Plant Archives Vol. 20, Supplement 2, 2020 pp. 2338-2342 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

THE STRUCTURE, COMPOSITION AND UTILIZATION OF PLANTS AT LEMBANG BURI TONGKONAN GARDENS IN REMBON DISTRICT OF TANA TORAJA, INDONESIA

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Abstract

The traditional house in Tana Toraja, Tongkonan, has a vast land overgrown with various vegetation. Its vacant land (Tongkonan garden) develops and influences with the knowledge of managers, tradition, culture, area, capital, and commodities. This study applied to identify the composition, structure, and utilization of crops cultivated in Tongkonan gardens. Data obtained through field observation, observation, and measurement of the structure and composition of species and the utilization of plants in the Tongkonan garden. The findings showed that the total number of species found was 50 species with 335 plant individuals. Commodity/commercial crops occupied the highest percentage of plant utilization (43.32%), and the lowest percentage was fodder-producing plants with a percentage of 3.85%.

***Keywords*:** Composition, Structure, Tana Toraja, Tongkonan, Utilization.

Introduction

Agroforestry is a land-use system that combines the cultivation of trees with seasonal crops in the form of food or other plants as commodity crops (Nurkin, 2012). Moreover, agroforestry is a land-use technique that has been carried out by many farmers in Indonesia (Syahri *et al*., 2019). For example, the shifting cultivation system, mixed plants that are cultivated around the house (home garden), and the pasture. In the Agroforestry system, people can practice both traditional and modern ways by observing the physical condition of the environment, society, economy, and culture of the communities that are participated (Sandabunga *et al*., 2019).

One of the most agroforestry systems commonly done by Indonesian people is a home garden agroforestry system. The home garden is the land around the house that is planted a mixture of seasonal and perennial plants, accompanied by various wild animals and livestock. In addition, the home garden is a system with specific limits and has economic, biophysical, and socio-economic benefits for the owner. The home garden agroforestry system is mostly found in rural areas because there are provided extensive plots of land and also the people culturally like to plant crops. Therefore, the home gardens around the houses used by the rural communities can support their financial income that meets their daily needs.

Tana Toraja is a regency in South Sulawesi, which is famous for its agricultural products. It has long been implementing a traditional agroforestry system or yard. It can be seen from the Tana Toraja people who mostly like to do gardening in their home yards. The home garden agroforestry system in Tana Toraja has been developed around the Toraja traditional house area that called Tongkonan. Tongkonan comes from the word *Tongkon* which means to sit or sit because it is commonly used to be a gathering place for Toraja nobles who sit in tongkonan to discuss something. This traditional house has multi-level social and cultural functions in society. Initially, it was the center of government, tradition power, as well as the development of the socio-cultural life of the Toraja people (Tangdilintin, 1975). In general, the Tongkonan traditional house has a large area covered with various types of plant vegetation. It is due to the socio-cultural factors of the community, especially in building the Tongkonan traditional house.

The residents of Lembang Buri, Rembon district of Tana Toraja have a long-practiced home garden agroforestry system because most of the people considered the agriculture products for both seasonal and annual crops can fulfill their needs. The spatial arrangement patterns, structure, and the composition of plant species developed in a home garden agroforestry system in the tongkonan garden are influenced by habit, culture, land area of ownership, capital availability, and commodity prices (agricultural products) in the market.

It is noticed that the needs of the Tana Toraja people cannot be separated from the use of carpentry woods, crops, livestock products, and traditional medical materials. Therefore, it encourages the people to plant various types of wood-producing plants, to be the providers of food crops, fodders, medicinal plants, and fruits. The more varied the species, the more diverse the structure and the composition of the plant species developed. Based on the reasons above, it is essential to research the composition and the utilization of plants at Lembang Buri Tongkonan Garden, Rembon District of Tana Toraja.

Materials and Methods

This research was conducted for two months, from March to April in the Tongkonan Garden, Lembang Buri village, Rembon district, Tana Toraja Regency.

The tools and materials used in this study were: 1. Compass was used to determine the direction in doing observation plots. 2. Meter ruler, raffia ropes, and stakes were used to make plot. 3. Hagameter was used to measure tree height. 4. Tape meter was used to calculate the tree circumference. 5. Global Positioning System (GPS) was used to determine the geographical location of the study site. 6.

Tally sheet and stationery were used to record the results of observation in the research. 7. Graph paper was used to draw the structure of vegetation. 8. The camera was used to document all activities in the research. 9. The questionnaire was used for the interview.

Materials or objects observed in this study were the structure, composition, and the utilization of plants in the Tongkonan garden of the Lembang Buri community, Rembon District of Tana Toraja.

Data Collection Method

Data and information collected in this study consisted of two types: primary and secondary data.

(1) Primary data

Primary data were obtained by observing the object in the field and then collecting the data on the plant types. Hence, they could be identified and classified based on their type. There were ten respondents of the interview that were selected by purposive sampling. They were considered to represent the whole owner of the Tongkonan garden using questionnaire blanks and also taking the pictures and photos in these research activities.

(2) Secondary data

Secondary data were obtained from information in the village office and related institution to see the general condition of the research location, socio-economic situation, population data, and the condition of the study area.

Research procedure

The Determination and the Manufacture of Plots

The plot determination in this study used a purposive sampling method that was proposed by Delaney and Roshetko (1999). The determination of the plot was carried out by selecting 10 of 21 Tongkonan gardens or locations with traditional Tongkonan houses that cultivated a lot of trees and home garden plants with full of vegetation criteria and also having the area larger than 0.05 hectares. Then, making a plot by choosing a part of the Tongkonan garden that could represent the diversity of all types of the compilers of home garden plants with a size of 25 m × 25 m by using a meter ruler, and providing stakes (in the form of bamboo sticks), then putting up the raffia ropes at four corners of the plot as the boundary marker.

Data Collection Structure and Composition

In collecting data, the researchers documented all the names of plant species and counted the number of all plant species found in each plot and then recorded them on a Tally sheet. Moreover, the stand structure and composition of the agroforestry type in each plot were observed. It had been determined by measuring the dimension of the stand with calculating the diameter and height of the tree and the position in the canopy of the plant in the plot. Then, observing and measuring the canopy cover area using a meter ruler within a size of 25 meters for the X-axis and 25 meters left for the Y-axis. Then, drawing a header projection on the graph paper. Furthermore, recording the utilization of each tree planted by distributing a questionnaire to the owner of the Tongkonan garden, which was considered to represent the whole owner of the existing Tongkonan garden at the research location. Next, having a short interview with the headman of the village and other community leaders who were related to the development and utilization policy of the Tongkonan garden.

Data analysis

The data analysis used in this research was descriptive. The data obtained such as plant type data, plant height, diameter, and the utilization of plant types, and they were tabulated. Then, the data were analyzed descriptively to get the results in the form of the structure, composition, and utilization of plants in the Tongkonan garden so that the results become the reason for concluding.

Results and Discussion

Standing Structure

Plants Structure in Tongkonan Garden

The results showed that the vertical structure of the home garden agroforestry system consisted of 4 (four) different canopy stalls in each plot. The division of canopy stage was based on the classification of the home garden canopy as follows according to Millang (2010):

a. Stage I with a height less than 1 m

b. Stage II with a height between 1-5 m

c. Stage III with a height between 5-15 m

d. Stage IV with a height more than 15 m

The vertical structure of the home garden agroforestry system found in the gardens of Buri Tongkonan, Rimbua Tongkonan, Tanete To'ao Tongkonan, Tinakka Tongkonan, To'ao Tongkonan, and Pambala Tongkonan had four stages. In contrast, in Tandung Tongkonan, Ta'ba Tandung Tongkonan, Rumenden Tongkonan, and Bamba Tongkonan only had three stages. It is due to differences in knowledge, goals, resources, land area, and the budgets they had. So, the tongkonan garden had some differences in selecting the plant types.

The stage I was dominated by bushes, herbs, grasses, and vegetables such as taro, sweet potatoes, ginger, turmeric, tomatoes, chilies, eggplants, teki grasses, and other plants. Stage II was dominated by groups of herbs, shrubs, small shrubs, and commodity crops such as cocoa, coffee, cassava, oranges, bananas, papaya, etc. Then, stage III was dominated by small trees, large shrubs, and fruit trees such as guava, jackfruit, rambutan, mango, langsat, and others. However, stage IV was dominated by fruit trees and tall trees such as uru, buangin, durian, sengon, white teak, pangi, and other tall plants.

There were three examples of Tongkonan gardens in Lembang Buri that represented a total of 10 Tongkonan gardens where they varied each other. Buri's Tongkonan Gardens had ten types of plant species with a total of 36 and consisted of IV stage with randomly planting space. In the Tandung's Tongkonan garden, there were eight types of plants with 27 total number of individual crops and only consisted of III stages with randomly cropping space. However, in the Tinakka's Tongkonan garden, there were seven types of plant species with a total individual number of 31 and consisted of IV stages with randomly planting space. The differences in the three Tongkonan Gardens can be seen more clearly in Table.

Table 1 : The differences among the Tongkonan Gardens

No	Plant types	Buri Tongkonan			Tandung Tongkonan			Tinakka Tongkonan		
		Com*	Stage	Cropping pattern	Kom*	Stage	Cropping pattern	Com*	Stage	Cropping pattern
1	Cocoa	□	II	RANDOM	□	II	RANDOM	□	II	RANDOM
2	Coffee	?	II		·	II		-	-	
3	Mango	·	III/IV		-	-		-	-	
4	White Teak	·	III/IV		·	III		·	IV	
5	Durian	·	II		·	III		-	-	
6	Areca Nut	·	III		-	-		-	-	
7	Bamboo	·	III		·	III		·	III/VI	
8	Kecrutan	·	III		-	-		-	-	
9	Suren	·	VI		-	-		-	-	
10	Palm	-	-		·	III		-	-	
11	Langsat	-	-		·	III		-	-	
12	Sengon	-	-		-	-		·	III	
13	Uru	?	-		-	-		·	III	
14	Banana	-	-		-	-		·	III	
15	Buangin	-	-		-	-		·	III	
Total Number of Crops		36	IV		27	III		31	IV	

Notes : ? = Yes, - = No, * = Composition

Plant Type Composition

The results showed that the composition of the species in the tongkonan gardens of Lembang Buri was different in each pattern of agroforestry, especially in the term of the plant type number. The community of Tongkonan garden developed as many as 50 species with a total of 335 individual numbers.

The types of plants that were developed consisted of wood-producing plants, such as Uru (*Elmerilia ovalis*), Buangin (*Casuarina junghuniana*), Bamboo (*Bambussa* sp), White Teak (*Gmelina arborea*), Suren (*Toona sureni* Merr), sandalwood (*Casuarina junghuniana*), Sengon (*Paraserianthes falcataria*), commodity crops such as Cacao (*Theobroma cacao*), Coffee (*Coffea* sp). Fruit and vegetable producing plants such as Mango (*Mangifera indica*), Durian (*Durio zibethinus*), Coconut (*Cocos nucifera*), Areca (*Areca catechu*), Sugar palm (*Arenga pinata*), Langsat (*Lanzium domesticum*), Guava (*Psidium guajava*), Rambutan (*Nephelium lapaceum*), Jackfruit (*Arthocarpus heterophyllus*), Avocado (*Persea americana*), Banana (*Musa paradisiaca*), Papaya (*Carica Papaya*), Mangosteen (*Garcinia mangostana*), Orange (*Citrus* sp), Kecapi (*Sandoricum koetjape*), Pangi (*Pangium edule* Reinw), Kapok (*Ceiba pentandra*), Salak (*Salacca zalacca*), Pineapple (*Ananas amosus*), Cassava (*Manihot esculenta*), Taro (*Calacosia esculanta*), Chayote (*Sechium edule*), Eggplant (*Solanum melongena*). Herbs, spices, and medicines, such as Turmeric (*Curcuma longa*), Lemongrass (*Andropogon margus*), Ginger (*Zingiber officinale*), Jatropha (*Ricimus communis*), Galangal (*Alviana galangal*), Gedi Leaves (*Abelmoschus manihot*), Red shoots (*Syzigium oleina*), Mahkota Dewa (*Phaleria macrocarpa*), Pandan leaves (*Pandanus amaryllifolius*), Miana (*Coleus benth*), Chillies (*Capsicum* sp). Forage-producing plants such as elephant grass (*Cenchrus pupurcus*), teki Grass (*Cyperus rotundus*), Sweet Potato (*Ipomoea batatas*), and Taro (*Calacosia esculanta*).

The Plant Utilization in Tongkonan Gardens

The composition and the structure formed in the home garden system was influenced by the selection of tree species to be planted. Every Tongkonan owner had its own reasons for integrating the types of plants planted. Based on the results of the study showed that there were several reasons revealed by the community in integrating the types of plants such as economic, social, and cultural reasons. It could be seen from the results of the questionnaire in which of the ten respondents listed. Seven respondents sold the products of Tongkonan home garden in order to satisfy their daily needs (economy), one respondent contributed the crops planted for social purposes in order to help the local community in ceremonial activities or customary events (social). Three respondents used the products of the home garden for ceremonies and traditional (cultural) events. Besides, the cropping was to utilize the vacant land around the yard of Tongkonan traditional house.

The types of wood often found in each Tongkonan garden at Lembang Buri are uru, Buangin, and white teak wood. The uru tree is the most common woody plant and found in every Tongkonan garden plot. It is due to the quality of uru wood that is durable and quite expensive. Moreover, the uru tree is the main wood supporting the traditional Tongkonan house so that the community took considerations to develop this species. Other types of wood that are commonly found are suren, sandalwood, and sengon. The community utilizes the wood in order to meet the needs of carpentry in houses' construction, tongkonan traditional houses, and the carving materials. Another plant found in

each plot of the Tongkonan garden as the construction material is bamboo. The bamboo is used to make the roof of the Tongkonan traditional house and is also used for traditional events in Tana Toraja.

Cacao and coffee plants are found in almost every plot in Tongkonan home garden as commodity crops because cacao with a high income is relatively stable in the market. Therefore, it becomes one of the communities' considerations to keep cropping in the home garden in order to increase the income of the community, like in Kolaka district (Yolanda Fitria Syahri *et al*., 2020) (N Manglili, B Nurkin, S A Paembonan, S Millang, 2019). Besides, coffee also has a high price and is one of favorite drinks of the Toraja people who stay in the highland area that is generally cold. Hence, coffee drinks are always available for the Toraja people.

The types of fruit and fruit-producing plants are durian, langsat, rambutan, mango, jackfruit, avocado, orange, pineapple, papaya, pangi, guava, mangosteen, banana, kecapi, salak, coconut, areca nut, and other fruit-producing plants. The Lembang Buri community planted many fruit-producing crops for sale and consumption as well as firewood for cooking.

Herbs, spices, and vegetables, such as Turmeric, lemongrass, ginger, jatropha, galangal, gedi leaves, cat's whiskers, red buds, mahkota dewa, miana, squash, palms, chilies, eggplants, cassava are also used by the community to meet daily food needs. The surrounding community also develops Pangi plants because the fruit can be processed as a spice for cooking a traditional *pammarasan* (rawon) cuisine. It is one of the special foods that are very popular with the Toraja people.

The young sengon tree, sweet potato leaves, elephant grass, teki grass, and banana are types of plants that are used as fodder for livestock such as buffalo and pigs that are mostly maintained and found in Toraja. They are intended for the traditional events of the Toraja people. Moreover, the areca nut plant has developed in the Tongkonan garden by Lembang Buri community because this plant is a complimentary fruit for the Toraja people who are used to eating betel vine or *sirih* (called *ma'papangan*) in daily life, as well as in the traditional ceremonies, rituals of the beliefs, and the habits of the Toraja people.

The bamboo was mostly used by the community and found in every home garden of the tongkonan house of this research because the bamboo is a multifunction and also a fast-growing plants (S A Paembonan, 2019). The bamboo is not only widely used by the Toraja residents for constructing the roof of the tongkonan traditional house, but also used for traditional events and ceremonies where bamboo is the main material in building a resting and sitting place for guests, and also firewood for traditional events and ceremonies (*alang-alang*), and making *lakkean* (the resting place of the deceased at a *rambu solo* traditional event).

Furthermore, the wood barter system has been habitually practiced hereditary by the Toraja people, and it is a good habit for sure. Everyone who is building a house, Tongkonan traditional house, rice barn (*alang*), traditional event, and ceremony does not need to buy the wood, but barter enough by swapping or asking help to the neighbors in the term of wood barter because they consider that one day they will also need it later on. Besides the commercial commodity crops of cacao and coffee farming, the most highly economic value to the Lembang Buri community is from rice fields with have a large area that produces rice. Then, it is sold in a relatively short period among the other farming businesses in Toraja.

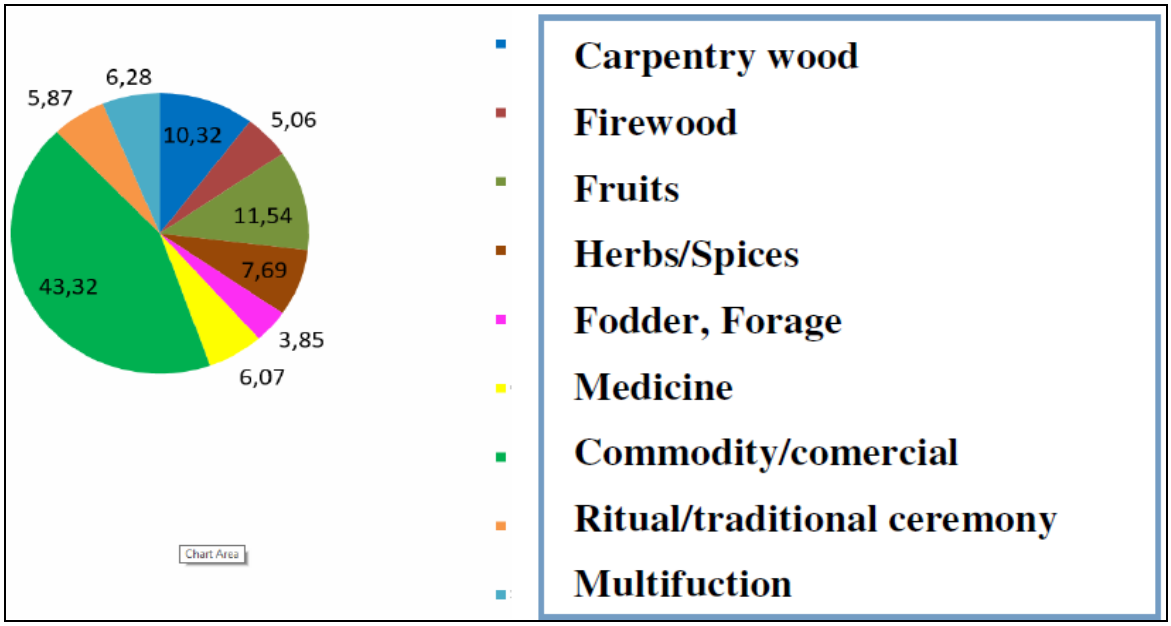

Fig. 1 : The percentage of plant utilization types by the communities in Lembang Buri's Tongkonan Garden, Rembon District, Tana Toraja Regency.

Figure 1 shows that 43.32% of the plant utilization in the Tongkonan garden was from commercial plants. Besides, the smallest plant utilization was from the fodder of livestock, with a percentage of 3.85%. Based on the results obtained, it was known that the Lembang Buri communities aimed to develop estate crops/agriculture from commodity/commercial types around the home garden area of the Tongkonan house. It is due to the existence of the Lembang Buri communities habit that is really excited to plant crops from the commodity/commercial types,

especially from the types of cacao and chocolate. Thus, it cannot be denied that the profession of the Lembang Buri community are mostly farmers.

Fruit-producing plants stood as the second-largest percentage of 11.54%. The plants planted in the home garden was intended for sale on market days and also for daily consumption. The carpentry wood with a percentage of 10.32% was due to the existence of cultural factors that could not be separated from the construction of the tongkonan traditional house itself. The spices and herbs ranked the next percentage (7.69%). Communities mostly used the rest of 6.07% for cropping in their home garden to meet their household needs for reducing other outcomes. Besides, the shops that sold spices, herbs, and vegetables were rarely provided there. Therefore, they do not need to the market because they already planted the crops in the home garden. The multifunction plants were in a percentage of 6.28%.

The plants for traditional events occupied a percentage of 5.87%. This event could not be separated from the culture of the Toraja community, which was still thick for traditional events/ceremonies. Then, the firewood-producing plants with a percentage of 5.06% were related to the habits of some people who were still cooking in the traditional way that used firewood both for cooking daily food and used for cooking the livestock feed (fodder). The smallest percentage of plant utilization was the type of fodder producing plant with a percentage value of 3.85%. It is because the people of Lembang Buri preferred to plant fodder in a large area (pasture) compared to the home garden. For buffalo, feed types are grasses, but pigs commonly eat tubers. Hence, the community usually plants the tubers around their home garden in a small quantity of them.

Other benefits obtained from the use of the home garden in the Tongkonan traditional house are the place to carry out the traditional ceremony of *rambu solo*, *rambu tuka*' and *mangrara banua*. In general, the Toraja traditional activities are carried out in the home garden because the garden is cultivated with many types of plants needed in the traditional events/ceremonies. Then, the garden is large enough to carry out traditional events/ceremonies. The utilization of the Tongkonan garden in the Lembang buri is also used as the stable of buffaloes and pigs. This action is supported by the local community in order to make them easier to take care of, feed, and control their livestock. Another home garden utilization is a playground for children so that it can lead to the fresh atmosphere of the house yard with beautiful scenery.

The changes that occurred in the Tongkonan garden at lembang buri get used to planting many types of commodity crops and other plants. It became a place to build a home for the family cluster as well as the changes that will be constructed in the future of the Tongkonan garden because basically every land or Tongkonan land is from family inheritance land that is fully owned by each family cluster.

Conclusion

The composition number of the main stage and also the types of compilers were relatively similar in the ten Tongkonan gardens at Lembang Buri. The number of plant species found was 50 species with 335 individual plants. Then, the commodity/commercial crops stood as the highest percentage of plant utilization, showing at 43.32%. Next, the lowest percentage was from fodder producing plants, with a percentage of 3.85%. The utilization and consideration in integrating plants were based on economic, social, and cultural reasons. Moreover, the products of Tongkonan home garden could be sold by the communities in order to meet their daily needs (financial purpose). Other benefits of the home garden were to help the local people in ceremonial activities or traditional (social) events, to contribute their home gardens for traditional ceremonies and events (culture), and to cultivate the vacant land around their houses for agricultural activities.

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