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REGULAR RESEARCH ARTICLE

Ethnobotany of the Kombong Agroforestry System and Tongkonan Conservation in the Toraja Tribe, South Sulawesi, Indonesia

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ABSTRACT

The *Kombong* agroforestry system (KAS) has long been practiced and plays an important role in the livelihoods of the Toraja tribe's settlements, in addition to their social, cultural, and environmental sustainability. This research aims to explain the species composition and wood volume, how the utilization of plant species in the KAS has social, cultural, economic, and ecological functions, analyze the plant cultural significance of KAS of the Toraja tribe, the role of KAS for the conservation of Tongkonan Traditional Houses (TTHs) and KAS in preserving the Rambu Tuka' and Rambu Solo' traditional ceremonies of the Toraja tribe. The research used vegetation survey methods and in-depth interviews with respondents, which were conducted using a set of guidelines for questionnaires. The research results indicate that there are 115 plant species belonging to 49 families. The plant use category is high, with foodstuffs and fruit being the use category with the highest number of species. The index of cultural significance (ICS) of the Toraja tribe varies greatly, from very high categories to those whose use is not yet known. Rice has the highest ICS value, with a score of 130. The KAS and TTHs are closely related and are always found in traditional Toraja settlements. They form a unit that supports each other, and the existence and sustainability of a TTH largely depend on the preservation of the KAS. The KAS has a close connection to both the *Rambu Solo'* and *Rambu Tuka'* traditional ceremonies. All plant species needed to build and maintain a TTH and for conducting these two traditional ceremonies are found in the KAS. Thus, the KAS is very important for the Toraja tribe because it not only supports the economic and social aspects of their lives but also functions to protect the environment and traditional culture, including preserving the TTH form and the Rambu Solo' and Rambu Tuka' traditional parties.

KEYWORDS
Ethnobotany; *Kombong* Agroforestry System; Conservation; Tongkonan; Toraja Tribe.

1. INTRODUCTION

Rural communities use plants to meet their needs in terms of food, housing, cosmetics, and medicines. They have a close relationship with these plants, as they experience the process of knowing, cultivating, and using these plants over a long period (Ogwu et al., 2017). Their knowledge of medicinal plants is also passed on to the next generation (Navia et al., 2021). Ethnobotany is a multidisciplinary science that studies the relationships between people and plants (Gandolfo & Hanazaki, 2014; Silalahi, 2020) and is a part of ethnoecology. Ethnobotany is concerned with local communities that are noted for their cultural components related to plant utilization and classification, and it is very important for the conservation of biological resources (Najmah et al., 2022; Osawaru & Ogwu, 2014; Wakhidah & Sari, 2019; Wakhidah & Silalahi, 2020). Ethnobotanical research is very relevant, especially for tribes like the Toraja tribe in South Sulawesi that have traditionally utilized plants in aspects of their lives and still

adhere to traditional customs. For instance, Liling et al. (2016), Karaeng et al. (2020), and Rombe et al. (2022) have conducted studies that shed light on the relationship between culture and plant usage.

Each tribe has a different set of life values from other tribes in cultivating, utilizing and preserving plants. Differences in the cultivation, use and preservation of these plants are caused by differences in environmental, social and cultural conditions. Local communities such as the Toraja tribe utilize plants in their environment according to their cultural level. The local wisdom possessed by a tribe in cultivating, utilizing and preserving plants is a manifestation of their cultural level in managing the biological resources they have. The socio-cultural background of the tribe contains local knowledge and wisdom that is unique and different from other tribes (Permana, 2010). Index of Cultural Significance (ICS) is a form of evaluation of the total role of plant species in the life of a particular tribe. ICS is the results of quantitative ethnobotanical analysis based on the importance value of each type of useful plant based on the needs of local communities (Purwanto, 2002), intensity and exclusivity value (Helida et al., 2015).

The *kombong* agroforestry system (KAS) is defined as traditional land that is jointly owned by a family cluster around a t*ongkonan* traditional house (TTH) where various plant species are grown. They are both cultivated and naturally grown and cared for by family members. Plant and animal products are intended for building and maintaining TTHs, conducting traditional ceremonies, and general family consumption (Mulyadi, 2013; Paembonan et al., 2018). The KAS is very similar to the homegarden system found in West Java. Both systems consist of house buildings and various components such as forest plants, agriculture, and livestock (Liling et al., 2016; Karaeng et al., 2020; Rombe et al., 2022). Plant diversity in agroforestry systems, including the KAS, is influenced by many factors, including the socio-culture of an ethnic group (Wiersum, 2006; Galhena et al., 2013). The homegarden system is closely related to the life of its owner (Galluzzi et al., 2010). Homegardens serve as an important food source that supplies tubers, fruits, and vegetables for households (Galhena et al., 2013; Millang, 2021) and show the social status and economic level of a family (Coomes & Ban, 2004). In addition, homegardens with high plant diversity act as in situ conservation sites, especially for local species. In the tropics, homegarden agroforestry systems have a rich variety of plants. However, this diversity is under threat from land expansion as a result of population growth and the transformation of plant composition due to changes in the owner's lifestyle (Wiersum, 2006).

The sustainability of the TTH is influenced by various factors. such as the involvement of local government and cultural observers. The availability of wood as a building material is also crucial. Poles and pegs are required for the construction of a TTH: floors and walls are made of strong and durable wood, and the roof of the house is made of bamboo obtained from the KAS which surrounds the TTH (Alahudin, 2012; Pakan et al., 2018; Patriani, 2019). Thus, the sustainability of the KAS will support that of the TTH, or vice versa if the former is damaged, the latter will not be sustainable. The close relationship between the KAS and the TTH stems from the fact that the TTH plays an important role in the life of the Toraja tribe; it serves as a unifying symbol of family groups, a venue to carry out daily activities, a site to carry out traditional ceremonies, and a place to decide cases between family groups (Mulyadi, 2013). For this reason, it can be stated that the KAS is integral to the TTH. In the traditional Toraja village, two elements are always present: tongkonans and *kombongs*. The TTH does not stand apart but is rather always associated with other elements, namely barns (*alang*), courtyards (*rante*), burial sites (*leang*), agricultural areas such as rice fields, and gardens and

forests (*kombong*) (Utomo, 2001; Mulyadi, 2013).

Another unique aspect of the Toraja tribe, besides the TTH, is the existence of the *Rambu Solo'* and *Rambu Tuka'* traditional ceremonies. Rambu Solo' is a funeral ceremony, while Rambu Tuka' is a ceremony that gives thanks for the blessings that have been bestowed by God Almighty, held to mark the construction of a new house or getting married (Salu et al., 2018). The term "Rambu Solo'" literally means "smoke down", which signifies sadness or misfortune, whereas Rambu Tuka' means "smoke up", which denotes joy or happiness. These two traditional ceremonies are always celebrated and carried out by the Toraja tribe as part of their life which has been passed down from generation to generation by their ancestors. In particular, the Rambu Solo' traditional ceremony is very lively and can last for weeks, so it requires a lot of raw materials, such as building materials to build *lantang* (party huts), food and drink ingredients (for the families and guests who attend), and unique and sacred ceremonial objects. The raw materials for the two traditional parties are obtained from the KAS. Thus, the existence of the KAS is very important for the Toraja tribe, because it supports their daily life and their culture. Unfortunately, not many studies have been conducted on the KAS and its relation to the culture of the Toraja tribe. This makes the present study on the ethnobotany of the KAS worthwhile.

This study aims to: (1) explain the species composition and wood volume in the *Kombong* agroforestry system; (2) explain how the utilization of plant species in the *Kombong* agroforestry systems has social, cultural, economic and ecological functions; (3) analyzing the plant cultural significance of *Kombong* agroforestry systems of the Toraja tribe (4) analyzing the role of *Kombong* agroforestry systems for the conservation of Tongkonan traditional houses; (5) analyzing the role of the *Kombong* agroforestry system in preserving the Rambu Tuka' and Rambu Solo' tradisional ceremonies of the Toraja tribe.

2. MATERIALS AND METHODS

2.1 Study area

This research was conducted in two sub-districts: Sa'dan and Soluara'. In Sa'dan sub-district, three *lembang* (villages) were selected purposively: Sangkaropi, Malimbong, and Matallo. In Sesean Suloara' sub-district, three lembang were selected: Lempo, Tongariu, and Sesean Mata Allo. The research location can be seen in **Figure 1.**

2.2 Ethnobotanical data collection

Data collection was carried out from March to July 2020, followed by data processing and analysis from June to October 2021. Data collection in this study used qualitative and quantitative methods. Qualitative data were obtained through in-depth open-ended interview techniques and direct observation in the field. Quantitative data were obtained using structured interviews in the form of questionnaires (Gomez-Beloz, 2002; Vogl et al., 2004) related to the Toraja people's knowledge of plant identification, categories of plant utilization, the importance level of utilization of plant species, the type and quantity of wood used in building the TTH, and the role of the KAS in the development and preservation of the TTH. Respondents were determined using the purposive sampling method. Respondents were managers/owners of the KAS and had TTHs within the KAS. Tongkonan owners were considered to have more knowledge about TTHs, the diversity of plant species around tongkonan, and their utilization. Information about the owner of the tongkonan was obtained from the head of the village. The number of respondents was 90, divided into 45 in the Sa'dan sub-district and 45 in the Sesean Suloara' sub-district.

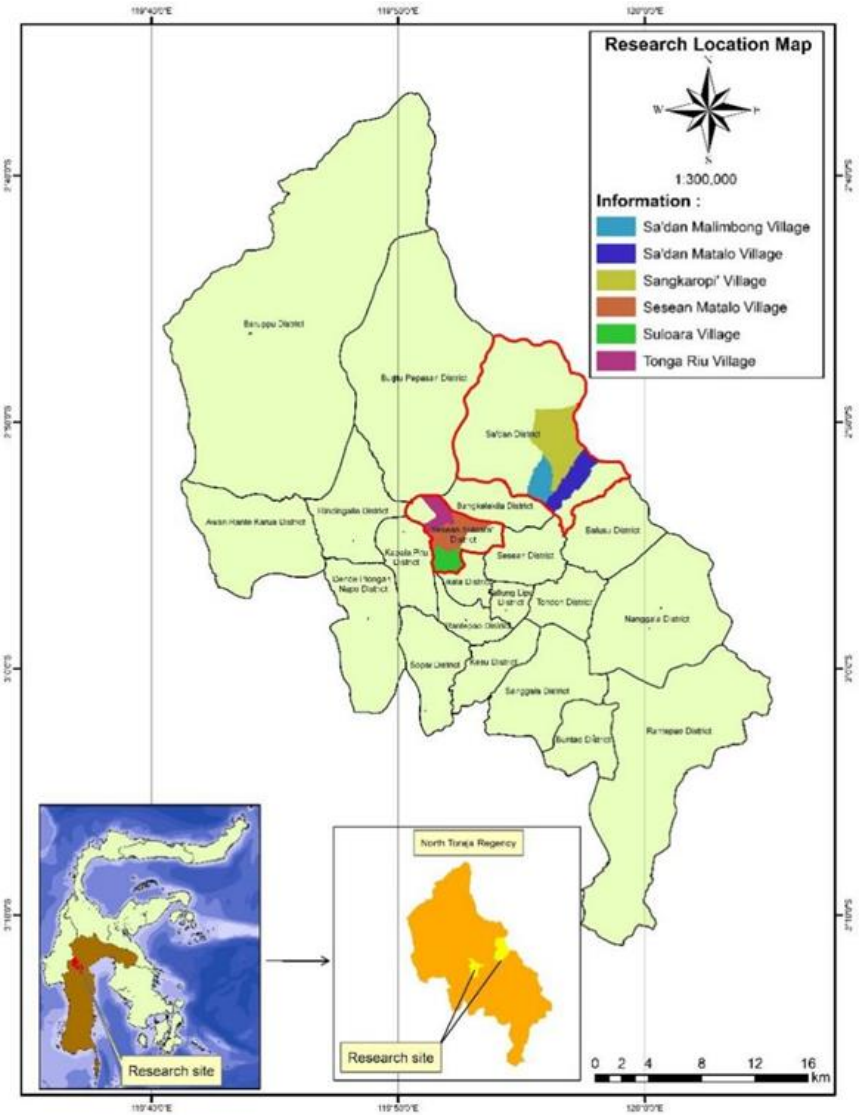


Figure 1. Map of the study area

2.3 Data Collection of Wood Volume

Data collection related to the species composition, and species diversity of the KAS was carried out with respondents by visiting the KAS they owned. For each selected respondent, one observation plot measuring 20 m x 50 m (0.1 ha) was created which was placed in the KAS area with the most plant species. The number of plots made for each village was four, so the total number of observation plots was 24, covering an area of 2.4 ha. Within each observation plot, tree height, tree diameter was measured, and the local name of each plant was recorded and then the scientific name was identified. The unknown plant species were then collected and made into an herbarium and identified at the Laboratory of the Department of Forestry, Faculty of Forestry, Hasanuddin University. The scientific name of the plant was verified by referring to the

website Plants of the World Online.

2.4 Data analysis

Data on the species composition of KAS plants, categories of plant use, and the role of KAS were analyzed with a qualitative approach and presented in the form of sketches, tables, or diagrams. Analysis of the level of cultural importance of a plant species for the Toraja tribe is carried out by measuring the ICS to determine useful plant species that are important to the life of the Toraja tribe. The ICS is the result of a quantitative ethnobotanical analysis based on the importance value of each useful plant species according to the needs of the local community (Wakhidah et al., 2020). The ICS calculation results show the level of cultural importance of each plant species useful to the community based on the scoring value. This value was derived from Turner (1988), as cited in Hoffman & Gallaher (2007). ICS calculations use the formula:

$$ICS = \sum_{i=1}^{n}(q\ x\ i\ x\ e) \quad (1)$$

ICS = (q x i x e)1 + (q x i x e)2 + (q x i x e)3 + ... + (q x i x e)n

Where:
ICS = the sum of the calculations for the utilization of a plant species from 1 to n, where n indicates the umpteenth (last) utilization; while the symbol i describes the value 1 to n, and so on; q = quality value; i = intensity value, showing values from 1 to n, respectively; e = exclusivity value.

To calculate the volume of trees in KAS, we used the formula:

$$V = 1/4\ \pi\ D^2 \text{ x } T \text{ x } F \quad (2)$$

Where:
π = phi, a constant of 3.14
D = tree diameter at breast height (cm)
T = tree height (m)
F = tree form factor = 0.8

3. RESULT AND DISCUSSIONS

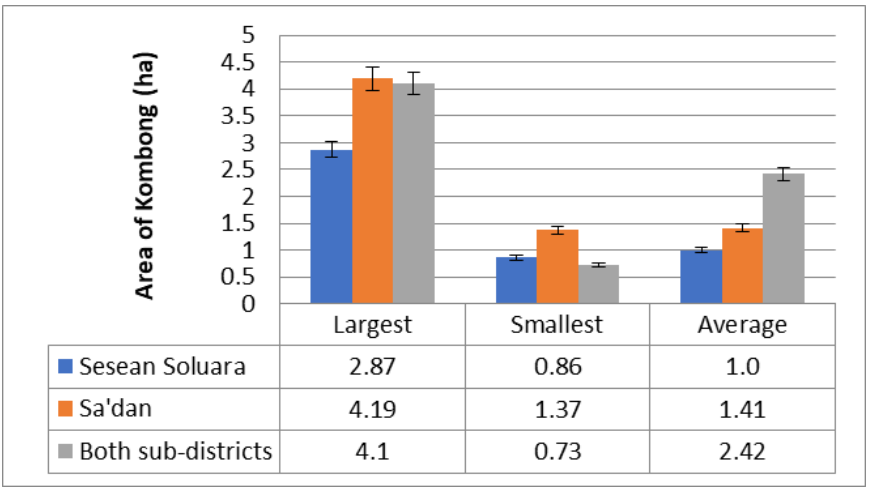
3.1 Characteristics of respondents and the KAS

The area of Sa'dan and Sesean Suloara sub-districts is 8,049 ha and 4,005 ha, respectively. The research area is in the lower and middle mountain forest type with an altitude between 900–2,000 m above sea level in Sa'dan sub-district and 830–1,530 m above sea level in Sesean Suloara' sub-district (Badan Pusat Statistik Kabupaten Toraja Utara, 2023). The climate of the study area, based on data from Meteorology Station Class IV Pongtiku, is climate type A according to the Schmidt and Ferguzon climate type classification. The average annual rainfall is 2,665 mm/year, with a maximum of 3,736 mm/year and a minimum of 2,002 mm/year. The rainy season generally occurs from December to June, and the dry season occurs from July to November. The average air temperature is 22.68°C, ranging from 14.60°C to 31.8°C.

The results showed that the size of the KAS owned by respondents in Sesean Suloara' sub-district varied between 0.86 ha and 2.87 ha, with an average of 1.0 ha, while in Sa'dan sub-district it varied between 1.37 and 4.19 ha, with an average of 1.41 ha. The average size of land holdings in both sub-districts is 2.42 ha. An overview of the size of the KASs is presented in **Figure 2.**

Figure 2 shows that the size of the *Kombong* owned by respondents is large given that the average is >1 ha. The size of the KASs was larger than other homegardens found in tropical regions, such as in West Pesisir Regency, Lampung Province, Indonesia, with

a size range of 0.0063–0.5794 ha (Wakhidah et al., 2020), and homegardens in Kumaun Himalaya, India, with a size of <0.001–>0.004 ha (Vibhuti et al., 2019). Research by Sulistiyowati et al. (2023) in Gunungkidul Regency, Yogyakarta Province, Indonesia also shows that most of the respondents have an area of agroforestry land that is less than 0.5 ha. The size of land owned under the KAS is relatively large (average >1 ha) because the Tongkonan system (that is, ownership by the family group) dictates that land is never distributed to heirs. In line with what was reported by Pakan et al. (2018), the tongkonan land in the Toraja society is shared property and is used for the benefit of all family members, so that all family members have the right to use the land. Management of the KAS is usually entrusted to the oldest family member, who is also responsible for the care and preservation of the TTH. These respondents are also known as smallholders. They tend to cultivate hybrid crops such as corn and rice in addition to several woody plants such as *Paraserianthes falcataria* and teak so that the need for wood is lower than for food crops.



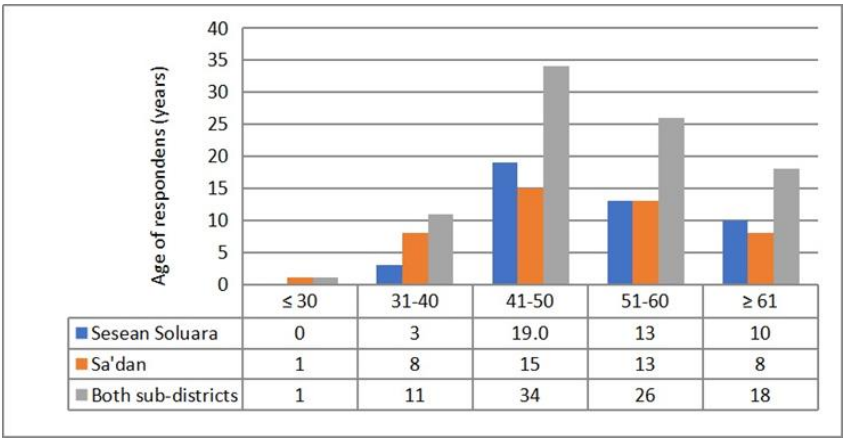
	Largest	Smallest	Average
Sesean Soluara	2.87	0.86	1.0
Sa'dan	4.19	1.37	1.41
Both sub-districts	4.1	0.73	2.42

Figure 2. The size of the KASs in the study area

Based on the 2013 Land and Building Tax Notification Letter [SPPT-PBB] in the Law of the Republic of Indonesia Number 12 of 1994, it is stated that yard area is divided into three categories, namely narrow (≤500 m2), medium (501–1,500 m2), and wide (≥ 1,500 m2) (Wakhidah et al., 2020).

The age of respondents ranged from 38 to 68 years with an average age of 53 years in Sesean Suloara' sub-district, while in Sa'dan sub-district the age of respondents ranged from 30 to 76 years with an average age of 50 years. The average age of respondents in both sub-districts was 52 years. An overview of the age of respondents who own KASs is presented in **Figure 3.**

Figure 3 shows that the respondents are generally elderly. The average age of respondents is over 50 years old. Specifically, over 38% of respondents are between 41 and 50 years old, 29% are between 51 and 60 years old, and 20% are over 60 years old. In fact, as many as 87% of KAS owners are over 41 years old. This is because the KAS is typically owned by the family, and the oldest person in the family usually has the right to manage it. The *kombong* and the tongkonan are one unit, so the owner/manager of the *kombong* is also entitled to own and maintain the tongkonan. The produce from the *kombong* is used to build and maintain the tongkonan. Thus, the sustainability of tongkonan is highly dependent on the sustainability of the KAS.

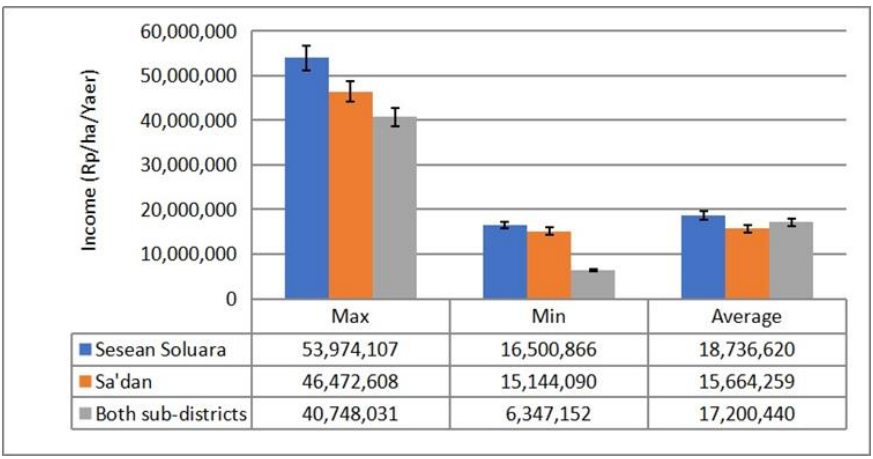


	≤ 30	31-40	41-50	51-60	≥ 61
Sesean Soluara	0	3	19.0	13	10
Sa'dan	1	8	15	13	8
Both sub-districts	1	11	34	26	18

Figure 3. The age range of respondents who own KASs

For the Toraja people, the KAS is very important because it has various roles and functions, namely as a source of income, food and drink (economic function) (Duffy et al., 2021), a source of raw materials for the construction of KAS and holding traditional parties, medicine and ritual (socio-cultural function), as a source of drinking water and rice field irrigation and fodder, and as a place to collect medicinal plants and fruits (ecological function). One of the economic aspects that is interesting to consider is the income of KAS owners. The results of the research show that the average income (IDR ha^{-1} $year^{-1}$) obtained from KAS varies between KAS owners, and differs between Sesean Suloara' and Sa'dan sub-districts. The average income in Sesean Suloara' sub-district is greater than that of Sa'dan sub-district. For more details, see **Figure 4**.

Figure 4 shows that there are differences in income between KAS owners in Sesean Suloara' sub-district and those in Sa'dan sub-district. This may be caused by differences in the size of the KAS owned and the species of plants that are grown. There is a tendency towards the width of the KAS affecting income. The wider the KAS, the higher the income that is received. Likewise, the types of plants grown also play a role. If more high-priced commodity crops (clove, coffee, cocoa) are planted, income tends to be higher and vice versa, if the KAS is dominated by sawn timber-producing trees, their income tends to be lower (Duffy et al., 2021).



	Max	Min	Average
Sesean Soluara	53,974,107	16,500,866	18,736,620
Sa'dan	46,472,608	15,144,090	15,664,259
Both sub-districts	40,748,031	6,347,152	17,200,440

Figure 4. Average income earned by the KAS

The average income received by KAS owners in Sesean Suloara' sub-district is IDR 18,736,620 $ha^{-1}year^{-1}$, with a range of IDR 16,500,866 to IDR 53,974,107. In Sa'dan sub-district, the average income is IDR 15,664,259 $ha^{-1}year^{-1,}$ with a range of IDR 15,144,090 to IDR 46,472,608, while the average income in both sub-districts is IDR 17,200,440 $ha^{-1}year^{-1}$, or the equivalent of IDR 1,433,370 $month^{-1}$. The provincial minimum wage (UMP), city minimum wage (UMK), and regional minimum wage (UMR) for North Toraja Regency in 2023 was IDR 3,384,876 (Nugrahani, 2023). The income obtained from KASs when compared with the UMR of North Toraja Regency is equivalent to 42.35% of the UMR, indicating that KASs contribute greatly to the income of the Torajan people (Duffy et al., 2021). Therefore, the government should recognize and support the existence of KASs as local land-use systems to maintain their sustainability.

3.2 Plant usage in KASs

The findings indicated a considerable variation in plant usage within the KASs of the Toraja tribe, with 19 distinct categories of use. Each category of use also differs in terms of the number of species. The categories of plant usage within the KASs of the Toraja tribe are presented in **Figure 5.**

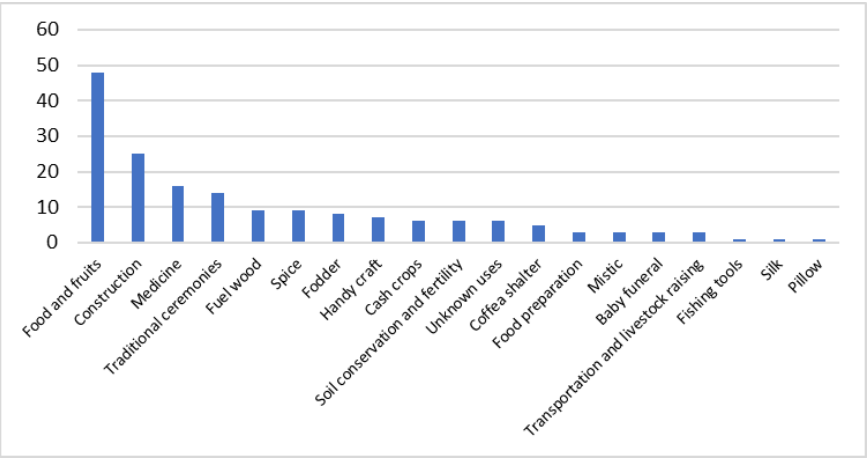


Figure 5. Plant Use Categories of the KASs of the Toraja Tribe

Figure 5 illustrates that within the KASs of the Toraja tribe, there were 19 distinct categories of plant usage. This number surpasses the 16 categories identified in the Saibatin community in Lampung (Wakhidah et al., 2020), the ten categories in Rajegwesi, Banyuwangi Regency (Pamungkas et al., 2013), and the seven categories in the Sundanese community, Cianjur Regency (Silalahi, 2019). It also significantly exceeds the five categories found in the Malay community in Jambi (Hidayat et al., 2014). However, the findings of this study fall short of the 35 plant use categories–comprising 16 categories of cultivated plant usage and 19 categories of wild plant usage–identified among the To Bada ethnic group in the Lore Lindu National Park, Central Sulawesi (Yuniati, 2020).

Foodstuffs and fruits constitute the categories with the highest number of species, specifically 48, followed by construction materials with 25 species, medicines with 16 species, 14 species for traditional ceremonies, and 15 other categories with fewer than 10 species each. The sources of food and fruits are divided into four groups: vegetables (e.g., eggplant, mustard greens, prey onions, chayote, cowpea bean, red beans), fruits (e.g., durian, salak, cempedak, langsat), beverages (e.g., palm sugar, tamarillo, passion

fruit, coffee), and staple food substitutes (e.g., cassava, sweet potato, taro and breadfruit). Similar findings were reported by Amboupe et al. (2019), who found that the Bentong tribe in Baru Regency, South Sulawesi Province, utilized 70 species of plants as food, comprising four species of staple food, 34 species of vegetables, 33 species of fruits; and five species used for beverages.

Of the 48 types of plants serving as food and drink, 18 species are fruits, 13 species are vegetables, eight species are food substitutes/supplements, and six species are beverages. This demonstrates the pivotal role that KASs play in supporting the livelihoods of local communities and providing food (Eyasu et al., 2020). The availability of substitute food is crucial as it can serve as a source of carbohydrates, and fruits and vegetables can provide the vitamins and minerals needed by Toraja people in the event of a rice crop failure (see Figure 8). Interview results indicated that the community does not face significant challenges in the event of a rice harvest failure due to pests, diseases, or dry seasons, as they can switch to alternative sources provided by the KAS. The types of replacement plants commonly found in the KAS include taro (*Colocassia esculenta*), sweet potato (*Ipomea batatas*), and cassava (*Manihot utilissima*). These three types of tubers are also used as food sources by the Bentong tribe in Barru Regency (Amboupe et al., 2019). Taro and sweet potato plants are not only used as substitute food for the Toraja people but also serve as the primary feed for their pigs. The tubers, petioles, and leaves of taro and sweet potato are processed by cooking into pig fodder. These factors contribute to the Toraja people´s consistent cultivation of these two plant species within their KASs. This description underscores the function of the KAS as a provider and guarantor of food security for the Toraja tribe, including their livestock.

The KAS boasts a considerable variety of fruit trees, specifically 18 species. This illustrates that when developing a KAS, the Toraja people always emphasize growing fruit trees as a source of vitamins and minerals, not to mention as a source of income. Types of fruit plants that are often found include langsat, banana, and tarra. The langsat tree (*Lansium domesticum*), which produces a tropical fruit rich in antioxidants and vitamins, enjoys widespread popularity in Indonesia. Langsat fruit harvested from the KAS not only fulfills the vitamin and mineral requirements of family members but also provides an additional source of income when sold at the nearest market. The langsat tree´s ability to thrive under the shade of larger trees such as mango, durian, uru, and buangin ensures its presence in the second or third layer of the canopy. These characteristics position the langsat tree as a key component of the KAS ecosystem and the livelihoods of the Toraja people. The utilization of plants grown in the KAS as sources of food, nutrients, and vitamins is a common practice among several other tropical communities (Tayanin, 2010; Kabir & Webb, 2008; Carvalho et al., 2013; Pamungkas et al., 2013; Hidayat et al., 2014; Feriatin et al., 2017; Amenu, 2017; Mahmud et al., 2021; Abdoellah et al., 2020). For the Toraja tribe, the benefits of the KAS extend beyond its function as a source of income, food, beverages, medicines, and vitamins, it also offers social advantages. Indeed, the 18 species of fruit (including durian, jackfruit, tarra, avocado, rambutan, and banana) cultivated in the KAS typically bear fruit and are harvested at different times to the fruiting and harvest period of coffee and cocoa crops. This variation in harvest times between commodity crops and fruit crops, and among the fruit crops themselves, affords KAS owners employment opportunities and regular income each month.

The second most prevalent category of plant use is construction materials, encompassing 25 species. This is understandable given the Toraja people's unique and beautiful traditional houses, which necessitate a substantial volume of wood for

construction. Every Toraja tribal family aspires to build a THH in addition to their everyday dwelling. The construction of the THH requires robust and durable wood and bamboo which are obtained from the KAS. Consequently, the Toraja people consistently plant various tree species within the KAS to meet their needs for timber, firewood, food, and medicine (Mahmud, et al., 2021). The prominence of plant species in the category of construction materials is also attributable to the requirement for building materials for guest and family huts during the Rambu Solo' traditional ceremony.

The category of plant usage for medicinal purposes by the Toraja tribe encompasses 16 species spread over 10 families, a number that is comparatively smaller than the use of medicinal plants by several tribes in tropical and subtropical regions. For instance, in the Lower Dir district of Pakistan, 147 species and 57 families are used (Irfan et al., 2023), the Malays of Lingga Regency, Riau, Indonesia, use 102 species from 53 families (Qasrin et al., 2020), the Indian Sub-Himalayan region uses 67 species from 44 families (Roy et al., 2022), the Serawai Tribe of Bengkulu, Indonesia, uses 52 species from 33 families (Rahayu et.al., 2020), and the Indonesian Uud Danum Dayak tribe uses 47 species from 35 families (Julung & Ege, 2020). Despite the relatively small number of medicinal plant species used by the Toraja people, they treat a wide range of diseases (25 types in total), from minor ailments such as fever, coughs, and mouth sores to chronic and severe diseases such as heart disease, cancer, and diabetes mellitus. This suggests that the Toraja people possess extensive local knowledge and experience in using medicinal plants to treat various diseases. Interview results reveal that the use and preparation of medicinal plants are quite straightforward. For instance, to treat a fever or a cough, they consume the juice of washed and squeezed miana leaves (*Coleus scutellarioides*), sometimes adding honey. Similarly, for canker sores or toothache, they apply the sap of a jatropha plant (*Jatropha* sp.) by cutting a branch or twig of the sap and then taking the sap and affixing it to the part of the mouth affected by canker sores or the aching tooth. Interestingly, their local knowledge and use of medicinal plants are highly effective, as several plant species are used to cure more than one type of disease. For example, bay leaves (*Syzygium polyanthum*) are used to improve digestion, maintain heart health, treat gout, and relieve stomach inflammation.

The Toraja people, who continue to adhere to the beliefs of their ancestors, often called *Aluk Todolo*, maintain the customs and culture passed down through the generations. One such custom is Passiliran, a funeral process for infants who die before the age of six months or before they have grown teeth (Ilma & Bakthawar, 2020; Limbong et al., 2017). Instead of being buried in a rock cliff or cave, as is the case with adults, these infants are interred in a tarra tree (*Arthocarpus campedan*) in a sitting position, akin to their position in their mother's womb. Before being placed in the tarra tree, the infant's body is swaddled in areca nut fronds (solong). The body is positioned to face the direction of the grieving family's residence, and the hole in the tarra tree is then covered with palm fibers. According to Aluk Todolo belief, an infant buried in a tarra tree will be at peace and content, as it is akin to being returned to the mother's womb. When injured, the tarra tree emits an abundant white sap, which is considered to be the mother's "milk" in Aluk Todolo belief. The tarra tree, a member of the Moraceae family, is characterized by its release of sap when any part of the tree, especially the trunk, is injured (Ilma & Bakthawar, 2020). Three tree species are commonly used within the Aluk Todolo belief for infant burials: tarra, sipate (*Alstonia scholaris*), and kau-kau (*Ceyba pentandra*). Tarra trees are the most commonly used, while sipate and kau-kau trees are rarely used for this purpose. Consequently, the tarra tree holds a sacred status among the Toraja people. Given these considerations, tarra trees are consistently planted within KASs, underscoring the close relationship between the KAS and the

cultural life and beliefs of the Toraja people.

The tarra tree, a fruit-bearing tree popular among the people of Toraja and South Sulawesi in general, is known as *cempedak* in the Indonesian language. The fruit of the tarra tree bears a resemblance to jackfruit, albeit smaller in size and characterized by thick, rambutan-like hair. The fruit, which boasts a sweet and slightly savory flavor, can be consumed fresh, and its seeds can be roasted and eaten, offering a taste akin to cashews. During the tarra season, the owner of the KAS harvests the ripe tarra fruit and sells it on the side of the road or at the nearest market. For the Toraja people, especially those who still adhere to the Aluk Todolo belief, the tarra tree holds special significance. It not only serves as a burial site for infants, thereby preserving cultural practices, but also functions as an additional source of income. Research conducted by Nauw et al. (2016) reported that the fruit and seeds of the tarra tree are used as an alternative food source.

3.3 Plant cultural significance of the Toraja Tribe in South Sulawesi

The findings indicated that the ICS among the Toraja tribe in South Sulawesi exhibited considerable variation, spanning from very high to low, and even extending to plants with unknown utilization. Out of the 115 plant species identified and utilized by the Toraja tribe, ten species exhibited the highest ICS values, as presented in **Table 1**.

Table 1. ICS of the Toraja Tribe in South Sulawesi

No.	Local Name	Latin Name	Family Name	ICS	Category
1	Pare	*Oriyza zativa*	Poaceae	130	Very high
2	Induk	*Arenga pinnata*	Arecaceae	105	Very high
3	Uru	*Elmerillia pubescen*	Magnoliaceae	80	High
4	Parring	*S. zollingeri*	Poaceae	68	High
5	Tallang	*Bambusa sp.*	Poaceae	64	High
6	Bulo	*Schizostachyum lima*	Poaceae	60	High
7	Kalosi	*Areca catechu*	Arecaceae	59	High
8	Nangka	*Arthocarpus integra*	Moraceae	57	High
9	Buangin	*Gymnostoma rumphianum*	Casuarinaceae	56	High
10	Nyato	*Palaquium sp.*	Sapotaceae	52	High

As indicated in **Table 1**, rice (*Oriza sativa*) has the highest ICS value of 130, which is classified as very high, compared to other plant species. This finding aligns with research conducted by Yuniati (2020) on the To Bada ethnic group in the Lore Lindu Biosphere Reserve, Central Sulawesi, which identified rice as the primary food with an ICS value of 170, also classified as very high. Similarly, Amboupe et al. (2019) reported that the Bentong tribe in Baru district, South Sulawesi, relied on rice and maize as staple foods when settled, and *kenrang* fruit (*Ficus racemosa*) and *sikapa* tubers (*Dioscorea hispida*) during their nomadic phase, with an ICS value of 100 for rice. The high ICS value of rice is attributable to its multifaceted benefits for the Toraja people, serving as a staple food, raw material for cake preparation (including traditional Dori cakes), medicine, and an integral component of traditional ceremonies (Riadi et al., 2019; Ranteallo et al., 2020; Helida et al., 2015). As stated by Barumbun et Al. (2018), rice is intended as the main dish, accompanied by pork and buffalo, during parties. According to Toraja mythology and the belief system of Aluk Todolo, rice is believed to possess a spirit and is cared for by the "Goddess of Rice". Consequently, rice plants receive more special treatment than other plants.

The sugar palm (*Arenga pinnata*) also exhibits a very high ICS value of 105, attributable to its varied roles and functions, primarily as an ingredient in a drink known as *ballo'* in the local language, or *saguer* in the language of the Tobada ethnic group (Yuniati, 2020). Most Toraja people consume ballo' during ceremonies, particularly during mandatory parties or as part of a traditional party dish. The drink, which is a requisite presence during the Rambu Solo' and Rambu Tuka' ceremonies, symbolizes family unity, intimacy, and respect for guests. This practice mirrors that of the Tobada ethnicity in Lore Lindu, Central Sulawesi, where the saguer drink is used in traditional rituals, including weddings and ceremonies for welcoming distinguished guests (Yuniati, 2020). In addition to serving as a drink ingredient and a component of traditional parties, the sugar palm is also used as a raw material for making palm sugar, its stems are utilized as building materials, and its fibers are made into ropes or binders (Masduki, 2023), its sticks are fashioned into brooms, and its fruit is used in food or drink, known as kolang-kaling (Ridanti, 2022), which is flavorful, supple, and fresh. Kolang-kaling is a key ingredient in the preparation of delicious, fresh, and appealing fruit ice, making it highly popular among the people of Indonesia, especially during the breaking of the fast in the month of Ramadan.

The Uru plant (*Elmerillia pubescen*) has a high ICS value of 80, reflecting its varied uses and importance to the Toraja people. This plant yields sawn timber that is robust, durable, and easily shaped, making it a dominant material in the construction of TTHs. In fact, this wood is a necessity in TTH construction. The beautifully carved walls, ceilings, and unique adornments of TTHs are crafted from Uru wood. Beyond its role as a building material for TTHs, it is also used to carve typical Toraja souvenirs, which are sold to both foreign and local tourists (Anwar, 2019). Uru wood has an attractive texture and color, so it is also widely used for making household furniture such as tables, chairs, and beds. In North Sulawesi, the Uru plant is widely cultivated for its use in constructing traditional Minahasa houses (Abdullah et al., 2021).

Various types of bamboo are integral to the daily lives of the Toraja people, with four types–*parring*, *tallang*, *bulo*, and *pattung*–exhibiting high ICS values ranging from 52 to 68. These types of bamboo have high ICS values because they are indispensable to the daily lives of the Toraja people due to their diverse uses. They serve as materials for constructing family and guest huts during the Rambu Solo' traditional party and the raw material for constructing TTHs, particularly the roofs (Utami et al., 2014). They are also used to carve souvenirs, construct livestock pens and means of transporting pigs (Arhamsyah, 2009), create household appliances (Mesiyani & Suprehatin, 2020; Mainaki & Maliki, 2020), and manufacture traditional musical instruments (Nurmala, 2018). Additionally, they serve as a source of food and fuel wood (Salim et al., 2019).

The areca nut plant species (*Areca catechu*) has a high ICS value of 59, reflecting its numerous benefits and extensive use in daily life and traditional Toraja events. The Toraja people use the areca nut as a medicinal ingredient and for betel consumption. The tradition of eating betel, passed down through the generations, remains prevalent among the Toraja people, particularly the elderly. Even in the Rambu Solo' ceremony, consuming betel nut is an obligatory offering, signifying sacredness and respect for the ceremony. Beyond the Toraja tribe, several tribes in Indonesia use the betel and areca nut plants as part of their traditional ceremonies (Gandasari et al., 2022; Dwinanto et al., 2019). This is also the case in other countries, such as the Manobo tribe in Hinapuyan, Philippines (Jamera et al., 2020), and the Malays in Malaysia (Mohamed & Bidin, 2012).

The jackfruit plant (*Artocarpus integra*) holds a high ICS value of 57 (high) as a consequence of its diverse uses, including as a nutrient-rich food (fresh fruit),

vegetables (Ranasinghe et al., 2019), house poles, cutlery (spoons and plates), and furniture. As reported by Nansereko & Muyonga (2021), jackfruit is rich in nutrients, and its biochemical profile makes it a very attractive fruit with the potential to sustain food security, especially in underprivileged countries. Further research (Takeuchi et al., 2019) indicated that Artocarpus species (*A. dadah, A. nitidus, A. elasticus, A. tamaran, A. anisophyllus,* and *A. odoratissimus*) can produce solid wood for construction, furniture, and other uses, potentially serving as alternative tree species for timber production in agroforestry in Asian countries. *Nangka* wood holds a special and sacred value, as it is used to create a statue of the head of a *Tedong bonga* (striped buffalo), complete with its original horns, which is then affixed to the front of the house or on the pillars supporting the TTH roof (see **Figure 6**). The head of the Tedong bonga must be made of jackfruit wood as a symbol of the social status and economic capacity of the owner of the house.

The poles and columns of the TTH invariably use sendana wood (*Pterocarpus indicus*) or buangin wood (*Gymnostoma rumphianum*), owing to the strength and durability of these two types of wood. This practice suggests that the Toraja people possess local wisdom in selecting the wood used to build the TTH, especially the house's columns. The columns, which are always in contact with soil exhibiting high humidity, are susceptible to rapid rot and deterioration. The portion of the house column in contact with the consistently moist soil surface–typical of tropical climates–may be attacked by fungi or subterranean termites, potentially damaging the pillars of the TTH. This demonstrates that the Toraja people possess local knowledge and wisdom in choosing and utilizing the plants within the KAS.

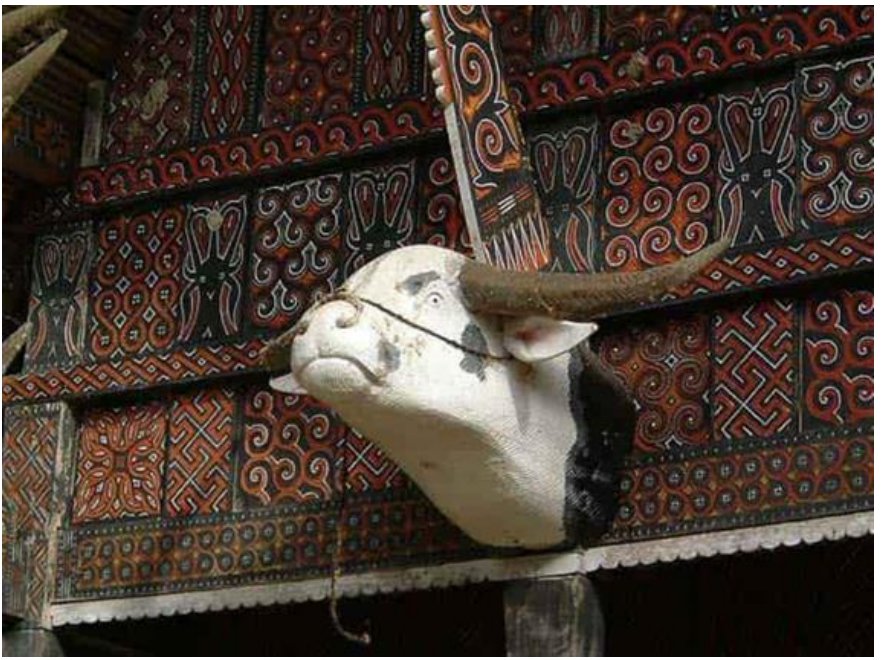


Figure 6. A striped buffalo statue made of jackfruit wood serves as a symbol of the social and economic status of the house owner [Source: Indonesian Culture (2023). The uniqueness of the TTH]

Buangin plants hold a high ICS value of 56, reflecting their varied uses and importance to the Toraja people. The wood from these plants is used as a construction

material for houses, firewood, and the creation of guest huts during the Rambu Solo' and Rambu Tuka' traditional ceremonies. It also serves to fertilize the soil. Buangin wood is the primary wood used in the construction of TTHs, particularly for columns or pillars. The Toraja people prefer to use buangin wood for this purpose due to its strength and durability. This wood is not easily weathered and is resistant to fungi and termite attacks. This aligns with the findings of Prakosa et al. (2018), which classified buangin heartwood as highly resistant to termite attack (class 1) and sapwood as somewhat resistant to termite attack (class 2) based on the Indonesian National Standard (SNI 01-7207-2014).

Nyato plants (*Palaquium sp.*) hold a high ICS value of 52, reflecting their diverse roles and functions for the Toraja people, including their use in the construction of TTHs and rice barns, in addition to making furniture and the production of souvenirs. Nyato wood is not only cherished among the Toraja people but is also commonly used across Indonesia and Malaysia for solid doors, boards, and furniture (Jusoff, 2010). Nyato wood is generally used for floors, walls, doors, and carvings that decorate THHs. However, nyato wood is seldom used as a pole or column for the TTH due to its susceptibility to wood-destroying insects and fungi (Soerianegara & Lemmens, 1993). Thus, it can be concluded that the use of plants by the Toraja people to support survival, preserve their culture, and maintain their residential environment is not arbitrary, but rather based on sound knowledge and experience, enabling them to select the most suitable types of plants for their needs.

3.4 The role of KASs in the conservation of TTHs

Constructing a TTH necessitates a substantial amount of money due to the extensive requirement for wood and bamboo. Similarly, crafting beautiful and unique carved objects to decorate the walls, ridges, and ceilings of the TTH also demands a significant investment. The future existence and sustainability of TTHs are heavily reliant on the participation of all stakeholders, including the government and cultural observers, and particularly the Toraja people themselves.

A crucial element in the construction and preservation of TTHs is the availability of wooden materials, both in terms of volume and type, for building and maintaining the traditional house in case of damage. TTHs are built using specific types of wood (uru, buangin, nyato, and sendana) that are strong and resistant to wood-destroying organisms. The research results show that the volume of wood required to build a TTH varies significantly, ranging from 29.5 to 46.5 m^3 per house, with an average of 38.2 m^3 per house (see Figure 13). Each Toraja family constructs TTHs of different sizes depending on the availability of funds, social strata, and land availability. The volume of wood needed for each part of the TTH also varies. The column section of the house (bottom) requires the largest volume of wood, averaging 18.18 m^3 per house, with a range from 12.5 to 22.5 m^3 per house. The roof section (top) requires the smallest volume of wood, averaging 5.70 m^3 per house, with a range from 4.0 to 8.0 m^3 per house. An illustration of the proportion of wood used in each part of the TTH is presented in Figure 7.

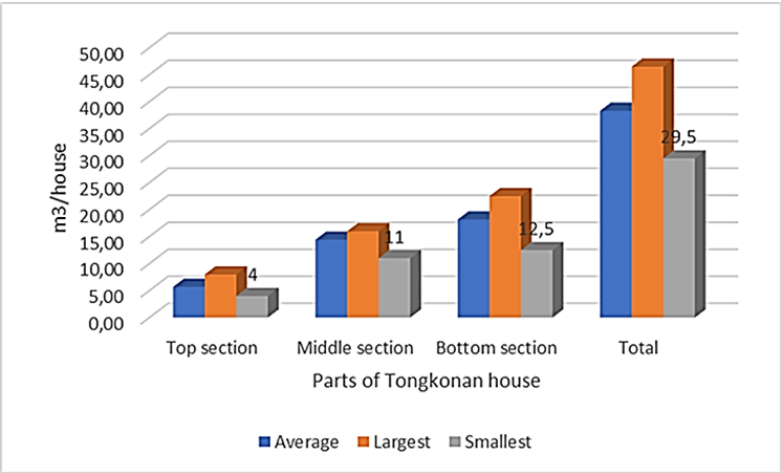


Figure 7. The average volume of sawn timber used to build a TTH and the proportions in each section.

Figure 7 illustrates that the volume of sawn timber required to build a TTH is substantial, ranging from 29.5 to 46.5 m^3 per house, with an average of 38.2 m^3 per house. Based on the size of KAS land ownership, it was found that the volume of lumber available in KASs was relatively larger, specifically 40.63 m^3, with a distribution between 8.13 and 130.03 m^3 **(**see **Figure 8).** This shows that the volume of timber available in KASs exceeds the volume of sawn timber needed to build a THH. Consequently, the future sustainability of THHs is assured, considering the availability of the required volume of sawn timber. This is further corroborated (based on interviews conducted) by the Toraja tribe's practice of lending lumber to each other among close relatives. A family wishing to build a TTH but lacking sufficient sawn timber can borrow what they need from other members of their extended family**.** However, if the lending family wishes to build a **t**ongkonan, the borrowing family must return an equivalent volume of lumber. Such practices are highly beneficial for families wishing to build or maintain a TTH but lacking sufficient lumber. These commendable practices certainly warrant emulation and preservation, particularly among the Toraja tribe in the future.

Each Toraja family constructs TTHs of varying sizes depending on the availability of funds, wood materials, social strata, and land availability. The TTH is divided into three main parts based on the vertical position and the need for wood and bamboo building materials: the upper part (*rattian banua*), the middle part (*kale banua*), and the lower part (*sulluk' banua*) (Sir, 2018). The upper part comprises the roof and roof frame, the lower part consists of the walls, wall frame, and floor, and the lower part includes the pillars and supports of the house. In general, the type of wood used to make TTHs is relatively consistent. Sendana wood (*Pterocarpus indicus*) or buangin wood (*Gymnostoma rumphianum*) is used for its poles. The same type of wood is used in the middle part of the tongkonan, specifically for the pillars (columns). The roof of the TTH is made from bamboo; however, over time, and due to considerations of practicality, durability, and limited availability of bamboo, some have opted to use more durable tin roofs (Maghviroh et al., 2020).

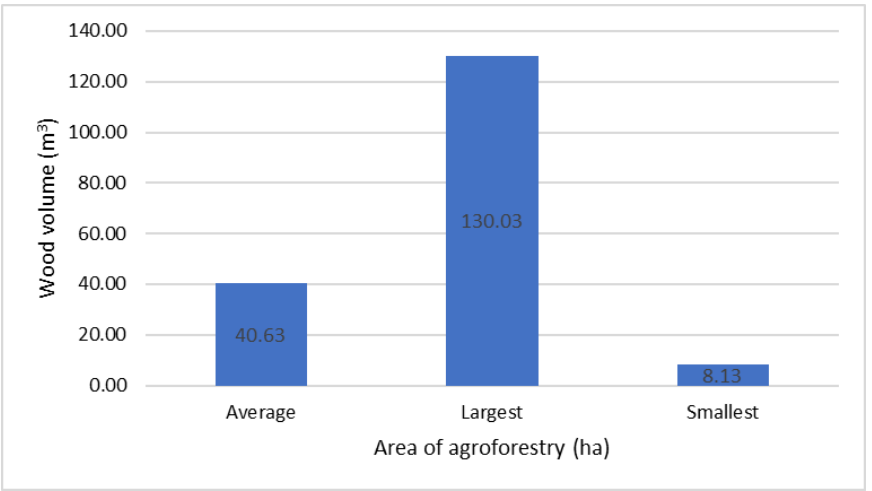


Figure 8. Average timber volume based on land tenure area of KASs.

Figure 8 illustrates that the average standing stock of a KAS is less compared to the findings of a study on homegardens in Thrissur district, Kerala, India, which reported that the average standing stock of timber was 55.12 m^3ha^{-1} (Unnithan, 2018). However, the average standing stock of timber in KASs was smaller, at 40.63 m^3, but still exceeded the volume required to build a TTH, which is 38.2 m^3.

As previously discussed, in addition to the volume of wood, the type of wood is also crucial in the construction and preservation of TTHs. The research results indicate that construction and preservation of TTHs require 21 species of plants, including 11 species of trees that produce sawn timber, five species of bamboo, three species of palm, and two species of shrubs. Both types of shrubs serve aesthetic functions, and one type is used in traditional ceremonies as a symbol of happiness. Further details can be seen in **Table 2.**

Table 2. Name of plant species in the KAS for the construction and preservation of TTHs and food granaries

No	Name of plant species			Usage and time used		
	Local name	Latin name	Family Name	Component of Tongkonan	Before and during construction	After construction
1	Uru	*Elmerillia pubescen*	Magnoliaceae	√		
2	Buangin	*Gymnostoma rumphianum*	Casuarinaceae	√		
3	Nangka	*Pterocarpus integra*	Moraceae	√		
4	Pinus	*Pinus merkusii*	Pinnaceae	√		
5	Suren	*Toona sureni*	Meliaceae	√		
6	Bulo	*Schizostachyum lima*	Poaceae	√	√	
7	Tallang	*Bambusa sp.*	Poaceae	√		
8	Pattung	*Dendrocalamus asper*	Poaceae	√	√	
9	Ao	*Bambusa vulgaris*	Poaceae	√	√	
10	Parring	*Schizostachyum zollingeri*	Poaceae	√	√	
11	Induk	*Arenga pinnata*	Arecaceae	√		

12	Jati	*Tectona grandis*	Verbenaceae	√		
13	Betau	*Calophyllum inophyllum*	Clusiaceae	√		
14	Banga	*Pigafetta filaris*	Arecaceae	√		
15	Nyato	*Palaquium sp.*	Sapotaceae	√		
16	Bakan	*Sterculia foetida*	Malvaceae	√		
17	Ekaliptus	*Eucalyptus sp,*	Myrtaceae	√		
18	Sendana	*Pterocarpus indicus*	Fabaceae	√	√	
19	Kalosi	*Areca catechu*	Arecaceae	√		
20	Tabang	*cordyline fruticosa*	Asparagaceae		√	
21		*Canna sp*	Cannaceae		√	

Figure 9. Landscape Overview of a KAS and Settlement of the Toraja Tribe

Table 2 indicates that 21 plant species are used in the construction and preservation of TTHs and alang (food barns). All species listed in Table 4 are among the 115 species found in the KAS. This suggests that the types of wood required to build and preserve TTHs and alang are either available or have been planted by KAS owners. In other words, the Toraja tribe does not face any challenges in sourcing the types of wood needed for TTH construction. The Toraja tribe possesses local wisdom as regards preparing building materials for TTH construction, specifically by cultivating suitable plant species that meet the requirements for this process. Consequently, it can be asserted that the KAS forms a single unit with the TTH. Tongkonan and *kombong* are two elements that are invariably present in traditional Toraja villages (*tondok*). The existence of TTH is not isolated but rather is always associated with other elements, namely barns (alang), courtyards (rante), burial places (leang), agricultural areas (rice fields and gardens), and forests (Utomo, 2001; Mulyadi, 2013). The close interrelationship between these components to form a unified Toraja settlement ecosystem can still be observed today (see **Figure 9**). The components of forest

(*kombong*), rice fields, tongkonan and alang traditional houses (settlements), and livestock (livestock pens) interact positively with each other, resulting in a sustainable Toraja settlement ecosystem. An illustration of the interaction of the various components in the Toraja settlement ecosystem, which creates a beautiful and sustainable agroforestry landscape, is provided in **Figure 9.**

Figure 9 illustrates the critical role played by forests (*kombong*) in sustaining water management and soil fertility. These elements are instrumental in enhancing the productivity and sustainability of rice fields and supplying animal feed in Toraja settlements. It is customary for the Toraja tribe to position their livestock pens, housing pigs, buffalo, and occasionally chickens, at the rear of their dwellings, sourcing their animal feed from the *kombong* or rice fields. The survival of the community is heavily reliant on the rice fields and *Kombong*, which serve as sources of food, water, and sawn wood (Watts et al., 2023). These resources are particularly vital for the construction and preservation of TTHs. Thus, the existence and sustainability of TTHs are intrinsically linked to the sustainability of the KAS.

3.5 The role of KASs in the conservation of the Rambu Solo' and Rambu Tuka' traditional ceremonies

The Rambu Solo' and Rambu Tuka' are two traditional ceremonies conducted by the Toraja people at specific times. The Rambu Solo ceremony is a traditional funeral ritual, serving as a form of final tribute to the deceased, while the Rambu Tuka' ceremony is a thanksgiving event for the blessings that have been bestowed by God Almighty. The Rambu Solo' ceremony, in particular, is typically very vibrant and can last for several days, necessitating a substantial number of raw materials. These include building materials for the construction of a lantang (party hut), food and drink for the families and guests, and offerings for the unique and sacred rituals of the traditional party.

The study revealed that the raw materials for these two traditional ceremonies were sourced from the KAS. The types of plants obtained from the KAS serve various functions. The species of plants and livestock used in the Rambu Solo' and Rambu Tuka' traditional ceremonies are presented in **Table 3.**

Table 3. Names of plant and animal species in the KAS used for the Rambu Solo' and Rambu Tuka' traditional ceremonies

No	Local Name	Latin Name	Family Name	Rambu Solo'	Rambu Tuka'	Function
1	Buangin	*Gymnostoma rumphianum*	Casuarinacea e	√		Temporary hut pole and fuel wood
2	Bulo	*Schizostachy um lima*	Poaceae	√	√	Materials for making a temporary hut
3	Tallang	*Bambusa sp.*	Poaceae	√	√	Glutinous rice cooking container
4	Pattung	*Dendrocalam us asper*	Poaceae	√	√	Materials for making temporary huts
5	Ao	*Bambusa vulgaris*	Poaceae	√	√	Materials for making temporary huts
6	Parring	*Schizostachy um zollingeri*	Poaceae	√	√	Materials for making temporary huts
7	Induk	*Arenga pinnata*	Arecaceae	√	√	Beverages

No	Local Name	Latin Name	Family Name	Rambu Solo'	Rambu Tuka'	Function
8	Pinus	*Pinus merkusii*	Pinnaceae	√	√	Fuel wood
9	Kalosi	*Areca catechu*	Arecaceae	√	√	Ceremony
10	Tabang	*cordyline fruticosa*	Asparagaceae	√	√	Ceremony and rituals
11	Pare	*Oryza zativa*	Poaceae	√	√	Main meal
12	Buah sirih	*Piper sp.*	Piperaceae	√	√	Ceremony
13	Sangatana	*Piper betle*	Piperaceae	√	√	Ceremony
14	Bulunongko	*Coleus scutellarioides*	Lamiaceae	√	√	Spice meat dishes wrapped in bamboo used by the Toraja tribe
15	Bai	*Sus scrofa domesticus*	Suidae	√		Main side dishes
16	Tedong	*Buballus bubalis carabauesis*	Bovidae	√	√	Main side dishes
17	Manu'	*Gallus gallus domestica*	Phasianidae		√	Side dishes
18	Ikan Mas and at all	*Cyprinus carpio*	Cyprinidae	√	√	Side dishes

Table 3 delineates three categories of plants and animals utilized in the Rambu Solo' and Rambu Tuka' traditional ceremonies: food and drink, party hut construction, and traditional rituals. The group with the highest number of plant species is the food and drink category, comprising ten species. This is followed by the party hut construction category with five species and the traditional ritual category with four plant species. The existence of the KAS is of paramount importance to the Toraja people. It not only underpins their daily life (Galhena et al., 2013), but also serves to preserve their culture, including the TTH and the Rambu Solo' and Rambu Tuka' traditional ceremonies.

4. CONCLUSION

The Toraja tribe, one of the five major tribes in South Sulawesi, resides in the Toraja and North Toraja Regencies. This tribe exhibits local wisdom in land management to meet living needs, preserve the environment, and uphold their culture. This is achieved by cultivating various species of plants and animals on the same land, a practice known as the KAS. Research has identified 115 plant species and 49 families. Volume of sawn wood required to build TTH ranges from 29.5 to 46.5 m^3 per house, with an average of 38.2 m^3 per house, smaller than that available in KAS on average 40.63 m^3, with a distribution between 8.13 and 130.03 m^3. The plant use category is extensive, encompassing 19 categories. Food and fruit represent the use category with the highest number of species (48 species), while fishing gear has the lowest (one species). The ICS of the plants used by the Toraja tribe varies greatly, ranging from very high to low, and also includes plants whose use is unknown. Even though rice is the main food with the highest ICS value, root crops from KAS are also commonly used, so the Toraja people are not vulnerable to food shortages. The KAS and the TTH form a symbiotic unit and

always found in traditional Toraja settlements. Therefore, the existence and sustainability of the TTH are largely determined by the preservation of the KAS. The KAS is closely associated with the Rambu Solo' and Rambu Tuka' traditional ceremonies. There are three groups of plant and animal uses for these ceremonies: food and drink, party hut buildings, and traditional rituals. All plant species and animals required to construct and maintain TTHs and to implement these two traditional ceremonies are found in the KAS. Thus, the KAS is of paramount importance to the Toraja tribe. It not only supports their lives in economic and social aspects but also functions to preserve the environment and culture, including the preservation of TTHs and the traditional Rambu Solo' and Rambu Tuka' ceremonies. For this reason, it is highly recommended to maintain, develop, and preserve KAS as part of preserving the culture of the Toraja tribe and their environment.

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