

# Community Application of Agroforestry in Sigi District, Indonesia

Rafiuddin, Imran Rachman, Andi Sahri Alam, Rajindra, Ahmad Yani

**Abstract** - Short and long biological production systems in a way that is based on the principle of sustainability, simultaneously or sequentially both within the forest area and outside the forest area. The purpose of this study was to determine the agroforestry patterns used on community land in Bakubakulu Village. This research was conducted for three months, from October to December 2018. Respondents in this study used a purposive sampling technique. Data were analyzed using descriptive methods - the results of research on the age of the dominant respondents at the age of 21-30 years. The general education level of the respondents is a secondary school. The respondent's length of stay is more than 30 years. The area of dominant respondent's land is 0-1.5 Ha. The agroforestry pattern applied by respondents based on the time dimension is Intermittent on sloping ground and Coincidental on flat ground. According to the spatial aspects of the model used by respondents are Temporary Regular on flat land and Random Permanent on sloping land. The types of plants most widely planted by the community are candlenut, sugar palm, cocoa, clove, and coconut. And the Ordinary Temporary Pattern is the pattern most often applied by respondents.

**Keywords** - Agroforestry, Agroforestry Patterns, Organized Places, Permanent Random.

## INTRODUCTION

Land as a natural resource has a role, among others, as a producer of agricultural commodities. The increase in population and basic needs has led to the need for more extensive agrarian areas and more intensive cultivation. One way that can be used for optimal land use is through agroforestry activities [1].

Agroforestry is an activity that is defined as an optimal land use method, which combines short and long rotating biological production systems in a manner based on the principle of sustainability, simultaneously or sequentially both within the forest area and outside the forest area [2]. Agroforestry has advantages compared to other land-use systems, including higher total products, diversity of products and services, free from dependence on outside products, and guarantee farmers' income [3].

*Rafiuddin, Faculty of Agriculture, Universitas Muhammadiyah Palu, Indonesia. Imran Rachman, Andi Sahri Alam, Department of Forestry, Faculty of Forestry, Tadulako University, Palu, Indonesia. Rajindra, Faculty of Economics, Universitas Muhammadiyah Palu, Indonesia. Ahmad Yani, Faculty of Public Health, University of Muhammadiyah Palu.*

Sustainable agriculture is a concept of future thinking. Sustainable agriculture is sustainable agriculture, for now, the future, and forever [4]. This means that agriculture still exists and benefits all and does not cause disaster for all. While agroforestry is a permanent land-use system, where annual and annual crops are planted together or in rotation to form a layer of the canopy, so it is beneficial to protect the soil from raindrops. This system will provide benefits both ecologically and economically [5]. So that the concept of complex agroforestry can be used as one of the sustainable agricultural efforts in overcoming environmental problems [6].

Agroforestry-based land-use systems and patterns in Bakubakulu Village, have been implemented for quite some time. However, the lack of information about agroforestry systems results in the community lacking understanding of the combination patterns that exist in the system. While applying the agroforestry pattern appropriately can provide financial benefits to the community, optimizing the yield of each land managed by the city, as well as an effort to conserve soil and forest resources. The purpose of this study is to find out the pattern of agroforestry used on community land.

## MATERIALS AND METHODS

This research was carried out for three months, from October to December 2018 in Bakubakulu Village, Palolo District, Sigi Regency, Central Sulawesi Province. The choice of location was based on the consideration that in Bakubakulu Village the community adopted an agroforestry pattern in their garden area. Data collection techniques used consisted of literature studies and interviews. A literature study is used to obtain information about agroforestry patterns used by the Bakubakulu Village community. Interviews were used to get precise information from respondents about the habits of agroforestry used by the Bakubakulu Village community.

Respondents in this study were 16 farmers who managed agroforestry land in Bakubakulu Village. Respondent taking in this research uses a purposive sampling technique that is a sampling of respondents intentionally (not randomly) adjusted to the purpose of the study [7]. With the consideration that the sample meets the criteria needed in the study. To find out the pattern of agroforestry in this study used descriptive methods in analyzing data. The data obtained from the respondents are thoroughly described by looking at the composition or combination of tree species and forestry plants.

## RESULTS AND DISCUSSION

### Age of Respondents

The age of respondents was classified into four groups, including group I (21-30 years old), group II (31-40 years), group III (ages 41-51 years), and group IV (Ages over 50 years). The distribution of the number of respondents by age class is presented in Figure 1.

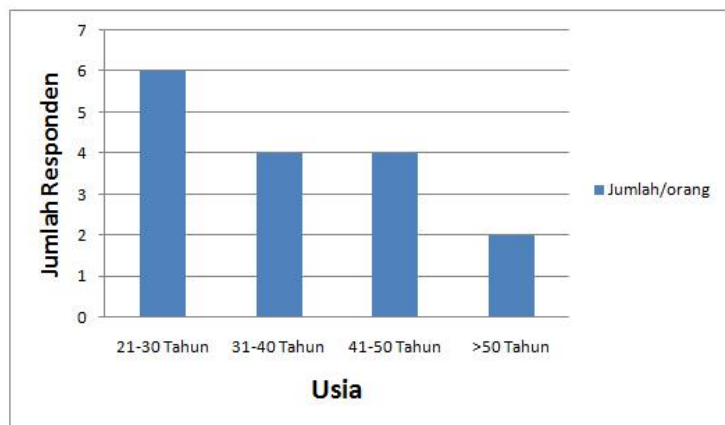


Figure 1. Respondents Age Chart

Figure 1 shows the age level of the dominant respondents in group I (age 21-30 years). A number of 6 respondents. While the lowest quantity of respondent's age is in age group IV (age > 50 years). Total of 2 respondents.

### Education Level of Respondents

The education level of the respondents was classified into three groups, including group I (elementary school), group II (junior high school), group III (high school), group IV (vocational high school). The distribution of the number of respondents based on their level of education is presented in Figure 2.

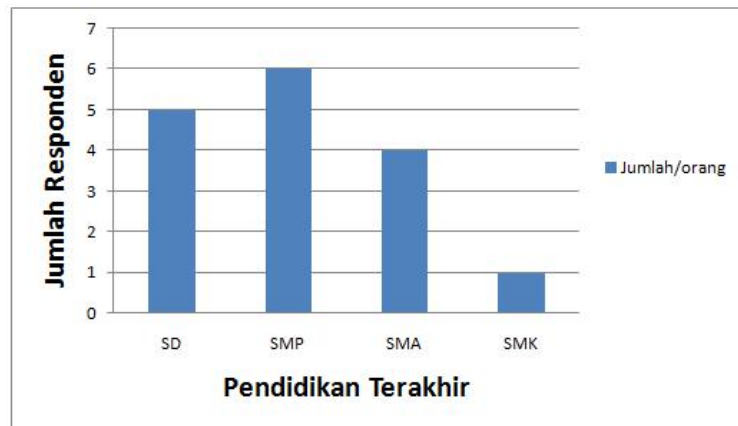


Figure 2. Education Level of Respondents

Figure 2 shows that the level of education of the dominant respondents in group 2 (junior high school) was six respondents. While the education level of the lowest respondents in group IV (Vocational High School) was one respondent.

### Length of Respondents' Residence

The length of stay of respondents in Bakubakulu Village was classified into three groups, including group I (11-20 years), group II (21-30, and group III (Over 30 years). Distribution of the number of respondents based on length of stay is presented in Figure 3.

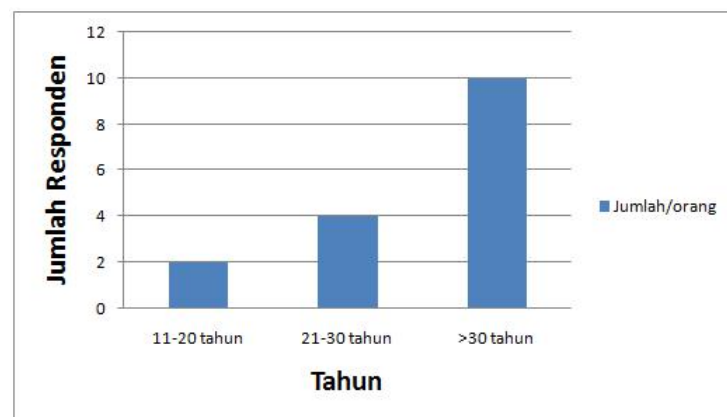
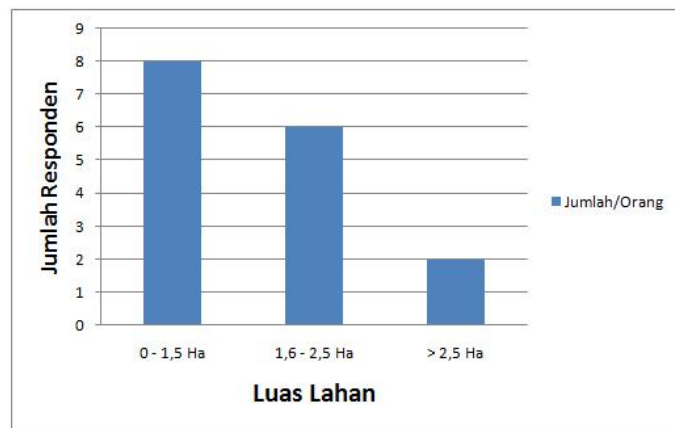


Figure 3. The length of time the respondent lived

Figure 3 shows the length of stay of dominant respondents in group III (> 30 years) of 10 respondents. While the lowest range of the respondent in group I (11-20 years) was two respondents.

### Land Ownership

The respondent's land area in Bakubakulu Village is classified into 3 groups including group I (0 - 1.5 Ha), Group II (1.6 - 2.5 Ha) and group III (Above 2.5 Ha). The distribution of respondents based on land area is presented in Figure 4.



**Figure 4. Land of Respondents**

Figure 4 shows that the dominant land area of respondents in group I (0 - 1.5 Ha) was eight respondents. While the lowest respondent's area in group III (above 2.5 Ha) is two respondents.

### **Community Agroforestry Patterns**

Combinations made by the community in Bakubakulu Village according to the time dimension, there are two types of intermittent/periodic combining patterns used on flat land, which means that crops are usually planted only for one harvest. The plants will be replaced with other vegetables. While forestry plants will continue to grow as a living fence (Border tree planting). In the sloping land, the Coincident combination pattern is used, that is, the combination of components continuously as long as the area is used. Meanwhile, if seen from the spatial aspects of the combination pattern used by the Bakubakulu community is a regular Temporarily where the combination pattern can be seen in Figure 5 below.



**Figure 5. Examples of agroforestry patterns on community flat land**

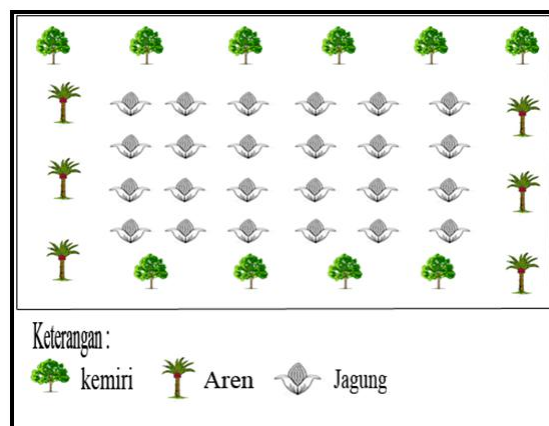
In Figure 5 above, where the tree is placed around a plot or placed on the sides of a scheme called a tree along the border of a box system. In the picture above can be seen crops (corn) planted in one plot, and outside the scheme, there are forestry plants (candlenuts) that line around the plot. Whereas on sloping land, agroforestry patterns used by the community when viewed in spatial aspects are Random Permanent. The combination pattern can be seen in Figure 6 below.



**Figure 6. The pattern of community combination on sloping land**

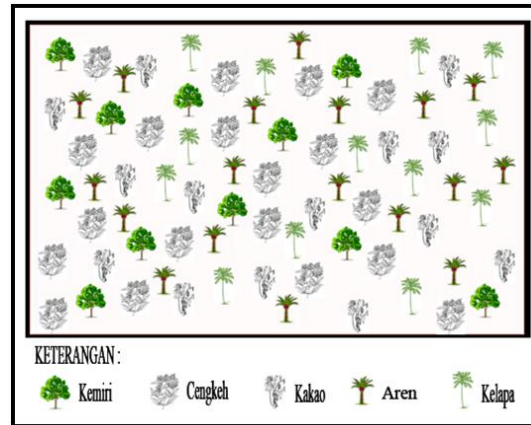
In Figure 6 above can be seen candlenut trees, and sugar palm grow irregularly, under these candlenut trees, there are clove plants, bananas, grapefruit, and cocoa. From the picture above it can be seen that the tree that dominates is hazelnut because hazelnut is the main commodity with results that are considered to be more profitable economically [8].

To see more clearly the details of cropping patterns used on community flat land can be seen in Figure 7.



**Figure 7. Regular Temporary Agroforestry Patterns**

To see details of cropping patterns used on community sloping land can be seen in Figure 8.

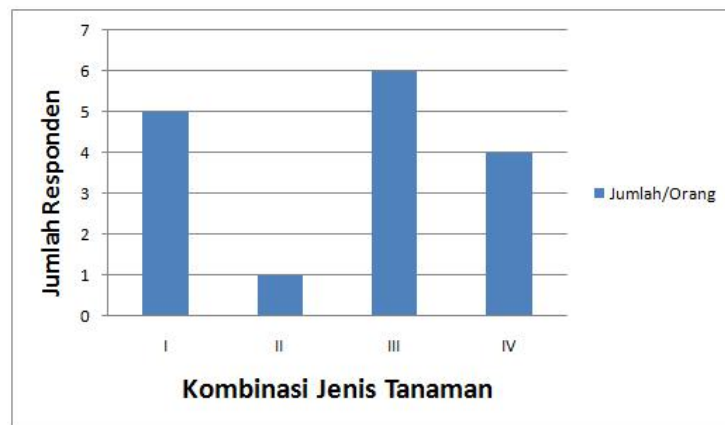


**Figure 8. Random Permanent Agroforestry Patterns**

In Figure 8 above, it can be seen that the candlenut, clove, cocoa, and coconut plants are planted randomly. Spacing also varies from 5-15 M; clove plants are always under shade plants such as candlenut or sugar palm because if cloves are planted without other protective plants, it is likely to cause wilting of the clove plants.

### Combination of Community Plant Types

The combination of community plant species in Bakubakulu Village is classified into 4 groups, including group I (Candlenut, sugar palm and corn), group II (Candlenut, Cassava and Coconut), Group III (Candlenut, sugar palm, cacao, clove and coconut), Group IV (Candlenut, cassava, grapefruit, coconut and avocado).



**Figure 9. A combination of community plant types**

Figure 9 shows the combination of plant species that are being developed in Bakubakulu Village is more dominated by group III (Candlenut, sugar palm, cacao, clove, and coconut) as many as six respondents while the lowest combination of plant types is group II (Candlenut, cassava, and coconut) of 1 respondent.

### CONCLUSIONS

This study concludes that the agroforestry pattern applied by the community in Bakubakulu Village according to the time dimension is the intermittent/periodic combination pattern on flat land and the coincident pattern of combination on sloping ground. Meanwhile, if viewed from the spatial aspects of the combination pattern applied by the Bakubakulu community is regular temporary for flat land and random permanent combination for sloping ground. The combination pattern that is most widely used by the community in Bakubakulu Village is the Temporary Combined Pattern pattern.

## REFERENCES

- [1] H. K. Widiyanto, D. Suharjito, and M. A. Sardjono, “Fungsi dan peran agroforestri. Bahan Ajaran Agroforestri 3. Bogor: World Agroforestry Centre (ICRAF).” 2003.
- [2] G. J. Measey and K. A. Tolley, “Sequential fragmentation of Pleistocene forests in an East Africa biodiversity hotspot: chameleons as a model to track forest history,” *PLoS One*, vol. 6, no. 10, p. e26606, 2011.
- [3] C. S. Everson, P. J. Dye, M. B. Gush, and T. M. Everson, “Water use of grasslands, agroforestry systems and indigenous forests,” *Water Sa*, vol. 37, no. 5, pp. 781–788, 2011.
- [4] N. T. Tjatjo, “Karakteristik pola agroforestri masyarakat di sekitar hutan Desa Namo Kecamatan Kulawi Kabupaten Sigi,” *JSTT*, vol. 4, no. 3, 2015.
- [5] M. Franzen and M. B. Mulder, “Ecological, economic and social perspectives on cocoa production worldwide,” *Biodivers. Conserv.*, vol. 16, no. 13, pp. 3835–3849, 2007.
- [6] E. T. Craswell, A. Sajjapongse, D. J. B. Howlett, and A. J. Dowling, “Agroforestry in the management of sloping lands in Asia and the Pacific,” in *Directions in Tropical Agroforestry Research*, Springer, 1998, pp. 121–137.
- [7] N. Nadeak, R. Qurniati, and W. Hidayat, “Analisis Finansial Pola Tanam Agroforestri di Desa Pesawaran Indah Kecamatan Padang Cermin Kabupaten Pesawaran Provinsi Lampung,” *J. Sylva Lestari*, vol. 1, no. 1, pp. 65–74, 2014.
- [8] O. Tulum, *Political economy, productivity and profitability of Turkish hazelnut production*. University of Massachusetts Lowell, 2008.