

# An investigation of spatial arrangement, form, and structural system of traditional houses in Pedawa indigenous village - Bali

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**Abstract.** The Balinese traditional architecture has become valuable inheritance from the ancestor which still exists and is preserved until now, it is a symbol of local culture and reflects its characteristics. However, overpopulation has become one of the major challenges for Bali to cope with, and the impact of this phenomena significantly transform the traditional houses both its use and its form. The uniqueness of the architecture of Pedawa village has not yet been investigated in previous research. This paper aims to explore the detail of spatial arrangement, form, and structural system of the traditional houses, and its conservational effort. The case study method is employed for this research. Both primary and secondary data from interview, site observation, and literature data are analysed with qualitative analysis. The results show that the locals make every effort to sustain their values. The unique spatial arrangement, form, and structural system of the houses are strongly influenced by local customs; lifestyles; beliefs, and the environment. Hence, challenges are due to lack of understanding about conservation by the locals of their values and lack of natural resources; lifestyles; beliefs sand the environment.

## 1 Introduction

The Balinese traditional architecture is one identity of Bali which has been preserved. There are many types of traditional architecture in Bali according to its area or region. The traditional houses from one region to the other have different shapes and forms, such as their sizes; functions; ornaments, and materials. Traditional indigenous architectures are also different from the common traditional architecture widely known as Balinese traditional architecture. However, they adopt similar concepts from the past. The important thing is the strong relationship between humans, the nature, and the gods known as the universal concepts of Tri Hita Karana. This concept maintains the harmonious relationships amongst them. It is the foundation of most indigenous village settlements, traditional houses, and villages across Bali.

The traditional house is a symbol of local culture and reflects its characteristics. A traditional house could reflect the characteristic of the local culture which includes norms, values, behavioural patterns, artefacts, and activities [2]. The expression of the local residents' sociocultural system is reflected on their architecture; therefore the architecture is based on their local norms, values, and behaviour [11, 15]. According to Samadhi [10]

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there are seven Balinese Hindu conceptions of space and their core periphery continuum order in the contemporary Balinese spatial formation: 1) psycho-cosmic concept; 2) Tri Hita Karana; 3) Tri Angga; 4) Kaja-Kelod; 5) Kangin-Kauh; 6) Sanga Mandala; 7) local knowledge systems (Tri Pramana and Tri Masa). These conceptions reflect their degree of importance within the spatial formation.

Pedawa village is one of the old indigenous villages in Bali which has an ancient heritage from megalithic era. The uniqueness of the architecture in Pedawa village has not yet been investigated in previous research about this village. This paper aims to explore the detail of spatial arrangements, forms, and structural systems of the traditional houses. At the same time, it shows that the characteristics of Pedawa house are different compared to the well-known Balinese traditional house typology. Further, this paper also reveals the effort of the locals to sustain their values and the challenges they cope during the conservational process.

## 2 Pedawa village overview

This village is located in Banjar District, Buleleng Regency, it is about 30 km to the west of Singaraja. Located on the highland about 450-800 above sea level, this village is considered to have colder temperature than the villages in the mainland. The name of Pedawa is derived from Pada Wang which means everyone is the same, Pedawa also means Panjak Dewa (God's helper). This village is one of the 62 indigenous villages in Bali. It has existed before Hindu and Buddha religions came to Bali during the Majapahit Kingdom [5].

This village has two ancient heritages in the form of sarcophagus in Jinjit and Ingsakan area as proof that this village has existed in the megalithic era. It has its own uniqueness based on its nature, architecture, and tradition which has not been explored in depth yet. In addition, the uniqueness of this village is that there are no castes in the community like other traditional villages in Bali generally. Furthermore, the characteristics of public temples in Pedawa are different from those in other traditional villages in terms of land division concept. The well-known concept for public temple land division in Bali is Tri Mandala (three divisions of the area of public/profane, semi public and private/ sacred area). Though, the temples in Pedawa only use the concept of Rwa Bhineda (two divisions of sacred and profane) and Eka Bhuana (no divisions of sacred and profane).

There are 62 indigenous villages identified based on the research of Carole Muller in 1980 and the inventory of the Government of Bali, Department of Public Works with the project entitled The Conservation of Villages and Environment Planning in 1988/1989 [5], but only few of them were explored in architectural point of view. Some research about Pedawa has been done by some scholars. The research was in the field of agriculture conducted by Udayana University ([www.pps.unud.ac.id](http://www.pps.unud.ac.id)); research on the management of funding in adat village and dinas by Tera Padmani, *et.al* in 2015; research on health by Budiarta and Suka Aryana in 2012; research on education of primary school children by Komang Arini *et.al* in 2013; and some unpublished field surveys [8].

## 3 Method

The case study method is applied for this research. This method offers a descriptive analysis to analyse the relationship between the research object and the related determinant factors such as history and community and individual behaviour across the sites. This method helps the researcher to find a comprehensive way to explore the object of research deeply [13]. Therefore, this method is very suitable for research in social disciplines. The strength of this method is that all data could be gathered from different data collection

methods or a combination of several data collection methods both qualitatively and quantitatively. This research applies some interview with 12 selected respondents and observes 24 indigenous houses as the primary data. The secondary data were gathered from the report on the physical data of the village, village map, local regulation, custom regulation named awig-awig, and some relevant literature. The use of multiple source of data enhances the quality of analysis and optimizes the result [6]. Using two different methods of data collection would improve the objectivity of data before the analysis process [9].

## 4 Results and discussion

Traditional house in Pedawa village has two different types. The first one is called Bandung Rangki which has 18 wooden columns and the second one is called Sri Dandan which has 16 wooden columns. The former is the authentic Pedawa traditional house, while the latter is the influence from neighbouring village of Cempaga. Therefore, the majority of traditional houses in Pedawa are Bandung Rangki. Both Bandung Rangki and Sri Dandan have similar functions within the house which reflect, looked at from its spatial arrangement.

### 4.1 Spatial arrangement

Spatial arrangement of the traditional house both Bandung Rangki and Sri Dandan is based on the daily activities of the owner. Sulistyawati mentions that a traditional house in Bali has two functions which includes a place for living and an activity such as the area for sleeping, eating and resting; and the second function is for psychological needs such as doing ritual activities and local traditions [12, 15]. Further, Balinese traditional houses are classified into four attributes which include: sociology; symbolic; morphology; and function [7]. It is clear that Balinese traditional houses as a place for different kinds of activities for both physical and psychological activities of the owner.

The traditional houses in Pedawa, both Bandung Rangki and Sri Dandan, have a similar spatial arrangement based on the activities of the owner. There are six categories in daily and special activities of the villages.

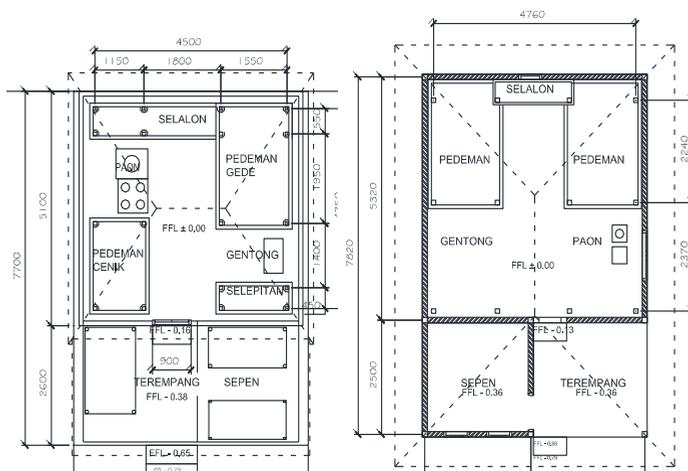


Fig. 1. Bandung Rangki (left), Sri Dandan (right)

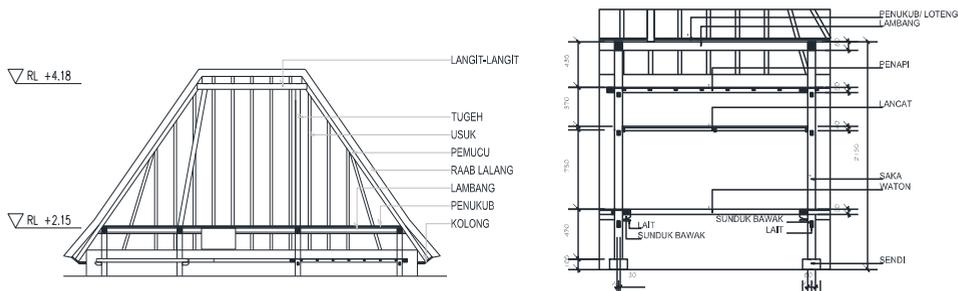
The spatial arrangements (see figure 1) are divided into six categories: {1} Area for resting and sleeping consist of two different bed sizes called Pedeman Gede (for parents

and has bigger size) and Pedeman Cenik (for children with smaller size). These two beds are made of wood and these beds columns are the structure of the house. Other function for the Pedeman Gede is to place offering during ritual ceremonies; {2} The activity of cooking is accommodated with a kitchen called Paon. The kitchen has three different types of burner made of Tanah Polpolan (soil/clay), the three different burners are: (a) Paon Tuak (the biggest one, for making palm sugar), (b) Paon Jakan (medium one, for cooking rice and meat) and (c) Irun (the smallest one, for heating food); {3} The social activities in this house are performed in the inner part of the house as the empty space called Tengan Umah (for hosting relatives only) and the front part of the house serving as veranda called Terempang (for hosting guest); {4} To accommodate ritual activities, this house has Pelangkiran placed on the top of Pedeman Gede, where the owner puts the offerings for their ancestor on a daily basis. Other ritual activities are also done outside the house with a special shrine made of bamboo called Sanggah Kemulan Nganten (see Figure 1 right); {5} To store the equipment and other household stuff and also groceries, these houses have areas called Sepen located next to the veranda. Further, there is also a place called Gentong to store kitchen equipment, cooked food, and water. The unprocessed rice and food from the farms are stored outside the house in a special building as a rice barn called Jineng. It is placed just in front of each house and commonly right in front of the front door of the house; {6} During the funeral ceremony, the corpse will be put on the Pedeman Gede and some offering along with the corpse. The corpse is bathed and laid on the Pedeman Gede before bringing it to the graveyard for cremation ceremony. The point to be made here is that traditional houses in Pedawa are able to express its characteristics. As mentioned by Broadbent [2] that the characteristics of the traditional house express its local culture including norms, values, behavioural pattern, artefacts, and activities. Nowadays some changes of the spatial arrangement occur due to changes of lifestyle and growing number of family members. Even though it changes, the culture and especially ritual activity are very well maintained.

## 4.2 Form and structure

The form and structure of these two houses adopted are very simple. The form of the house is using simple basic shape of form to be harmonized with the nature. The shape of roof adopted from a triangle which means the shape of mountain as a place of gods. Further, the triangle is steeper than a typical traditional Balinese house. It is due to the climate in highland which has more rains compared to the mainland. The shape of the floorplan is also using basic shape of rectangle. This shape provides an easier way for the people to arrange the spatial arrangement of the house based on their daily and special activities. Simple shape of these houses reflect simple ways of thinking and doing activities.

Further, the material for these two houses and the rice barns in the past were from local materials easily found within the surrounding areas. The local woods, bamboo and grass roof (called Alang-Alang) were commonly used for Bandung Rangki and Sri Dandan houses. The wooden columns that support the houses are integrated with the bed both for Pedeman Gede and Pedeman Cenik. All structural materials are made from local wood and bamboo. The roof and wall structures are made of bamboo. There are simple structure adopted for these houses. The wood and bamboo joining all the constructions were using simple cuts and wooden pegs called *lait* and also using bamboo ropes. Therefore the renovation to some part of the materials would not damage other parts or the whole structure. The structure of these houses are shown in detail in Figure 2. These types of construction system are simple and long lasting. Even though there were changes in the materials used, these simple construction principles are still applied to modern materials, and are well sustained for the future generation.



**Fig.2.** Structural system of roof (left), Pedeman Gede (right)

These two houses use human scale based on the concept of harmonious relationship between the human and the nature. This scale is grounded on the spatial design which has to consider the relationship between microcosm (human) and macrocosm (universe) which is the core conception of all the structures [10]. Therefore all the traditional indigenous houses in this village are based on this concept. By using human scales, the buildings nicely fit in with the nature without any attempt to dominate the nature.

### 4.3 House transformation, sustainability, and its challenges

The lesson learned from Pedawa traditional houses is that significant changes of the traditional houses today happen. People tend to have modern houses rather than old traditional indigenous houses. Further, natural resources are also one main reason such as the lack of good quality of bamboo and wood for house structures. Some houses are totally demolished and new modern houses are built, but some make transformation of the old houses. The changes of the houses such as (1) Replacing materials of the roof and wall structure for more modern, stronger and more affordable houses; (2) Replacing the floor material of local clay (Tanah Polpolan) to tile and bricks. The changes have brought some significant impacts to the thermal comfort in the house as new materials could not help to protect the people from cold weather. Further, the funeral activates for bathing the corpse could not be done due to the change of floor materials. However, two important functions that are sustained by the community and do not face any changes in the two traditional houses are the Pelangkiran and Sanggah Kemulan Nganten. These two ritual functions are the most important unchangeable functions. Rituals are the most important cultural attributes both in private or public uses and have created a specific spatial structure and it became the centre of orientation and identification for the community [4, 11]. The sustainability of this indigenous houses are strongly based on belief and religion of the community. Even though the community struggles to sustain their houses as a physical part, but they maintain their belief and religion.

As mentioned in the National Regulation No 11 of 2011, traditional houses are part of traditional villages that need to be protected. Therefore, the need to sustain traditional houses is very important as part of traditional villages themselves. It is important to widespread the knowledge to all society about the protection of traditional houses as cultural resources. Some efforts have been made to sustain the traditional houses in Pedawa by some group in the community. The efforts are: they work together to fix some traditional damaged houses; making family shrines; and making one original house for informational purposes. These efforts have brought awareness for the preservation of the cultural values in the community. To face the challenges for the future, it is suggested that the need to sustain the cultural resources is not only on the physical aspects but also more to the aspect of value and reinterpretation of the value and spirit into new built form based on the current context and situation. As mentioned by Olgyay in Altomonte [1], to promote sustainable

design in a built environment, architecture must therefore assume a further dimension, conscientiously responding to the context where it is built and to the environment as a whole. Cuthbert [3] points out that architectural forms in Bali are not fundamentally architectural typologies, but are based on social typologies such as caste, class, and capital. However, since Pedawa does not recognize any caste and that everyone is socio-religiously the same, then there are no typologies for the houses, and it would be easier to sustain the existing cultural values.

## 5 Conclusion

The results show that the space arrangement of the traditional houses is closely linked to the local tradition and the lifestyle of the population in the past, while the transformation of the spatial arrangement is also the result of the change of life style and demographic in this village. However, the transformation of the spatial arrangement of the two houses still preserve the space for rituals as a proof that the villagers still have the same belief as their ancestors. The spatial arrangement, and the choice of form, material and structural system of Bandung Rangki and Sri Dandan refer to the local climate; the ability of local craftsmanship; affordability; local belief; local custom; and local natural and materials in the past. The building detail and technique have some similarity to the general Balinese traditional architecture typology. Thus, the spatial arrangement, form, material, and structural system of the traditional houses in Pedawa are used to accommodate the local's daily activities, protecting them from the local climate which serves as a form of the local identity. Lastly, the main important factor of the sustainability of this house is based on the belief and religion of the local community.

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