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LIVELIHOOD STRATEGY OF COMMUNITY FOREST FARMERS: A CASE STUDY IN CIAMIS REGENCY, WEST JAVA, INDONESIA

SUHARTONO[1] Ary WIDIYANTO[2] Budi MULYANA[3]

Abstract: *The problem of small and limited agricultural land ownership constrains community forest farmers in Indonesia. A strategy is needed to drive the small and limited farmland to meet the needs of farmers' lives. This study aims to determine the strategy of community forest farmers in meeting their daily needs. We have conducted case studies in Muktisari Village and Cipaku Village, Cipaku Subdistrict, Ciamis Regency. The method used was interviews with 30 farmers who were randomly selected. The results showed that the average area of community forest land owned by farmers was 0.31 ha, with the majority being mixed gardens (63%). The strategy of smallholder forest farmers in meeting their needs is to plant more than one species as a source of income. Farmers with private forest landholdings <0.25 ha are more intensive by planting more species than smallholder forest farmers with larger land. The most widely cultivated cropping pattern combines trees (sengon) and secondary crops (bananas and coconuts). In addition to land use strategies, community forest farmers have side jobs such as traders and laborers, especially during the dry season.*

Key words: *Community Forest, farmers, livelihood strategy, agroforestry, economic analysis.*

1. Introduction

Most Indonesians live in rural areas. The population in rural areas still in the poverty line until March 2019 is recorded at 13.1% [7]. Most of the population in rural areas generally have a livelihood as farmers in irrigated (paddy) and dry land (garden-forest) agriculture. One of the causes of high poverty in rural areas was narrow land ownership. Farmers in Java are particularly small farmers with an average land tenure of fewer than 0.5 hectares [6]. The proportion of small farmers with land ownership of fewer than 0.1 hectares is 17.2%, and those with land with an area of 0.1 - 0.5 hectares rest 39.2% [10]. The income they earn was

[1] Research Center for Ecology and Ethnobiology, National Research and Innovation Agency, Bogor, Indonesia;
[2] Research Center for Population, National Research and Innovation Agency, Jakarta, Indonesia;
[3] Faculty of Forestry, Universitas Gadjah Mada, Yogyakarta, Indonesia;
Correspondence: Suhartono; email: har436@gmail.com.

very small for farmers who only depend on agricultural products from such a narrow land, so efforts need to be made to soptimise the land.

Farmers with limited land will intensify their land by planting various plants with agroforestry patterns. Communities with a limited area applying mixed cropping patterns aim to increase the intensity of collection per unit of the land area to meet the needs of their subsystems [20]. Agroforestry patterns can play a role in increasing income and meeting food needs. The types of agroforestry patterning plants in each region generally vary. Agroforestry patterns in the Pasawar area include trees (teak, mountain *waru*), plantation commodities (cocoa, rubber), fruits (avocado), and bamboo [35], while the people in Kulonprogo plant their land with tree species (sengon, mahogany) and plantation commodities (cocoa, coconut, cloves) [15]. Suryani and Dariah [37] stated that the weaknesses in the agroforestry system included the low level of knowledge of the community regarding the interaction between trees and other crops so the results could not be optimal.

In general, agroforestry planting is widely practised as a climate change mitigation strategy that impacts agricultural production due to uncertainties and varying climatic conditions [18], [25], [27]. Furthermore, agroforestry has provided many benefits and improved farmers' livelihoods through better access to food sources, timber, fodder, firewood, and greater livelihood options [5]. Currently, agroforestry is not just a strategy to produce food in the context of mitigating climate change but has developed into a business [29], [34], [39]. Many smallholder forest farmers soptimise their land to produce commercial crops under tree stands.

This study aims to determine whether mixed cropping patterns developed by the community can benefit the community. This study also aimed to determine the strategies of community forest farmers with agroforestry patterns in seeking income. The focus of the research is on the strategy for selecting types of trees and intercropping as well as selecting additional types of job.

2. Theoretical Framework

Most tropical developing nations have embraced various community-based forest management models [19]. In Indonesia, a form of community forest (CF) where management authority is fully in the hands of the community is a private forest. On the other hand, the capacity of agriculture to ensure food and livelihood security is occasionally drastically reduced. Diversifying livelihood options has recently spread throughout the study area as a typical occurrence [12].

Compared to wealthier households, relatively poor households rely more on forest resources as a percentage of their total income [9]. Farmers choose their adaptive behaviors based on the socio-economic makeup of their households. The recommended adaptive behavior was a traditional agricultural adjustment. The adoption of various adaptive behaviors was significantly influenced by external factors, such as effective irrigation rates, labor training and agricultural technicians, and farmers' livelihood capital, including knowledge and awareness, natural capital, income and expenditure, and social networks [41].

A crucial component of the local livelihoods approach is that it tries to understand the problems from the locals' viewpoint, concentrating on what matters most to them: their daily livelihoods [14]. To improve the design of the CF approach, it is especially important to have a clear understanding of a household's asset pentagon, the primary livelihood strategies, and the outcomes. Forest management is expected to create or deplete household assets and determine accumulation and access to these assets [19].

Community forest with an agroforestry pattern is one of the most common types of community forest management, especially in Java Island, Indonesia. Agroforestry, or the integration of trees and shrubs with other farming activities, can boost the productivity of those other activities while generating extra income streams, spreading out farm labor over the year, and conserving soil, water, and wildlife [8].

Many studies have been conducted on people's livelihoods, especially in social forestry programs. The novelty of this research is, how this paper explains the motivations and reasons behind farmers' choicein selecting types of plants and types of work. By knowing these motivations and reasons, it is hoped that the right approach can be taken from related parties, especially the government, to implement programs related efforts to improve the welfare of smallholder forest farmers. In addition to highlighting aspects of the outside world that are reflected in local livelihoods, this study seeks to understand a portion of this local perspective. Once one decides to conduct research in local communities that focuses on the issues that are most important to the people there, the focus on livelihoods comes naturally.

3. Materials and Methods

3.1. Research Area

In Ciamis Regency, the agricultural lands in rural areas can be divided into three groups, namely home garden (*pekarangan*), garden (*kebon*), and forest (*leuweung*). In this study, the research areas were focused on gardens and forests with agroforestry systems. Referring to Achmad et al. [3], most farmers in Ciamis Regency have preferred to practice the agroforestry system in their private forests to support their incomes. The research was conducted in Cipaku Villege and in Muktisari, Cipaku Sub-district, Ciamis Regency. Ciamis Regency is located at the east end of the province, about 121 km from the provincial capital (Bandung). This regency is located at 108°20' to 108°40' east longitude and 7°40'20" up to 7°41'20" south latitude. Ciamis Regency has 26 sub-districts and 265 villages [10]. The location of the two villages which are the research locations is close together, so they have the same characteristics, including soil type, altitude, and rainfall intensity. The research location can be seen in the Figure 1.

Cipaku Subdistrict has an area of 65.39 square kilometer with a population of 69,369 people and a population density of 1,061 people / km^2. The largest population is in Buniseuri village, which is 7,444 people, while the highest population density in Buniseuri village is 1,764 people/square kilometer. The Geographical location of Cipaku Sub-district is one of the districts in the Regency Ciamis, which is in the middle of the Ciamis Regency area, bordering the

north with Kawali Sub-district to the west bordering Sadananya Sub-district.

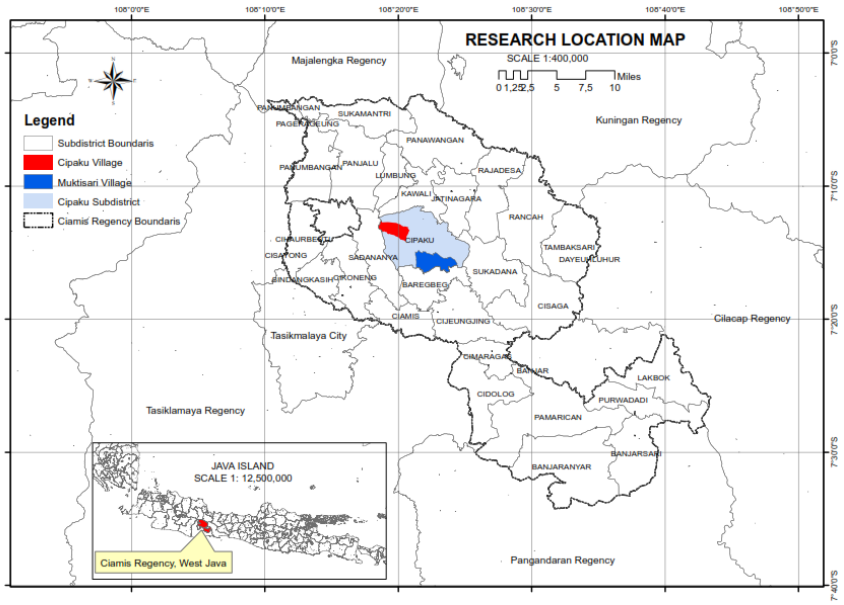

Fig. 1. *Research location*

The eastern borders, Sukadana Sub-district and the next South are bordered by the Baregbeg sub-district. The distance from the Cipaku sub-district to the capital city of Ciamis Regency is 12 kilometer. The farthest distance to the capital city of Ciamis Regency is Ciakar Villagewhich is 9.7 kilometer, while the closest distance is Buniseuri Village, which is 0.3 kilometer. The average number of rainy days in Cipaku District is 17.25 days/month and the average rainfall is 410.45 mm/month. The highest amount of rainfall occurs in January, amounting to 542 mm, andthe lowest amount of rainfall occurs in October, which is 15 mm.

3.2. Data Collection

The primary data in this research were community income, community cost, and vegetation composition during community activities as private forest farmers. These data were collected through questionnaires, interviews, and field observation. Following Achmad et al. [3] on choosing the representative respondents of forest farmers in Ciamis Regency, the steps were: 1) collecting the secondary data of the research areas; 2) coordinating with the stakeholders (government officers and farmers' leader groups); 3) choosing the respondents. The respondents selection has been applied by Roshetko et al. [32] in Sumatra, Indonesia, to get representative respondents in the smallholder home garden system.

In this research, the respondent sare farmers who own the community forest (*pekarangan, kebon, leuweung*) and using the agroforestry system. The agroforestry pattern used is a mixed garden, which is a combination of various types of wood and understorey plants. This pattern generally does not have regular spacing. The

understorey is placed in the empty space between the trees. A sampling of the community was randomly selected, and the number of respondents was 30 respondents or 15 respondents for each village. The respondents who fill in the questionnaire were heads of household. Interviews were also conducted to elaborate on the farmers' livelihood strategies. After completing the questionnaire and interview, the enumerators and respondents visited the community forest to check the vegetation structure. Melaku [21] also applied this approach, which analysed Ethiopia's subsistence agroforestry.

3.3. Data Analysis

A descriptive approach was used to describe the primary data from the survey interviews, including farming strategies. The main data from survey interviews, including farming strategies, are described using descriptive and narrative methods. Descriptive methods were used to describe certain phenomena more concretely and detailedly. First, the survey questionnaire data were analysed using Microsoft Excel. The data included people's income, cropping pattern, age, education, and land area owned by farmers. An Independence t-test was conducted to determine whether the two villages differed regarding their contribution to community forest income.

Futhermore, economic data consisting of community cost and income were calculated to determine the economic benefits of farming. Their activities in this program were calculated and converted into wages to get the total community cost. Total income is all income that they receive, including product sales and wages. The equation to calculate the cost and income of private forest farmers can be displayed as follows:

$$TC = \sum_{i=1}^{n} C_i \quad (1)$$

$$TI = \sum_{i=1}^{n} I_i \quad (2)$$

where *TC* was the total cost (USD/year), C_i was the cost of activities *i* (USD/year), TI_i was the total income (USD/year), and I_i was the income from the revenue from selling the product-*i* (USD/year).

The last step was describing the vegetation structure in the community forest. In this study, we detailed the name of species, either trees or crops, and calculated their occurrence. The plant occurrence was the number of species (trees or crops) in sampling area divided to total number of samples. This approach has been applied in agroforestry practice in Sudan [16]. In-depth interviews were also conducted to get information on the sutilisation of this vegetation to support the community's livelihood.

4. Results and Discussion

4.1. Farmer' Characteristics

The socioeconomic characteristics of the respondents varied between the two villages. In general, farmers' main occupation is as a farmer. Of the 30 respondents who owned community forests, 22 had main jobs as farmers. The other three people work as district government employees, two people as village government employees, two people as laborers, and one person as a trader.

The average income of the members is about USD 149 (USD 1 = +/-IDR 15,000)/month, which is higher than the regional minimum wage (RMW) of Ciamis Regency, which is USD 91/month. The average farmer's income from farming is about USD 94.5 which is about 63% of their monthly income. The amount of income received by each farmer is different for each village. The average monthly income of community forest owners in Site B is USD155 and this amount is more than the average income per month of the community forest owners in Site A, which is USD 143. Nevertheless, the level of dependence of the community in Site A, on community forests is greater than that in Site B. The contribution of community income from community forests in Site A is 65% and this number is higher than in Site B, which is 63% of the total income.

In terms of the extent of community forestland ownership, the Site A community has average land ownership of 0.34 ha, which is greater than the area of Site B average ownership of 0.28 ha. The socio-economic conditions of the people in Site A and Site B can be seen in Table 1.

The narrow and less intensive number of landholdings indicates that community forest business activities are included in subsistence activities. This means that even though it contributes greatly to the total income of farmers, this result is only to meet their daily needs. Subsistence activities are good from a conservation and environmental standpoint, because usually, the fertiliser input provided by farmers is organic fertiliser or only a small amount of chemical fertiliser [2], [40].

Table 1

An overview of the socio-economic conditions of the community at the research site

No	General information	Village	
		Site A	Site B
1	Number of respondents (Persons)	15	15
2	Male respondents (Persons)	2	2
3	Female respondents (Persons)	13	13
4	The average length of education (years)	9,7	8
5	Average age (years)	45.8	52.6
6	The average income per month (USD 1 = +/- IDR 15,000)	149	155
7	Income from the private forest (%)	65	63
8	Average land ownership (Ha)	0.34	0.28
9	Family member (Persons)	3-4	3

Table 1 shows that the socio-economic conditions of farmers in the two villages are almost the same. The average number of family members, duration of education, and total monthly income are almost the same between the two villages. The average area of land owned is somewhat different, where the average area of land owned in Site A is slightly larger than the average area of land owned in Site B. Furthermore, the details of the average area of land owned by each village can be seen in Figures 2a and b.

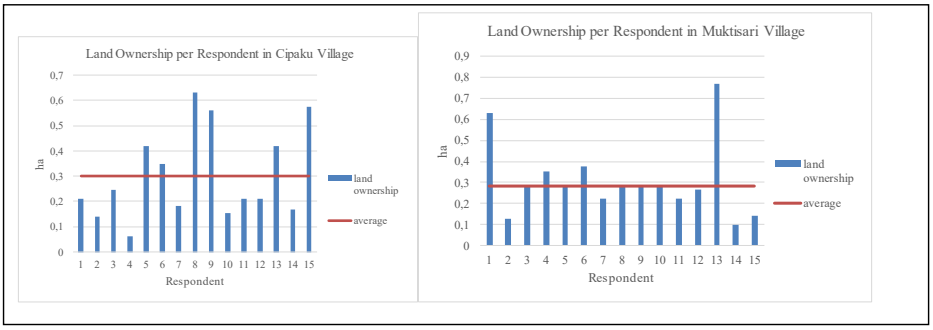

Fig. 2. *Land Ownership in Site A (a.) and Site B (b.)*

The results of the T test showed that farmers in the two villages had income levels, education levels, average land area, and average age that were not statistically different. The results of the correlation test show that of all variables, only age has a positive effect on income. This means that on average, older farmers earn more than younger farmers. This is thought to be related to farming experience related to decision making regarding plant types, maintenance techniques, and community forest management.

4.2. The Contribution of Community Forests to Farmers' Income

Based on this source, farmers' income can be grouped into two categories: main income (farming) and income from additional work. Income from community forest farming is divided into income from main crops (timber) and income from intercropping crops.

The average income of community forest owners in Site B is greater than the average income of community forest owners in Site A (Table 1). The amount and average income show that the contribution of income from community forests at Site A is greater than that from Site B. However, statistically, the farmers at sites A and B were not significantly different regarding income from community forests.

A significance level of >0.05 indicates that the income level of smallholder forest farmers in the two locations is not significantly different. This condition is reinforced by the size of the cost and income components of community forest farming, as shown in Tables 2 and 3.

Table 2

Results of the analysis of differences in the contribution of community forests to farmers' income in two locations

Independent Samples Test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Income	Equal variances assumed	1.256	.272	.461	28	.648
	Equal variances not assumed			.461	16.533	.651

Costs and incomes from primary plants (trees) and crops Table 3

Components of costs and incomes	Tree		Crops	
	Site A	Site B	Site A	Site B
1. Cost/year/ha (average)/USD				
a.Seed*	21.7	25.1	16.1	19.3
b. Fertilizer	21.8	15.7	55.0	46.2
b. Labor	43.8	39.5	98.9	100.1
Total	87.3	74.6	128.1	165.6
2. Income/year/ha (average)/USD	323.3	390.5	1,804.1	1,261.4

Note: *seed only in the first year for tree

The average total cost for the means of production for community forest activities using the agroforestry system in the two locations was almost the same for both timber and agricultural types. The absence of significant differences in the contribution of community forest revenues to the two groups indicates equality of opportunity between the two regions. Factors such as access to resources, environmental conditions, and similar markets in the two locations may affect economic stability and quality of life for smallholder forest farmers in the two regions.

4.3. Job Type Selection Strategy

Of all respondents, 73% had primary jobs as farmers and additional jobs. About 27% of them do not have additional jobs. The choice of additional jobs owned by most of the community is as traders and laborers. The choice of additional work is based on the consideration that working as a trader and laborer is more flexible, in terms of time.

Professions as traders and laborers are generally carried out when work in their community forests does not require too much activity. For example, they cannot plant their crops during the dry season. For the people of Site A, this additional work contributes quite a large amount of 35% or an average of around USD 807.600/month.

Meanwhile, 87% of respondents in Site B have a main job as farmers and have additional jobs. About 13% of them do not have additional jobs. About 60% of respondents have additional jobs as traders and laborers. The reason for which they are the same is that the additional work is flexible. They can leave their forest or garden when there is no annual crop activity. For farmers in Site B, income from additional work contributes around 37% or an average of around USD 923.000 / month.

4.4. Plant-Type Selection Strategy

Community forests are a model of community natural resource management that can become a source of livelihood and make a real contribution to the economy [11], [22]. Timber and non-timber products are not only a source of income but also future savings [22]. However, the contribution of community forests to the economy is still considered low due to the limited land area and the

fact that the community forest business is only a side activity [23].

One of the factors supporting the success of managing community forests is the selection of plant species [23]. This was also done by the farmers in the research location who treated the selection of plant species as an important thing to do in community forest business activities. The different plant species can be divided into two categories: intercropping plants (lower plants), which take the shape of crops, and primary plants, which are various tree species. Each farmer has different reasons why they choose a particular type. The following are the types of tree and intercropping plants chosen by community forest farmers in Site A and Site B.

Table 4 shows that Sengon (*Paraserianthes falcataria*) is the most widely planted wood species by farmers (87.5%). The main reason for farmers to grow this species is that they have been accustomed to planting sengon for a long time and have a large market. Sengon is a fast-growing type of wood. Therefore, that it can be harvested from the age of 3-4 years which is much intended for the needs of the large timber industry. Nonetheless, at that age the productivity of sengon trees is not optimal. Farmers generally sell young sengon trees for reasons of family economic needs that are urgent, for example for children's schools, child marriages or home renovations, and so on.

Plants composition in community forest Table 4

	Occurrence [%]		Utilisation*
	Site A	Site B	
A.Tree			
Sengon (*Paraseriathes falcataria*)	87.5	100	1, 2, 3, 4, 6
Mahogany	50	78.6	1, 2, 3, 6
Africa wood (*Khaya antotheca*)	50	28.6	1, 2, 3, 6
B.Crops			
Coconut	75	92.9	2, 3, 4, 6
Banana	87.5	100	4, 6
Corn	18.8	28.6	4, 5, 6
Fruits/multipurpose tree species	12.5	28.6	3, 4, 6
Bitter bean	31.3	28.6	4, 6

Note: 1= timber, 2= construction, 3= fuelwood, 4= food, 5=fodder, 6=cash income [21]

Sengon is one of the superior types of community forest plants that are in great demand by the community because of its fast growth, high economic value, and high market demand [13], [31], [36]. In addition to the selection of plant species, the diversification of community forest products also needs to be considered, especially in limited areas. An agroforestry planting system is an appropriate land-use technology to soptimise productivity and income by planting more species [17, 30].

Sengon trees will be essential for farmers for medium-long-term needs. The choice of wood plants and lower plants is generally more than one type. This aims to

reduce the risk of failure and to distribute income time for a year. Community forest farmers in Java applied the strategy of diversifying plant species in narrow lands to increase yields, spread risk management, optimiseland and fulfil their living needs [26], [38]. Meanwhile, Achmad and Purwanto [1]states that farmers who have increasingly narrow land will plant more types of plants because they have more potential to fulfil their needs. This cropping pattern has also been widely applied by farmers outside Java, who also use the agroforestry pattern as a livelihood strategy to meet their daily needs [4], [24], [28], [33]. Agroforestry provide many alternative incomes and more products for land-owning farmers [30].

Meanwhile, the types of intercrops most planted by farmers are from Non-Timber Forest Products (NTFPs) and Multipurpose Tree Species (MPTs) rather than seasonal crops (Figure 3). The types of intercrops most planted by farmers in both villages are bananas and coconut. Based on information from farmers, the Cipaku Sub-district area is an area suitable for the cultivation of these two types of plants. In addition, these two types are plants whose products are easily sold at the time of harvest. In addition, both types of plants also do not require intensive maintenance.

Banana plants can be used for both fruit and leaves. This plant easily produces new shoots, so farmers do not need to look for seeds when the old plants have been harvested and cut down. Meanwhile, coconut plants can be harvested routinely after starting to bear fruit. Farmers make bananas a source of short and medium-term income and coconuts as a medium and long-term source of income.

Concluding from the discussion in points 4.3 and 4.4 above, farmers in the two villages have their own ways of meeting their needs. The non-agricultural sector is the most likely option to increase income. The combination of various plant types is good in sources of income gradually. Even so, it is necessary to consider the productivity of each commodity, especially with a very limited land area.

5. Conclusions

The two villages that were the location of the study had many similarities, which included socio-economic conditions and livelihood strategies. The agriculture sector contributes around 63% of their total income. Most farmers plant more than one type of timber plant and intercropping on their land. Sengon is the most widely grown species. This type of wood is planted to meet their mid-long-term income, and they plant various types of intercrops to meet short and medium-term needs, they plant various types of intercrops. The most planted species are bananas and coconuts. With limited land area, farmers are trying to find strategies to meet their basic needs. Farmers maximise land use by cultivating the most economically profitable types of crops. In addition to income, most of the farmers have off-farm jobs.Land management becomes very important to combine short-medium-long term needs, with productivity from a limited land.

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