced in Pangasinan is shown in **Figure 11**. The bamboo poles are locally sourced or obtained from Tarlac through pole TCs. These chicken cages are

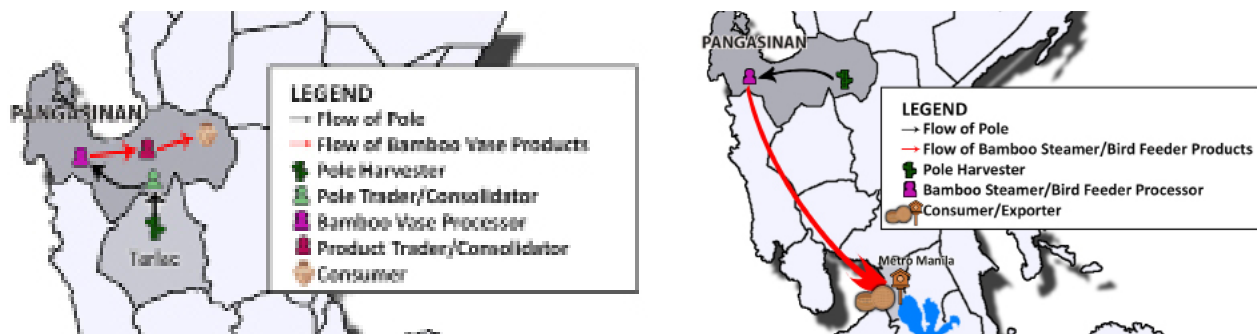


Figure 10. Geographical flow of vase (left) and bamboo steamer and bird feeder (right) produced in Pangasinan, Philippines.

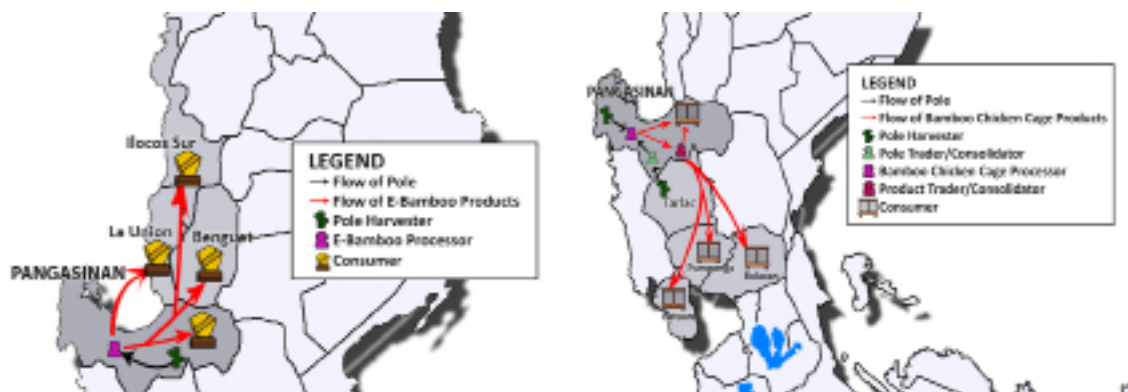


Figure 11. Geographical flow of engineered bamboo plaques (left) and chicken cages (right) produced in Pangasinan, Philippines.

sold by displaying them in front of their yards, through established contacts in the cockpit arena, and *via* product TCs. These links utilize personal connections and local familiarity to reach broader consumer bases. Some product traders originally hail from San Carlos City but relocated to other provinces for marital reasons. Eventually, they established shops in areas such as Magalang, Pampanga, and Bulacan. Their establishments showcase diverse bamboo and rattan products sourced from Pangasinan. Other product traders market chicken cages in Bataan.

The case study of Pangasinan shows that bamboo products have an established market, albeit predominantly informal. Nonetheless, this underscores Pangasinan's rich natural resources and its people's craftsmanship. The Pangasinan bamboo industry benefits from the proximity of bamboo resources to processing facilities. This local production encourages economic activity within communities. The industry could benefit from resource management programs ensuring sustainable harvesting practices and more support to secure raw material supply. One specific strategy to substantially increase the volume of high-quality bamboo poles available to the industry is to train farmers on properly managing clumps (DTI-BOI, 2016). Furthermore, the industry's dependence on nearby provinces, like Tarlac, for additional bamboo poles indicates the interconnectedness of regional resources and the importance of regional cooperation in sustaining this sector.

The involvement of various chain actors, from pole production to processing and consumption of bamboo products, is essential for the harmonious distribution of sustainable, eco-friendly products in local, national, and international markets. The geographic clustering and short distances between pole harvesters, pole traders, and processors form a tightly knit network within the province, which minimizes logistical challenges that could benefit micro-scale producers. The industry could gain from training programs to support micro-scale producers and encourage value-added production. The increasing demand for these bamboo products and the industry's

continuous growth will showcase Pangasinan's craftsmanship and contribute to the overall economic development of the province and the country.

The effective advancement of micro, small, and medium enterprises (MSMEs) of different industries in emerging nations is determined by various critical elements. Schmitz & Musyck (1994, as cited by Tambunan, 2023) highlighted six general characteristics, including market reach, specialized knowledge and skills, internal organization, the role of self-help organizations and public service facilities, especially at the local level, local government support, and networks with local institutions providing education/training and technology. In addition, innovation and a skilled workforce, complemented by research and development activities, are vital to the advancement of industries (Stichhauerova *et al.*, 2020). Another determining factor for success is the presence of effective institutions where institutional support, such as grants, startup funds, and an entrepreneurial-friendly environment, is available (Gajsek & Kovac, 2016). In Ghana, institutions and organizations contribute significantly to its bamboo value chain through various initiatives, including bamboo cultivation and resource management, environmental sustainability and climate action, business development and market access, training, research, and capacity building, and product development and industrialization (Obiri *et al.*, 2020). In the Philippine setting, DTI supports various industries through information dissemination, seminars, training, and product development initiatives. An example is a young man from Tayum, Abra, who could not pursue higher education and turned to bamboo crafting as an alternative pathway, ultimately leading to his success as an entrepreneur. With the help of the Subcontracting Partners for Innovation Network (SPIN) project, he efficiently managed the production, enhancing both the quantity and quality of their products and through Project *Kapatid's* Mentor micro-entrepreneurs (ME) program, he and the bamboo craftsmen received skills training, allowing them to scale up the production (DTI Web Team, 2019). DTI also links

its stakeholders to possible clients through trade fairs, like *Sikat Pinoy* Trade Fairs, connecting them with buyers, clients, and exporters. In addition, annual competitions for priority commodities are held that give stakeholders recognition, enabling their introduction to the international market and allowing them to enhance the pricing of their products.

The current findings provide a valuable overview of the geographical flow of Pangasinan bamboo products that can guide initial efforts to support the industry. Building on this groundwork, more comprehensive surveys and mapping studies could enhance understanding and pave the way for targeted initiatives and policies to contribute to the growth and sustainability of the Pangasinan bamboo industry.

CONCLUSION

The products identified in the study are nipa huts, furniture (e.g., *sala* sets), handicrafts (e.g., winnowing trays, chicken coops, fruit baskets, vases, bird feeders, and steamers), engineered bamboo (e.g., plaques), and other bamboo products (e.g., chicken cages). Pole harvesters, pole and product traders/consolidators, processors, and consumers are involved in producing nipa huts, furniture, and other bamboo products. The addition of market intermediaries, such as wholesalers and exporters, was identified for some of the handicrafts. Lastly, engineered bamboo products only have three actors involved in the chain (harvesters to processors to consumers). Players were categorized as upstream (pole harvesters and pole traders/consolidators) and downstream (processors, product traders/consolidators, wholesalers, exporters, and consumers), where each played an essential role in the production-to-consumption of the bamboo industry. Steamers and engineered bamboo plaque reach Metro Manila, Pangasinan, Ilocos Sur, La Union, and Benguet consumers, respectively. Nipa huts are distributed within Pangasinan and neighboring provinces such as La Union, Tarlac, Bataan, Zambales, and Batangas. *Sala* sets, chicken coops, fruit baskets, and vases are marketed within the province. Crafts, like

winnowing trays and other bamboo products such as chicken cages, reach Metro Manila, Cavite, Bataan, Pampanga, and Bulacan through product traders/consolidators. Bird feeders can reach the US through an exporter. The presence of these market intermediaries is essential for bamboo products in Pangasinan to reach a broader market. Aside from the established connections to different buyers, other marketing strategies, such as posting online, are deemed necessary to bring forth more opportunities and income for the actors involved in producing bamboo products. These were among the recommendations that arose during the focus group discussion.

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LITERATURE CITED

- Aggangan, R. T. (2015). *The Philippine Bamboo Industry: Issues, Potentials, Strategies, and Action Programs*. Paper Presentation. World Bamboo Congress. Damyang, Korea. 17–22 September 2015.
- Bwanbale, A. J. (2024). The role of road transport in the marketing of agricultural products. *Research Invention Journal of Current Research in Humanities and Social Sciences*, 3(2): 49–52.
- Castillo, J. A. A., Cuadra, P. J., & Dorado, M. A. D. (2022 unpublished). *Bamboo Resources Inventory and Mapping Using New-Generation Satellite Remote Sensing Data and Geospatial Techniques*

- in the Province of Pangasinan, Philippines. Project Completion Report. Ecosystems Research and Development Bureau. CCAP [Community Crafts Association of the Philippines] & CCAP Fairtrade - Handicrafts Philippines. (03 September 2022). CCAP. Retrieved from: <<https://ccapfairtrade.com/>>.
- Chizaryfard, A. & Karakaya, E. (2022). The value chain dilemma of navigating sustainability transitions: A case study of an upstream incumbent company. *Environmental Innovation and Societal Transitions*, 45, 114–131.
- DTI [Department of Trade and Industry]. (2023, July 5). *Industry Clusters Roadmap*. Department of Trade and Industry Philippines. Retrieved from: <<https://www.dti.gov.ph/industry-clusters-roadmap/>>.
- DTI-BOI [Department of Trade and Industry - Board of Investments]. (2016). *The Philippine Bamboo Industry Development Roadmap*. 227 p. Retrieved from: <<https://www.dti.gov.ph/industry-clusters-roadmap/>>.
- Dtiwebteam. (2019, November 7). Abra: Carlo's Bamboocraft Furniture and Furnishing. Department of Trade and Industry Philippines. Retrieved from: <https://www.dti.gov.ph/zero-to-hero/zth_luzon/zth_car/carlos-bamboocraft-furniture-and-furnishing/>.
- Dtiwebteam. (2025, January 9). DTI backs new resolution to revitalize OTOP in Pangasinan. Department of Trade and Industry Philippines. Retrieved from: <<https://www.dti.gov.ph/archives/news-archives/dti-backs-new-resolution-revitalize-otop-pangasinan/>>.
- Gajšek, B. & Kovac, J. (2016). Key Factors for the successful operation of clusters: The case for Slovenia. *Organizacija*, 49, 150–161.
- Gauli, K., Durai, J., & Oduor, N. (2018). *Value Chain Analysis and Market Assessment of Bamboo Products in Kenya*. INBAR. 80 p.
- Greene, S. M., Hammett, A. L., & Kant, S. (2000). Non-Timber Forest products marketing systems and market players in Southwest Virginia. *Journal of Sustainable Forestry*, 11(3), 19–39. <https://doi.org/10.1300/j091v11n03_02>.
- Kendra, V. V. (2008). *A Handbook of Propagation Cultivation and Management of Bamboo*. India: Rain Forest Research Institute, Indian Council of Forestry Research and Education.
- Lapis, A., Tesoro, F., Palijon, A., & Virtucio, F. (undated). *Bamboo the Grass of Hope*. Philippine Bamboo Foundation, Inc.
- Lee, J. H. X. & Nadeau, K. M. (2011). *Encyclopedia of Asian American Folklore and Folklife* (Vol. 1). Santa Barbara, California: ABC-CLIO.
- Mariano, K. A., Miole, G. L., Alles, C. A. Dr., Del Mundo, K. D., Manuel, R. E. C., & Reonal, Z. N. R. (2018). Tinikan, kayas at ténglawan: Bamboo knowledge in Gamata, San Carlos City, Pangasinan. *Aghamtao*, 26, 149–174.
- Maoyl, F. & Banik, R. L. (1995). Bamboo production systems and their management. Bamboo, people, and environment. Proceedings of the Vth International Bamboo Workshop and the IV International Bamboo Congress. Ubud, Bali, Indonesia. 19–22 June 1995. Vol. 1 - Propagation and Management. ISBN 81-86247-15-7.
- Obiri, B. D., Oduro, K. A., Obeng, E. A., Pentsil, S., & Appiah-Kubi, E. (2020). Bamboo Value Chain Study. INBAR Working Paper. IFAD. Retrieved from: <https://www.researchgate.net/publication/346961220_Bamboo_value_chain_study_-_Ghana>.
- PNA.GOV.PH. (2023). Pangasinan sees more opportunities for investments in 2024. Retrieved from: <https://www.pna.gov.ph/articles/1215666?utm_source>.
- Razal, R. A., Bantayan, R. B., Delgado, T. S., & Elec, J. A. (2013). Bamboo poles for engineered-bamboo products through improved clump management and harvesting: Lessons for the Philippines. *Ecosystems & Development Journal*, 4(1), 39–49.
- Razal, R. A., Dolom, P. C., Daracan, V. C., Tolentino, N. L., Palacpac, A. B., Villanueva, M. B., Codilan, A. L., Capinpin, H. L., Devera, E. D., Camacho, S. C., Castillo III, A. A., & Alborida, L. M. (2018). Creating an enabling environment for a vibrant Philippine bamboo industry: Addressing policy constraints and information needs. Technical Report. Retrieved from: <https://www.researchgate.net/publication/377029475_CREATING_AN_ENABLING_ENVIRONMENT_FOR_A_VIBRANT_PHILIPPINE_BAMBOO_INDUSTRY_ADDRESSING_POLICY_CONSTRAINTS_AND_INFORMATION_NEEDS>.
- Razal, R. A., Maralit, A. C., Colili, N. B., Alsa, L. N., & Canlas, R. P. (2013). Value chain study for almaciga resin. Non-Timber Forest Products Task Force. Retrieved from: <https://www.researchgate.net/profile/Ramon-Razal-2/publication/342876155_Value_Chain_Study_on_Palawan_Almaciga_Resin/links/5f0a6eff92851c52d62cfdb6/Value-Chain-Study-on-Palawan-Almaciga-Resin.pdf>.
- Roxas, C. (2012). *Handbook on Erect Bamboo Species Found in the Philippines*. College,

- Laguna: Ecosystem Research and Development Bureau, Department of Environment and Natural Resources.
- Sharma, B., Gatóo, A., Bock, M., & Ramage, M. (2015). Engineered bamboo for structural applications. *Construction and Building Materials*, 81, 66–73.
- Štichhauerová, E. & Zizka, M., & Pelloneova, N. (2020). Comparison of the Significance of Clusters for Increasing Business Performance. *Journal of Competitiveness*, 12, 172–189. DOI: 10.7441/joc.2020.03.10.
- Tambunan, T. (2023). Success factors for the development of micro, small, and medium industrial clusters in Indonesia. *Journal of Asian Development Studies*, 12(1), 7-25.
- Teshale, T., Woldeamanuel, T., Bekele, T., Alemu, A., & Pretzsch, J. (2017). Market channels for highland bamboo poles originated from Hula District, Sidama Zone Southern Ethiopia. *Small-scale Forestry*, 16(4), 469–485.
- The Bamboo Technical Committee. (2009). *The Philippines Recommends for Bamboo*. Los Baños, Laguna: PCAARRD-DOST. 120 p. (Philippines Recommends Series No. 53-C/2009).
- The Official Website of the Province of Pangasinan. (2023, May 10). *Banning and Penalizing the Cutting and Selling of Bamboo Shoots in Public and Private Properties (Environment)*. The official website of the Province of Pangasinan.
- Yeh, Y., Lai, S., & Ho, C. (2006). Knowledge management enablers: a case study. *Industrial Management & Data Systems*, 106(6), 793–810.
- Zheng, Y. & Zhu, J. (2021). The application of bamboo weaving in modern furniture. *BioResources*, 16(3), 5024–5035.