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Household Survey on Livelihoods of Communities in Nipah Industry in Sarawak - A Baseline Study

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Abstract

This study presents the first large-scale, evidence-based baseline of the nipah palm (Nypa fruticans) industry in Sarawak, Malaysia, focusing on harvesting, processing, trading and food service activities. Using the Sustainable Livelihoods Framework and snowball sampling, surveys were conducted with 761 respondents, including 452 harvesters/processors, 91 traders and 218 food and beverage operators. Results show that 75% of harvesters work full-time, 88% produce palm sugar and 59% earn RM1,000 - RM1,500 monthly, indicating a low-margin, small-scale sector. Key constraints include high competition, rising input costs and limited marketing capacity. Despite these challenges, the industry sustains rural livelihoods, particularly in coastal areas and holds potential for value-added diversification. Priority interventions include targeted training, infrastructure upgrades and supply chain formalization to enhance market access and resilience. Findings provide a foundation for policy, investment and comparative studies on underutilized tropical resources.

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Introduction

Nipah palm or locally known as *pokok apong* is a native mangrove species with significant ecological, cultural and economic importance in Sarawak, Malaysia. Commonly found in tidal estuaries and coastal swamps, the plant is well adapted to brackish water environments and forms an integral part of the state's mangrove ecosystem. Beyond its ecological value, the nipah palm contributes to traditional livelihoods, particularly among rural and coastal communities that harvest its sap for *gula apong* (palm sugar), use its fronds for thatching and weaving and engage in small-scale food processing and trading activities.

In recent years, growing awareness of sustainable and underutilized natural resources has spurred renewed interest in the commercial potential of nipah-

based products. However, despite its long-standing presence in local economies, the nipah industry in Sarawak remains largely informal, fragmented and under-documented. Data on the scale, structure and socio-economic impact of nipah-related activities, especially at the household and community levels, are limited. This lack of baseline information poses challenges for policy formulation, value chain development and targeted support for nipah-dependent communities.

Recognizing these gaps, this study was undertaken to provide an evidence-based understanding of the livelihoods of communities involved in the nipah industry. It focuses on three main segments of the value chain: harvesting and processing, trading and retail and food and beverage services. The research applies the Sustainable Livelihoods Framework (SLF) to assess how community members utilize assets, navigate vulnerabilities and engage in economic activities related to nipah. The findings are expected to inform strategies for enhancing rural incomes, promoting sustainable resource use and developing inclusive policies for the growth of the nipah industry in Sarawak.

Objectives

The study aims to develop a baseline database of communities involved in the nipah industry in Sarawak. Specific study objectives are as follows:

- To map the nipah value chain and identify key stakeholders and systems that determine the livelihoods of communities in the nipah industry.
- To determine the scale and distribution of communities in the nipah industry.
- To analyse communities' livelihood strategies, assets and outcomes in relation to the nipah industry.
- To analyse the constraining and enabling factors that influence communities' livelihood in relation to the nipah industry.
- To provide recommendations and insights for developing the nipah industry.

Significance of the Study

This study is significant as it provides the first large-scale, evidence-based assessment of the livelihoods of communities engaged in the nipah industry in Sarawak. By applying the Sustainable Livelihoods Framework and mapping the nipah value chain, the study fills a crucial data gap in understanding how rural and coastal communities interact with an underutilized yet culturally and economically valuable natural resource. The findings offer practical insights for policymakers, development planners and industry stakeholders in designing inclusive, data-driven interventions that can enhance community resilience, improve value chain efficiency and unlock the full commercial and socio-economic potential of the nipah industry.

In alignment with Sarawak's Post COVID-19 Development Strategy 2030 (PCDS 2030), the study reinforces goals related to inclusive rural development, food security and sustainable economic growth. By highlighting the untapped potential of an underutilized crop sector, it establishes a foundation for future research, investment and commercialization efforts that promote rural entrepreneurship, preserve indigenous knowledge and improve community livelihoods.

Literature Review

Nipah palm (*Nypa fruticans*) is a mangrove-associated species with a broad geographic distribution across estuarine and tidal swamp environments in Southeast Asia, the Pacific Islands and parts of the Indian Ocean [1]. Its ecological significance stems from its role in coastal resilience, acting as a natural buffer against storm surges and tidal waves [2]. The unique morphology of the nipah palm, particularly its underground trunk and adaptive fronds, allows it to thrive in brackish water environments, making it an essential component of mangrove ecosystems [3].

In Malaysia, mangrove forests span approximately 627,567 hectares, with Sarawak accounting for 22% of the national coverage [4]. Within Sarawak, the nipah palm is found predominantly along estuaries and riverbanks in divisions such as Kuching, Sarikei and Limbang [5]. Its multipurpose value has long been recognized: the leaves are used for thatching and weaving, while the sap is tapped for fermentation into alcoholic beverages or boiled into *gula apong*, a form of palm sugar with growing popularity for culinary and commercial applications [6].

Globally, the potential of nipah palm is increasingly recognized not just for food, but also for industrial

applications. For instance, the fronds and fibers have shown promise as raw materials for eco-friendly composite materials and particleboards, reinforcing the relevance of the species in circular bioeconomy models. Furthermore, physicochemical studies of nipah syrup, such as those by Saengkrajang et al., underscore its nutritional value and functional appeal, providing a scientific basis for product innovation [7,8].

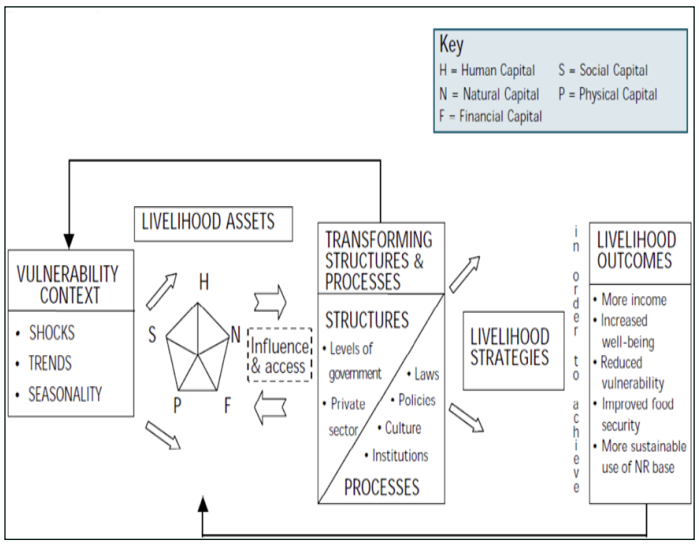
Despite its ecological and economic potential, the nipah industry remains under-researched, particularly at the community and household levels. No comprehensive baseline existed to measure the extent of rural participation, livelihood strategies, or income dependency linked to nipah-related activities. This gap in empirical data limits the ability of policymakers and development stakeholders to design targeted interventions. Furthermore, the informal and small-scale nature of most nipah enterprises, ranging from sap harvesting to cottage-based food processing, presents challenges in terms of scalability, technology adoption and market integration.

To address these gaps, the current study employs the Sustainable Livelihoods Framework to examine the socio-economic dynamics surrounding nipah-related livelihoods [9]. This analytical model is well-suited to understanding the interplay between community assets, institutional structures and vulnerability contexts, offering a holistic lens to explore both constraints and opportunities within the value chain. By combining value chain mapping with livelihood assessments, the present study contributes to the growing body of knowledge on underutilized tropical resources and offers strategic insights for inclusive, community-based economic development.

Methodology

This study employs the Sustainable Livelihoods Framework, developed by the UK Department for International Development (DFID), to analyze the livelihood strategies of communities involved in the nipah industry. The framework has been widely used in research to understand how rural households sustain their livelihoods. It captures the complex interplay of socio-economic factors, capital assets, institutional structures, processes and livelihood strategies in shaping household livelihood outcomes.

Guided by the sustainable livelihood framework, a comprehensive survey questionnaire was developed, soliciting information on the socio-demographic profile, livelihood strategies, household income size and source and livelihood assets.



Source: Department for International Development (1999)

Figure 1: Sustainable Livelihoods Framework

The household survey targeted communities engaged in various livelihood activities along the nipah value chain, from harvesting to retail. A snowball sampling strategy was used to identify and recruit participants by leveraging social networks. This approach is particularly useful when reaching hard-to-access populations, such as rural communities, where formal sampling frames are unavailable. While snowball sampling enables the inclusion of knowledgeable individuals who can provide valuable insights, it may introduce bias due to participant referrals, making generalizations to the broader population challenging. In total, 761 respondents were surveyed across key locations, including Kuching, Asajaya, Pusa, Sibu, Betong and Mukah, among others.

Table 1: Number of Respondents Surveyed

Roles/Activities	N	%
Harvestors (air nira, pucuk nipah) & Processors (gula apong, cuka, tuak)	452	59
Traders (street & market stalls, grocery shop, wholesalers, manufacturers)	91	12
Food vendors	75	10
Drink vendors	91	12
Pastry vendors	52	7
Total	761	100

Data were analyzed using descriptive statistics to profile socio-economic characteristics, livelihood strategies and asset ownership patterns across value chain segments. The choice of descriptive analysis reflects the study's baseline, exploratory nature, aimed at generating foundational data rather than testing specific hypotheses. To mitigate potential bias from the snowball sampling approach, initial "seed" participants were purposively selected from diverse districts and value chain roles and recruitment continued until geographic and role-based saturation was achieved. All enumerators underwent structured training and the questionnaire was pre-tested to ensure clarity and cultural appropriateness. Ethical considerations were also observed, with all respondents providing informed consent prior to participation, ensuring their understanding of the study's purpose, voluntary nature and confidentiality of responses.

Mapping the Nipah Value Chain

This section addresses the following two study objectives:

- To map the nipah value chain and identify key stakeholders that determine the livelihoods of communities in the nipah industry
- To determine the scale and distribution of communities in the nipah industry.

The nipah value chain comprises three interconnected stages: upstream, midstream and downstream. Each stage involves distinct actors, roles and value-adding processes that collectively shape the industry's structure and output. Figure 2 illustrates the range of actors and value-added activities at each stage of the nipah value chain.

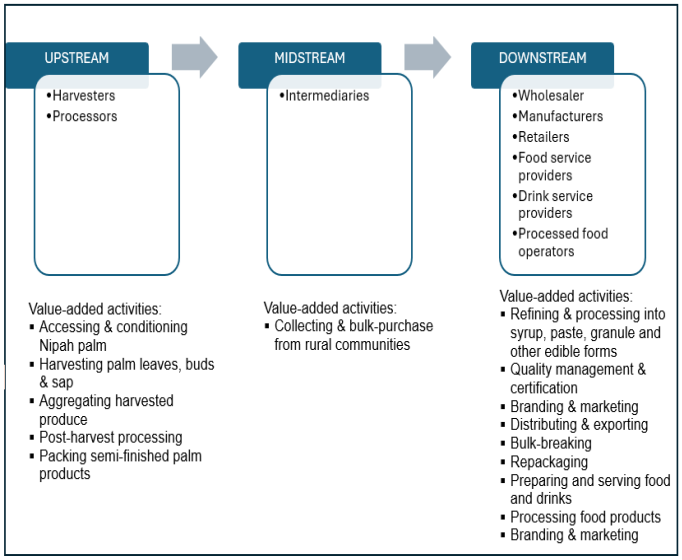


Figure 2: Value Chain Map of Nipah Industry

Upstream

The upstream segment involve managing nipah palm and harvesting sap, primarily carried out by local communities in nipah forests. In some well-organized communities, sap harvesters consolidate their yields for post-harvest processing, which is often handled by the same individuals. At this stage, the primary commercial product is gula apong in its molasses form. Major nipah sap harvesting and processing hubs are situated in coastal communities near mangrove forests in Sarawak, where nipah forests are abundant. This study used a snowball sampling strategy and local informants to survey community members actively engaged in nipah sap harvesting and processing. In total, 452 nipah sap harvesters and processors participated in the survey, residing in the areas summarized in Table 2.

Table 2: Locational Distribution of Nipah Sap Harvesters and Processors

Division	District/Sub-District	Village	N	%
Kuching	Kuching	Kampung Pinggan Jaya	28	6%
		Kampung Tanjong Bako	17	4%
		Kampung Goebilt	2	0%
		Kampung Bako	6	1%
		Kampung Semilang	8	2%
		Kampung Senari	3	1%
		Kampung Telaga Air	6	1%
Samarahan	Asajaya	Kampung Sri Tajo	10	2%
		Kampung Beliong	16	4%
		Kampung Tambirat	27	6%
	Sebuyau	Kampung Bajong Hilir	11	2%
Betong	Kabong	Pekan Kabong	15	3%
	Pusa	Kampung Baru Tambak	3	1%
		Kampung Hilir Tambak	68	##
		Kampung Hulu Tambak	20	4%
		Kampung Tambak	82	##
		Kampung Tengah Tambak	19	4%
	Spaoh	Kampung Spaoh	15	3%
		Kampung Buda	14	3%
		Kampung Serembang	10	2%
Mukah	Daro	Kampung Saai	10	2%
		Kampung Betanak	10	2%
		Kampung Penipah	10	2%
		Kampung Semop	10	2%
	Dalat	Kampung Medong	5	1%
	Matu	Kampung Sekerang	12	3%
	Igan	Kampung Baru Dagang	15	3%

Nipah sap harvesting and processing is highly concentrated in the Betong Division, particularly within the Pusa sub-district, highlighting its potential as a strategic hub for targeted investment, training programs and infrastructure development. The cluster of villages in the Tambak area alone accounts for 42% of all nipah sap harvesters and processors, positioning it as a dominant production zone within the state. In contrast, other divisions such as Kuching, Samarahan and Mukah exhibit more dispersed and small-scale involvement. While villages like Kampung Pinggan Jaya and Kampung Tambirat contribute meaningfully to the sector, their overall output remains modest compared to the scale observed in Betong.

The relatively low participation in Mukah, despite its extensive peatland and wetland areas, suggests that other socio-economic or infrastructural factors may be limiting wider adoption of nipah sap harvesting. This uneven distribution pattern implies that nipah-based activities are geographically localized, driven by a mix of traditional practices, environmental suitability and community-based knowledge. Consequently, development strategies for the nipah industry must be tailored to these localized strengths. Priority should be given to Betong for resource allocation, capacity building and the establishment of value-added infrastructure, followed by targeted support for Kuching and Samarahan to scale and diversify their contributions to the industry.

Midstream

The midstream stage involves sourcing and purchasing bulk quantities of gula apong from various processors. These activities are managed by intermediaries, many of whom operate under contracts with downstream commercial buyers. By facilitating market access for rural and dispersed communities of nipah harvesters and processors, intermediaries play a vital role in optimizing the supply chain.

Downstream

The downstream stage involves refining and advanced processing of semi-finished palm products, particularly gula apong, into various consumable forms such as syrup, granules and paste to meet consumer demand. Wholesalers and manufacturers, primarily based in major towns, play a key role in ensuring product quality and compliance with certification standards. While most businesses operate on a small scale, focusing on refining and packaging for distribution, some larger companies, such as SPL Food Industries, Kit Hin and Royal Borneo Products in Kuching, employ advanced technologies, implement strict quality assurance measures and utilize their own branding and distribution networks to serve both domestic and international markets.

Retailing is another key downstream activity in the nipah value chain, primarily driven by domestic consumption. While larger wholesalers and manufacturers expand into international markets, domestic retailing ensures business sustainability. It involves bulk-breaking, repackaging and direct sales to consumers through various channels, including street vendors, family-owned grocery stores and traders with both physical and online outlets. This study surveyed a total of 91 nipah wholesalers, manufacturers and retailers, as presented in Table 3

Table 3: Locational Distribution of Nipah Wholesalers, Manufacturers and Retailers

Division	District/Sub-District	N	%
Kuching	Kuching	12	13%
	Lundu	10	11%
Samarahan	Samarahan	1	1%
	Asajaya	5	5%
	Simunjan	1	1%
	Gedong	1	1%
Serian	Serian	1	1%
Sri Aman	Sri Aman	4	4%
Betong	Betong	2	2%
	Debak	4	4%
	Pusa	4	4%
	Maludam	3	3%
Sarikei	Sarikei	16	18%
Sibu	Sibu	17	19%
Mukah	Mukah	3	3%
Bintulu	Bintulu	5	5%
Miri	Miri	2	2%

The distribution of nipah wholesalers, manufacturers and retailers in Sarawak is relatively dispersed, with higher concentrations observed in urban and trade-oriented divisions. Sibu and Sarikei stand out as major commercial hubs, collectively accounting for 37% of

all players. This reflects their established infrastructure and proximity to major markets. Kuching, the state capital, also plays a significant role, likely due to its large consumer base and better access to logistics and facilities.

Meanwhile, Betong shows moderate downstream involvement despite being a key upstream production zone for nipah sap, suggesting a possible gap in local value addition or market access. The lower figures in districts such as Simunjan, Gedong, Serian and Miri may reflect either lower production levels or logistical challenges in reaching broader markets. Notably, Mukah records only 3 players, further reinforcing the pattern that downstream nipah activities tend to cluster near urban and semi-urban centers with access to consumer markets, rather than solely where the raw materials are produced.

This study also examined two additional downstream activities: food & drink service providers and processed food operators. Food & drink service providers range from small food stalls and mall-based outlets to cafés and restaurants that incorporate nipah products into their offerings. Similarly, processed food operators, primarily pastry vendors, use nipah products as key flavouring ingredients. In total, the study surveyed 91 food service providers, 75 drink service providers and 52 processed food operators.

Table 4: Locational Distribution of Food & Drink Service Providers and Processed Food Operators

Division	District/ Sub-District	Food Service Providers		Drink Service Providers		Processed Food Operators	
		N	%	N	%	N	%
Kuching	Kuching	18	20%	30	40%	19	37%
	Bau	0	0%	1	1%	0	0%
	Lundu	0	0%	0	0%	1	2%
Samarahan	Samarahan	1	1%	1	1%	0	0%
	Asajaya	2	2%	2	3%	5	10%
	Simunjan	0	0%	1	1%	1	2%
	Sebuyau	4	4%	0	0%	0	0%
	Gedong	0	0%	1	1%	0	0%
Serian	Serian	1	1%	1	1%	0	0%
	Siburan	1	1%	0	0%	0	0%
Sri Aman	Sri Aman	3	3%	1	1%	4	8%
Betong	Spaoh	0	0%	0	0%	1	2%
	Debak	1	1%	0	0%	1	2%
	Pusa	0	0%	0	0%	1	2%
Sarikei	Sarikei	2	2%	1	1%	0	0%
Sibu	Sibu	28	31%	11	15%	11	21%
Mukah	Mukah	13	14%	7	9%	5	10%
	Balingian	1	1%	0	0%	1	2%
	Dalat	0	0%	1	1%	0	0%
	Daro	4	4%	0	0%	1	2%
Bintulu	Bintulu	7	8%	10	13%	1	2%
Miri	Miri	5	5%	6	8%	0	0%
Lawas	Lawas	0	0%	1	1%	0	0%

The distribution of respondents across different locations is presented in Table 4. The findings indicate that Kuching and Sibu, being major urban centers, are the two dominant contributors, together accounting for more than half of the food and drink-related service providers in the state. Kuching particularly excels in drink services, likely due to its dense population and urban lifestyle that favors café culture and mobile drink kiosks. Sibu, on the other hand, leads in food services, which may reflect its position as a central business and transit hub for surrounding rural areas. Mukah, while not as dominant, demonstrates a balanced presence across all categories, possibly reflecting growing consumer demand and entrepreneurial activities in a semi-urban setting. Smaller districts such as Asajaya, Debak and Daro show isolated but meaningful signs of local food processing and service ventures. The minimal presence in remote areas suggests limited infrastructure, demand, or entrepreneurial support for downstream food and beverage activities.

Communities' Livelihood Strategies, Assets and Outcomes in Relation to the Nipah Industry

This section addresses the third objective of the study, which is to analyse the communities' livelihood strategies, assets and outcomes in relation to the nipah industry. The analysis focuses on three key components of the nipah value chain:

- Nipah Sap Harvesters and Processors
- Nipah Wholesalers, Manufacturers and Retailers
- Food & Drink Service Providers and Processed Food Operators

Nipah Sap Harvesters and Processors

Table 5 presents the livelihood strategies of nipah sap harvesters and processors. The activities is driven by an experienced and largely full-time workforce, with over half of participants having 5 to 15 years of experience. Palm sugar or gula apong is the dominant product, processed by nearly 90% of the respondents, reflecting its cultural and commercial significance. Most producers generate modest output volumes, primarily between 200 and 400 kilograms per month, which is consistent with their income levels, as nearly 60% earn between RM1,000 to RM1,500 monthly. Higher earnings are rare, indicating limited scalability or market reach.

Table 5: Livelihood Strategies of Nipah Sap Harvesters and Processors

Years in nipah industry	N	%
0 - < 5	84	19%
5 - < 10	130	29%
10 - < 15	120	27%
15 - < 20	82	18%
20 - < 25	19	4%
25 - < 30	16	4%
30 and longer	1	0%
Status of involvement in nipah activity	N	%
Active, full-time	340	75%
Active, part-time	112	25%
Primary products harvested/ processed	N	%
Palm sugar	400	88%
Palm sugar syrup	26	6%
Palm sap & bud	317	70%
Palm salt, alcohol, vinegar	36	8%
Monthly palm sugar production volume (kg)	N	%
0 - < 200	115	25%
200 - < 400	283	63%
400 - < 600	26	6%
600 - < 800	18	4%
800 - < 1000	1	0%
1000 - < 1200	1	0%
1200 - < 1400	0	0%
1400 and above	8	2%
Monthly income (RM) from nipah-related activity	N	%
Below 1000	96	21%
1000 - < 1500	266	59%
1500 - < 2000	52	12%
2000 - < 2500	26	6%
2500 - < 3000	1	0%
3000 - < 3500	1	0%
3500 and above	2	0%
Primary source of supplies	N	%
Self	298	66%
Harvesters	154	34%
Major distribution channels for selling nipah products	N	%
Wholesaler, Manufacturer	362	80%

Distributor, Retailer	325	72%
Food & Drinks Providers, Processed Food Operators	113	25%
End user	23	5%
Major channels for marketing and selling nipah products	N	%
Short Messaging Apps	8	2%
Attractive packaging	3	1%
Online shop	12	3%
Social media	23	5%
Direct marketing	43	9%
Delivery	9	3%
Direct sales	108	24%
Discount promotion	4	1%
Banners	7	2%
Word of mouth	47	10%
Number of household members involved	N	%
None	177	39%
1 to 3	244	54%
4 to 6	23	5%
7 and more	9	2%
Number of workers employed	N	%
None	384	85%
1 to 3	68	15%
4 to 6	0	0%
7 to 9	0	0%
10 and more	0	0%
Supplementary income source for sustaining livelihood	N	%
None	74	16%
Estate work	58	13%
Farming fruits	46	10%
Farming vegetables	48	11%
Part-time work	35	8%
Salaried work	34	8%
Selling pastries	30	7%
Processing sago	25	6%
Weaving	19	4%
Selling miscellaneous goods	18	4%
Food vendoring; Selling seafood; Tailoring; Rearing crabs; Own business; Tapping rubber; Teachers; Technician; Mechanics; Rearing goats	65	14%

Self-sufficiency is notable, with two-thirds of producers sourcing raw materials themselves, but the lack of employment generation suggests these are predominantly small-scale or family-run operations. While wholesalers and retailers are the main distribution channels, the marketing of products remains highly traditional, relying on direct sales and word-of-mouth. Digital marketing and packaging innovations are used minimally, suggesting an opportunity for modernization.

Family involvement is present in over half of the households, though many operators still work alone. The reliance on supplementary income, ranging from estate work and food vending to sago processing and farming, indicates that nipah-based income alone is insufficient for sustaining livelihoods. Overall, the data paints a picture of a traditional, low-margin industry with strong cultural roots, operational resilience and opportunities for modernization, market expansion and value-added strategies.

Table 6 presents data on livelihood assets. The data reveals that the nipah sap harvesting and processing sector is deeply community-rooted and largely informal in structure. A significant proportion of participants operate on land that is either inherited or allocated by local authorities, highlighting traditional land tenure systems common in rural livelihoods. While culturally embedded, these informal arrangements may pose legal and financial constraints for future expansion or formal investment.

Table 6: Livelihood Assets of Nipah Sap Harvesters and Processors

Ownership of primary asset i.e. land or property utilised for nipah activity	**N**	**%**
Allocated by family	24	5%
Allocated by local authority	149	33%
Inherited	233	52%
Purchased	3	1%
Squatting	30	7%
Renting	13	3%
Ownership of equipment/ tools/ transport for nipah activity		
Owned	412	91%
Loan/Rented	41	9%

Completion of formal training related to nipah activity		
Yes	54	12%
None	398	88%
Source of initial funding for nipah activity		
Loan from bank	5	1%
Loan from family/friends	136	30%
Own savings	312	69%
Received government funding for nipah activity		
Yes	230	51%
None	220	49%

The high rate of equipment ownership (91%) suggests a notable level of self-sufficiency and relatively low barriers to entry in terms of infrastructure. However, this strength is not matched by formal capacity building, 88% of respondents have not received any training related to nipah activities, which could impede productivity, innovation and safety compliance. The sector also demonstrates a strong reliance on personal and family-based financing, with the majority using their own savings or informal loans to fund their operations. The limited use of formal banking services points to potential challenges such as risk aversion, lack of financial literacy, or absence of collateral. While approximately half of the participants have received government assistance, the remaining half may be underserved, indicating possible gaps in program outreach, eligibility criteria, or community awareness.

Nipah Wholesalers, Manufacturers and Retailers

Table 7 outlines the key characteristics of nipah traders' livelihood strategies. The data indicates that this sector is predominantly composed of small-scale, part-time operators, with 82% engaged on a part-time basis. Most players handle modest trade volumes, with nearly three-quarters trading below 2,000 kg monthly and 64% earning less than RM5,000 from nipah activities. This suggests that for many, nipah trade is a secondary or supplementary source of income, often supported by the sale of miscellaneous goods.

Table 7: Livelihood Strategies of Nipah Wholesalers, Manufacturers and Retailers

Monthly trade volume (kg)	N	%
Below 1,000	40	44%
1,000 - < 2,000	25	27%
2,000 - < 3,000	11	12%
3,000 - < 4,000	5	5%
4,000 - < 5,000	3	3%
5,000 and above	7	8%
Monthly income (RM) from nipah trade	N	%
Below 5,000	58	64%
5,000 - < 10,000	14	15%
10,000 - < 15,000	7	8%
15,000 - < 20,000	7	8%
20,000 and above	5	5%
Primary source of supplies	N	%
Trader	7	8%
Wholesaler	36	40%
Harvester	46	52%
Major distribution channels for selling nipah products	N	%
End user	72	79%
Retailer	19	21%
Status of involvement in nipah activity	N	%
Active, full-time	16	18%
Active, part-time	75	82%
Major distribution channels for selling nipah products	N	%
Online shop	4	4%
Social media	32	35%
Direct marketing	16	18%
Discount promotion	30	33%
Banners	18	20%
Word of mouth	55	60%
Years trading nipah products	N	%
Below 5	20	22%
5 - < 10	44	48%
10 and above	19	21%
Number of household members in the current trade	N	%
None	15	16%
1 to 3	76	84%
Number of workers employed	N	%

Below 5	77	85%
5 to 10	6	7%
10 and above	7	8%
Supplementary income source for sustaining livelihood	N	%
Food vendoring	4	4%
None	4	4%
Part-time work	4	4%
Selling miscellaneous goods	75	84%
Selling seafood	4	4%

A large portion of supplies is sourced directly from harvesters (52%), indicating a close linkage to the upstream supply chain, while only a minority engage in multi-tiered trade structures. End-user sales dominate distribution channels, reflecting a localized and informal sales model with limited penetration into structured retail networks.

Marketing remains traditional, with word of mouth (60%) and social media (35%) leading, while online shops and formal promotions are underutilized. Most traders are relatively new or mid-career in this field, with 70% having less than 10 years of experience. Household participation is common, with 84% involving 1–3 members and only a small minority employ more than 5 workers, further emphasizing the micro-enterprise nature of this segment.

As shown in Table 8, the livelihood assets of nipah wholesalers, manufacturers and retailers reflect a largely self-financed and independent micro-enterprise sector. Almost half of these actors operate from rented premises (48%), while 44% have invested in purchasing property for their activities. High levels of equipment ownership (84%) indicate a commitment to self-reliance and the low infrastructure requirements for this type of business.

Table 8: Livelihood Assets of Nipah Wholesalers, Manufacturers and Retailers

Ownership of primary asset for nipah activity	N	%
Allocated by family	4	4%
Inherited	4	4%
Purchased	40	44%
Renting	44	48%
Ownership of equipment/ tools/ transport for nipah activity		
Owned	76	84%
Loan/Rented	15	16%
Completion of formal training related to nipah activity		
Yes	2	2%
None	89	98%
Source of initial funding for nipah activity		
Loan from bank	7	8%
Loan from family/friends	4	4%
Own savings	80	88%
Received government funding for nipah activity		
Yes	5	5%
None	86	95%

Despite this investment in physical assets, there is a critical gap in human capital development. A staggering 98% of participants have not received formal training related to nipah activities, which could limit opportunities for productivity, quality improvement and business expansion. Financial practices are overwhelmingly conservative, with 88% relying on personal savings and very limited use of bank loans (8%), reflecting both risk aversion and possible barriers to accessing formal financial services. Government support for this segment remains minimal, with only 5% having received funding. This lack of institutional support, coupled with limited training and credit access, suggests that these enterprises remain highly vulnerable to market changes and rely heavily on personal or family resources for sustainability.

Food & Drink Service Providers and Processed Food Operators

Table 9 presents the livelihood strategies of food & drink service providers and processed food operators. The data reveals that the players involves in these sectors are predominantly small, community-based businesses. Most businesses are relatively young, with more than half operating for less than five years, indicating a sector that is still emerging and developing. Monthly usage volumes and income levels indicate that these food and drink operators are not yet large commercial entities, but micro-entrepreneurs, often supplementing their earnings with other activities like

food vendoring or miscellaneous trade.

Table 9: Livelihood Strategies of Food & Drink Service Providers and Processed Food Operators

Monthly nipah products use (kg)	N	%
Below 10	5	2%
10 - < 20	41	19%
20 - < 30	59	27%
30 - < 40	44	20%
40 - < 50	30	14%
50 and above	39	18%
Monthly income (RM) from nipah-based products		
Below 500	24	11%
500 - < 1000	64	29%
1000 - < 1500	67	31%
1500 - < 2000	29	14%
2000 - < 2500	18	8%
2500 - < 3000	7	3%
3,000 and above	7	3%
Supply source		
Wholesaler	79	36%
Retailer	135	62%
Harvester	4	2%
Distribution channel		
End user	213	98%
Retailer	5	2%
Status of activity		
Active, full-time	135	62%
Active, part-time	82	38%
Seasonal	2	1%
Marketing strategies		
Online shop	15	7%
Social media	68	31%
Delivery	32	15%
Discount promotion	38	17%
Banners	21	10%
Word of mouth	27	12%
Attractive packaging	8	3%
Short messaging app	9	4%
Others	1	0%
Years trading nipah products		
Below 5	118	54%
5 - < 10	69	32%
10 - < 15	24	11%
15 - < 20	4	2%
20 - < 25	4	2%
Number of household members in nipah industry		
None	60	28%
1 to 3	150	69%
4 to 6	7	3%
7 and more	1	0%
Number of workers employed		
None	60	28%
1 to 3	86	40%
4 to 6	61	28%
7 and more	11	5%
Supplementary income source		
Food vendoring	108	49%
None	38	18%
Part-time work	38	18%
Selling miscellaneous goods	21	10%
Others	12	6%

Marketing and customer outreach remains modest, with social media, direct sales and discounts as the main tactics. Most products are sold directly to end-users, emphasizing the importance of face-to-face community-level commerce rather than formal distribution networks. The reliance on retailers and wholesalers for supply rather than direct access to harvesters may reflect logistical limitations or lack of linkages with upstream producers. Labor input is modest, with most operators either working alone or employing fewer than 3 workers.

Table 10 highlights the livelihood assets of nipah-based food & drink service providers and processed food operators. The majority of these operators run their businesses on rented premises, indicating a flexible and possibly short-term approach to business operations, which could also reflect limited capital to acquire property. Despite this, a large portion of them own their tools and transport, showing a degree of independence and commitment to their trade. The lack of formal training among 97% of operators is concerning and highlights a significant gap in skills development and structured capacity building within this sector.

Table 10: Livelihood Assets of Food & Drink Service Providers and Processed Food Operators.

Ownership of primary asset for nipah activity	N	%
Allocated by family	12	6%
Allocated by local authority	23	10%
Inherited	9	4%
Purchased	29	13%
Renting	135	62%
Ownership of equipment/ tools/ transport for nipah activity		
Owned	156	72%
Loan/Rented	62	28%
Completion of formal training related to nipah activity		
Yes	6	3%
None	212	97%
Source of initial funding for nipah activity		
Loan from bank	99	46%
Loan from family/friends	35	16%
Own savings	83	38%
Received government funding for nipah activity		
Yes	93	43%
None	125	57%

In terms of financing, reliance on bank loans (46%) shows that many have managed to establish credibility with financial institutions, which is a positive sign for scalability. However, the limited access to government support (only 43%) suggests that more targeted outreach or eligibility facilitation may be needed to ensure broader inclusion in government programs. Overall, while the operators show strong self-reliance and financing capacity, there is an urgent need for formal training and better policy access to enhance their sustainability and growth potential.

Constraining Factors that Influence Communities' Livelihood in Relation to the Nipah Industry

This section addresses the fourth objective of the study, which is to analyse the constraining and enabling factors that influence communities' livelihood in relation to the nipah industry. It presents findings related to the challenges encountered by respondents in their nipah-related activities.

Table 11 reveals that nipah sap harvesters and processors face a variety of challenges, both structural and operational. The most pressing concern is high market competition (15%), suggesting saturation in the industry or insufficient differentiation among players. Rising input costs (11%) and labour shortages (11%) are pressing issues that likely affect production efficiency and scalability. Additionally, the complexity of processing and lack of effective marketing strategies further compound operational inefficiencies and limit market reach.

Table 11: Major Challenges Encountered by Nipah Sap Harvesters and Processors

Type of challenges	N	%
Inconsistent supply	12	8%
Increased materials costs	18	11%
Lengthy and complex processing	15	9%
Unsuitable/ ill-equipment work area	6	4%
Seasonal demand	5	3%
Weak bargaining power	4	3%
Poor health and safety	12	8%
Inadequate manpower	18	11%
Reliance on weather conditions	10	6%
Challenging economic prospect	5	3%
Cash flow management	1	1%
Transportation	9	6%
Marketing and promotion	16	10%
Competition	24	15%
Maintaining consistent quality	2	1%
Capital sourcing and management	1	1%

Secondary but still notable concerns include inconsistent supply, safety issues and weather dependency, all of which are typical in traditional, semi-formal industries reliant on natural resources. Manual harvesting of nipah sap presents significant physical and environmental challenges. Navigating through dense nipah forests with uneven, muddy terrain requires substantial physical effort and stamina. Many harvesters, particularly the elderly and those in poor health, cited these conditions as major barriers.

Additionally, fluctuating tides and soil erosion further complicate access and safety during harvesting. Although not constant, the presence of wild animals especially crocodiles, continues to pose a serious threat to the safety of harvesters. Overall, the industry's

resilience is hampered by a mix of market forces, structural inefficiencies and environmental unpredictability.

The most commonly encountered challenges by nipah wholesalers, manufacturers and retailers are summarised in Table 12. The data suggests that the players in this sector are predominantly challenged by rising input costs, which affect over a third of players (36%). This reflects inflationary pressure on raw materials, packaging, or logistics. Transportation challenges are the second-most cited issue (24%), likely due to the rural origin of raw materials and fragmented infrastructure, which affects timely delivery and cost efficiency.

Table 12: Major Challenges Encountered by Nipah Wholesalers, Manufacturers and Retailers

Type of challenges	N	%
Inconsistent supply	15	16%
Increased materials costs	33	36%
Manpower management	7	8%
Challenging economic prospect	7	8%
Cash flow management	4	4%
Transportation	22	24%
Capital sourcing and management	4	4%

Another notable concern is the inconsistency in supply (16%), indicating potential issues with upstream coordination or seasonal availability. Human capital and economic-related uncertainties (each 8%) add further pressure, particularly for small and medium enterprises with limited resources. Although less frequently mentioned, challenges like cash flow and capital access (4% each) still suggest underlying weaknesses in financial planning and institutional support.

The major challenges faced by food and drink service providers and processed food operators are summarised in Table 13. The most pressing challenge is increased material costs, cited by 29% of respondents. This highlights inflationary pressures and supply chain disruptions affecting input prices. Cash flow management (14%) and inconsistent supply (11%) also pose significant operational difficulties, likely due to unreliable procurement networks or seasonal variability in nipah-based products.

Table 13: Major Challenges Encountered by Food & Drink Service Providers and Processed Food Operators

Type of challenges	N	%
Inconsistent supply	25	11%
Increased materials costs	64	29%
Manpower management	23	10%
Challenging economic prospect	16	7%
Cash flow management	31	14%
Transportation	10	4%
Capital sourcing and management	14	7%
Marketing and promotion	23	11%
Competition	12	5%
Suitability of trade premise	2	1%

Manpower management (10%) and marketing and promotion (11%) are tied challenges, indicating that HR issues (e.g., staff retention, training) and low visibility in competitive markets affect business growth. Notably, transportation and competition are cited by 4% and 5% respectively, less frequently but still relevant. Suitability of trade premises, although least reported (1%), may impact compliance or expansion efforts for a few operators.

Implications of the Study

The study offers timely and practical insights into the socioeconomic dynamics of communities engaged in the nipah industry. By highlighting the different forms of participation across the value chain, from harvesting and food processing to retail and services, it supports evidence-based interventions to strengthen community resilience and local entrepreneurship. The findings carry important implications for government agencies, local authorities and development planners. They underscore the need for enhanced support mechanisms, including training in food safety and product diversification, financial assistance tailored to small-scale entrepreneurs and infrastructure improvements in nipah-rich areas. Additionally, the study advocates for the formalization of community-led supply chains that blend traditional knowledge with modern practices. These efforts align with the goals of PCDS 2030 by fostering rural entrepreneurship, stimulating innovation and unlocking export potential within the sector.

Limitations and Future Research Directions

This study faced limitations due to its reliance on

self-reported data from household surveys, which may be affected by respondent bias or recall inaccuracies. Additionally, in-depth time-motion and profitability analyses of nipah-based economic activities were not conducted because of data and resource constraints. Future research should include quantitative assessments of income generation among different nipah value chain actors, market feasibility studies for new nipah-based food and beverage products, investigations into youth engagement and gender dynamics within nipah-related enterprises, environmental and ecological studies focusing on sustainable harvesting and propagation of nipah palms, as well as longitudinal studies examining community transformation resulting from interventions in the nipah sector.

Conclusion

This baseline study offers a comprehensive overview of the livelihoods of communities engaged in the nipah industry in Sarawak. It highlights the diversity of participation across the value chain, from harvesting and food processing to retail and food services and reveals the industry's role in sustaining rural incomes, especially among women, informal workers and multi-generational households. Despite its cultural and economic value, the industry remains largely informal and faces key challenges such as unstable supply, limited infrastructure, inconsistent quality standards and inadequate policy support.

These constraints limit the ability of producers and entrepreneurs to scale up, improve margins, or diversify products in line with modern market expectations. The findings underscore the need for structured interventions to strengthen supply chains, formalize small enterprises, expand technical training and enhance product development. There is significant potential for the nipah industry to contribute to rural development, environmental sustainability and the broader objectives of PCDS 2030 in Sarawak, provided that its development is inclusive, innovation-driven and aligned with the aspirations of local communities.

Recommendations

To ensure the sustainable growth of the nipah industry, improvements must address all stages of the supply chain. At the production level, enhancing infrastructure and establishing centralized processing hubs can help reduce post-harvest losses. Inland nipah cultivation, guided by good agronomic practices, is recommended to ensure a stable and consistent supply of sap. Capacity building is equally essential, training programs should focus on practical skills such as quality control, entrepreneurship and modern processing techniques. Strategic partnerships with research and development organizations can further drive innovation and product development through knowledge sharing and technical support.

Equally important is improving access to essential resources by facilitating financing, providing modern equipment and introducing the latest technologies. Expanding market presence requires targeted promotional efforts, participation in trade events and the adoption of food safety certifications such as HACCP and GMP. Inclusivity should be prioritized by empowering women and engaging youth through tailored training programs, cooperative models and skills development initiatives. Together, these integrated efforts will help build a more resilient, competitive and sustainable nipah industry.

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