

“*Para-Para Api*”: Vernacular Architecture of Nutmeg Farmers’ Settlements in the Banda Islands, Maluku, Indonesia

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ABSTRACT

This article examines the *Para-Para Api* (PPA), a modest yet enduring form of vernacular architecture developed by nutmeg-farming households in the Banda Islands, Maluku. While spice-route scholarship has largely focused on palaces, forts, and trading ports, little attention has been given to the everyday structures that sustain nutmeg production. The study investigates the architectural characteristics and socio-cultural roles of the PPA, particularly how vernacular building practices adapted influences from colonial-era smokehouses within a household-scale context. Using qualitative methods that combine field surveys, architectural documentation, and semi-structured interviews with nutmeg farmers across several Bandanese settlements, the research analyzes construction techniques, spatial organization, and typological variations. The findings show that PPAs are typically small rectangular structures located beside or behind the main house, allowing smoke from nutmeg roasting to disperse while remaining integrated with domestic activity. They commonly use locally available materials such as timber frames, bamboo drying racks (*para-para*), earthen or concrete floors, and zinc or palm-leaf roofing. Most structures follow a two-level configuration with a fire chamber below and elevated drying platforms above, while larger examples may include wood storage or cooking spaces. Beyond their utilitarian role in nutmeg preservation, PPAs also function as spaces that express household autonomy and cultural continuity within Bandanese farming communities.

Keywords: nutmeg cultivation, colonial influence, smokehouse, Banda Islands, vernacular architecture

INTRODUCTION

The global network of the spice trade has long been celebrated for ushering in waves of prosperity and rich cultural intertings across numerous Indonesian port cities and beyond (Anuraga, 2021). This transoceanic exchange flourished most intensively in Indonesian maritime hubs such as Tuban, Banten, Jepara, Gresik, Lao Sam, Sunda Kelapa (now Jakarta), and as far as Banjarmasin (Muslimin, 2022). Yet, the spice trade entailed more than the mere circulation of commodities; it also facilitated profound cultural encounters, manifested in material exchanges (Effendy & Hamid, 2020), religious dissemination (Hamid, 2022), and the emergence of cosmopolitan urbanisms (Fahmi, 2022).

Among the most coveted spices was nutmeg (*Myristica fragrans*), believed to be endemic to the Banda Islands. Its global popularity arose from its aromatic and culinary qualities (Hancock, 2021; Spence, 2024) and effective preservation

during long maritime journeys (see Figure 1). While sun-drying was the most common method (Divekar et al., 2011), the Banda Islands' humid and unpredictable climate often reduced its reliability. Hence, the Dutch East India Company (VOC) developed smokehouses (*perk*) as part of their colonial nutmeg monopoly. After independence, these large colonial facilities declined, but local farmers adapted the technique into small, household-scale smokehouses called *Para-Para Api* (PPA).

In architectural terms, the PPA belongs to the domain of vernacular architecture, understood as built environments created by local communities using indigenous knowledge, locally available materials, and adaptive techniques to meet everyday needs (Noble, 2013; Khakpour et al., 2015). The PPA reflects this principle: constructed without architects, responsive to climatic challenges, and embedded within the lifeworld of nutmeg farmers. This study's primary focus is a comparative analysis of PPA forms

Figure 1

The Global Dissemination of Nutmeg From Banda



Note. This Map, adapted from *Banda Neira: Bandar Rempah di Timur Nusantara* (p. 20), by M. I. Kersapati, F. Faturohman, B. Sihite, and H. Purwanto, 2025, Pustaka Indis. Copyright 2025 by M. I. Kersapati, F. Faturohman, B. Sihite, and H. Purwanto.

across different settlements in the Banda Islands, while situating these typologies within their historical context of colonial smokehouses and post-independence adaptation. By prioritizing typological comparison, the research highlights the spatial diversity and the shared vernacular logic that characterizes PPAs.

Despite the importance of everyday production spaces in sustaining nutmeg culture in the Banda Islands, little attention has been paid to how such structures adapt to historical influences while remaining embedded in domestic life. To address this gap, this study is guided by the following research questions: (1) How do nutmeg-farming communities in the Banda Islands adapt colonial-era architectural influences within the vernacular form of the PPA? (2) What architectural and socio-cultural roles does the PPA play in contemporary domestic life?

The article contributes to scholarship in two ways. First, it extends debates on vernacular architecture by documenting how local communities transform inherited technologies into flexible, small-scale forms embedded in domestic life. Second, it engages with colonial architectural history by showing how colonial-era preservation infrastructures were vernacularized after independence, producing hybrid forms that persist in contemporary nutmeg culture. In doing so, the study links the broader history of the spice route to specific architectural formations. It introduces the PPA as a utilitarian facility, a cultural artifact that embodies adaptation, resilience, and identity in the Banda Islands.

LITERATURE REVIEW

Global Nutmeg Trade and the Rise of the Dutch Perkeniers

The Banda Islands were central nodes in long-distance exchange networks centuries before European expansion. Archaeobotanical and textual evidence demonstrate nutmeg's early use in India and Rome (Pakpahan et al., 2020; Zumbroich, 2012), while Chinese records document voyages to the Moluccas in search of spices (Ptak, 1992). Arab and Indian traders integrated nutmeg into interregional circuits by

the 6th century, and by the Middle Ages, it was a rare luxury in European markets, symbolizing status and wealth (Freedman, 2015). Javanese and Arab merchants regularly visited Banda, exchanging rice, textiles, and gold for spices, while transmitting Islamic practices and cultural forms (van Ittersum, 2016). These interactions reveal that nutmeg was already embedded in a cosmopolitan maritime world, long before European colonial ambitions reshaped the archipelago.

The arrival of European powers in the 16th century inaugurated a new era of competition. The Portuguese and Spanish were the first to attempt control, followed by the English. Still, it was the Dutch East India Company (VOC) that consolidated a monopoly after the violent conquest of 1621, which involved the mass killing of Bandanese inhabitants and the expulsion of rival Europeans (Hanna, 1983; Reid, 2015). Thereafter, the VOC instituted the *perken* system, a plantation regime that fundamentally transformed Banda's socioecological and architectural landscape.

The term *perk* (plural *perken*) denoted plantation units, while *perkeniers* referred to Dutch-appointed overseers, and *perkenislaven* to the enslaved laborers who worked them (Winn, 2010). The *Perkeniersstelsel* thus described the entire system of forced nutmeg cultivation. At its peak, there were 68 *perken* across the archipelago: 34 on Banda Besar, 31 on Ay, and 3 on Neira (Farid, 2021; see Figure 2). Lonthor emerged as the principal production hub due to its fertile land and freshwater resources, whereas Neira functioned as the VOC's administrative and trading entrepôt (Dhont, 2022).

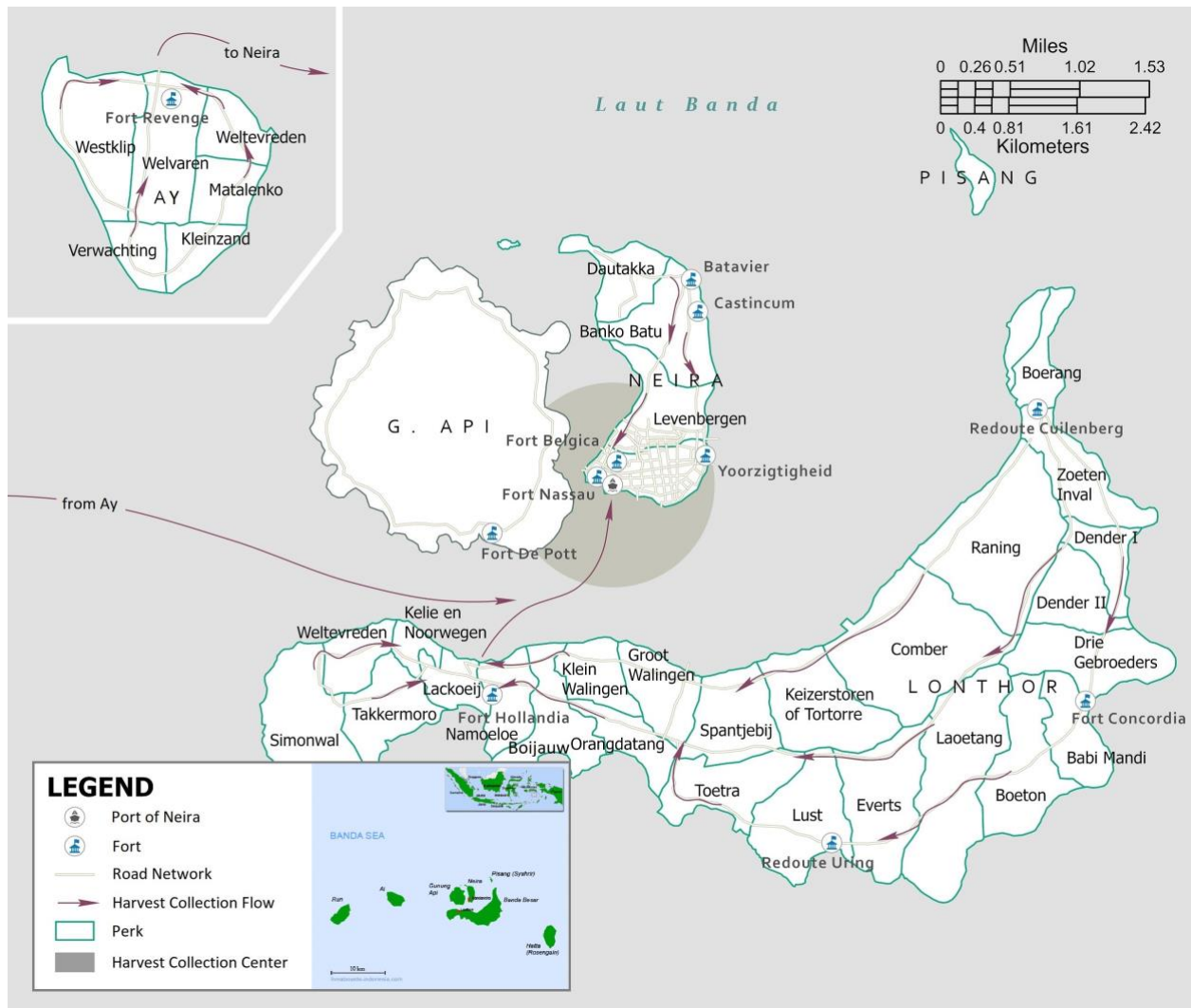
Architecturally, each *perk* was strategically situated near plantations and transport routes to facilitate the flow of nutmeg to harbors. Within these complexes, freshly harvested nutmeg underwent processing: The outer husk was removed, and the seeds were roasted for three to five days to prevent spoilage in the islands' humid climate. This infrastructure was essential to maintaining quality for long-distance trade, embedding Banda into the VOC's global commercial system. The process relied heavily on enslaved and exiled laborers, whose forced work underpinned the VOC's monopoly (van Donkersgoed, 2019).

The architectural imprint of the *perken* system is crucial, as smokehouses established by the VOC introduced a spatial and technological model of nutmeg preservation at scale. Although many of these structures fell into disuse after independence, their logic of fire-based

preservation was vernacularized into household-scale PPA. In this sense, the PPA may be read as a local reappropriation of colonial infrastructure, transforming the architecture of extraction into an architecture of subsistence and community resilience (see Figure 3).

Figure 2

Locations of the Perken in the Banda Islands



Note. This map, adapted from “Schetskaartje van de Voornaamste Nederlandsche Oudheden in Banda,” by Van de Wall, in H. Straver, *Het lot van Egeron en Adeka: Banda verhaald door Jan Fredrik Helmers*, 31, p. 3–21, 2016, Indische Letteren (https://www.dbnl.org/tekst/_ind004201601_01/_ind004201601_01_0002.php). Copyright 2016 by H. Straver.

PPA as a Vernacular Architecture

While sun-drying remains common (see Figure 4), unpredictable climatic conditions in Banda often undermine its reliability, making the PPA indispensable for ensuring consistency in nutmeg preservation. The PPA constitutes a crucial yet understudied architectural element of nutmeg farmers' settlements in the Banda Islands. The term derives from the Malay-rooted *para-para*, meaning "woven bamboo platform for storage," and *api*, meaning "fire," together denoting a structure designed for roasting or smoking nutmeg (Takaria & Pieter, 1998). Locally, PPA refers to facilities for *pengasaran pala*, roasting nutmeg seeds to prevent spoilage during humid seasons. Despite its ubiquity in domestic landscapes, the PPA has remained conspicuously absent from architectural scholarship.

To situate the PPA analytically (see Figure 5), this study adopts the framework of vernacular architecture, a concept denoting built environments created by local communities using indigenous knowledge, locally available materials, and adaptive strategies to meet everyday needs (Khakpour et al., 2015; Noble, 2013). Vernacular architecture is often characterized as "architecture without architects," constructed by and for the people through intergenerational knowledge transfer (Mileto et al., 2022). Historically, such forms were marginalized by European observers, dismissed as "inferior" or "barbaric," and excluded from canonical architectural discourses (Lanier, 2009). Contemporary scholarship, however, emphasizes their adaptive and evolving nature, distinguishing them from the notion of "traditional" forms that imply stagnation (Joseph, 2017; Philokyprou & Michael, 2021).

Figure 3

One of the Models of a Nutmeg-Smoking Kitchen (Pengasaran, Left), and the Activities of Plantation Workers Processing Nutmeg (Right), Circa Pre-1942 (Dutch Colonial Era)



Note. Photo archives curated from *Kepulauan Banda, Maluku Tengah, pusat perdagangan pala abad ke-16–19* [PowerPoint slides], by Sarjiyanto, 2013, Pusat Arkeologi Nasional. Copyright 2013 by Pusat Arkeologi Nasional.

Figure 4

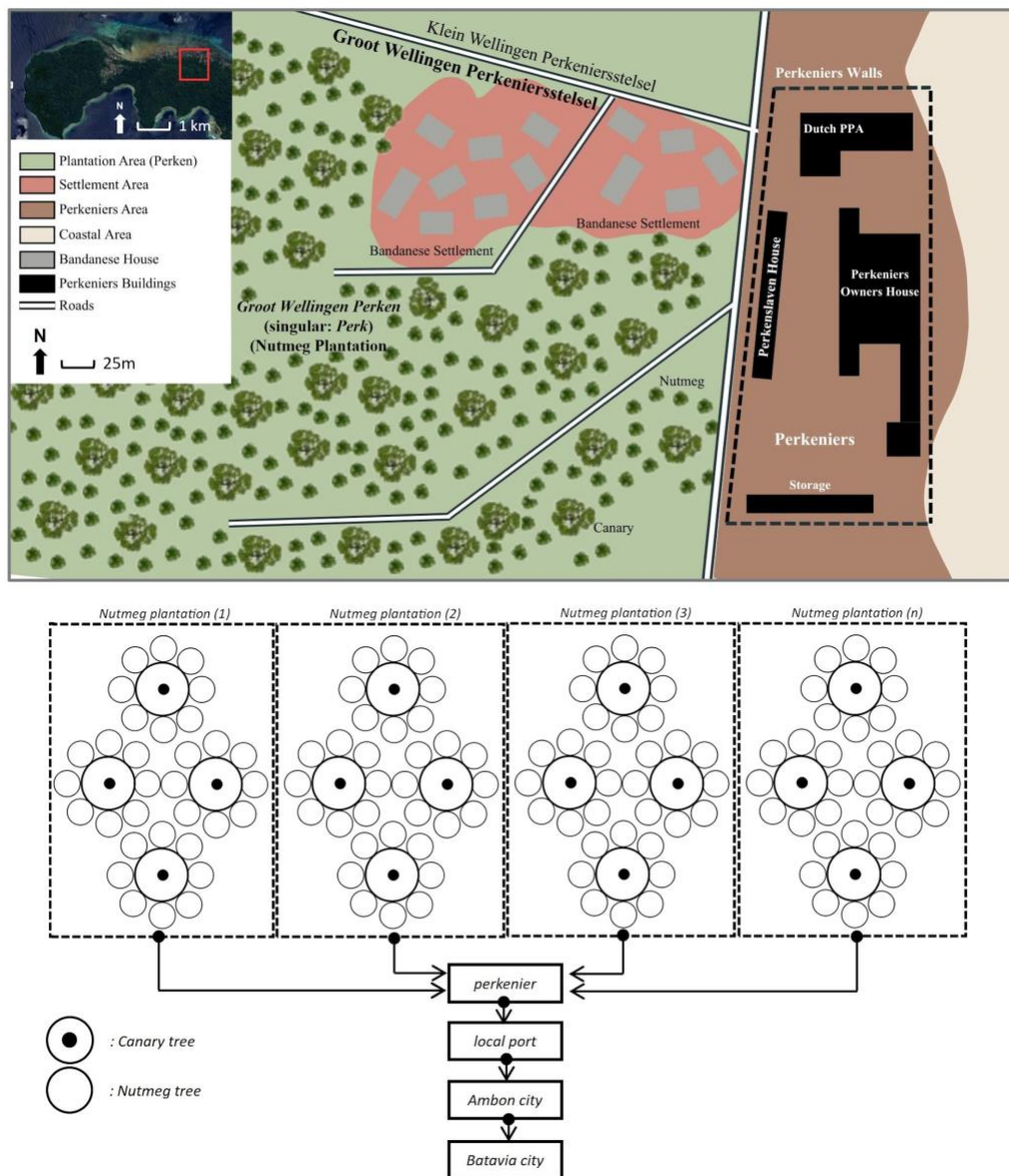
Comparison of Smoking and Sun Drying Methods



Note. The image shows the smoking technique (*pengasaran*) (left) and sun-drying (right) for spice preservation.

Figure 5

Spatial Aspects Differences of Perk, Perken, and Perkeniers (Top); The Pivotal Role of Perken in the Global Nutmeg Trade (Bottom)



Note. The division of space remains a matter of record regarding the location of the Bandanese slaves' houses, whether inside or outside the Perkeniersstelsel. The diagram below shows the flow of nutmeg from cultivation on various plantations through *perkenier* processing and its subsequent journey from plantation harvest to international distribution hubs.

Positioning the PPA within vernacular discourse also challenges reductive typologies that treat such architectures as static artifacts. As Vellinga (2013) argues, vernacular forms should be seen as dynamic practices of adaptation and identity-making. The PPA exemplifies this: While rooted in colonial-era technologies of nutmeg preservation, it has been vernacularized into a flexible, household-scale structure that sustains

livelihood and cultural continuity. In this regard, the PPA enriches studies of Indonesian vernacular architecture while contributing to global debates on the resilience, adaptability, and socio-cultural embeddedness of community-built environments.

The PPA embodies these vernacular qualities. It is built not by professional architects but farming households, drawing on empirical knowledge

from elders, often those who once labored in colonial *perk*. Its materials range from bamboo and palm leaves to brick and corrugated metal sheets, reflecting local availability and economic constraints. Functionally, the PPA responds directly to environmental challenges, ensuring nutmeg preservation across seasons. Socially, it integrates into the rhythms of domestic life by serving multiple household uses outside the harvest period.

Comparative Study in the Regional Context

As Joseph (2017) and Noble (2013) argue, vernacular architecture is distinct from “traditional” architecture precisely because it responds dynamically to environmental and social change, rather than remaining fixed. In various regions, embedding production facilities within domestic space reflects adaptive strategies that balance ecological constraints, labor demands, and social organization. Empirical studies on rural housing demonstrate how settlement patterns inherently adapt to specific geographical and climatic challenges, such as in the Haor-basin region of Bangladesh (Das & Rahman, 2025) or the fault-line cultural landscapes of Kampung Batu Lonceng, Indonesia (Martokusumo et al., 2025). Furthermore, this dynamic response often manifests as climate-resilient traditional architecture that sustains local lifeworlds (Kaundal et al., 2025). This adaptability underscores vernacular architecture’s resilience as a living process rather than a static tradition.

The integration of domestic and productive spaces is a recurring theme across regional contexts. In Indonesia, the most explicit parallel is found in Tana Toraja, where the *tongkonan* (traditional ancestral house) and the *alang* (rice barn) form a complementary architectural unit, often facing one another in paired arrangements (Waterson, 2009). The rice barn reproduces the *tongkonan*’s form and ornament in miniature while embodying its economic and ritual significance. Comparable insights have been documented in other regions, where kinship systems structure the organization of settlements and houses from West Nusa Tenggara (Solikhah & Fatimah, 2020) to North Sumatra (Tobing &

Hutabarat, 2019) and West Sumatra (Widiastuti & Nurhijrah, 2021). The comparative literature also illuminates broader theoretical insights. Sato (1991) suggests that many stilt-house typologies across the Asia-Pacific may have originated from granaries, with domestic dwellings developing out of productive storage structures. These cases demonstrate that the integration of living and production is neither incidental nor peripheral, but fundamental to the evolution of vernacular house forms.

In South and Southeast Asia, the architectural form of traditional houses was often inseparable from the agricultural practices that sustained local livelihoods. For instance, in Sri Lanka’s cinnamon-growing regions, domestic compounds incorporated specialized spaces such as peeling sheds and drying areas, thereby embedding cycles of cultivation and processing directly into the rhythms of everyday life (Song et al., 2020). A comparable pattern can be observed in northern Thailand, where *Miang* House, historically tied to tea and later coffee cultivation, integrated processing, drying, and storage functions into the dwelling environment (Chinwong et al., 2021). Such integration is indicative of a broader characteristic of Thai vernacular houses, which historically maximized local topographies to sustain both domestic life and, more recently, community-based heritage tourism (Kiatthanawat et al., 2024).

These examples highlight how vernacular architecture in agrarian societies reflected ecological and economic conditions while mediating the intersection between household space, labor organization, and agricultural specialization. Ultimately, the fusion of residential and productive functions illustrates a spatial logic where the dwelling was both a habitation site and a node in broader agro-economic networks.

At the same time, scholars warn against reductive typological readings that emphasize only formal characteristics while neglecting embedded cultural processes. Gil-Piqueras and Rodríguez-Navarro (2021) caution that such approaches risk turning vernacular forms into static artifacts devoid of meaning. Vellinga (2013) similarly critiques the instrumentalization of vernacular knowledge solely for climate adaptation, which can obscure these forms’ everyday social and symbolic significance. From a conservation perspective, acknowledging the

value of this 'ordinary' or everyday built heritage is crucial; while such modest structures frequently face the threat of disappearance amidst modernization, they possess considerable potential for sustainable adaptation and preservation (Tienthavorn, 2024). Instead, vernacular architectures should be read as performative practices, continually reproducing kinship, labor, and authority relations. Chiarappa and Berlinger (2019) show this clearly in North American agrarian settings, where built forms mediate kinship and work.

METHODOLOGY

Study Area

The primary research site was Banda Besar Island, selected due to its historical and contemporary prominence as the principal site of nutmeg cultivation (Rais et al., 2026). Banda Besar, with an area of 98.78 km², is the largest and has the highest population density (9,091 people/km²) among the other islands (Indonesian Statistics Bureau of Maluku [BPS], 2024). Notably, Banda Besar hosts the largest concentration of PPA structures, indicating their embeddedness in local housing typologies. Between 2014 and 2023, an estimated 1,211 smallholder households cultivated nearly 1,000 tons of nutmeg annually across 3,000 hectares, reflecting the deep entwinement of vernacular architecture with agrarian livelihoods (Indonesian Statistics Bureau of Maluku, 2024). Figure 6 shows the surveyed areas, including Lonthor (1-3), Walang-Spancisby (4-7), Lonthor (8-12), and Dender Waer (13-14).

Data Collection

Field Observation and Documentation

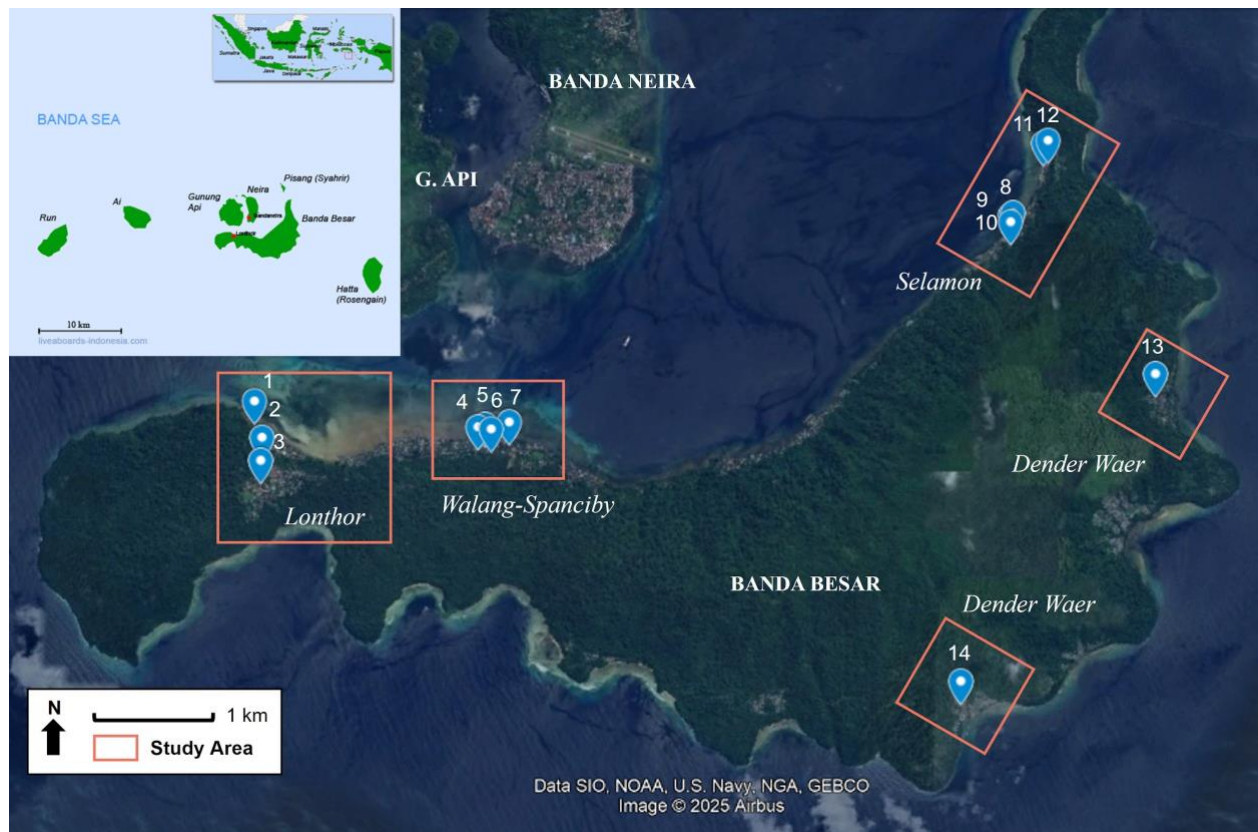
Studies on vernacular architecture require a multidimensional approach encompassing participant observation, contextual analysis of environmental adaptability, and componential analysis of how built forms reflect familial and cultural values (Groat & Wang, 2013). These methodologies facilitate a holistic understanding

of how everyday life, spatial practice, and material culture are intertwined within vernacular environments. Following Yin's (2018) proposition that a case study is the most suitable approach for gaining an in-depth understanding of contextualized phenomena, this research employs a multiple-case study methodology. The selection of multiple sites allows for comparative interpretation across geographic and sociocultural contexts. In total, 14 PPA structures were selected and documented across the surveyed settlements, before being measured, sketched, photographed, and recorded on-site, with field sketches digitally redrawn to ensure accurate representation of their dimensions, construction techniques, and material specifications.

The selection of case studies was guided by five main criteria, each grounded in Kazimee's (2008) six attributes of vernacular architecture. First, **building age** was considered by including both older PPAs, some dating back to the early twentieth century, and more recent constructions, with the youngest being more than ten years old, to capture continuity across generations and the responsiveness of the form to evolving community needs (attribute 5). Second, the **construction system** was restricted to structures built through household or community labor rather than professional contractors, reflecting the self-help processes central to vernacular traditions (attribute 1). Third, **materials** were evaluated to ensure that cases primarily utilized locally available timber, bamboo, and stone, while also noting adaptive uses of introduced resources such as corrugated iron, thereby demonstrating ecological adaptation and reliance on accessible materials (attribute 3). Fourth, **location** was diversified by selecting cases from across the Banda settlements of Neira, Lonthor, and Ay, allowing the study to observe how physical environments and sociocultural contexts shaped architectural responses (attribute 2). Finally, **typological variation** was sought by including examples ranging from small single-function drying huts to larger multi-functional structures integrated with dwellings, illustrating their origin in basic housing forms (attribute 4) and the sociocultural meanings embedded in their form and use (attribute 6).

Figure 6

Survey Locations on Banda Besar



Note. The surveyed areas include Lonthor (1-3), Walang-Spangiby (4-7), Selamon (8-12), and Dender Waer (13-14).

To facilitate the narrative of historical development, this study adopts a threefold periodization—pre-colonial, colonial, and post-independence—primarily as a convenient framework to situate the discussion of the PPA within broader socio-political and economic transformations of the Banda Islands. However, this study focuses on the typological and socio-cultural role of PPA. The **pre-colonial period** refers to the era before the arrival of European powers in the early 17th century, characterized by indigenous nutmeg cultivation and localized settlement patterns; indicators for this phase are derived from oral traditions, early travelers' accounts, and archaeological references. The **colonial period**, beginning with Dutch control through the VOC in 1621, extends through the late 19th and early 20th centuries, marked by the *perkeniers* system, forced labor regimes, and the introduction of European building typologies such as nutmeg smokehouses. Indicators include archival documents, maps, and surviving architectural forms linked to colonial economic

practices. The **post-independence period**, after 1945, reflects the vernacular adaptation of colonial prototypes into household-scale PPAs as nutmeg cultivation returned to local control, with indicators drawn from oral histories, field surveys, and the continued transformation of PPAs within living memory. It should be emphasized, however, that this periodization is employed chiefly.

Interviews

This study involved fifteen purposely selected informants with direct PPA knowledge. To ensure a comprehensive understanding of the PPA, the primary selection criterion was direct, sustained engagement with the physical, historical, or socio-cultural dimensions of these structures. Specifically, participants were selected if they met at least one of the following criteria: (1) active involvement in nutmeg cultivation and daily operation of a PPA; (2) technical expertise in

local vernacular construction methods; (3) recognized authority in local oral history and the transition from the colonial *perk* system; or (4) leadership roles capable of contextualizing the PPA within customary regulations and heritage discourses. Based on these criteria, seven were nutmeg farmers (47%), mostly middle-aged (early forties to late fifties), representing active cultivators and PPA users.

Three elder community figures (20%)—La Raman (historian and lecturer, Banda Neira University), Pongky van den Broeke (*perk* owner, Lonthor), and Haji Basar Alimudin Latar with Irwan Alimudin Latar (King and Prince of the Banda Eli tribe, interviewed online)—all over seventy, provided oral histories and cultural recollections. Two carpenters (13%) in their fifties contributed technical perspectives on construction, while two village leaders (13%), in their forties and sixties, contextualized PPA within customary regulation. One heritage community representative (7%) discussed its role in identity and heritage discourses.

Prior to data collection, the purpose of the study was fully explained to all participants, and informed consent was obtained regarding their voluntary participation, data protection, and the use of anonymized quotations. Procedures followed standard qualitative research ethics and the principles of the Declaration of Helsinki. The study qualified for exempt status from formal Institutional Review Board (IRB) review, as the methodology involved standard, non-invasive interviews focused on everyday architectural practices and collected no sensitive or protected personal data. Semi-structured interviews, conducted in Bahasa Indonesia and lasting 15–45 minutes, were recorded and noted, and guided by eight core questions:

1. How were PPAs placed, and what arrangements have you observed?
2. Who usually builds a PPA, and how is the construction process carried out?
3. What materials are used, and have there been changes in material choices over time?
4. What role does the PPA play in nutmeg cultivation and drying today?
5. How are PPAs linked to family or community practices beyond their practical use?

6. What symbolic or cultural significance do PPAs hold for the community?

7. What challenges exist in maintaining or rebuilding PPAs in the present day?

8. How do younger generations view PPAs, and what is their future role in community life?

Data Analysis

The collected data were analyzed using a qualitative, interpretive approach that combined architectural and ethnographic analytical techniques. Architectural documentation and field observations were examined through typological analysis to identify recurring structural forms, material configurations, and construction variations of the PPA across different households and settlements. Spatial analysis was employed to examine the organization of the structure in relation to domestic spaces, work areas, and daily nutmeg-processing practices. Interview data were analyzed thematically through an iterative process of coding, focusing on narratives related to construction knowledge, household use, intergenerational transmission, and perceptions of functionality and meaning. These analytical processes allowed for the integration of material, spatial, and socio-cultural dimensions, enabling a comprehensive interpretation of the PPA as a vernacular architectural form shaped by everyday practice and historical influence.

RESULTS AND DISCUSSION

Landscape Spatial Characterization

The study of settlement spatial patterns involves the rich regional history to reveal the “spatial DNA,” focusing on exploration and a systematic categorization of the spaces in the components’ configuration based on their syntactic characteristics (Alalouch et al., 2022; Kersapati & Setiadi, 2021; Zhang et al., 2024). Many communities in the Indonesian Archipelago built spatial order systems organized by the socio-cultural life of the people inhabiting the area (Widana et al., 2023). In the case of the Banda Islands, the settlement was primarily driven by its

abundant spice plantations, including the oldest nutmeg plantations on the island, as well as a concentration of historical spice estates, such those as found in Lautaka (Isnaeni et al., 2025).

Although the historical trajectory of the Banda Islands has been extensively chronicled, scant attention has been paid to the origin and evolution of PPA structures in the pre-colonial era. The absence of written documentation and archaeological remains renders their existence before European contact highly uncertain. Local oral histories, as conveyed by elders and cultural figures such as Haji Basar Alimudin Latar, contain no references to PPA (personal communication, 2024).

This silence suggests that PPA may not have been a significant architectural form before Dutch intervention. La Raman (personal communication, October 20, 2024) supported this notion by affirming that neither written nor material evidence regarding their precolonial presence exists. Pongky van den Broeke (personal communication, August 2, 2024) likewise argues that structured nutmeg plantations were unlikely to have existed before the conquest. Nutmeg was cultivated primarily for household use or limited trade. Within this interpretation, the colonial *perken* system, characterized by formalized plantations operated under coercive labor, became the institutional precursor of PPA. Present-day PPAs can be read as a vernacular re-adaptation of that system in the post-independence period.

Yet, spatial and architectural evidence complicates a purely colonial origin. As Figure 7 illustrates, nutmeg plantations and scattered trees interweave with the settlement fabric, where houses, PPAs, the mosque, and the village office form a tightly integrated village core. We made a model of the spatial characteristics of settlement in *Lonthor*, considering the most representative village, with an adequate universal example of the settlement's components and configuration, including PPA as the center in this study. The cross-section shows how mountainous groves transition into residential clusters and communal PPAs near the coast, underscoring a continuum between productive and domestic spaces.

PPAs, situated adjacent to or within residential areas, operate as semi-public workspaces for nutmeg processing, thereby embedding economic activity into everyday social life. Documentation further demonstrates this integration: Nutmeg harvesting (A, B) leads directly into processing in PPAs (C), which in turn flows into household-scale sorting and communal practices (D). Direct references to PPA are absent in oral traditions such as *Kabata (Hikayat Lonthor)*; however, the embeddedness of nutmeg within both livelihood and settlement patterns supports the possibility of earlier processing forms that were later formalized under Dutch rule. The architectural continuity observed between colonial *perk* structures and present-day PPAs is less an invention of the colonial period than an adaptation of preexisting spatial practices, transformed yet preserved across historical ruptures.

Comparison of other settlement arrangements shows that vernacular communities across Asia have long organized their environments through a close interweaving of subsistence, work, and cultural life. In Sri Lankan peasant hamlets, for example, settlements evolved around irrigated paddy fields, *chena* cultivations, and village tanks, creating a holistic system where domestic clusters, agricultural production, and water management formed a single ecological and social unit (Dayaratne, 2018).

Similarly, in Northern Thailand's *miang*-producing communities, residential areas are directly embedded within forest gardens where *cha miang* (fermented tea) is cultivated, harvested, and processed. Here, fermentation spaces and household compounds are spatially inseparable, and *miang* itself permeates the local diet, ritual practice, and community identity, reinforcing the integration of livelihood and domesticity (Chinwong et al., 2021). However, such integration is not universally characteristic of all traditional spatial arrangements. In Sri Lanka, for instance, *Ambalam* structures, constituting open, colonnaded pavilions often located along travel routes, served primarily as resting places, administrative nodes, or sites of religious charity rather than as extensions of domestic and productive life (Mendis et al., 2023).

Figure 7

Spatial Characteristics of Settlement in Lonthor



Note. Activities related to nutmeg cultivation and processing: (A) Nutmeg plantation with canaries planted as a colonial strategy to protect the nutmeg trees from the climate, wind, and birds; (B) Harvesting nutmeg using *gai-gai* (a bamboo pole); (C) PPA used for drying nutmeg; and (D) Women processing nutmeg seeds in a communal setting. Photographs on the right side show the documentation of houses.

These stand in contrast to the Banda case, where nutmeg groves, PPAs, and houses are enmeshed in a continuous landscape, demonstrating a spatial logic in which agricultural work is inseparable from everyday living. When situated alongside these comparative examples, the Banda settlement pattern underscores a broader vernacular principle of integrating livelihood and residence, while also highlighting the unique role of PPAs as semi-public processing structures that simultaneously sustain economic activity, community cohesion, and cultural continuity. In addition, historical trade patterns provide important clues. Mace (*fuli*) was already in use in Europe by the 1530s, indicating that effective post-harvest techniques must have been developed to preserve and export nutmeg (Villiers, 1981). A degree of political and

economic sophistication was present before European arrival, as indicated by the presence of *Orang Kaya*, or local elites. These elites monopolized nutmeg trade routes and oversaw extensive plantations, reinforcing the plausibility that PPA-like structures existed to support this commerce.

Materials, Structures, and Functions: A Comparative Analysis

Our study successfully documented PPA materials across various locations in Banda Besar, including Lonthor, Walang-Spancisby, Selamon, and Dender Waer (see Figure 8). Overall, the materials across these locations

combine traditional and modern elements, with wood, bamboo, and zinc alloy being common. The fire chambers are predominantly constructed from wood and bamboo, demonstrating a shared functional approach to nutmeg drying across Banda Besar.

In Lonthor (Locations 1-3), walls are made from a mix of timber, asbestos, and zinc alloy (Location 1), or bamboo and zinc alloy (Location 2), while the roof is consistently zinc alloy. The floors are soil, and structures are primarily wood. Fire chambers in some locations are made of bamboo, while wood and bamboo are used in others. These variations reflect an adaptation of traditional and modern materials based on function. In Walang-Spangciby (Locations 4-7), the construction materials vary. Location 4 uses a mix of bricks and concrete for the walls, zinc alloy for the roof, and a soil floor with a reinforced concrete and wood structure and a wooden and bamboo fire chamber. Locations 5-7 employ a mix of timber, asbestos, and zinc alloy for walls, zinc alloy roofs, and wood for structures, with wood and bamboo used for fire chambers. These materials show a balance between traditional and durable construction methods.

In Locations 8-11 (Selamon), a combination of wood, zinc alloy, and concrete, is used. Location

8 has timber walls, a zinc alloy roof, a concrete floor, a timber structure, and a bamboo fire chamber. Locations 9-11 feature walls made from zinc alloy or a mix of bricks and concrete, zinc alloy roofs, and concrete or soil floors. Structures are reinforced with concrete and timber, and fire chambers are made from wood and bamboo. These materials suggest practical choices for durability and functionality. At locations 12-14 (Dender-Waer), the materials are similar to those in Selamon. Location 12 has a mix of bricks and concrete walls, a zinc alloy roof, a soil floor, reinforced concrete and wood for the structure, and a timber and bamboo fire chamber. Location 13 uses zinc alloy for the walls and roof, with a timber structure and a bamboo fire chamber. Location 14 combines bricks and concrete for walls, asbestos for the roof, and reinforced concrete and wood for the structure, with a timber and bamboo fire chamber. This consistency reflects a focus on durable, locally available materials.

PPA structures are typically two levels: a stove at the base and a nutmeg shelf above. Limited firewood storage leads to a three-level design in some cases, adding a ground-level wood storage beneath the stoves. Dimensions vary based on

Figure 8
Matrix of Material Comparison based on Their Components: Wall, Roof, Floor, Framework, and Container, and Their Functions across Observed Geographic Locations



each family's nutmeg production and available space. The construction is the domain of neither architectural experts nor professional craftsmen. Rather, it is embedded in intergenerational memory and shared labor of local communities. Respondent 14 noted, "We built it ourselves, guided by our elders who once worked in the *perk*" (personal communication, 2024). The absence of formal design protocols underscores the vernacular essence of the PPA, constructed by and for the community, using locally available materials and techniques rooted in everyday life.

The PPA reflects this ethos. In its simplicity, the PPA materializes memory, utility, and vernacular resilience drawn from the legacy of the *perkenier* system. According to Respondent 2 (personal communication, August 2, 2024), "It's just a rectangular box attached to the house, easy to build." Its pitched roof, often crafted traditionally from sago palm, is functionally designed to allow smoke from roasting to escape. However, the decreasing availability of natural materials and the rise of modern alternatives influence this shift. Several factors shaped these characteristics, such as economic constraints, land availability, and spatial ingenuity. According to Respondent 8 (personal communication, August 4, 2024), limited yard space often dictates whether the PPA is a detached structure, allowing smoke from nutmeg roasting to dissipate without permeating the main house. Essential components such as a covered stove enable a consistent flame over a five-day drying period, while the elevated interior space and protective roof shield the process from seasonal rain.

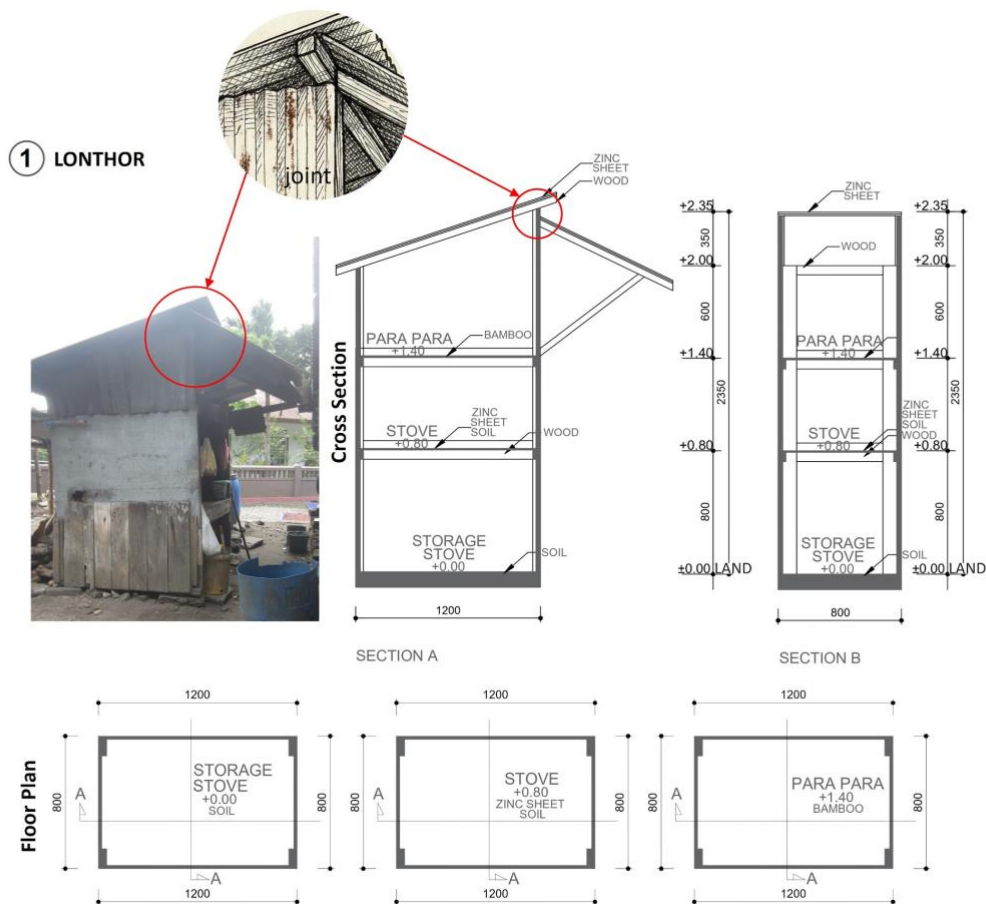
While brick is considered the ideal construction material for its durability, many farmers resort to metal sheeting due to budgetary limitations. These sheets, interestingly, though economically driven, possess the added benefit of retaining internal heat, thus accelerating the drying process (Respondent 4, personal communication, August 3, 2024). Such material and spatial decisions are emblematic of an empirical, adaptive knowledge system, an architecture of necessity and innovation. This aligns with scholarship on vernacular architecture, which frames local built environments as dynamic responses to socio-material contexts (Mobaraki & Oktay Vehbi, 2022; Philokyprou & Michael, 2021).

The function analysis emphasizes the smokehouse function across all sites. Lonthor, Walang-Spancisby, and Dender-Waer primarily focus on smoking, with minimal or no involvement in storage and kitchen functions. In contrast, Selamon integrates the smokehouse, storage, and kitchen functions. Overall, the smokehouse function dominates, while storage is selectively utilized, and the kitchen function is largely absent, indicating that the locations are predominantly oriented toward smoking activities rather than storage or culinary operations. While the knowledge of constructing PPA is communally shared among nutmeg farmers through experiential learning and intergenerational transmission, the resulting architectural forms and functions exhibit notable variation.

Location 1 in Lonthor showcases an example of the "smokehouse only" function (see Figure 9). The structure is described as small and open, lacking a door, as shown in the cross-section. The roof consists of zinc sheets, and wooden and zinc walls. It features only one *para-para* (a fire chamber with a bamboo base for drying) and has a single small stove. The floor plan shows the arrangement of these areas, including a storage stove and a stove with a zinc sheet covering. The joint connection at the top of the structure provides insight into how the different materials (wood and zinc) are joined to form a stable roof framework, although not integrated with the main house building.

Location 6 in Walang-Spancisby exhibits an example of the "smokehouse and storage" function (see Figure 10). The cross-section illustrates the construction details, including a zinc sheet roof supported by timber and walls made from wood and bamboo. Similar to the previous type, the ceiling and the wall are not integrated. The structure size is medium to large and enclosed, with a door. It includes at least two layers of *para-para* (shown in the section at the upper part of the building) serving as a fire chamber with a bamboo base. The floor plan shows the internal layout of the building, with designated spaces for one or two stoves placed on the soil floor and a wood storage area. The close-up highlights the joint connection at the roof, which shows how the zinc sheets are joined with the wooden structure to form a stable roof.

Figure 9
Architectural Details of the Lonthor (1) Structure as an Example of a Smokehouse-Only Function



Location 12 in Selamon represents the “smokehouse, storage, and kitchen” function (see Figure 11). The cross-section showcases a medium- to large-sized, enclosed structure with a roof made of zinc sheets and supported by wooden beams. Sections A and B display different views of the internal spaces, including the stove and wood storage areas. These sections emphasize zinc sheets for roofing and timber for structural elements. The floor plan outlines the layout of the stove, wood storage, and the *para-para* section, illustrating the efficient use of space in this functional structure. The walls were of timber and bamboo, with a *para-para* (a bamboo fire chamber) positioned above the stove. This structure may have one or two stoves and is sometimes integrated with the main building, placed on the soil floor, with designated areas for wood storage. The joint connection shows how the zinc roof is connected to the wooden structure.

Table 1 shows the comparative analysis of PPA and vernacular settlement forms. A cross-case synthesis of the documented sites reveals distinct analytical patterns in how vernacular production spaces adapt to socio-economic and environmental demands. Rather than adhering to a uniform traditional typology, the material matrix across all Banda sites demonstrates a calculated hybridity. Communities actively combine organic materials, such as wood and bamboo, with industrial materials, such as zinc alloy and reinforced concrete. This material blending is a strategic vernacular adaptation: Zinc sheets are deployed not merely for affordability, but to optimize thermal efficiency and heat retention during the smoking process, while concrete ensures long-term structural resilience against a harsh tropical climate.

Furthermore, the PPA exhibits a dynamic functional spectrum that reflects varying degrees of domestic integration. In contexts like Lonthor,

the architecture remains highly specialized and mono-functional, isolating the smoking process to manage spatial constraints and smoke dissipation. Conversely, as observed in Selamon, the PPA evolves into a multi-functional domestic hub, structurally expanding to subsume storage and kitchen duties. This spatial trajectory, from an isolated utility structure to a fully integrated domestic wing, closely mirrors broader agrarian vernaculars in Asia. For instance, the integration of livelihood and habitation seen in Northern Thai *miang* villages and Sri Lankan peasant hamlets highlights a shared regional logic where economic production is spatially inseparable from household rhythms. This contrasts sharply with structures like the Sri Lankan *ambalam*, which remain functionally segregated for public or ritual use. Ultimately, this synthesis indicates that the PPA's architectural value lies in its continuous, pragmatic evolution, seamlessly weaving historical preservation techniques into contemporary domestic reality.

Beyond its seasonal function, the PPA is interwoven into the rhythms of daily life. Outside the nutmeg harvest period, the stove is used to roast fish or prepare subsistence foods like cassava or canary nuts (*Canarium amboinense Hoch*), while the structure doubles as a storage space for household items (Respondents 4 and 7, personal communications, August 3, 2024). These multifunctional uses reinforce the PPA not simply as an architectural artifact but as a spatial embodiment of livelihood, sustenance, and domestic continuity. Thus, the PPA is more than a practical adaptation of the colonial *perk*; it is a spatially and materially embedded vernacular form that sustains economic survival and everyday domesticity. Its presence in Banda affirms that vernacular architecture is deeply intertwined with the lifeworlds of its inhabitants (Vellinga, 2013).

Figure 10

Architectural Details of the Walang-Spangiby (6) Structure as an Example of Smokehouse and Storage Function

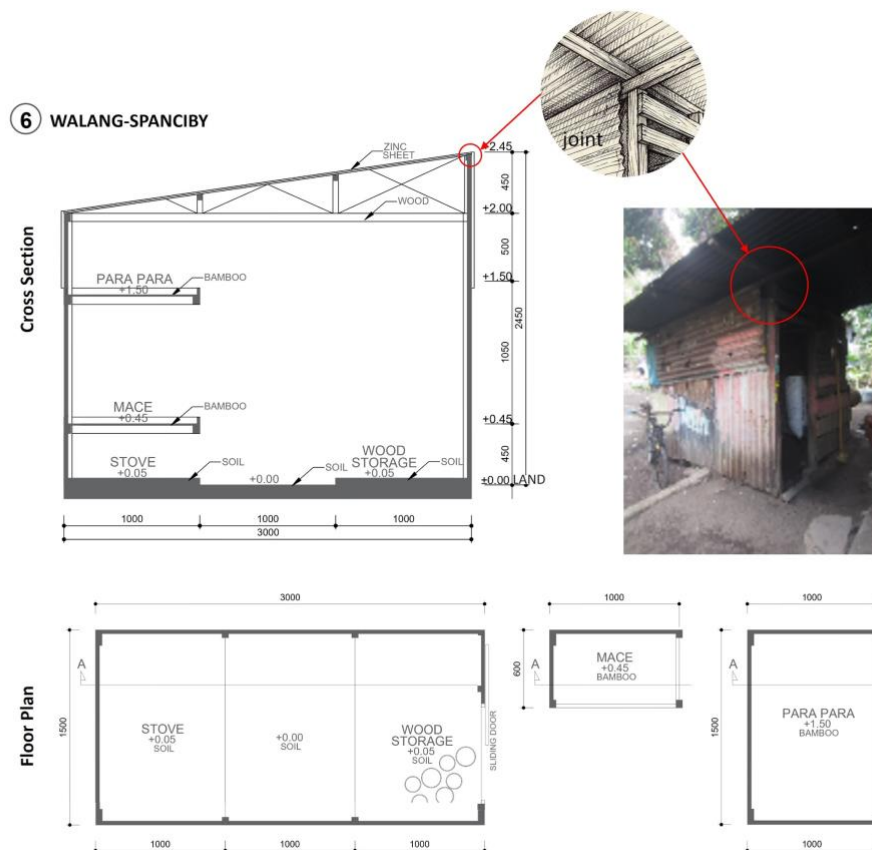


Figure 11

Architectural Details of the Selamon (12) Structure as an Example of Smokehouse, Storage, and Kitchen Function

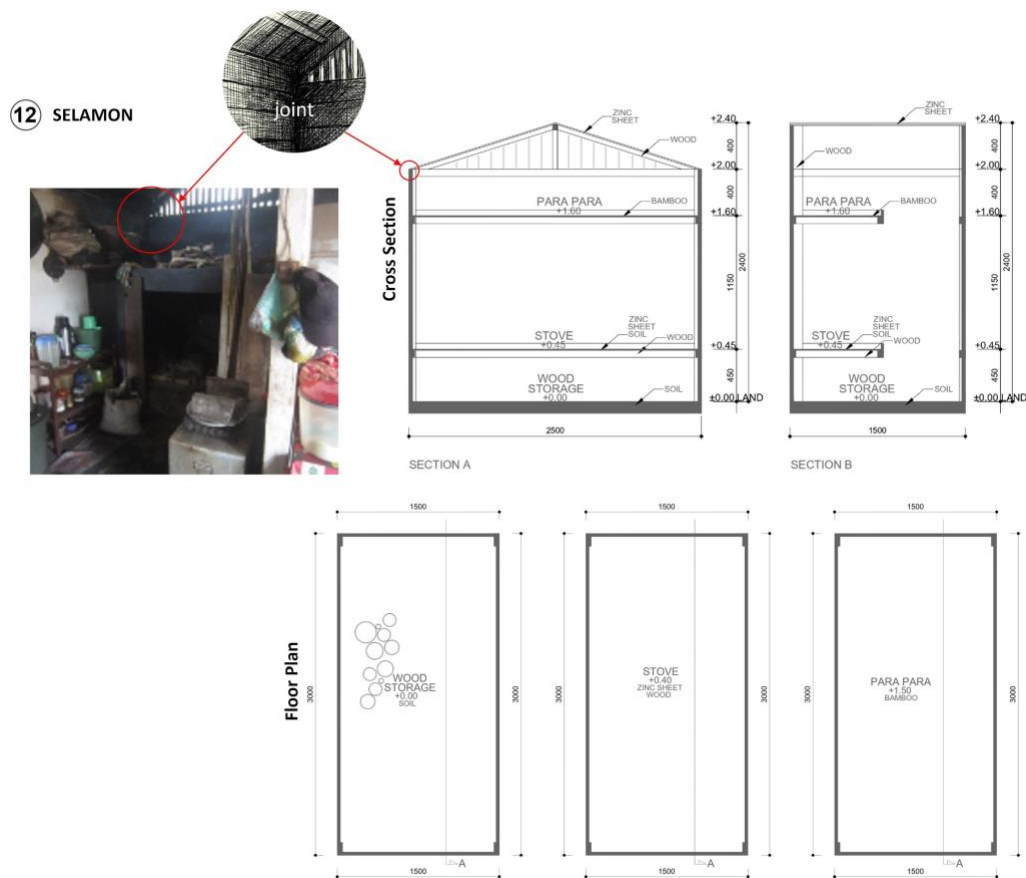


Table 1

Comparative Analysis of PPA and Other Vernacular Settlement Forms in terms of Materials, Structures, and Functions

Location	Material	Structure	Function
Lonthor (1) - Smokehouse Only	Zinc sheets, wood, bamboo (affordable, locally sourced)	Simple, open, single function (smoking)	Focused solely on nutmeg drying and smoking
Walang-Spangiby (6) - Smokehouse and Storage	Wood, bamboo, zinc alloy	Medium to large, enclosed; integrates storage and smoking	Smokehouse with storage for nutmeg
Selamon (12) - Smokehouse, Storage, and Kitchen	Reinforced concrete, wood, bamboo, zinc alloy	Large, multi-functional (smoking, storage, and kitchen)	Smokehouse, storage, and kitchen for multi-use
Sri Lankan Peasant Hamlets	Wood, stone, local materials	Residential areas interwoven with agricultural spaces	Integration of production (rice fields, agriculture) and residential spaces
Northern Thai <i>Miang</i> Villages	Wood, bamboo, and modern elements for durability	Households embedded in productive landscapes	Integrated household production and economic activity
Sri Lankan <i>Ambalam</i> Structures	Wood, stone, and traditional materials for ritual	Open, colonnaded pavilions used for public functions	Public and ritual purposes; no integration with domestic life

Beyond the "Static Entity" of Vernacular Architecture

Following Indonesia's proclamation of independence in 1945, the nutmeg industry persisted under the auspices of the state-owned enterprise *Perkebunan Pala Banda* (Banda Nutmeg Plantation), which inherited the colonial *perken* system. Local farmers continued to serve as cultivators, harvesters, and roasters within these state-managed operations. However, advanced archaeological research should be conducted to trace the historic transformation of PPA in detail, since there is no documentation or archival remnants of how they constructed the buildings in the past. By the 1980s, the enterprise collapsed due to chronic mismanagement, compounded by a catastrophic eruption of Gunung Api. This dual crisis precipitated the redistribution of nutmeg plantations to individual farming households, catalyzing the emergence of domestic PPA structures.

Nutmeg is typically harvested three times a year, from February to March, June, and October to November. The most favorable harvest period occurs post-monsoon, between October and November, whereas the least productive season aligns with the June monsoon. According to local knowledge, the traditional sun-drying method becomes unreliable during the monsoon, often resulting in a diminished yield of high-quality nutmeg. As explained by Respondent 3 (personal communication, August 2, 2024), "The harvest in June yields less. Many fruits fall prematurely due to wind and heavy rain. It's uncommon to have three to five consecutive days of strong sunlight to effectively dry them. We usually rely on the PPA to roast the nutmeg for three to five days with consistent flame."

This account underscores the critical role of PPA in ensuring quality nutmeg preservation during adverse weather. By stabilizing post-harvest processing across all seasons, PPAs safeguard household consumption and market supply, echoing the functional legacy of the colonial-era *perken* system in a contemporary vernacular adaptation. Beyond its instrumental function in the post-harvest processing of nutmeg, the PPA embodies a profound social and symbolic significance within the everyday lives of Banda's nutmeg-farming families. While PPA structures

are widely recognized for their role in securing economic livelihood through roasting, drying, and preserving nutmeg, they also serve as spatial articulations of familial identity and autonomy. Typically, each family maintains its own PPA, even when multiple generations cohabit a single household. This spatial and operational autonomy reflects a commitment to preserving individual livelihoods within kinship networks as a social mechanism to mitigate potential conflicts over labor and resource distribution (Respondent 12, personal communication, August 4, 2024).

An informant emphasized that the PPA confirms a household's material engagement in nutmeg production and affirms their moral and symbolic status as an independent nutmeg-farming family. In this regard, the PPA functions as a token of consensual autonomy: a declaration of self-sufficiency in cultivating, harvesting, processing, and trading nutmeg. It manifests the reified identity of the farmer, inscribed in space and sustained through practice. Nevertheless, the absence of a PPA in some households does not necessarily indicate disengagement from the nutmeg economy. In several cases, younger married children refrain from constructing their own PPA to support aging parents, particularly widowed elders, by maintaining collective labor and yield-sharing practices. When land inheritance remains undivided, the logic of co-dependency persists, rendering the construction of a separate PPA redundant (Respondent 3, personal communication, August 2, 2024).

This dynamic illustrates how the presence or absence of a PPA indexes shifting configurations of inheritance, responsibility, and familial authority. The construction of a personal PPA often marks a transition into marital and economic maturity, especially when accompanied by the transfer of land rights. Conversely, its absence reveals a continued reliance on parental ownership and labor structures. In either case, the PPA, whether built or withheld, functions as a spatial expression of relational status and economic independence. Importantly, despite its humble, even grotesque appearance, the PPA is highly esteemed among residents (Respondent 14, personal communication, August 5, 2024). It is simultaneously a working structure and a symbolic artifact, an architectural form that encodes social meaning. The PPA, therefore, is

not a mere “static entity,” as some architectural studies have suggested (Gil-Piqueras & Rodríguez-Navarro, 2021), but rather a mutable and meaningful space that reflects and restructures social relations (Vellinga, 2013; Chiarappa & Berlinger, 2019). It is at once a node of production and a site of identity-making within the socio-material landscape of the Banda Islands (Nasution et al., 2025).

Alongside its functional and spatial roles, the PPA carries meanings that are deeply valued within nutmeg-farming households as part of a long-standing familial and relational tradition. The structure functions as a site where architectural knowledge, labor practices, and social relations are transmitted across generations, reinforcing a sense of continuity within families. Its persistence is not driven by formal heritage recognition, but by everyday use and relational attachment, through which households affirm their autonomy, competence, and connection to ancestral practices. In this sense, the value of the PPA lies not only in its material form but in its role as a lived architectural tradition that sustains social memory and household identity. Recognizing these meanings helps explain why such structures continue to be maintained and adapted, and suggests that their conservation is inseparable from the preservation of everyday practices and family-based knowledge systems embedded within the socio-material landscape of the Banda Islands.

CONCLUSION AND RECOMMENDATIONS

This study examined the *Para-Para Api* (PPA) as a form of vernacular architecture embedded in the everyday socio-material practices of nutmeg-farming communities in the Banda Islands. The research aimed to understand how this modest structure reflects the adaptation of colonial-era architectural influences and how it functions within contemporary domestic and productive life. The findings demonstrate that while the PPA draws its architectural and technological lineage from the Dutch colonial *perken* system of nutmeg preservation, it has been transformed through household-scale ingenuity, environmental responsiveness, and intergenerational

knowledge transmission into a resilient vernacular form. The analysis shows that the PPA is not merely a utilitarian structure for nutmeg preservation, but a multifunctional space that operates simultaneously as a node of production and a site of social and cultural significance. Through its material form, spatial organization, and daily use, the PPA reinforces family autonomy, sustains long-standing practices of nutmeg cultivation, and contributes to the continuity of Bandanese household life. This ongoing adaptation highlights the dynamic nature of vernacular architecture, in which inherited technologies are continuously reshaped through everyday practice rather than formal design or institutional planning. Despite its unassuming physical form and marginal position in global architectural and spice-route scholarship, the PPA remains central to the lived landscape of the Banda Islands. Its persistence reflects not only historical continuity, but also the value attributed to it by local communities as a carrier of knowledge, labor, and relational identity. Recognizing the PPA as a living architectural tradition helps to reposition it within broader discussions of vernacular architecture and colonial architectural legacies in Southeast Asia.

Based on these findings, several recommendations are proposed to support the continued understanding and conservation of the PPA. First, systematic documentation initiatives should be undertaken to record PPA structures through architectural drawings, photographs, and ethnographic accounts, with particular attention to traditional construction techniques and sustainable materials. Second, mechanisms to encourage intergenerational knowledge transfer, such as community workshops or collaborations with local schools, could help ensure the continuity of PPA building knowledge. Third, local government and NGO programs could integrate the PPA into community-based economic initiatives, including sustainable nutmeg farming and culturally sensitive tourism. Fourth, future research could expand archaeological and vernacular studies through comparative analysis with similar structures in other spice-producing regions to trace the historical transformation of nutmeg-related architectures. Finally, heritage conservation policies at both local and national levels could formally recognize the PPA,

integrating scientific research and technical support to promote its maintenance and continued use.

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