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Comparison of Materials in the Construction of Bale Tani Houses and Bale Lumbung in Sade Village, Central Lombok

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ABSTRACT

This study discusses the use of local materials in two traditional Sasak buildings in Sade Village—Bale Tani and Bale Lumbung—as representations of sustainable vernacular architecture. The purpose of this research is to identify the types of materials used, their functional roles within the buildings, and the ecological as well as cultural values embedded in their application. The research employs a qualitative descriptive method with a literature review and field observation approach. The results indicate that each material serves a specific function according to the building's context. Bale Tani utilizes coconut wood, bamboo, clay, thatch, and natural fibers to maintain thermal comfort, enhance energy efficiency, and harmonize with the tropical environment. Meanwhile, Bale Lumbung employs hardwood, bamboo, natural stone, thatch, and natural fibers to ensure structural durability, air circulation, and protection of harvested crops from humidity and pests. The selection of materials for both buildings is based on local availability, ease of maintenance, and resistance to climatic conditions. Moreover, the application of passive design principles and traditional construction techniques reflects the Sasak people's local wisdom in creating environmentally adaptive architecture. In conclusion, Bale Tani and Bale Lumbung embody the concept of sustainable vernacular architecture, integrating functional, ecological, and cultural aspects while serving as inspiration for contemporary environmentally friendly architectural design.

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1. INTRODUCTION

Traditional architecture in Indonesia, particularly in the West Nusa Tenggara region of Lombok, reflects the harmony between people, the environment, and local culture. Sade Village in Central Lombok is one area that still maintains elements of Sasak architecture, characterized by the use of natural materials and construction techniques passed down through generations. (Wijnhoven et al., 2021). In this context, buildings such as the Bale Tani (farmer's house) and Bale Lumbung (barn or agricultural storage shed) play a vital role in the lives of agrarian communities. The Bale Tani serves as a residence for the farmer's family, while the Bale Lumbung is used to store rice, agricultural tools, and other crops. Both types of buildings are often constructed from locally available materials, but differences in function and construction needs can influence material selection, leading to variations in design and durability (Hassanain et al., 2022).

Previous literature reviews show that research on construction materials in traditional Indonesian buildings has developed, especially in the context of sustainability and adaptation to climate change. Example, (Federation et al., 2020) examines the ethnographic and functional aspects of Bale Tani and Bale Lumbung in Lombok, but the main focus is on cultural values without in-depth analysis of the specific material composition (Hassanain et al., 2022) discusses sustainable materials in traditional West Nusa Tenggara houses, including the use of bamboo and wood, but does not make a direct comparison between different building types. Meanwhile, (Hassanain et al., 2022) analyzed construction materials in Sasak dwellings for disaster resilience, but their study was broader and not specific to the comparison of Bale Tani versus Bale Lumbung in a particular geographic location such as Sade Village. (Wijnhoven et al., 2021) emphasizes the preservation of Sasak architecture through natural materials, and the gap lies in the lack of comparative studies that consider functional variations and local environmental impacts. Overall, this literature highlights the importance of local materials for sustainability, but no research has specifically compared construction materials between Bale Tani and Bale Lumbung in the context of a hill village like Sade, which is vulnerable to high rainfall and earthquakes.

Based on the literature review, the scientific novelty of this article lies in its in-depth comparative approach to the construction materials of Bale Tani and Bale Lumbung in Sade Village, Central Lombok, with an integrated analysis of local resources, installation techniques, and implications for structural resilience and environmental sustainability. This research fills a gap by focusing on functional differences that influence material selection, which have not been specifically explored in previous studies. The research problem is whether there are significant differences in the types, sources, and installation techniques of construction materials between Bale Tani and Bale Lumbung in Sade Village, Central Lombok, and how these differences affect the resilience and sustainability of these buildings in the context of a hilly environment prone to disasters. The purpose of this article is to compare construction materials between Bale Tani and Bale Lumbung in Sade Village, Central Lombok, with a focus on aspects of material types, resources, installation techniques, and their impact on the resilience and sustainability of buildings, in order to provide insights for the development of sustainable architecture and the preservation of local culture.

2. RESEARCH METHODS

This study uses a descriptive qualitative method to determine the materials used in the Bale Tani and Bale Lumbung traditional houses and their sustainability. The research location was Sade Village, with the Bale Tani and Bale Lumbung traditional houses as the research objects. Data were obtained through three stages: field observation to see the actual

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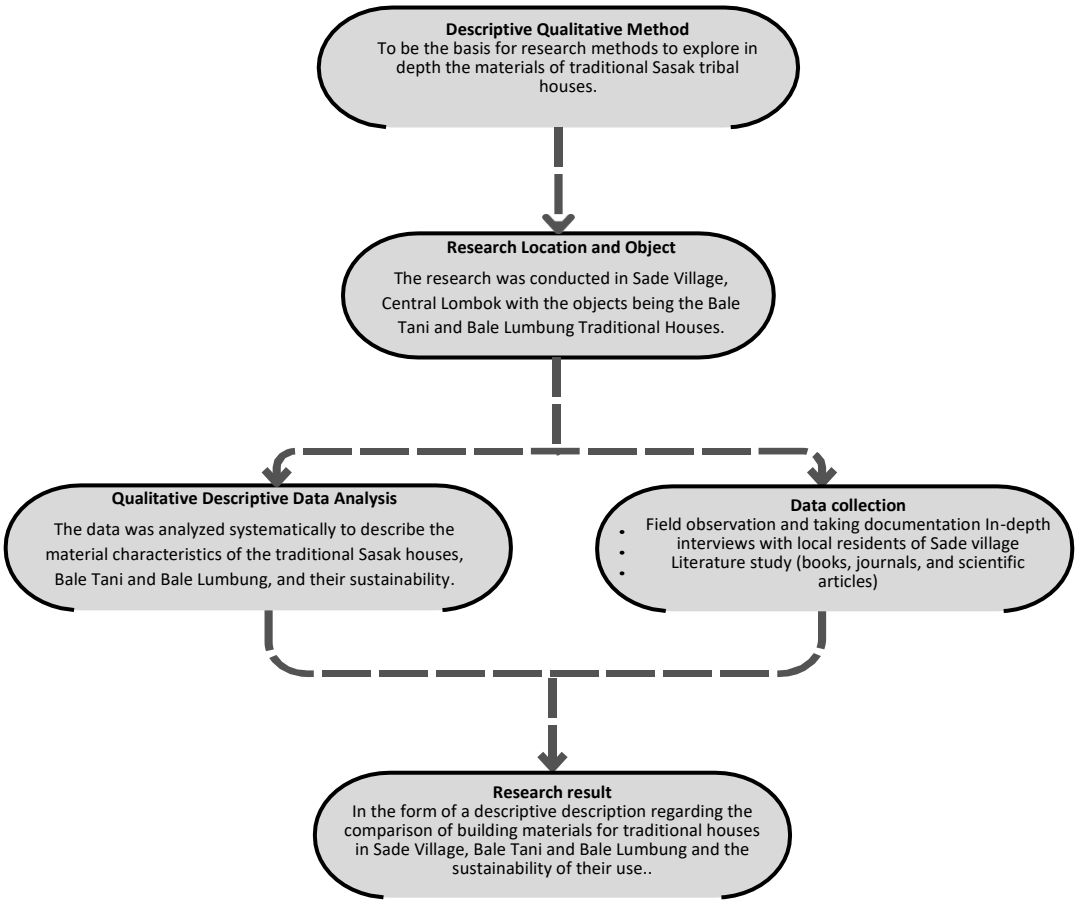
condition of the research objects, in-depth interviews with competent local residents to obtain detailed information, and literature studies from books, journals, and other written sources relevant to the research topic. The results of this study are in the form of descriptive research results that explain the building materials in the traditional houses of Sade Village and the sustainability of their use. This descriptive approach was used because it is able to provide a systematic description of the research objects, resulting in a clear, in-depth, and comprehensive understanding.



3. RESULTS AND DISCUSSION

3.1 Result

This research was conducted in Sade Village, a traditional village located in Pujut District, Central Lombok Regency, West Nusa Tenggara. Sade Village is known as one of the traditional villages of the Sasak Tribe that still maintains its traditions, culture, and architectural forms of traditional houses. This village environment has high historical and cultural value, making it the right location to research the sustainability of traditional building materials. In Sade Village, there are several types of traditional houses, including Bale Tani and Bale Lumbung. The building massing pattern for the Sade and Limbungan traditional houses is made to follow the contour lines, with the Bale Tani always facing towards the higher contour (G. A. Susilo & Umniati, 2021).

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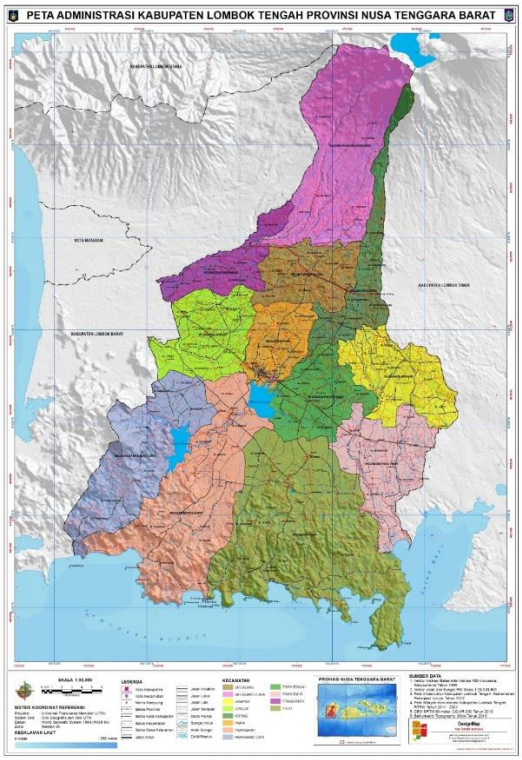

Figure 1. Map of Central Lombok
(Sumber: petatematikindo.wordpress.com)

Figure 2. Entrance to Sade Village
(Sumber: Dokumentasi Lapangan)

3.1.1 Farmhouse and Barn Materials

The analysis of traditional building materials in Sade Hamlet will focus on two typologies, namely the Farmer's House (Bale Tani) and the Barn House (Bale Lumbung), both of which make full use of natural materials from the surrounding environment.

3.1.2 Tani House (Bale Tani)

Materials used in Bale Tani:

1. Roof

The Bale Tani roof is made of alang-alang or straw. The use of alang-alang as a roofing material in traditional Sasak houses reflects environmentally friendly architectural practices, as this material comes from an abundant local source and is easily renewable (L. Saputra, 2025). The roof of this building is pyramid-shaped and made of thatch and bamboo, which are readily available locally. Observation reveals that the roof is wider than the body of the house, with the front of the roof extending downward, symbolizing a bowing posture when entering the house (Wahyudi et al., 2024). The use of alang-alang grass offers benefits such as protecting the Bale Tani from tropical heat and rain and creating a cool environment inside the house, thus reducing the need for artificial cooling. The installation process includes collecting the alang-alang and bamboo materials, constructing the bamboo roof frame, drying the alang-alang or straw, constructing the roof frame, and installing the alang-alang as the final layer.

2. Wall

The walls of Bale Tani are made of woven bamboo. This material was chosen for its durability, flexibility, and strength, which support the construction of walls and structures. In terms of design, the use of bamboo in weaving also provides aesthetic value. The walls of the house are made of woven bamboo, which serves as decoration. The woven bamboo has a natural brownish color (Wahyudi, 2022). The front and rear

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walls are made of woven bamboo, with bamboo pillars also used to support the structure. The walls are tied to the pillars using rattan, while the building materials are very simple and readily available, such as soil and bamboo (Wahyudi et al., 2024). The use of woven bamboo provides the benefits of a lightweight yet strong material, capable of maintaining natural air circulation through the gaps in the woven fabric, and supporting thermal comfort. Furthermore, woven bamboo creates a simple, natural aesthetic that is in harmony with the surrounding environment, while also reinforcing the traditional identity of the Bale Tani house. The installation stages include felling and collecting the bamboo, splitting it to form the woven fabric, making the woven bamboo panels, and installing the woven bamboo as walls on the building frame.

3. Column

The columns of the Bale Tani house use wood as the primary structural material, serving as the supporting frame for the building's structure. The use of wood in various elements of the Bale Tani structure provides strength, sturdiness, and resistance to loads and weather. The installation process includes felling and collecting the wood, then measuring and cutting it as needed.

4. Beam

Wood is used as the support beams in the Bale Tani. This material provides structural strength while maintaining the stability and integrity of the building. The use of wood in various elements of the Bale Tani structure provides strength, sturdiness, and resistance to loads and weather. The installation process includes felling and collecting the wood, then measuring and cutting it according to requirements.

5. Doors and Windows

These traditional buildings have no windows, so the interior remains dim during the day because there are no channels for sunlight to enter. Natural light only enters through doors, terraces, and gaps in the woven bamboo walls (Komalasari et al., 2020). Doors and windows are made using readily available local wood. This wood can be repaired, recycled, and easily shaped to the desired size (Komalasari et al., 2020). The use of wood for doors and windows provides good air circulation within the building. The installation process includes felling and collecting local wood, splitting and measuring the wood to suit the home's needs, and then installing the doors and windows in the walls.

6. Floor

The floor of this farmer's pavilion is made from a mixture of soil, tree sap, and ash, mixed with buffalo or cow dung. The buffalo dung serves to remove moisture from the soil and repel mosquitoes (Sahira et al., 2023). The floor surface is then smeared with buffalo or horse dung to bind the soil, making it denser, stronger, and less prone to dust. This mixture creates a sturdy and environmentally friendly floor. Buffalo dung mixed with clay or straw ash contributes to the sustainability of traditional Sasak flooring. The installation process involves laying wood on the base of the floor, followed by laying bricks or natural stone, applying burnt straw ash, and then applying buffalo or horse dung to the floor surface.

7. Foundation

The foundations of the Bale Tani houses are made of stone, due to its durability and strength, capable of supporting the structural loads. This natural stone is readily available around Sade Village and is environmentally friendly, with its low carbon footprint. The foundations are made of river stones embedded directly in the ground without any cement. These stones are arranged to support the vertical loads of the structure above (L. Saputra, 2025). The use of natural stone provides moisture resistance, creates a natural feel, and supports the structural load of the Bale Tani. The installation process

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includes collecting the natural stone material, then measuring and cutting the stone to meet the foundation requirements of the Bale Tani house.

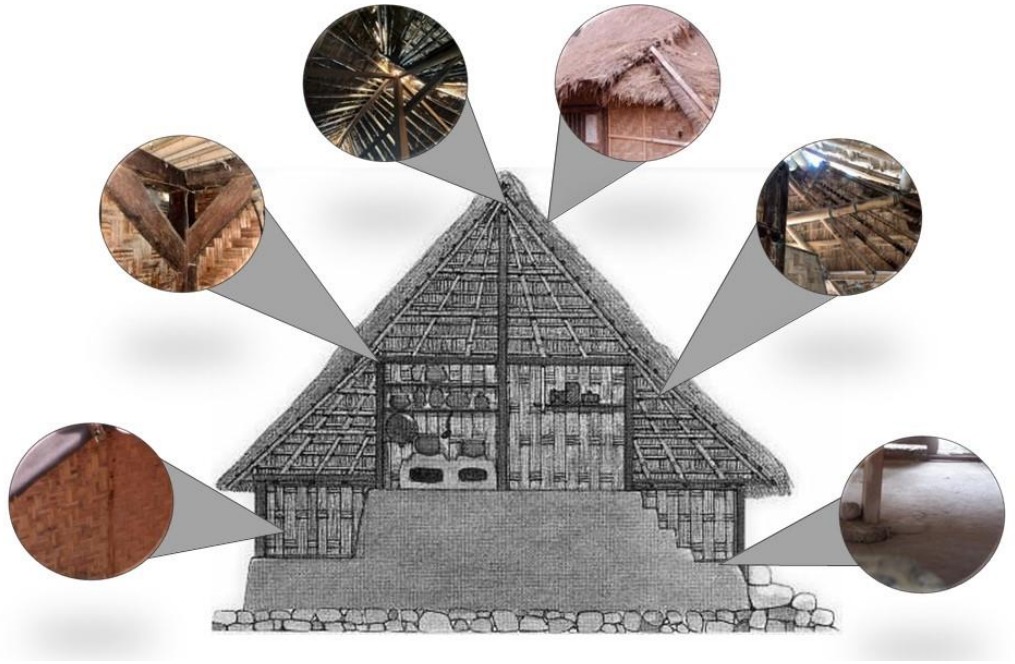

Figure 3. Section of Farmhouse (Bale Tani)
(Sumber: Personal Documentation and Google.com)

3.1.3 Lumbung House (Bale Lumbung)

Materials used in Bale Lumbung:

1. Roof

The roof of the Bale Lumbung is made of alang-alang (alang-alang) or straw. The use of alang-alang as a roofing material in traditional Sasak houses reflects environmentally friendly architectural practices, as this material comes from an abundant local resource and is easily renewable (A. R. Saputra et al., 2024). The use of alang-alang grass provides benefits, including protecting the Bale Lumbung from tropical heat and rain and creating a cool environment inside the house, thus reducing the use of artificial cooling. The installation stages include collecting alang-alang and bamboo materials, making a bamboo roof frame, drying the alang-alang or straw, assembling the roof frame, and installing the alang-alang as the final layer. The wood used to form the roof is arranged in such a way that the rhythm of the distance between the bamboo/wood poles is the same. This arrangement is done using gapit, namely bamboo/wood poles placed under the bamboo/wood poles of the roof frame by tying them (G. A. ; B. S. U. P. H. P. Susilo, 2020).

2. Wall

The walls of the Bale Lumbung are made of alang-alang (sorghum) or straw. This material was chosen because it plays a crucial role in maintaining humidity, as the Bale Lumbung serves as a storage area for agricultural products, ensuring they remain dry and prevent spoilage. The use of alang-alang on the walls also provides good air circulation and maintains thermal comfort in the building. The installation process includes collecting the alang-alang or straw, drying the alang-alang to form the walls, and installing the alang-alang on the Bale Lumbung walls.

3. Coloumn

The columns of the Bale Tani house use wood as the primary structural material, serving as the supporting frame for the building's structure. The use of wood in various elements

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of the Bale Tani structure provides strength, sturdiness, and resistance to loads and weather. The installation process includes felling and collecting the wood, then measuring and cutting it as needed.

4. Beam

Wood is used as the support beams in the Bale Tani. This material provides structural strength while maintaining the stability and integrity of the building. The use of wood in various elements of the Bale Tani structure provides strength, sturdiness, and resistance to loads and weather. The installation process includes felling and collecting the wood, then measuring and cutting it according to requirements.

5. Window

The doors and windows of the Bale Lumbung are a single unit. Because the building is a single structure, the Bale Lumbung only has one door at the front of the building. To reach the door, a wooden ladder is used, which is usually stored at the side of the building (Of et al., 2023). Natural light only enters through doors, terraces, and gaps in the walls made of woven bamboo (Komalasari et al., 2020). The material used is wood. The use of wood for doors and windows provides good air circulation within the building. The installation process includes felling and collecting local wood, splitting and measuring the wood according to the house's needs, and then installing the doors and windows into the walls.

6. Foundation

The foundation of the Bale Lumbung house uses stone because it is durable and strong enough to support the structural load of the building. This natural stone is readily available around Sade Village and is environmentally friendly, as it has no carbon footprint. The use of natural stone provides resistance to moisture, creates a natural feel, and supports the structural load of the Bale Tani. The installation process includes collecting the natural stone, then measuring and cutting the stone to meet the needs of the Bale Lumbung house foundation.

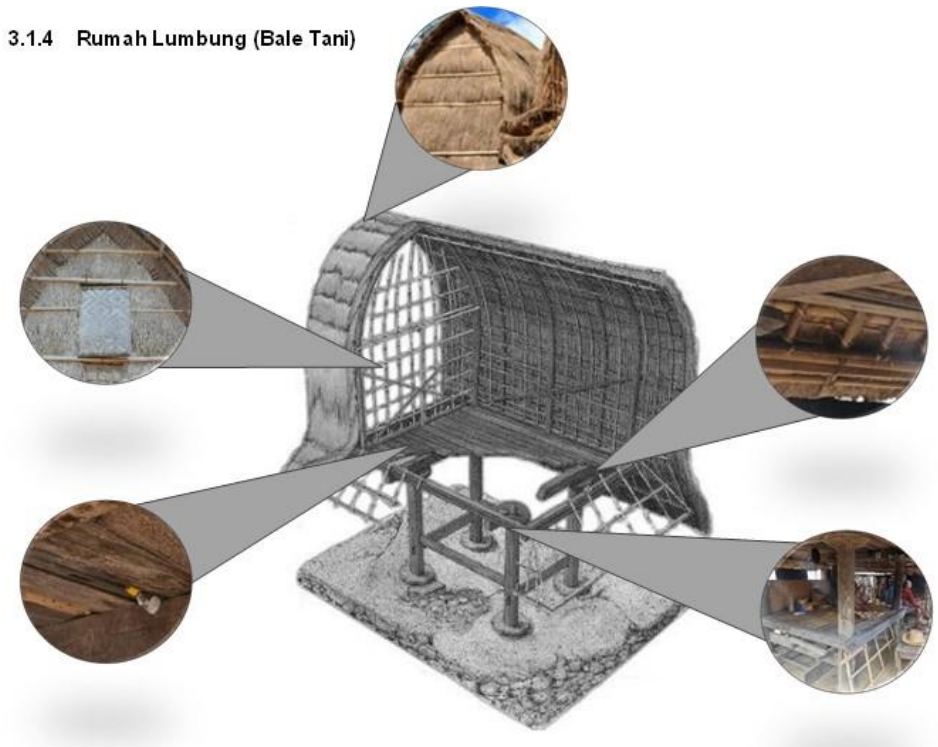

Figure 4. Section of Farmhouse (Bale Lumbung)
(Source: Personal Documentation and Google.com)

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3.2 Discussion

3.2.1 Construction and Structure Bale Tani

The structure of the Bale Lumbung initially only used wood and bamboo for all the ties and foundations of the building (Of et al., 2023). The building's main structure utilizes a wood and bamboo frame system assembled without nails, with wooden pegs, palm fiber rope, or rattan connecting the structural elements, ensuring flexibility and earthquake resistance. Four to six main pillars, called saka, support the roof and wall frames. A foundation of flat stone pedestals serves to transfer the load to the ground and prevent the wood from coming into direct contact with soil moisture.

1. Roof Construction

The roofs of traditional Sasak houses are designed to be very low and the doors are small, so that guests must bow down. This bowing gesture is a sign of mutual respect and appreciation between the guest and the host. (Widianti et al., 2017). The roof of the Sasak barn house is shaped like a mountain, sloping downwards at a distance of 1.5 to 2 meters from the ground surface (sulaeman, 2025). The roof of this building is shaped like a pyramid or steep saddle with a slope of around 45–60° to accelerate rainwater flow. The roof frame uses petung bamboo or light wood tied with a rattan rope system. The roof covering is made of alang-alang (alang-alang) or palm fiber, which functions as heat insulator and rain barrier. The roof overhang is designed wide enough to protect the walls from rainwater splash.

2. Wall Construction

The walls of this building are constructed from woven bamboo called gedek. The surface of the walls is coated with a mixture of clay and buffalo dung, which serves to stabilize the temperature and seal air gaps. The wall structure serves as a non-structural filler, while the wooden frame carries the main load. Currently, some Bale Tani use red bricks arranged systematically, known as masonry, as the walls (L. Saputra, 2025).

3. Floor Construction

The floor of this building is constructed of clay mixed with buffalo dung, compacted until smooth and hard. This natural material provides termite resistance, is soft on the feet, and maintains humidity. The floor, without a floor joist structure, is built directly on the ground, slightly elevated above the surface.

3.2.2 Structure and Construction Bale Lumbung

The building's main structure uses four main pillars, called saka, made of jackfruit, coconut, or local hardwood. The pillars rest on round stone bases, which support the building's weight while preventing the wood from touching the ground. The lower part of the building is left open with raised platforms to allow air circulation and prevent pests. The structural elements are connected using wooden pegs and rattan ties.

1. Roof Construction

The curved gable roof (mamak roof) uses a bamboo frame. The roof covering is made of thick thatch, which protects against heat and rain and maintains a stable temperature in the storage area. The roof's edges are typically elongated and slightly curved upward, symbolizing prosperity and well-being.

2. Wall Construction

The walls of this building are constructed from woven bamboo called gedek. The surface of the walls is coated with a mixture of clay and buffalo dung, which serves to stabilize the temperature and seal air gaps. The wall structure serves as non-structural filler, while the wooden frame carries the main load.

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3. Floor Construction

The floor of this building is constructed of woven bamboo called pelupuh, which is lightweight and allows air to circulate from below. The floor is supported by transverse wooden beams tied to the main pillars. This floor structure is designed to support the weight of the harvest stored above.

3.3 Comparison of Farmhouse Barn Materials

Based on the discussion of traditional building materials in Sade Village, it can be concluded that the Bale Tani and Bale Lumbung represent vernacular architecture that not only functions technically but is also rich in cultural values. The Bale Tani, as the main residence of the Sasak people, utilizes local materials such as river stone, clay, bamboo, wood, alang-alang grass, and natural mixtures for flooring. The choice of these materials demonstrates local wisdom in creating a residence that is adaptive to the tropical climate, environmentally friendly, and easy to repair. Meanwhile, the Bale Lumbung functions as a storage place for harvests, especially rice. The building structure uses river stone foundations, wooden columns and beams, tiered floors made of bamboo and wood, and a thatched roof. This design demonstrates a balance between the technical function of protecting the harvest from moisture and pests with its symbolic meaning as a symbol of the prosperity of the Sasak people. Overall, the materials used in the Bale Tani and Bale Lumbung reflect the principle of sustainability, as all materials are sourced from the surrounding environment, are renewable, and environmentally friendly. This proves that the local wisdom of the Sade Village community is still relevant as a reference in the development of sustainable architecture today.

3.3.1 Bale Tani Material

Bale Tani is a traditional Sasak dwelling built entirely from natural materials available locally. The selection of materials is based on principles of local wisdom and ecological efficiency. The main types of materials used include:

- **Cocos nucifera**

Used as the main structure, such as pillars and beams, coconut wood was chosen because it is readily available, lightweight, yet strong enough to support the weight of the roof (Kusumawardhani, 2018). Coconut wood was chosen because it is easily available in the coastal areas of Lombok, is affordable, and has sufficient strength to support the structure of the house.

Benefits: It is a strong, flexible, earthquake-resistant primary structural material (columns and beams), and has natural aesthetic value. According to Rapoport (1969) in House Form and Culture, the selection of local materials is a form of cultural adaptation to the geographical and economic conditions of the community. This shows that the Sasak people use materials according to their environmental potential without sacrificing structural function.

- **Bambusa vulgaris**

Functioning as a wall, floor, and partition element, the woven bamboo structure allows for good air circulation and maintains the thermal coolness of the space. (Rahmawati et al., 2021). Bambu tumbuh melimpah di sekitar perkampungan dan mudah diolah.

Benefits: Used for walls and floors, bamboo is porous, allowing for natural air circulation and maintaining a cool room temperature. Oliver (2006) explains that vernacular architecture developed through ecological adaptation, where bamboo materials support natural cross-ventilation and energy efficiency in humid tropical climates such as Lombok.

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- **Clay and Straw Mixture**

Used on floors to create a cool surface, and has moisture absorbing properties (Wicaksono & Penerbit, 2022). Both are used to make natural floors because they are abundantly available and easy to process without modern tools.

Benefits: Clay floors absorb heat during the day and release it at night, creating natural thermal comfort. According to Yeang (2006) in his theory of Sustainable Architecture, the use of natural materials that can regulate temperature passively is a form of sustainable architecture that is efficient and environmentally friendly.

- **Imperata cylindrica**

It is an important element for protection against the heat of the sun and tropical rain. Research (Astuti et al., 2020) He explained that the slope of the Bale Tani roof is designed to drain rainwater quickly and minimize leaks. It was chosen because of its lightweight, readily available, and good thermal insulation properties.

Benefits: Protects the house from heat and rain and speeds up the flow of water downwards without seeping into the structure. (Wicaksono & Penerbit, 2022) explains that the natural layered roof system in traditional Indonesian houses acts as a passive cooling element that supports the building's energy efficiency.

- **Rattan and Natural Fibers**

Used as a fastener between bamboo and wood structural elements without the use of metal nails. It is chosen as a fastener for structural elements because it is flexible and resistant to weather changes.

Benefits: Replaces the function of iron nails, simplifies maintenance, and increases the structure's resistance to earthquakes. Asquith & Vellinga (2006) in their Resilient Vernacular Design theory asserts that the use of traditional fastening techniques increases the resilience of building structures to dynamic forces such as earthquakes.

3.3.2 Bale Lumbung Material

A Bale Lumbung, as a harvest storage building, has a functionally different structure and materials from a Bale Tani. The primary focus of material selection is durability, lightness, and protection against pests and moisture.

- **Tectona grandis**

Used as the main pillars supporting a building (soko guru). This wood is resistant to termite attack and moisture, making it ideal for stage structures. (Lalu Amri Yasir et al., 2023). Chosen for its strength, termite resistance, and durability for stage structures that support the heavy weight of harvested produce.

Benefits: Provides long-term structural stability and resists moisture-induced deformation. Based on (Astuti et al., 2020), The selection of highly durable materials reflects the conservative values in Sasak vernacular architecture, which prioritizes protective functions and the sustainability of agricultural products.

- **Bamboo**

Used for wall frames and floors in rice storage warehouses, bamboo is a readily available and fast-growing plant in Indonesia (Gaffar Bakri, 2024). Bamboo grows abundantly around villages and is easy to process.

Benefits: Used for walls and floors, porous bamboo allows for natural air circulation and keeps the room temperature cool. Oliver (2006) states that traditional building forms and materials are the result of local climate adaptation to protect food resources, demonstrating the ecological efficiency of agrarian communities.

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- **Natural Stone (Loose Stone Foundation)**

Bale Lumbung uses a cement-free stone foundation system that allows for natural soil movement without damaging the building structure, in accordance with the theory of earthquake-resilient vernacular architecture (Asquith & Vellinga, 2006). Natural stone is easily available and the loose foundation system allows the building to move flexibly during earthquakes.

Benefits: Reduces structural damage due to ground movement, while maintaining ventilation under the building. Asquith & Vellinga (2006) emphasized that the non-rigid foundation system is an adaptive strategy of vernacular architecture in earthquake-prone areas, reflecting local structural intelligence.

- **Natural Fiber Rope (Gonda Rope and Rattan)**

Used to tie structural elements together and facilitate maintenance. Besides its functionality, the use of natural rope also has symbolic meaning, symbolizing the bond between family members (Astuti et al., 2020). Used to bind joints because of its strong yet elastic properties.

Benefits: Facilitates dismantling and regular maintenance of the barn structure. Koentjaraningrat (1984) in his Local Genius theory explains that the use of natural materials with traditional techniques is a form of local knowledge that is passed down to maintain a balance between technology and culture.

3.4 Comparison

A. Wood

Wood is a renewable resource that can be managed sustainably (Eka Saputra Yupa et al., 2024). Wood is the primary material used in the Bale Tani and Bale Lumbung. The Bale Tani uses coconut wood because it is lightweight, readily available, and strong enough for residential construction. Meanwhile, the Bale Lumbung uses hardwoods such as teak or jackfruit, which are more resistant to weather and termite attack. The use of coconut wood reflects the efficiency and utilization of local resources, while hardwood is chosen for its high resistance to loads and environmental conditions. This aligns with Rapoport's (1969) opinion, which states that vernacular materials are selected based on their function and local ecological context.

B. Bamboo

Bamboo is used in the Bale Tani and Bale Lumbung, each with different functions depending on the building's needs. In the Bale Tani, bamboo is used as walls and secondary supports due to its flexibility and fast-growing nature. Furthermore, bamboo also has structural and aesthetic value, enhancing the building's appearance. Meanwhile, in the Bale Lumbung, bamboo is used on the storage floor to maintain air flow within the barn, maintaining circulation and preventing excess humidity. This use of bamboo aligns with Yeang's (2006) thinking, which emphasizes the importance of natural materials in supporting passive cooling systems in sustainable architecture.

C. Clay

Clay is used in the Bale Tani and Bale Lumbung, with functions tailored to the building's thermal and environmental needs. In the Bale Tani, clay is used for the walls and floors due to its ability to maintain a stable room temperature, acting as a natural thermal regulator. Meanwhile, in the Bale Lumbung, clay is placed at the base of the pillars to reduce humidity and prevent termite attacks. This use of clay aligns with Olgyay's (1963) theory on thermal mass in tropical buildings, which emphasizes the importance of natural solid materials in maintaining temperature balance and thermal comfort.

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D. Roof (cogongrass)

The roofs of the Bale Tani and Bale Lumbung both utilize natural materials that serve as shading elements and microclimate regulators. The Bale Tani uses alang-alang grass because it is lightweight, inexpensive, and acts as a natural heat insulator. Meanwhile, the Bale Lumbung uses ijuk (alang-alang) to help maintain air circulation and protect crops from heat and rain. Both types of buildings apply passive design principles through the use of porous materials that allow for natural air exchange. This aligns with Ken Yeang's (2006) view that local organic materials contribute significantly to energy efficiency in tropical buildings.

E. River Stone

Stone is used as a foundation element in Bale Tani and Bale Lumbung, with functions that adapt to the structural needs of each building. In Bale Tani, stone is used as a simple foundation placed directly beneath the walls or wooden pillars to support the basic structure. Meanwhile, in Bale Lumbung, stone serves as a support for the stilts to prevent the wood from coming into direct contact with the ground, thus preventing moisture and termite damage. The structural system in Bale Lumbung demonstrates a higher level of sophistication because it is able to extend the life of the wood material by separating it from the soil. This is in accordance with Ching (2014) who stated that the stone foundation acts as a moisture barrier.

F. Organic Fiber

Natural fibers are used in the Bale Tani and Bale Lumbung, each with its own distinct function, depending on the construction needs. In the Bale Tani, natural fibers are used as binders and fillers for joints between building elements, while in the Bale Lumbung, they are used as a coating or soundproofing for the roof area. This use of natural fibers reflects the zero-waste principle of traditional architecture, where every material is utilized optimally without leaving any residue. This aligns with Irawan's (2021) view that traditional Indonesian architecture integrates local materials sustainably and in harmony with the environment.

4. CONCLUSION

Based on the research results, it can be concluded that Bale Tani and Bale Lumbung in Sade Village represent vernacular architecture that intelligently combine functional, ecological, and cultural values through the use of local materials that are adaptive to tropical climates and resilience to disasters. The differences in construction techniques between the two demonstrate a sharp specialization of functions, where Bale Tani prioritizes thermal comfort for its occupants, while Bale Lumbung emphasizes crop protection through structural durability and optimal air circulation. As a recommendation, the principle of sustainable architecture needs to be integrated into contemporary architectural design through the adoption of low-carbon materials and natural ventilation techniques, accompanied by efforts to conserve vegetation that provides local materials around the village to ensure the availability of traditional raw materials. In addition, technical documentation of this local wisdom is needed so that the traditional Sasak construction system not only survives as a cultural identity, but also becomes an applicable solution for the development of environmentally friendly buildings in the future.

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