

Sustainable architecture: The lessons from *ume kbubu*, the traditional house of Fatumnasi Community

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received July 02, 2020 Received in revised form July 22 2020 Accepted August 06, 2020 Available online December 01, 2020</p> <p><i>Keywords:</i> Local culture Sustainable architecture <i>Ume kbubu</i></p> <p>*Corresponding author: Apridus Kefas Lapenangga Architecture Study Program, Faculty of Engineering, Universitas Katolik Widya Mandira, Kupang, Indonesia Email: apriskefas2@gmail.com</p>	<p><i>Ume kbubu</i>, as the traditional house of the Fatumnasi community, is a cultural product from local wisdom which has continually been adapted to the environment to ensure its sustainability. This research was, therefore, conducted to explore the principles of sustainable architecture in <i>ume kbubu</i> using an explorative approach with an ethnographic design applied to obtain necessary information from the objects of study such as the houses of the Village Head and the leader of Hamlet 1 in Fatumnasi village which were determined using a purposive sampling technique. The data were obtained through observation, interviews, and literature study and the results showed the <i>Ume kbubu</i>'s sustainability is due to its long adaptation and natural selection for years which makes it a sustainable architecture and was also found to fulfill the three elements required which are economic, social and environmental.</p>

Introduction

South Timor Tengah is one of the 20 regencies or cities in East Nusa Tenggara Province (Ranimpi 2016) and Dawan tribal areas on the Timor Island include Kupang, South Timor Tengah, and North Timor Tengah Regencies (Depdikbud 1986). The Island has been reported to have extreme weather variations such as the strong winds from the North observed to be causing heavy rainfall in the West season (Badan Pusat Statistik 2018). Meanwhile, strong winds blow from the south with heat in the east season while the transition season starting from April is characterized by intertropical winds crossing the Timor Island to the north and the south in October (Maemunah 2015). The Dawan community house is known as the local *ume kbubu* and has been observed to be serving the purpose of a residence and food barn (Purbadi

2010). It has a lower room which is a place to rest in the night as well as a fireplace in the middle used for cooking and warming the room while the upper room is to store food (Lapenangga and Lakapu 2019).

Sustainable architecture

Sustainability is illustrated through three intersecting circles connecting the social, economic, and environmental aspects (Williams 2007) as presented in figure 1. The environmental change is influenced by human's general preference for ego and power over the environment. Moreover, the term 'sustainable development' is always defined anthropocentrically without the inherent value in the ecological system and found to be outside the

instrument value used for humans (Bennetts, Radford, and Williamson 2002).

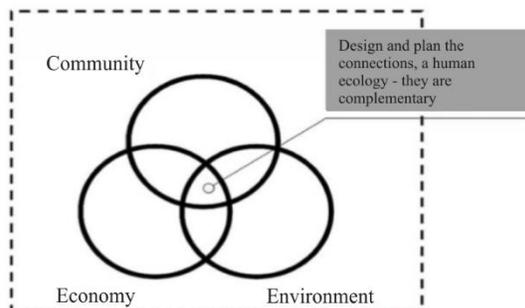


Figure 1. The 3 main aspects of sustainability
Source: (Williams 2007)

Traditions are sustainable for a long period and this is observed in traditional buildings (Suharjanto 2014) which are influenced by local wisdom and material availability in their architectural formation. Antariksa (2017) showed ideas and wisdom based on local perspectives are embedded in the people inhabiting a particular place (Antariksa 2017).

Local wisdom is defined as a collection of knowledge, practices, and beliefs developed through an adaptive process or adjustment from a generation to another (Piutanti 2015). It includes several aspects and life dimensions existing in local communities which are believed and observed to be consistently serving as a guide in human life and passed down from one generation to others (Purbadi, Djunaedi, and Sudaryono 2019).

The construction materials obtained from the surrounding environment reduce the carbon footprint produced during the material production process, transportation to the site, construction process as well as the activities of the occupants while consuming electricity (Lapenangga and Taneo 2019).

Traditional architecture encourages the use of more environmentally-friendly natural materials and renewable energy and also has the ability to fulfill the social, environmental, and functional needs of occupants (Tawayha, Braganca, and Mateus 2019). Wise people strive to maintain environmental sustainability to adapt to the changes in their existing environment (Bebhe et al. 2019). It has, however, been discovered that natural conditions encourage certain activities of humans which are directed towards adaptation to nature or proper acclimatization (Idham 2016). Moreover, it is possible to calculate the human

activities which produce CO₂ by analyzing the fossil fuels they use daily directly in the form of oil or natural gas and electricity consumed (Apridus and Prasasto 2016).

Ume kbubu

The word traditional refers to procedures and material objects accepted as norms in society with their elements passed down from one generation to the others usually verbally or more randomly through documents used to codify the knowledge, instructions, and information (Noble 2007). This means vernacular and traditional architecture is developed based on local needs and using local building materials to reflect local traditions. It is usually not constructed by officially trained architects but through the design skills and traditions of local builders (Gangwar 2016). *Ume kbubu* is, therefore, categorized as the traditional house built in line with local traditions. Moreover, the intrinsic values of beliefs and myths contained in culture have strengthened the concept and integrated it into the building construction process, especially in the case of traditional buildings (Subroto 2019).

Ume kbubu is generally a cultural product from the Dawan community being built by Fatumnasi, an area in the community, based on the belief that suaf (roof ribs) and supporting poles on the walls (*ni ana*) should have even number of elements at 26 and 24 respectively (Kelompok Kerja Arsitektur Vernakular Unwira 1992). Moreover, the architectural form is included as a physical culture or element and the functional aspect as part of the cultural social system or behavioral pattern while the meaning aspect is reported to be included in the cultural value system (Ashadi 2018).

The relatively cold weather in the community led to the provision of a fireplace in the middle of *ume kbubu* which also serves as a place to cook, warm the body, and as a means of lighting the traditional house (Prasetyo 2019). The smoke from the fireplace loft made using wood and bamboo is also used in preserving foodstuffs. The fireplaces are created in permanent locations and have grown extensively into building spaces which are also used to socialize and in performing rituals (Dewi, Trilita, and Safeyah 2017).

Method

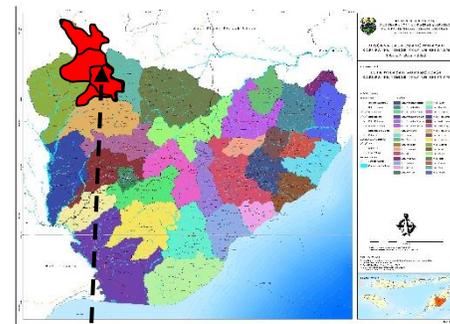
The relationship between sustainable architecture and *ume kbubu* was examined in depth using exploratory description methods with ethnographic design. All the aspects of *ume kbubu* including the physical elements such as size and shape, building construction, and non-physical elements such as economic life and socio-cultural society were analyzed. Furthermore, the physical and non-physical aspects were connected to the three basic elements of sustainable architecture which are social, economic, and environmental factors to explore the relationship between *ume kbubu* and sustainable architecture. Meanwhile, the most distinctive aspect of ethnographic research is the tendency to rely on observation as the main method to collect data (Groat and Wang 2013). Therefore, data were collected in this study by directly observing the residents of *ume kbubu* in Fatumnasi Village, 01 Neighborhood, and supported by literature studies. This involved measuring the object, identifying construction components, and forming the object material.

A purposive sampling technique was to determine the *ume kbubu* object by directly observing the house of the resource persons such as the Village Head and the leader of Hamlet 1 at Fatumnasi village.

Result and discussion

Research location

This research was conducted in the Mollo area, Fatumnasi District in Fatumnasi Village which is located at the foot of Mt. Mutis with some of its areas observed to be part of the Mutis Nature Reserve as shown in figure 2. The width is 34.97 km² or 17.60% of the sub-district total area and has a population of 1600 people with a density of 46 people per km² in 4 hamlets according to Central Statistics Agency of South Timor Tengah (2018) (BPS TTS 2018).



Map of South Timor Tengah Regency

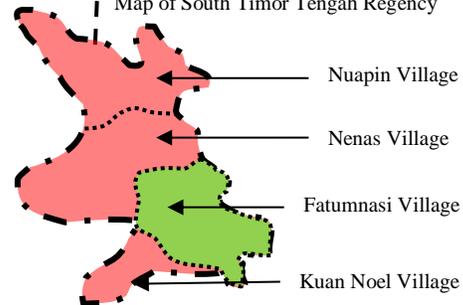


Figure 2. Map of Fatumnasi Village

Village spatial pattern

The community houses in Fatumnasi Village are fairly evenly distributed in each hamlet except for the nature reserve area which is a state-owned territory with hamlets separated into 1 to 3 and the fourth is directly bordering Nenas village on the Northside. The housing pattern is linear and spreads in line with the road pattern as shown in figure 3.

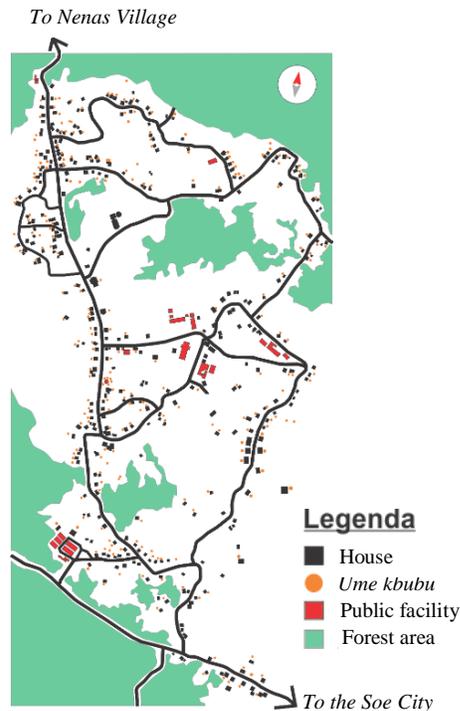


Figure 3. Map of villages and distribution of *ume kbubu*

The field observations and satellite sensing through Google Maps and interviews showed that almost every family has an *ume kbubu* with those observed not to have being either new families or those that have demolished theirs and expecting to rebuild.

The social life of the Fatumnasi people has, however, been influenced by time as observed in the need for a permanent house with a zinc roof compared to having only *ume kbubu* as a traditional house. The change in social status is also believed to be due to the acceptance of Protestant Christianity and the need for a place to be used for community worship. This, therefore, led to the rotation of the worship service in each house twice a week.

Some of the changes made to the existing *ume kbubu* in the Fatumnasi community are shown in [figure 4](#) and presented as follow:

1. The location in the village spatial pattern;
2. Function.

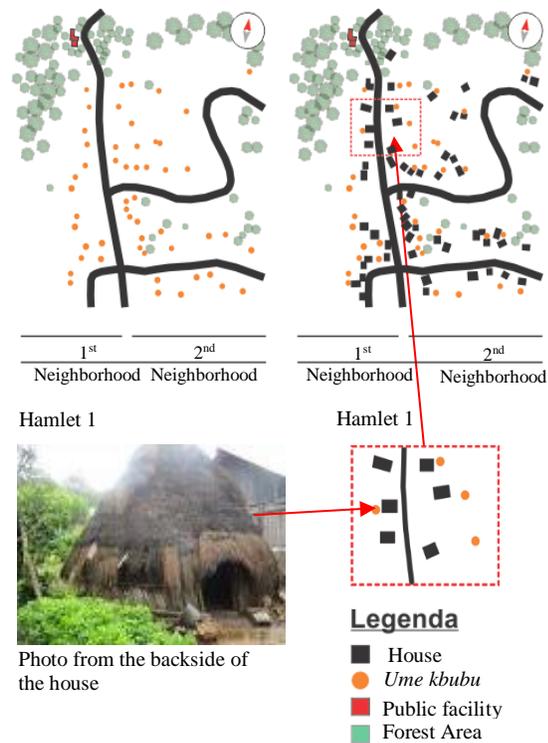


Figure 4. Location of *ume kbubu* in village spatial patterns

Culture and local wisdom in *ume kbubu*

The village is located at the foot of Mt. Mutis with an altitude of ± 1751 meters above sea level. It has cool air which produces a feeling of cold all year long. The data from the Central Statistics Agency showed the rainfall is quite high, reaching 526 mm in February which is the peak month of the rainy season with rainy days spreading almost throughout the year, even during the dry season (BPS TTS 2018).

This natural condition influences the type of residential accommodation developed by the Fatumnasi people. This is necessary due to the local and contextual creation of adaptation from culture and wisdom. The information from the interview showed June-August to be the peak of winter and several cattle and horses were reported to be dying of cold while grazing during this period. This led to the presentation of *ume kbubu* as a shelter which has been passed from one generation to the other and has been adapted to the surrounding environment. It is often referred to as a roundhouse due to its cone and circular shape as well as a door which is 1 meter high, thereby, requiring people to bow when going in and out. This is in line with the local wisdom which

presents the house as a protecting spirit which needs to be respected by bowing. The roof is also constructed to be conical in shape with the bottom side almost reaching the ground as shown in figure 5.

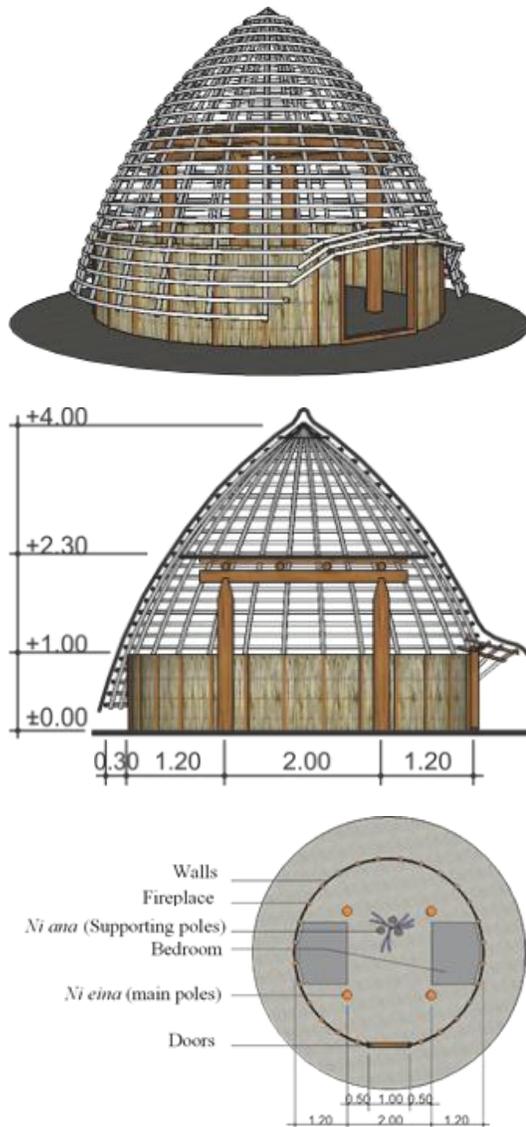


Figure 5. The plan and appearance of the *ume kbubu*

Sustainable architecture at *ume kbubu*

Sustainable architecture in the context of a traditional house also includes three elements of sustainability which are stated as follow:

1. Economic sustainability

Ume kbubu is a house in the community where all life processes begin. Its attic is usually used to store foods, especially corn, for up to 1 year or the following harvest season as shown in figure 6a. It

is also the storage area for looms used by women to weave while cooking.

a. Agriculture

Communities in Fatumnasi Village generally grow crops and raise livestock and this has been their major profession for generations. They use their yards and gardens for farming as shown in figure 6b-c with plants such as carrots, sweet potatoes/*petatas*, leeks, potatoes, and kidney beans being their mainstay commodities. The yields from these crops are sold to buyers from Kupang which come directly to Fatumnasi. Meanwhile, leeks are generally planted in the yard to ensure easy control and daily harvest. The price of carrots was also found to be Rp. 15,000 with high demand up to 100 kg per day during harvest from Kupang. Corn is a staple food usually processed into *bose* which is a type of food produced by crushing corn to remove the skin before cooking.

b. Animal husbandry

This is conducted using conventional methods with some of the cattle are tied around the yard while others are released in the forest or pasture as shown in figure 6d. Meanwhile, pigs are usually released near the garden to be fed easily by the owner but are normally moved stable close to the house during the winter. Each community has a large number of cattle and horses stamped or marked by the owner. Moreover, the farm animals are mostly used during parties, traditional ceremonies, grief, or prayer of thanksgiving after the *ume kbubu* construction.

c. Forest products

The forest at the foot of Mt. Mutis plays an important role in the lives of Fatumnasi people by being the source of food for livestock. It also supports the economic life of the community through its product such as forest honey which is produced from *Apis dorsata* bees in the area around the Mount Mutis Nature Reserve. These bees absorb nectar from the *Eucalyptus alba* tree when it blooms in June-July and December-January and build nests in the area to produce beneficial honey (Darusman 2015; Catriona 2016).

d. Weave

The weaving activities in the Fatumnasi community are being conducted mostly by adult women. Some of the products include blankets, sarongs, and shawls with the processing time observed to be in accordance with the woven fabric size and the complexity of the motifs. They are used by family members as traditional

clothing, blanket at night, and even sold as indicated in figure 6e. There are, however, three types of weaves and they include *futus*, *lotis*, and *buna*.



Figure 6. *Ume kbubu* is a place to live and store food

2. Social sustainability

The roof of the *ume kbubu* roof which dangles down to the ground and the absence of a window in its design allows the entrance of very minimal light. This, therefore, limit the activities to be conducted in the house during the day to cooking while others are outside. Moreover, the physical setting of the building and the absence of a fence in its yard influence the people to socialize intensely with each other. Community social relations are also strengthened by the habit of eating betel nut and story-telling between neighbors in free time. *Ume kbubu* is also usually constructed through cooperation by family and some of the closest neighbors between 2-3 days and the end of the is usually marked by a collective thanksgiving prayer.

3. Environmental sustainability

Environmental sustainability in *ume kbubu* is reflected in the construction materials used and the adaptation of forms to the surrounding environment.

a. Construction material

The materials used in constructing *ume kbubu* are considered environmentally-friendly due to their retrieval from around the site and the absence of carbon footprint starting from the collection to the processing stage. They are usually cut using a machete and transported from the traditional garden or forest to the construction site by human workers. These materials are easily obtained because they grow in the Fatumnasi environment and their life cycle is maintained and cultivated by the residents except for reeds and bamboo which grow very fast. They have the ability to last for up to 20 years due to continuous natural preservation through fumigation. Some of these materials include the following:

Ampupu wood (*Eucalyptus alba*)

Ampupu wood is the main material in the process of building *ume kbubu*. It is used as the main pillar (*ni eina*), supporting pole (*ni ana*) as well as the main and attic beams (*tunis*) which are obtained from trees with 30 cm and branches with 6-7 cm diameters. The doors also produced from wood boards. Meanwhile, the community was allowed to obtain wood from the forest in Mt. Mutis before it was converted to a nature reserve after which they are prohibited from cutting the woods. This, therefore, led to the initiative of planting in the village garden land for *ume kbubu* construction and others.

Bamboo

Two types of bamboo are usually used based on their sizes with the those with 3-5 cm diameter apply as battens (*takpani*) due to the ease with which they form a circle while those with large diameters of 15-20 cm from Betung bamboo are mostly used for stairs (*elak*), attic walls and floors (*pelupu*). The bamboos are obtained from near a spring on the edge of the Fatumnasi forest with their ecosystem quite maintained only due to their use for *ume kbubu* construction. However, due to the growth cycle of bamboo which is between 3-7 years, *ume kbubu* is usually maintained effectively up to the period for reconstruction.

Reeds

Reeds are used as roof material and obtained from the community's land. Meanwhile, its existence has begun to diminish due to the addition of agricultural land and this makes people without the material to buy from other residents. One reeds land area of 12-15 acres is valued at Rp. 500,000 and can be used to roof two *ume kbubu* buildings after which the excess is sold to residents in need of the material.

Cassowary wood

Cassowary wood is used as the roof rib (*suaf*) and this usually involves using a wooden stick with 5-7 cm diameter at the base and shrinks at the top end to ensure it is easily bent and bound to the other ribs. One of the ribs is usually obtained from 1 young cassowary tree which is 5 m high. This tree is easy to grow in the Fatumnasi area and most of the agricultural lands are fenced or planted using this tree in order to be available for developmental use.

The placement of the materials in the *ume kbubu* construction is shown in the following figure 7.

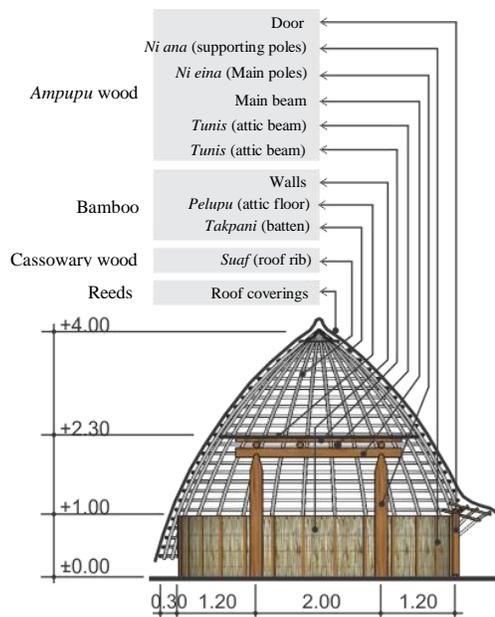


Figure 7. *Ume kbubu* construction material

b. Adaptation of forms

Form with the environment

The temperature in the Fatumnasi area is relatively low because it is on high terrain and often passed by strong winds from the south and east as well as the Mutis mountain in the north. The area is also often covered with fog which leads to high humidity reaching 90%. The *ume kbubu* forms adapt to the environment and their use as a shelter has been tested for a long time. A round plan with a cone-shaped building is an aerodynamic form as shown in figure 8. This, therefore, means it is very easy for the structure to pass through the wind which generally moves from the southeast. Moreover, a small windowless door with a long circular roof covering the wall

resists the cold air from moving directly into the building. The fireplace is also in the middle of the building and the smoke rising from the fire to the top of the building serves as a preservative for the corn and food stored in the attic. The fumigation or smoke does not also interfere with breathing due to its exit through the wall blemishes or split bamboo material and the roof with the reed structure. Furthermore, the poles, beams, attics, battens, and inner roof surfaces constantly exposed to the smoke are covered by a thin layer which naturally protects them from termites while the walls and poles of the *ume kbubu* are directly planted in the ground.

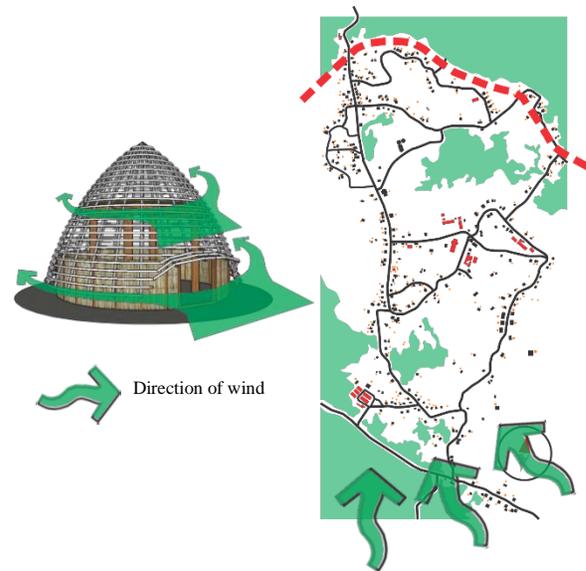


Figure 8. Direction with wind

Form with function

Ume kbubu forms are also adapted to the needs of the inhabitants by serving the function of a residence and a place to store food. Two beds are placed on the left and right sides with the fireplace in the middle which is used for cooking and heating the room. The fireplace also functions as a warmer for mothers that just gave birth due to the belief of the community in the ability of a relatively hot room to facilitate the release of residual blood during labor. Moreover, a storage area for kitchen equipment at the backside and space between the wall and the roof eaves is usually used to store firewood. Residents which are generally farmers conduct their farming activities in the garden during the day and this means there is no need for natural lighting through windows in the *ume kbubu*.

Conclusion

The thinking pattern of the Fatumnasi community is developing in line with the times and this is reflected in a shift in its architecture. The community understands having a permanent house with concrete walls and a tin roof improves its social status and this affects the *ume kbubu* layout and function in the environment but does not change its role as a place to start and give life. It starts life due to its use in the community, especially to keep the body temperature of women that just gave birth warm as well as their children while it gives life based on its application as a granary and to process food for daily consumption.

The use of *ume kbubu* as a traditional house is through a long adaptation process and natural selection for years and this, therefore, makes it a sustainable architecture. It also fulfills the social, economic, and environmental elements required for sustainability. (1) Economic sustainability, the use of *ume kbubu* as a food granary has an economic impact on society due to its application as storage for foodstuffs, weaving materials, and farming equipment. The yard around the building is also used in raising livestock and farming activities. Moreover, woven products are used by the residents as traditional clothing, gifts to neighbors for any events, and a commodity to sell in the city. Agricultural produce and yields are sold to Soe and Kupang cities, consumed by the residents, and distributed to neighbors or families in any events; (2) Social sustainability, *ume kbubu* is a traditional house built using local wisdom through mutual cooperation between the owner, neighbors, and close family. The end of the construction is always marked with a thanksgiving prayer and a meal together. Moreover, the absence of a massive fence in the yard allows neighbors to visit each other to tell stories and eat betel nut together in the afternoon after returning from the garden; (3) Environmental sustainability, the building is usually constructed using local materials such as ampupu wood, cassowary wood, bamboo, and reeds which have been discovered to have a low carbon footprint. This is associated with the non-use of mechanical equipment in the exploitation process around the site. They also have the ability to last up to 20 years due to continuous fumigation from cooking activities and this creates enough

time for the materials to regenerate in order to be applied for other *ume kbubu* development needs.

The economic, social, and environmental sustainability of *ume kbubu* is illustrated in figure 9.

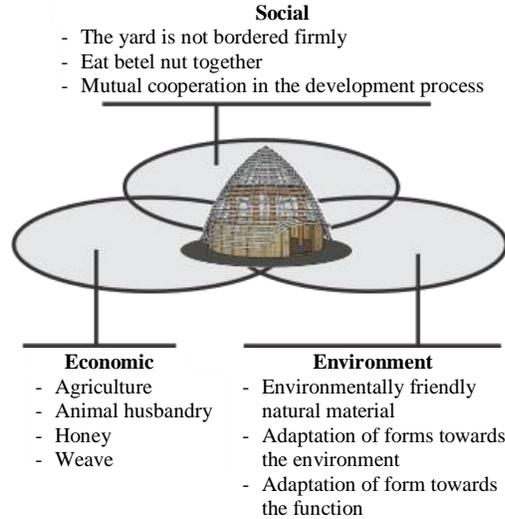


Figure 9. The sustainability elements in *ume kbubu*

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