

# The Some Aspects of Forms and Raw Materials Wood Buildings at the Liyangan Site

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## ABSTRACT

The Liyangan site is located in Liyangan, Purbosari, Ngadirejo, Temanggung, Central Java, Indonesia, was buried by material from the eruption of Mount Sindoro and reappeared due to sand mining activities in 2009. Based on the archaeological data found, the Liyangan Site has a very complex function with indications of traces of worship, settlement, and agriculture activities from a long period of time between 5th to 10th centuries AD. At the Liyangan Site, several buildings made of wood were found in a state of charcoal, whose remains can still be seen. The discovery of the remains of this building is very interesting if it is related to the function and character of the Liyangan Site which is very complex. The writing of this article aims to inform the aspects of the form and raw materials found in wooden buildings at the Liyangan Site. This study uses the archeoforestry method, which aims to reconstruct past life based on material remains with a forestry approach. Based on the analysis of data found in 2012, 2018, and 2020, it can be seen that the form of wooden buildings at the Liyangan Site consists of houses or residences, and rice barns, with raw materials derived from palm trees, bamboo, petung bamboo, puspa, jamuju, and pasang. The discovery of the remains of wooden buildings at the Liyangan Site provides information about the form of residences and rice barns during the Old Javanese period, as well as the reasons for choosing the use of wood as the construction of the building.

**Keywords:** *The Liyangan Site, The Wooden Building, The Rice Barn, The Eruption of Mount Sindoro.*

## 1. INTRODUCTION

The Liyangan site, which is located in Liyangan Hamlet, Purbosari Village, Ngadirejo District, Temanggung Regency, Central Java, is one of the relatively new sites, if calculated from the archaeological data found at the end of 2008 accidentally by sand miners. The Liyangan site consists of areas or locations related to worship activities, residential activities, and agricultural activities which are all three integral. (Riyanto, 2016: 50). This description makes Liyangan called a very complex site, in addition to its large area. The complexity of the Liyangan site is also shown by the diversity of data, almost all of which are in a charred condition due to the impact of the eruption of Mount Sindoro. The data includes structures and buildings consisting of temples, batur, fences, taluds, and stone roads; features consisting of holes used for bamboo and wood poles and agricultural land features; artifacts made from Chinese

ceramics during the Tang Dynasty various form; pottery container artifacts; stone artifacts such as beads, pipisan, and gandik; as well as artifacts made of metal in various forms; organic data, in this case the data that is classified as rare, namely sheet-shaped cloth and strappy bags; confectionery and agricultural products such as grain, nutmeg, and seeds; wood fragments from building and tree elements; and ecofact which generally includes fauna bone fragments (Riyanto, 2015: 36-46).

The diversity of the data shows that Liyangan is not just a worship site but tends to be a settlement site that at least includes residential, agricultural, and worship areas. The area of worship is indeed the most prominent, which includes buildings made of stone such as temples, batur-batur, and lightning. Residential areas are marked by the discovery of the remains of wooden buildings, the rest of daily equipment such as items made of pottery, ceramics, metal, and stone. Agricultural areas are indicated by findings in the form of yoni distribution of agricultural markers at the top of the site, metal

agricultural equipment, and rice and grain residues (Riyanto, 2016: 51). The temporal aspect is an interesting aspect to pay special attention to precisely because in this case it relates to the long chronological range of the site and on the other hand the area of worship with a Hindu religious background stands out so that it is easily associated with the Ancient Mataram kingdom. The results of ageing through carbon 14 analysis based on samples of bamboo charcoal, wood, and fiber taken from several locations resulted in the AD calendar age of 587, 742, 846, 913, and 971 (Riyanto, 2014b: 101; Riyanto, 2015: 47).

Since the Liyangan Site was reported and discovered, various agencies have carried out research activities at this location. The Archaeological Center of Yogyakarta as an agency that has research duties and functions in the working areas of the Yogyakarta, Central Java, and East Java Provinces conducted research and surveys at the Liyangan Site from 2010 to 2020. In 2015, the Culture and Tourism Office of Central Java Province collaborated with the Archaeological Center of Yogyakarta conducted research at the Liyangan Site, which in 2015, 2017, and 2018 the Temanggung Regency Culture and Tourism Office collaborated with the D.I. Archaeological Center of Yogyakarta is also conducting research at the Liyangan Site.

Regarding information regarding the findings of wooden buildings at the Liyangan Site, namely when research was carried out in 2012, 2018, and 2020. The purpose of writing this article is to find out some aspects of the forms and materials of wooden buildings at the Liyangan Site.

The Archaeological research at the Liyangan Site in 2012 with the aim of knowing aspects of site area, form and variety of settlement components in sector 01, as well as functional relationships between components and spaces. Based on the results of the study, the area of the site: the area of the Liyangan site in the research phase III in 2012 has not been sharpened. However, the hypothetical description that the site area covers a radius of 300 meters from the temple as the axis has not been corrected by new data so that it can still be used as a temporary reference. With regard to the spatial component, in sector 01 there is at least a residential component which includes 6 spaces and consists of the following components, the stairs leading to the temple and the hallway which are in the northeast of the temple; continued with the temple fence whose ends were found in phase II research; Batur pendopo in the northeast of the stairs – the hallway and northwest of the temple fence; The ends and elbows of the white stone fence (outer fence?) in the northeast of the temple fence; Stairs and hallways to the north of the temple; Advanced structure of the temple fence; Boulder

troughs found at the corners; Rock formations and signs of soil compaction between the two ends of the fence.

Regarding the functional relationship between components and space, it can be described as follows: Room A and Room B are the main areas related to religious aspects or places of worship. Room B is a place used in worship processions, especially in terms of preparation before heading to the temple building in Room A. Room C1 which is marked by houses on stilts "lined up" was initially thought to be a residential area, but based on its location, other allegations emerged, namely that the houses are not dwellings but as "dharmasala", a place to prepare for the procession.

In 2018, The archaeological research at the Liyangan Site showed that almost all of them were in a charred condition due to the impact of the eruption of Mount Sindoro. The diversity of the data is that structures and buildings consist of temples, batur, fences, taluds, and stone roads; features consisting of holes used for bamboo and wood poles as well as features of agricultural land; artifacts made from Chinese ceramics during the Tang Dynasty in various forms; pottery container artifacts; stone artifacts such as beads, pipisan, and gandik; and metal artifacts of various shapes; organic data, in this case it is data that is classified as rare, namely sheet-shaped cloth and rope bags; food and agricultural products such as grain, nutmeg, and seeds; wood fragments from building and tree elements, and ecofacts which generally include fauna bone fragments.

The diversity of the data shows that Liyangan is not just a worship site but tends to be a settlement site that at least includes residential, agricultural, and worship areas. As part of a long-term research series, 2018 focused on three areas, namely housing, religion, and the environment. The location of the excavation was chosen outside the worship area (enshrinement complex) based on the survey results which showed the potential of the data to reveal the three focus areas of the 2018 research, located about 120 meters from the main temple. As a result, the residential area is marked by the discovery of a courtyard or yard spot along with the building, namely a "house" on stilts made of wood, bamboo and fibers. All in the form of charcoal because the building "house" was affected by the eruption of Mount Sindoro in the 11th century. The courtyard is protected with a boulder slope of about 1.5 meters high, the surface is solid, relatively flat, there is another boulder arrangement as a yard divider, there are small pieces of pottery and ceramics, even visible traces of past activities on the ground surface of the courtyard. The "house" building is 10 meters from the talud. The components are quite complete, there are stone pedestals as bases, boards for floors, beams and room insulating boards, woven bamboo, ribs, battens, to piles of fibers for the roof. Because the condition of the remaining charcoal of the building is very fragile, the

excavation was carried out very carefully. Not all of the volcanic materials that "seal" the components are opened, therefore there are things that cannot be known, such as the size of the building, shape, facing direction, and spatial layout. The chronology of the remains of this "house" is based on ceramic shards from the Tang Dynasty, 9th century,

In October 2020, it started with information from BPCB of Central Java Province with the finding of charcoal concentrations at the Liyangan Site during fence rehabilitation activities and rescue excavations at the Liyangan Site. Research on the finding of charcoal concentration at the Liyangan Site, which was carried out by peeling the mound of earth, succeeded in revealing several types of charcoal that were concentrated in that area. The types of charcoal are wood charcoal, bamboo charcoal, and rice charcoal. Based on information from local workers who helped with the research activities, the height of the mound containing charcoal, both wood. Both bamboo and rice are actually much taller and wider than they appear today. This means that the findings of charcoal concentrations which include wood, bamboo, and rice charcoal are not complete and complete. However, the remaining components can still be analyzed which are the remains of the construction of wooden and bamboo buildings and their contents, namely piles of rice charcoal. So it can be concluded that the findings of concentrations of wood, bamboo, and rice charcoal are former rice barns.

## **2. IRON ORE SMELTING SITES IN THE BARITO RIVER BASIN**

### ***2.1. The House Building***

Prior to the discovery of the location where the charcoal was found, the most complete remains of the building were the results of excavations in 2010. The building materials consisted of wood, bamboo and palm fiber and based on the reconstruction of the remains, they were between 5 or 6 meters long and about 3 meters wide. The form is a stage supported by 16 main pillars, namely 4 each on each side. Wood is used for pillars, floors, and part of the walls of the building. Bamboo material is used for woven walls and roof construction. The fiber material is not only used as the roof of the building, but also used to make ropes to bind the construction of the building. The rest of the buildings found in this 2010 study are no longer on the site because at that time the location was still being mined, so they were lost along with the sand material. Judging from its shape, it is not certain if the building is a residential house, because it may be used for other purposes. However, at least the results of the reconstruction can be used as an illustration of the shape of the house at that time, namely a stage model made of

wood, bamboo, and fibers. (Tim Penelitian, 2018, hlm. 40).

One form of dwelling at the Liyangan site is complex and interrelated from one part to another. If depicted, based on excavation results in Block 1801, it shows that there is a "occupational corner" consisting of a bolder talud as high as about 1 meter that protects the expanse of land below it. On the expanse of land there is a building ("house") made of wood-bamboo-ijuk, in the form of a stage. The expanse of land is partly divided again with a one-layer bolder arrangement, the soil is slightly elevated at the "house" location. It is this expanse of land which can then be referred to as the "courtyard" or part of the courtyard, the exterior which is integral to the building.

The size of this building is relatively large, this is based on the components and materials used which seem to be made from selected materials. Several boards were recorded that were almost half a meter wide and up to 8 cm thick. In fact, when combined with the "courtyard" part, you can imagine how large the residential area is for one building. If the findings of this building are counted as one unit, then this is the 5th organic building unit. The first time the spot of wood-bamboo-ijuk charcoal which was later identified as a building was found in 2010 in three locations, meaning that three units were found at that time. The three building units are now gone, eroded by the mining process, and one of them is complete so that it can be reconstructed graphically. (Tim Penelitian, 2018, hlm. 36).

### ***2.2. The Rice Barn Building***

The identification of the concentration of charcoal found at the Liyangan Site resulted in a variety of Charcoal findings in the form of rice charcoal, wood charcoal, and bamboo charcoal. The three types of charcoal findings it was concentrated in one place in the worship area, precisely in the fourth page next door northwest of the Petirtaan Temple building. The concentration of these charcoal findings forms a mound because the surrounding land has been excavated using an excavator or backhoe. land that containing this concentration of charcoal is deliberately left for research purposes. The using excavation techniques cannot be done by digging boxes excavation but only stripping the mound to reveal the charcoal concentration. After the mound is peeled off, it looks like a pile Rice charcoal surrounds the mound. The thickness of the rice charcoal pile ranges from between 20-30 cm. Because it looks around the walls of the earthen mound, it is estimated that the remains The pile of rice charcoal is also as wide as the mound of land.

Furthermore, The charcoal in the form of woven bamboo was also found, mainly found on walls north of

the mound. The rest of the charcoal in the form of woven bamboo is mostly in the under a pile of rice charcoal. Apart from under a pile of rice, the rest of the charcoal is in the form of matting. The bamboo was also found on a pile of rice charcoal. According to energy information local people who helped this research, the concentration of the charcoal findings, especially the rice charcoal actually much higher than the current one. Most of that charcoal concentration has been lifted by the backhoe and wasted, only a small part can still be saved at the current location of the findings and some that have been removed are stored in the BPCB of Central Java warehouse.

If the information is correct, it is possible that the concentration of rice charcoal is quite high and it is possible that the previously unburned rice was piled in a smoky heap. What is visible now is rice charcoal, each of which is 20-30 cm high. Each sap of rice charcoal is insulated with woven bamboo. This is evidenced by the presence of woven bamboo under and above the pile of rice charcoal. Thus, the arrangement upwards at every 20-30 cm interval above the pile of rice charcoal is given a woven bamboo partition. Of course, the thickness of the sap when the rice has not been burned is thicker than the time after the rice is burned, because after the rice is burned there must be shrinkage. The possibility of the arrangement of the sapsap upwards with woven bamboo partitions was a rice storage technique at that time to make it more durable.

In the past, the rice harvest before being consumed was stored in rice barns. The storage technique to make the rice more durable is not to be threshed first from the stem. The rice with the stems is collected into one pile and tied. The piles of rice are then stored in the rice barn, of course, after drying to reduce the water content so that the rice becomes dry.

The findings of the charcoal concentration also found wood charcoal and whole bamboo charcoal and bamboo that had been split. The wood charcoal found is wood that is processed by humans, that is, wooden blocks have been formed, both large, medium, and small. The processed wood is thought to be part of the construction of a building. Likewise, the findings of bamboo charcoal, both intact and split, may also be part of the construction of the building. The charcoal blocks were mostly found under piles of rice charcoal and woven bamboo, which were visible on the north and south walls of the earthen mound in a north-south horizontal position. On the north wall it is found in boxes U41T28, while on the south wall it is found in boxes U39T28, U39T29, and U39T30. On the south wall, in addition to wooden charcoal blocks, wooden planks were also found which were not completely burned but were very fragile. The unburned wooden planks were also under piles of rice charcoal and on top

of woven bamboo. The unburned wooden planks were found in box U39T29.

On the east wall of the earthen mound, no fragments of wood charcoal blocks were found, but intact bamboo charcoal in a horizontal position stretching west-east, while on the west wall only one fragment of wood charcoal beams transverse north-south was found under intact bamboo charcoal stretching west-east. The whole bamboo charcoal on the east wall was found in box U39T31. On the west wall of the earthen mound, wood charcoal and intact bamboo charcoal were found in boxes U40T28 and U41T28.

If reconstructed, the wooden charcoal blocks and whole bamboo charcoal in a horizontal position, woven bamboo and rice charcoal piles are reconstructed, the possible arrangement is as follows: at the bottom are wood charcoal blocks across north-south, on top of which whole bamboo charcoal runs west-east, on top of the new bamboo charcoal put woven bamboo, on top of it there is a pile of rice charcoal, on top of a pile of rice charcoal as thick as 20 – 30 cm put another bamboo mat. Seeing this arrangement, the concentration of charcoal found at the Liyangan Site is probably a building for storing rice called a granary. Indeed, the vertical wooden charcoal blocks which are the pillars supporting the building have not been found in this study.

Likewise, the roof which may be made of palm fiber and the walls of the building which may be made of wooden boards or woven bamboo have not been found. This is because the concentration of charcoal found and in the form of a mound of earth is the middle part of the building. Meanwhile, the outskirts of the building which may be located on lower ground have not been excavated because the focus of the current research is stripping the mound to reveal the concentration of the charcoal found. In addition, it is possible that the edge of the building has been lifted by the backhoe so that the pillars supporting the building and the walls have disappeared. Likewise, the roof component may also have disappeared because most of the mounds where the charcoal concentration was found have also lost their tops (Priswanto, 2020, hal. 34–37).

### **3. THE ASPECTS OF THE WOODEN BUILDING MATERIALS AT THE LIYANGAN SITE**

The Information regarding the presence of wood charcoal, bamboo and palm fiber refers to a 2010 research report, namely in the east of the temple at a distance of about 50 m found the remains of a house structure with a wooden construction that has been burned to charcoal. The remains of the wooden house structure are in the form of houses on stilts attached to the walls of the sand dug cliffs. The remains of the

structure of the wooden house still appear to be standing upright with wooden pillars measuring 16 x 18 cm<sup>2</sup>, under the wooden pillars there is a pillar base in the form of andesite stone whose shape is irregular but the top is flat, the floor planks are 4 cm thick and wide. 54 cm, wooden walls measuring 6 x 7 cm<sup>2</sup>, and the remnants of the new palm fiber roof are only visible. (Research Team, 2010, p. 16).

As a follow-up to the findings in the form of a house structure with a wooden construction that has been burned to charcoal by sampling. Samples were taken in the form of wood that has become charcoal, bamboo that has become charcoal, and charcoal that is suspected of being palm fiber. The sample taken from the wooden house building includes several components, namely the pillars, walls, floors, roof components (ribs/battens), wooden pegs and roof components in the form of bamboo and fibers and pieces of wood charcoal whose origins are unknown (other components - other). Sampling was carried out at 3 loci of findings of burned wooden houses, namely ancient houses 1, 2, and 3.

The results of the analysis of the components of the ribs/battens are suspected to be wood from the *Fagaceae*, *Quercus*, *Quercus* spp species; the components of the house walls are thought to be wood from the *Theaceae*, the *Schima*, the species *Schima wallichii* (*Puspa*); and other components are thought to be wood from the *Podocarpaceae*, *Podocarpus*, *Podocarpus imbricatus* species (*Jamuju*, *Cemara Pandak*). (Tim Penelitian, 2012, pp. 119–122) (Riyanto, 2014, p. 62).

So far, the most widely used microbotanical analysis in revealing environmental conditions is pollen analysis. Pollen or pollen is a means of dispersal and fertilization of flowering plants. Pollen is produced by plants when the plants are mature. Pollen analysis in archeology has the goal of reconstructing the vegetation landscape and climate. In addition, pollen analysis also aims to reveal the relationship between humans and the surrounding vegetation environment in the past (S. Van Der Kaars et al., 2000). Pollen in archaeological research can be used to determine the environmental conditions and vegetation of a macro landscape. This happens because the pollen grains can be blown by the wind with a distance of more than 33 km. (V. D. Kaars, 1989) and is capable of being preserved at the location where it was deposited. Identification of pollen generally yields information about plant species in family strata or perhaps genera, but cannot be more detailed than that. Some pollen can also be identified to the type of plant or species. Some of the plant taxa indicated from the pollen grains have a fairly wide habitat so it is rather difficult to know where the identified pollen came from or to know the origin of the plant more precisely. However, this analysis of pollen can be used to determine the largest source of the pollen. In other

words, the information generated from pollen found in soil sediments is more representative of environmental conditions and vegetation on a large landscape. (Alifah, 2017, p. 139).

Related to knowing the description of environmental conditions and vegetation at the Liyangan Site in the VIII – X centuries AD, in early 2015 a palinological study was carried out to examine pollen data at the Liangan site in relation to the identification of plant species and the results showed symptoms of rice plants above the worship area (Research Team, 2016, p. 78). The palinological study at the Liyangan Site refers to the morphological characters found pollen from 7 plant families, namely Familia *Poaceae*, *Podocarpaceae*, *Liliaceae*, *Myrtaceae*, *Cyperaceae*, *Annonaceae*, and *Magnoliaceae* which were buried in sediments from volcanic material for  $\pm$  1,600 years. Reconstruction of the diversity and abundance of past plants based on morphological and molecular analysis of pollen fossils (Windriyani, 2016, p. ix).

#### 4. CONCLUSION

The beginning of the discovery of the Liyangan Site, findings in the form of wood charcoal, bamboo, and palm fiber were found which were thought to be part of a wooden house. Based on the results of the analysis of the components of the wooden building, it shows that there are several types, namely ribs/battens made of pairs of wood (*Fagaceae*, *Quercus*, *Quercus*); walls made of puspa wood (*Theaceae*, *Schima*, *Schima wallichii*); and other components come from jamuju wood, pandak pine (*Podocarpaceae*, *Podocarpus*, *Podocarpus imbricatus*). In 2018 at the Liyangan site, a concentration of wood charcoal was found which was suspected to be a wooden house like the one found in 2010. The "house" building with its components is fairly complete, there are stone pedestals as bases, boards for floors, beams and insulating boards. room, woven bamboo, usuk, battens, to piles of fibers for the roof. Therefore, there are things that cannot be known, such as the size of the building, its shape, the direction it faces, and its spatial layout.

The Research on the finding of charcoal concentrations at the Liyangan Site in 2020 which was carried out by peeling the mound of earth managed to reveal several types of charcoal that were concentrated in that area. The types of charcoal are wood charcoal, bamboo charcoal, and rice charcoal. Based on information from local workers who helped with the research activities, the height of the mound containing charcoal, both wood. Both bamboo and rice are actually much taller and wider than they appear today. This means that the findings of charcoal concentrations which include wood, bamboo, and rice charcoal are not complete and complete. However, the remaining components can still be analyzed which are remnants of

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The diversity of archaeological data shows that the Liyangan Site is not just a worship site but tends to be a settlement site which at least includes residential, agricultural, and worship areas. The area of worship is indeed the most prominent, which includes buildings made of stone such as temples, batur-batur, and lightning. Residential areas are marked by the discovery of the remains of wooden buildings, the rest of daily equipment such as items made of pottery, ceramics, metal, and stone. The agricultural area is indicated by the findings in the form of yoni distribution of agricultural markers at the top of the site, metal farming equipment, and rice and grain residues.

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