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From Laborers to Coffee Farmers: Collaborative Forest Management in West Java, Indonesia

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Abstract: Collaborative forest management (CFM) is assumed to provide benefits for improving the condition of the forest ecology and the community's economy. However, its effectiveness is often debated, particularly regarding the involvement of poor and landless farmers in program implementation. In this relation, this study examines a CFM program implementation in Bandung District, West Java, the so-called Pengelolaan Hutan Bersama Masyarakat (PHBM). The study combined qualitative and quantitative approaches in collecting data. GIS analysis and vegetation identification supported this study. The study shows that the PHBM program implementation in the study area provided benefits for improving forest ecological conditions and the livelihood of the farmers. This study also suggests that poor or landless farmers could secure their rights and access to the forest; they became coffee farmers. Despite this, to ensure the sustainability of the program, especially the involvement of the poor and landless farmers, support from the government is very much needed.

Keywords: sustainable forestry; forest management; social forestry; collaborative forest management; agroforestry; coffee farmer

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1. Introduction

The success of managing natural resources, such as forests, carried out only by the state has been long questioned. The state has often failed to manage natural resources sustainably and equitably [1]. On the contrary, many researchers argue that community group-based natural resource management can sustainably manage natural resources. The success of the community in taking care of these natural resources has encouraged the development of a community-based forest management system (CBFM) or collaborative forest management system (CFM) [2–4]. Successful examples of CBFM or CFM are presented in many South American and Asian countries [5,6]. Relatively recent studies show the achievements of CBFM in the REDD program in Tanzania [7], the CFM that can rehabilitate forests in Ethiopia [8] and the CFM which has reduced deforestation in Indonesia [9].

Some authors argued that the CBFM or CFM can provide benefits for forest conservation and livelihoods for the community [10,11], village development, and improvement of the local people's household economy [12]. By building local capacity and serious government support, CBFM or CFM programs can promote sustainable forest management. It is achievable when the communities depend on forest resources for their livelihoods [13].

Local communities who live close to the resources are more likely than the governments to pay attention to the long-term consequences of resource use because they depend upon the sustainable harvesting of the resource for their livelihoods [14].

Apart from those success stories, several articles criticized the achievements of the CBFM or CFM-based forest management programs. A study revealed the failure of such management system in promoting sustainability goals: efficiency, equity, democratic participation, and poverty alleviation [3]. Although the community forest management program succeeded in improving the ecological condition of forests, it failed to achieve other global indicators—for instance, increasing community welfare [15]. CBFM increased the vulnerability of marginalized groups in society [16]. In Indonesia, a study outside Java shows that the CBFM program did not pay attention to community participation and aspirations [17]. Other researchers mention many facts that indicate the potential of collaborative forest management for the welfare of poor people was weak [18]. Elite groups in their communities co-opted opportunities for poor people to gain access to forest management. The elite mostly controlled the entire resource management processes [19]. Due to several different findings as presented above, a researcher says further research to evaluate and investigate CBFM or CFM programs is necessary to carry out [20].

Regardless of the weaknesses in collaborative forest management, this study assumed that the involvement of communities in the CFM would promote better forest management. Without community involvement in forest management, the success of forest management is doubtful. The forest management program that only aims for the sake of conservation is just in vain. Forest management carried out in collaboration with the community will be able to protect the forest and will be able to provide economic welfare for the local community.

By taking a case from Bandung District, West Java, this study aims to demonstrate the importance of community involvement in forest management as an effort to carry out sustainable forest management by focusing on the process and impact of community involvement in a collaborative forest management program called Pengelolaan Hutan Bersama Masyarakat (PHBM), a kind of collaborative forest management in Java, a second generation of social forestry program in Indonesia [21]. Collaboratively, this program re-involved local communities in forest management and allowed the utilizing of part of the forestlands with the obligation to conserve forest ecosystem and participate in reforesting the critical bare forestlands.

2. Methods

2.1. Study Area

This study was carried out in a forest area at *Kesatuan Pemangkuan Hutan*/KPH Bandung Selatan (South Bandung Forest Management Unit). The study area is part of the Bandung District (Figure 1), in the upper part of the Citarum watershed, one of several watersheds in Java categorized as the most critical watershed [13].

Intensive research was conducted by studying a *Lembaga Masyarakat Desa Hutan*/LMDH (a forest village community organization). Formally, even though the LMDH was registered in a village in Bandung District, members of the LMDH were from three villages in three different sub-districts: Lebak Muncang Village-Ciwidey Sub-district and Alam Endah Village-Rancabali Sub-district—both were in Bandung District—and Mekarwangi Village-Sindang Kerta Sub-district in West-Bandung District.

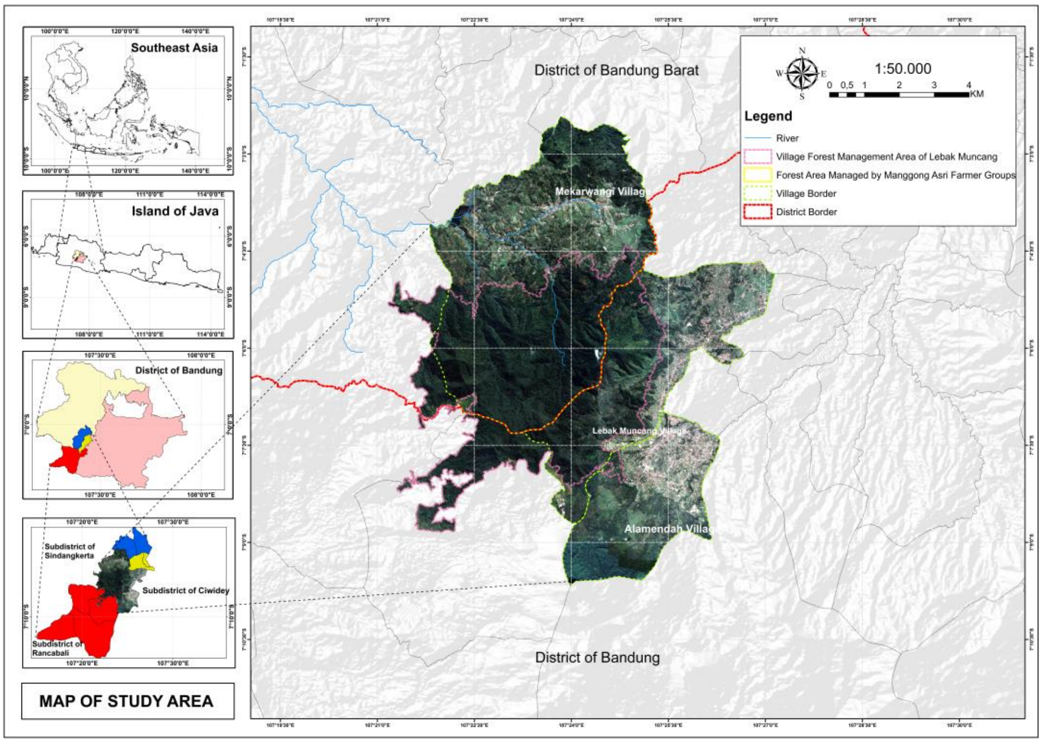


Figure 1. Study area.

2.2. Data Collection

In this study, the relevant data were collected using a qualitative approach to study the process of community involvement in the PHBM program in the selected research site. The study conducted observations and in-depth interviews with purposively selected informants: the officials of the Forest Management Unit, the village apparatus, the representatives of the LMDH, and the forest farmer groups. The data collected includes the history of forestland encroachment, the development of PHBM policy and collaborative forest management in the study area, and the history of involvement of local community in the PHBM program. The study also interviewed 48 households involved in the PHBM program who lived in a sub-village of Lebak Muncang Village and were members of a farmer group. The data collected in this household survey include socioeconomic status of the household: occupation, land ownership, involvement in the PHBM program, and sources of living. Regarding the in-depth study at the sub-village level, Kampung (sub-village) forms the factual unit of community interaction [22].

GIS analysis supported the study to see changes in forest cover between the period before and after the PHBM program (1999–2021) by interpreting satellite imagery from Planet Team [23] using the software QGIS and GRASS GIS. The data used were multi-temporal satellite imagery data starting from 1999, 2003, 2017, and 2021. The satellite imagery used for 1999 and 2003 was Landsat 5 TM imagery with a spatial resolution of 30 m. For 2017 and 2021, the images used were Planetscope with a resolution of 3 m. The study utilized the Google Earth Engine to get Landsat 5 TM imagery and the Planet Imagery Education and Research Program License scheme to get Planetscope. The analysis carried out simple pre-processing to enhance all images.

The Planetscope 25 May 2017 image was used as a baseline image for land cover analysis using the Object-Based Image Analysis method. For 1999, 2003, and 2021 land covers, the study performed an overlay imagery analysis of the year associated with the 2017 Landcover (vector). Pixels with different land covers were manually classified using ThRasE (QGIS plugin). The study analyzed landcover change at (1) landscape scale and (2) plot scale. For patch-scale land cover analysis, this study used each year's generalized land cover map (Figure 2).

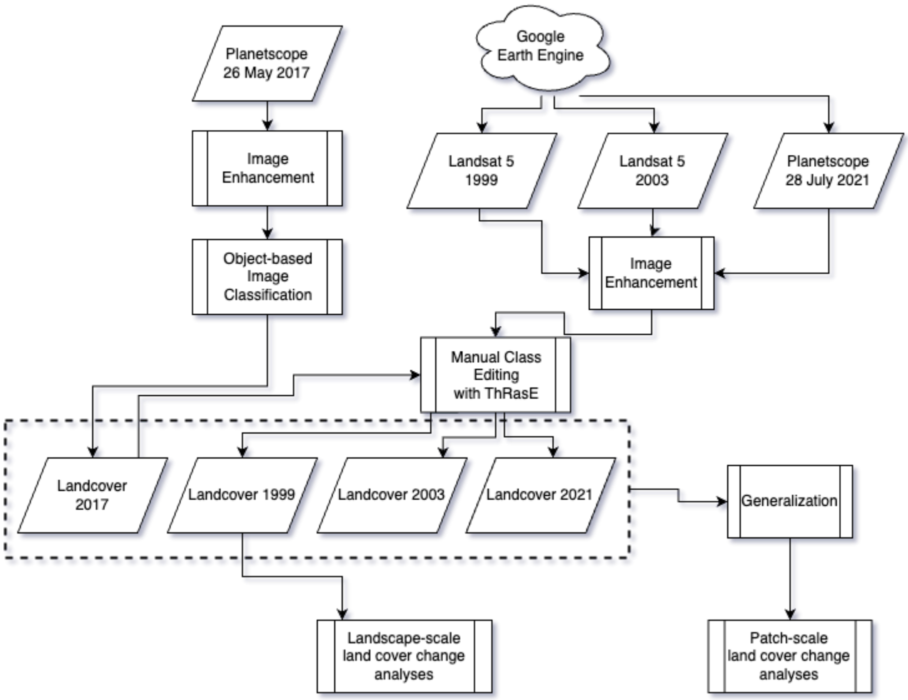


Figure 2. Classification methods workflow.

On a landscape scale, the study analyzed a forest area covering 3340.41 hectares to identify changes in forest land use between 1999 and 2021. On a plot scale, purposively, an analysis was also carried out on 54 hectares of forestland managed by a farmer group to identify changes in land cover. The study applied technique to estimate the accuracy of land cover change by filling the matrix with one of the six classes of change, namely: (1) Stable Forest (SF), (2) Deforestation (DEF), (3) Forest Degradation (DEG), (4) Stable Non-Forest (SNF), (5) Forest Gain (FG), and (6) Vegetation Gain (VG) [24]. Forest gain is a class where the land cover in the previous period is non-forest and the following year is forest, both natural forest and plantation forest. Vegetation gain is a class where the land cover in both periods is non-forest, in the next period has better carbon stocks (for example, agroforest from shrubs). The study carried out plot scale analysis in three periods: (1) between 1999–2003 or t1, (2) between 2003 and 2017 or t2, and (3) between 2017 and 2021 or t3. In the period of t1, t2, and t3, the class of land cover change that occurred were (1) Deforestation, (2) Stable Forest, (3) Stable-Non-Forest and (4) Vegetation Gain. The study also applied Univariate Local Moran's I [25] to conduct a geostatistical analysis to analyze whether or not land cover changes occurred spontaneously.

Identification of forest vegetation also supported the study, especially in 54 hectares of forest areas managed by the interviewed members of a farmer group. The data on vegetation composition in the form of trees, pioneer plants, and cultivated plants were collected using the roaming survey method. The study carried out a roaming survey in an area of 54 hectares of forest area divided into 54 grids.

The study observed the composition of the vegetation using natural transects in the form of footpaths often used by farmers to identify plant species found in forest land managed by the interviewed members of the farmer group. A study reveals that participatory forest management can affect species composition [26]. A visual estimation was used by observing the distribution patterns of plants that made up tree stands, pioneer plants, and cultivated plants to identify vegetation composition on different land cover.

2.3. Collaborative Forest Management and Coffee Cultivation: Research Context

In Java, forest management that involves the community, locally known as Tumpang Sari, has been applied since the colonial era in the 1880s. The forest management allowed people to grow food crops in between rows of teak seeds for a few years. After World War II, the forest management system evolved into a more socially responsive Social Forestry program [27–31]. However, the system did not anticipate the changes in the social condition of the forest villages and appropriately adjusted to the forest management system. These resulted in illegal logging, overgrazing, and increased encroachment, which in turn caused excessive forest degradation [32].

In West Java, particularly in the South Bandung area, the people living around forest area had long been involved in the Tumpang Sari program in forest areas. However, many accused such activity of causing damage to the forest environment. Responding to the severe forest degradation, in the mid-1980s the provincial government of West Java stopped the Tumpang Sari program in the forest area of Bandung District. Instead of recovering, however, forest degradation was even worse. Local people overrode the prohibition. At the same time, the forest managers were also unable to manage the forest properly.

Illegal activities became increasingly symptomatic during the 1997/8 economic crisis. Many people encroached on the forestlands to engage in cultivation. People earned an income that helped them overcome the problems of the crisis. But, as a result, forest destruction was getting worse. Local farmers cut forest trees and cleared the forestlands (Figure 3).

Figure 3. Encroached forestland (nature reserve) in Southern Bandung area in early 2000s.

To prevent further forest destruction, the government firmly stopped all illegal cultivation activities in forest areas in the South of Bandung area in 2000/1. In 2001, Perum Perhutani, the Forest Management of Java, formulated a policy, the so-called Pengelolaan Hutan Bersama Masyarakat (PHBM), a kind of collaborative forest management that applies throughout Java. This policy changed the existing forest management system. For the people in the surrounding forest area, it gave back access to involvement in forest management.

PHBM is a program developed by Perum Perhutani to involve local communities in forest management. The program's objectives are to provide economic benefits to local communities while preventing encroachment and improving the ecological condition of forest areas. This program is implemented collaboratively between Perum Perhutani and the local community organized in Lembaga Masyarakat Desa Hutan (Forest Village Community Organization) or LMDH.

The PHBM aims to provide direction for forest resource management by combining economic, ecological, and social aspects [33]. PHBM provides access to communities around the forest to manage forests in a participatory manner without changing the status and function of the forest, based on some principles, including a sharing system.

From 2003–4, collaboratively, local communities were allowed and started to utilize part of the forestlands, but they were obliged to maintain the forest trees and participate in the reforestation of the critical forestlands. In the Production Forest area, under Perum Perhutani's supervision, local people started cultivating coffee in-between forest trees and on forest lands that were overgrown with shrubs (Figure 4). The latter was a forest area encroached on and illegally planted with vegetables by the local community.

Figure 4. Coffee grown between Rasamala trees or in open forest lands and the arabica coffee and the Yellow Columbian coffee fruits.

After almost two decades, coffee cultivation in collaboratively managed forest areas has contributed significantly to coffee bean production in Java, particularly in the West Java Province. West Java's coffee bean production in 2000 amounted to 6218 tons. Coffee bean production increased to 13,783 tons in 2010 and 21,845 tons in 2020, more than 3 times the coffee bean production before the implementation of the PHBM [34–36]. One-third of the coffee beans produced in West Java was the production of Bandung District, harvested mostly from forest areas. The increase in coffee bean production in West Java should be much higher than the reported data. Accurate recording of the coffee bean production was nonexistent due to, among other things, the involvement of many farmers with small production scales and irregular marketing systems.

3. Results

3.1. Brief Description of a Forest Village Community Organization in Bandung District

The introduction of the PHBM program by Perum Perhutani in the study area began in 2004. Several community representatives attended various meetings on collaborative forest management and coffee cultivation training. In 2005, accompanied by Community Facilitators appointed by the Perum Perhutani, the representatives of residents of Lebak Muncang Village formed a forest village community organization (Lembaga Masyarakat Desa Hutan or LMDH).

In the early years of the formation of LMDH, the number of members reached about 500 people. The number increased over time. In 2020, the number of LMDH members was around 1000 people. They were from three villages in three different sub-districts. The majority of LMDH's members were people of Lebak Muncang Village, Ciwidey District, and Bandung Regency. The rest were people of Alam Endah Village, Rancabali Sub-district, Bandung District, and people of Mekarwangi Village, Sindangkerta District, and West Bandung District (see Figure 1).

3.2. The Ecological Condition of the Forest before and after PHBM

The ecological condition of the forest in the study area underwent a significant change. Before the PHBM program implementation, the forest area was encroached upon by local people and cultivated with vegetables. As presented in Table 1, in 1999, around 24.3% (809.45 ha) of land cover was vegetable land and bare land.

Table 1. Land Cover Changes, 1999–2021.

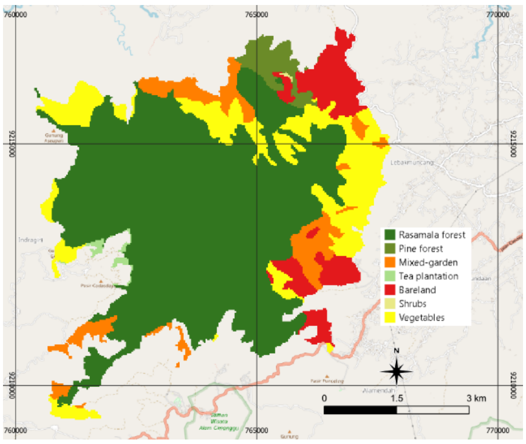
No	Land Cover	Coverage							
		1999		2003		2017		2021	
		Ha.	%	Ha.	%	Ha.	%	Ha.	%
1	Rasamala forest	2163.74	64.77	2163.74	64.77	2210.17	66.16	2210.17	66.16
2	Pine forest	96.64	2.89	96.64	2.89	127.32	3.81	127.32	3.81
3	Mixed garden/ Agroforestry	251.49	7.53	359.38	10.76	983.84	29.45	981.95	29.41
4	Tea plantation	17.46	0.52	17.46	0.52	17.46	0.52	17.46	0.52
5	Bare land	271.56	8.13	15.03	0.45	2,07	0	0	0
6	Shrubs	1.62	0.05	688.16	20.60	1.62	0.05	1.62	0.05
7	Vegetables	537.89	16.10	0	0	0	0	0	0
	Total	3340.41	100.00	3340.41	100.00	3340.41	100.00	3340.41	100.00

Source: based on satellite image analysis.

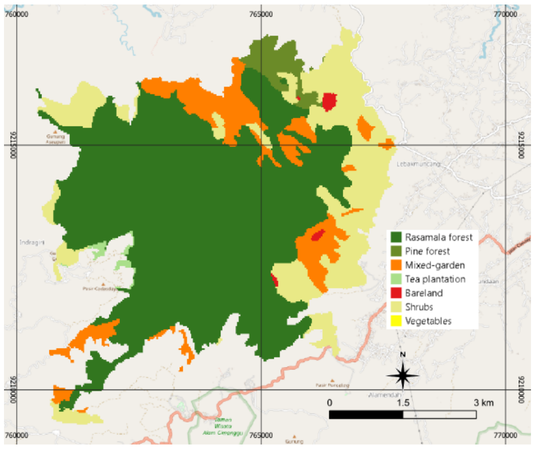
The land cover in the form of vegetable fields changed almost entirely to shrubs after the government forcibly stopped illegal cultivation activities in 2000/1 (Table 1). In 2005/6, those involved in the PHBM program changed the shrubs to be planted with coffee and intercropping plants with an agroforestry system. They also cultivated coffee in between the Rasamala trees (*Altingia excelsa* Noronha) and Pine trees (*Pinus merkusii* Jungh. & de Vriese) (Figure 5). Data in 2017 showed an increase in land cover in the form of mixed-garden/agroforestry that reached about 29% of the forest area of Lebak Wangi Village. The data in Table 1 show that there is almost no more land cover in the form of shrubs. The vast shrubs turned into agroforestry land. The Perum Perhutani planted pines while farmers planted coffee, some other fruit trees, and intercrops in between the pine and Rasamala trees. Pine trees planted by Perum Perhutani were looked after by the farmers.

Data in Table 1 also show an increase in the Rasamala forest area from 2163.74 ha (64.77%) in 1999 to 2210.17 ha (66.16%) in 2017. The forest area was likely to remain unchanged in 2021 (see Figure 6). The data imply that since PHBM implementation, pressure on the forest has decreased drastically.

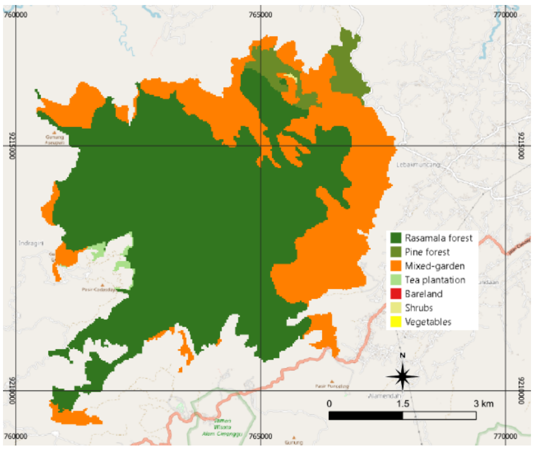
Figure 5. Coffee planted under Rasamala and Pine trees.



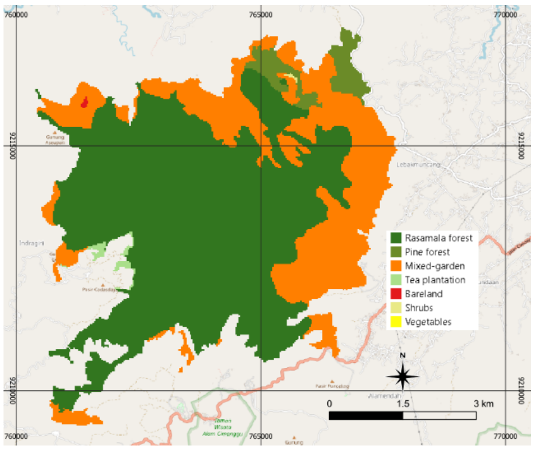
(**a**) 1999



(**b**) 2003



(**c**) 2017



(**d**) 2021

Figure 6. Land cover of forest area in Lebak Muncang Village.

On a patch scale of 54 hectares, bare land or vegetable gardens which were quite extensive in 1999, turned into shrubs in 2003, and changed to mixed-garden/agroforestry in 2017–2021. Following the criteria developed by some scholars [25], a vegetation gain occurred in the forest areas. Vegetation cover increased by around 25,93%. Figure 7 shows the process of analyses of the land cover maps for patch scale derived from landscape-level cover maps.

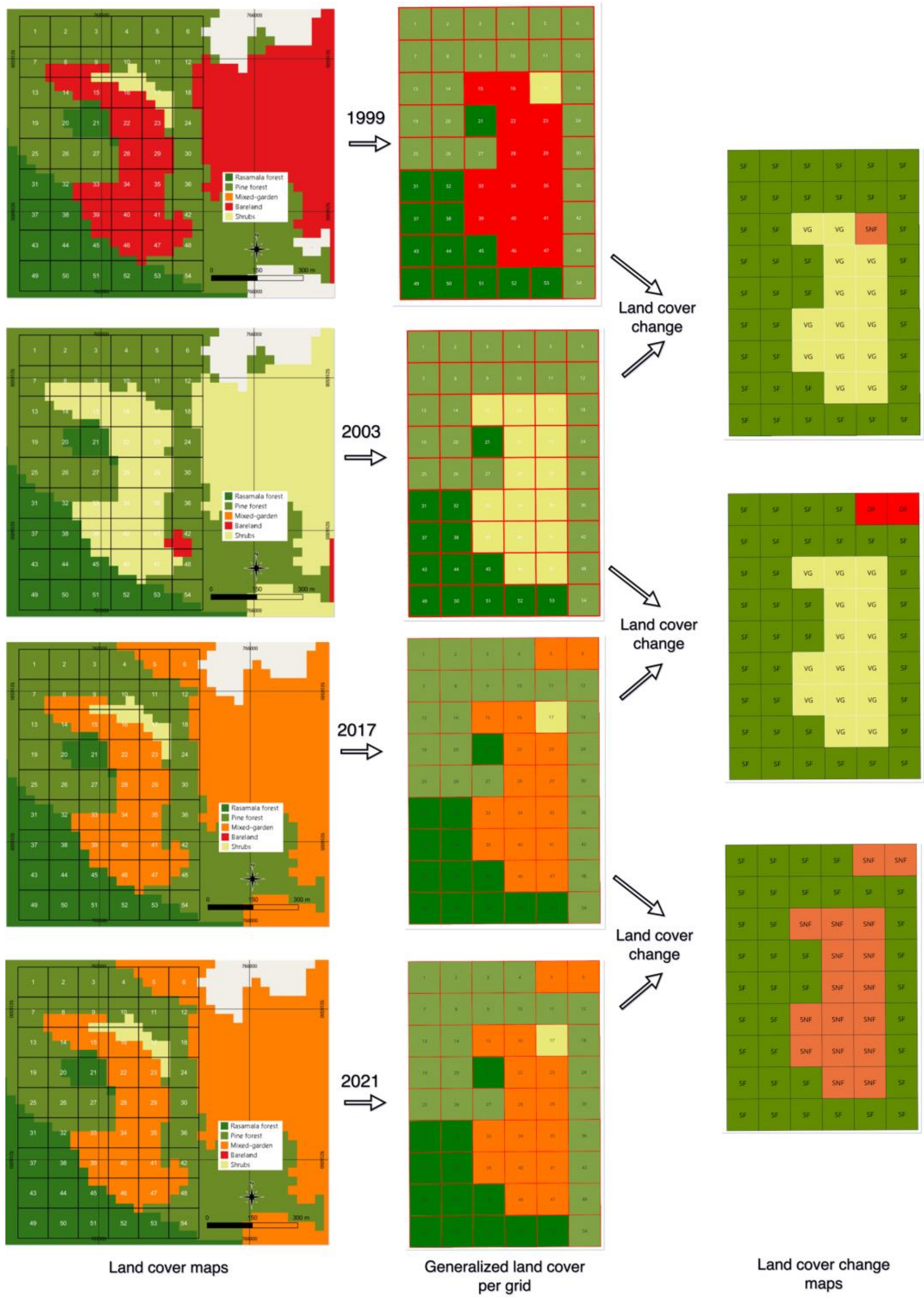


Figure 7. Land cover maps of 1999, 2003, 2017, and 2021 in patch scale.

Changes in land cover did not occur because of something random in nature, as evidenced by the results of geostatistical analysis using Local Moran's I that proves the presence of positive spatial autocorrelation (high-high and low-low) (Figure 8). The transition probability matrices of land cover changes of the 54 hectares of forestland between 1999 and 2021 are presented in Tables A1–A3.

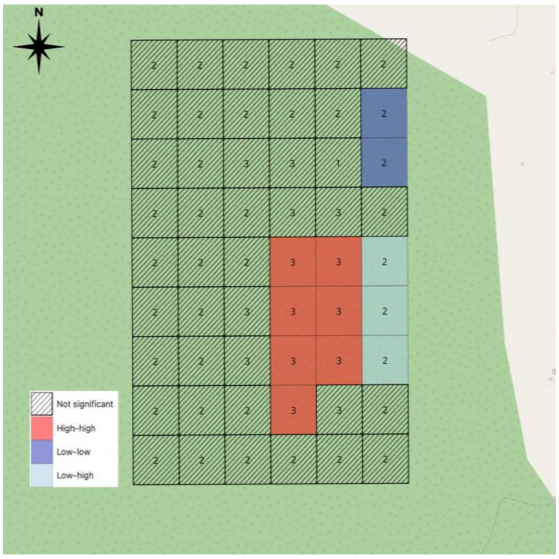


Figure 8. Moran's I Cluster Map of Land Cover Change in the study area.

Vegetation identification on a forest area of 54 hectares shows the composition of vegetation consisting of forest stands, understory vegetation, and cultivated plants. The vegetation composition that made up forest stands consisted of 47 species from 23 plant families (Table A4), understory vegetation consisted of 67 species belonging to 42 families (Table A5), and cultivated plants consisted of 46 types of cultivated plants belongings to 28 families (Table A6).

3.3. PHBM and Community Livelihood

3.3.1. Access to the Forest Lands

Community access in forest management is one of the main issues related to the PHBM program. In-depth interviews with informants indicate that in the early years of the PHBM program, many farmers relinquished their rights to others because they did not have sufficient capital to cultivate coffee and other crops. They relinquished their rights after clearing land to other people for some compensation. It was forbidden to do so. However, Perum Perhutani could not prevent the practice of "transferring or taking over" the cultivated land. This practice was known among the community as ngaleper, transferring or taking over the management rights of someone with a certain amount of compensation money.

On the other hand, the financial difficulties faced by poor farmers did not make many of them despair and gave up their rights to utilize forest lands. In-depth interviews with informants revealed that poor farmers could overcome the lack of capital by working as laborers for wealthy farmers who were also involved in the PHBM program. The laborers worked from morning until noon to earn wages. In the afternoon, they worked on their claimed forestlands, clearing the shrubs and planting coffee, fruit trees, and other intercropping plants.

The laborers had been working for the wealthy farmers for a long time. The two parties depended on each other though their positions were not equal. It looked like a relationship between client and patron. This patronage relationship gave the poor opportunities to earn wages which they used to buy coffee seeds. By doing this the poor farmers could utilize and secure their rights and access to the forestland.

The data in Table 2 show that most of the interviewed households were landless (70.8%). Out of this, 31.3% were those who joined the PHBM program in the early years of the PHBM program. They were the laborers who worked for the wealthy farmers clearing shrubs and planting coffee and other intercropping plants. They were later involved in the PHBM program in 2005-6. Data on the table also indicates that less than half of the interviewed households were members of the forest farmer group who joined the PHBM program after they got the managed forest lands from their parents or after they took over the management rights of someone.

Table 2. Land ownership based on forest cultivation status (N = 48).

Way to Get the Cultivated Forest Lands	Land Ownership (%)		Total (%)
	Own	Does Not Own	
Nyacar (conducted land clearing by self)	22.9	31.3	54.2
Ngaleper ("taking over" the cultivated forest lands)	6.3	14.6	20.8
Gift from parent	0.0	25.0	25.0
Total	29.2	70.8	100.0

The farmers involved in the PHBM program in Lebak Muncang Village claimed to acquire lands in the forest as large as they could manage once the program started. Some farmers even claimed forest land up to more than 10 hectares. Part of the forestlands they claimed was then "given" to their children. The data in Table 2 show that about 25% of the interviewed farmers stated that they obtained the right to manage the forest lands from their landless parents. The average forest area managed by each member of the farmer group was about 6000 m^2. Of the interviewed farmers, 54.2% occupied forest land below the average. Another 45.8% occupied forest land above the average.

With the average of managed forest lands, the farmers planted between 3000 to 5000 coffee trees. This way was not following the rules of coffee cultivation. Field observations show that the distance between coffee trees planted by farmers was generally between 1×1 m to 1.5×1.5 m. The density of planted coffee trees was very dense. But the farmers believed that they could get more harvest.

Another problem identified in the field was planting uncertified coffee seeds. Many poor farmers planted uncertified coffee seeds because they did not have sufficient capital to buy certified coffee seeds. They collected coffee seeds that grew naturally under coffee trees that had produced coffee cherries and planted the seeds on vacant land or to replace coffee trees that were no longer productive or dead. The death of coffee trees under ten years old was a common phenomenon. Farmers believed this because they planted uncertified coffee seeds.

3.3.2. Livelihood

Since the PHBM program implementation, the livelihoods of the interviewed forest farmer group members changed significantly. Before the PHBM program, data shows that only a few group members worked as farmers on their owned agricultural land or other people's agricultural lands (33.4%). Most of them worked as farm laborers (37.5%) or other jobs in the non-agricultural sector (29.1%). After the PHBM program implementation, the majority of the farmers interviewed (95.8%) had a source of income merely or partially from the forest land they managed. The rest (4.2%) did not or had not received any income from the coffee trees they owned (Table 3).

In addition to involving many households from villages around the forest as coffee farmers, PHBM activities also involved many other people who did various jobs related to coffee cultivation activities. The study identified several types of work related to coffee cultivation activities (Table 4 and Figure 9). Indirectly, the development of coffee cultivation activities also boosted the wider community's economy at the village level.

Table 3. Sources of living after PHBM program (N = 48).

Sources of Living	%
Only from the managed forest lands	27.1
The managed forest lands and other	33.3
Other sources and the managed forest	35.4
Others	4.2
Total	100.0

Table 4. Several types of work related to coffee cultivation activities.

Type of Work	Description
Laborers during planting and maintenance of coffee plants	Male and female laborers were needed to plant new coffee seedlings, fertilize, weed, and replace dead plant seeds. Laborers were also required to help carry fertilizer (chicken manure or rotted coffee husks).
Laborers during harvest season (coffee pickers)	During the coffee harvest time, many laborers worked to pick ripe coffee. Often coffee farmers had to compete with other coffee farmers to get coffee-picking workers. In situations like this, the laborers were paid based on the picking of the coffee obtained. For example, a coffee picker would be paid IDR 2000 for every kg of ripe coffee he/she picks.
Laborers in coffee transportation	Many male porters brought the coffee from the garden to the coffee processing site, usually owned by local big coffee buyers, through a dirt path that was steep and slippery. The porters earned IDR 2000 for every kg of coffee they transported. In one trip from the plantation to the processing site, about 2 to 5 km, a porter could carry up to 200 kg of coffee. These porters also worked to transport fertilizer from the warehouse to the coffee gardens.
Motorcycle workshop/repair	The motorcycles used to transport coffee or fertilizer were modified motorcycles that suited the condition of the steep and slippery trails in the forest when it rained. The need for modified motorcycles opened opportunities for some people to engage in a motorcycle repair business.
Laborers in the coffee processing unit	Some people worked to process the harvested coffee cherries to be coffee beans. They removed the skin of the coffee, soaked and washed the coffee beans, and dried the coffee beans in the sun for several days to produce green beans. The laborers got daily wages. Most of them were male laborers.
Small-scale coffee buyers	Coffee farmers could sell their harvest to anyone for a higher price. It attracted some people to work as coffee buyers. Sometimes they had to compete with coffee buyers coming from other regions. These small-scale coffee buyers the resold the coffee they bought to local larger coffee buyers.
Large-scale coffee buyers	In the study area, there were five large coffee buyers. They bought coffee from farmers directly or through small-scale coffee buyers. When the coffee business started to develop, there were 13 large coffee buyers, some of whom stopped being large coffee buyers due to increased competition, especially from large coffee buyers from other regions.

Figure 9. Coffee picker, coffee transportation, and laborers in coffee bean processing unit.

4. Discussion

Our analyses show two crucial issues related to the implementation of the PHBM program: the impact of PHBM and the access of poor and landless farmers to forest management.

4.1. Impacts of PHBM

The study results show that community involvement in forest management, as indicated in Table 1, increased forest cover in the study area by around 24.19% (Rasamala forest, pine forest, and agroforestry). PHBM activities also changed forest condition from bare lands to agroforestry land as an ecological succession phenomenon. These are similar to a study that stated that community involvement in forest management correlated with the improvement of forest condition [37]. Moreover, the findings also show a change in composition structure of vegetation from simple to more complex vegetation structure and an increase in plant diversity (Tables A4 and A5). This change in the composition of the vegetation plays a significant role in the balance of an ecosystem, as a source of habitat nutrients and habitat for insects, birds, and mammals. Its abundance and composition affect several ecological processes, including fire and erosion [38]. It means that the PHBM program can contribute to forest conservation and protection due to the PHBM program preventing deforestation and expanding forest cover. This finding is also in line with the research findings of a study in forest areas in other districts in West Java [39] and various findings in other countries.

Based on the results of reviewed cases in several countries, some scholars stated that there was evidence of improved forest conservation and water management related to CFM [40]. In Uganda, the CFM program could improve the forest status or condition and lowered incidences of human disturbances [41]. Meanwhile, in Malawi, the co-managed plots had higher tree density than state-managed plots [42].

As important as the impact of PHBM on forest conservation, PHBM also improved the farmers' livelihoods. As explained in the results, before the implementation of PHBM, only 33.4% of the people interviewed worked as farmers on their owned land or others owned land as sharecroppers. After the PHBM implementation, most of the interviewed household heads (95.8%) worked as farmers on agroforestry lands they managed in the forest area (Table 3). They also earned sufficient income to meet their daily needs from the intercrops they planted when they started growing coffee, or even after their coffee trees produced coffee cherries (see Table A6). The data also show that many people benefited from PHBM program; the coffee farmers, the laborers who got wages from caring for coffee trees, coffee pickers who worked at harvest, or motorcycle taxi drivers who transported coffee harvests from the forest (Table 4). The PHBM program has created various economic multiplier effects in the surrounding area of PHBM activities.

The findings of this study are in line with the findings of other studies in Ethiopia, Kenya, and South Korea. Under a participatory management arrangement in southern Ethiopia, forest resources contributed to the livelihoods of rural households [43]. In general, the result confirms the importance of forest income in poverty alleviation and as safety nets in times of income crisis. In Kenya, collaborative forest management programs improved people's livelihoods [44]. A recent study from South Korea mentioned that CFM participating households were likely to have a higher income than non-CFM participating households [45].

4.2. Rights and Access to the Forest

The PHBM program provides opportunities for people around the forest to be involved in collaborative forest management. The results of the study show that among the interviewed farmers, 70.8% were landless (Table 2). Before being involved in the PHBM program, many interviewed farmers who worked in agricultural sector as farm laborers had no capital to plant coffee and practice agroforestry in forest areas. By taking advantage of the patronage relationships they had with some wealthy farmers, they could utilize the forest land and maintain their rights and access to the forest area.

The result of this study is different from the statement put forward by several researchers who argue that the economic benefits of the CFM go to the rich more, the poorer groups have poorer access to the forest, and there is no guarantee that the benefits flow to local communities [41,46]. They further argue that the elites dominate access to resources. These are due to weaknesses in local governance and implementation of CFM initiatives, including poor accountability and no systematic monitoring.

This study found that the poor and the landless faced more difficulties than the wealthier farmers in developing agroforestry in the forest area. However, it did not mean that they had to relinquish their rights and access to the PHBM program. This study found the landless farmers succeeded in utilizing and securing their rights to the forest. By leveraging their social capital and patronage relationships with wealthy farmers, the landless farmers could keep their access to forest areas. After several years of growing coffee, they transformed themselves from farm laborers to coffee farmers. Utilization of social capital was a way for the laborers to maintain their rights and access to forest management systems when direct support from the government or forest management was not available. In this regard, some scholars mention that social capital is a determinant of successful community forest management for the sustainability of forests and communities [47]. A study from Nepal showed that Pengelolaan Hutan Bersama Masyarakat patron–client relationship matters in ensuring people's participation in social forestry. The poor farm laborers gained access to forest management facilitated by the rich farmers who were their patrons [48].

The study results show that the poor or landless farmers, by optimizing the patron–client relationships, could change their lives from laborers to coffee farmers. However, there is no guarantee that they will continue maintaining their rights and access to the forestland. A coffee-based agroforestry system requires capital that poor farmers cannot always fulfill. In addition, for poor farmers or landless farmers who do not have strong patronage relationships with wealthy farmers or certain other parties, it is unlikely that they will be able to utilize and maintain the forestland to which they are entitled because they do not have sufficient capital to practice agroforestry.

In that regard, support from the government is necessary. The government must have programs that support the poor or the landless farmers to utilize and maintain their rights and access to the forestland. A kind of long-term soft loan is very likely to be needed. This program can be an alternative to protect the rights and access of the poor or landless farmers to collaborative forest management. A case of provision of micro-credits in the Adaptive Collaborative Forest Management program in Nepal that has increased the opportunity of the poor people to benefit from forest management can be referred to [49]. Accordingly, identification the socio-economic characteristics of the people living surrounding the forest areas to give priority to the poor or landless farmers to be involved and supported in the development of collaborative forest management is important to carry out.

5. Conclusions

This study documents that involvement of the local people in forest management is an appropriate policy. This study raises two main issues: the impact of, and the local community rights and access to, collaborative forest management. Ecologically, collaborative forest management could improve forest conditions, as indicated by the increased forest cover. The application of an agroforestry system has increased plant diversity in forest areas. The study findings support the idea that granting certain tenure rights to the community will encourage community members to manage forest resources properly. The collaborative forest management system also contributes positively to the improvement of the livelihoods of the people involved and even contributes to economic development on the regional scale.

Regarding community rights and access, this study concludes that the case of collaborative forest management in the study area indicates that rights and opportunities for the community to access the program are not only obtained by those who are relatively economically secure but also by those who are poor or landless. Moreover, the study also identified that the poor or landless farmers could maintain their rights and access to collaborative forest management system by utilizing patronage relationships with wealthy farmers. However, the study also suggests that there is no guarantee that those who have patronage relationships with local elite groups will continue to utilize the forestland. Therefore, government support is needed to protect their rights and access to the collaborative forest management system.

6. Postscript

Forest management in Indonesia has fundamentally changed in terms of community access to forests. In 2016, the Ministry of Environment and Forestry issued a ministerial regulation on a new Social Forestry program that applies throughout Indonesia (the third generation of Social Forestry program). In Java, the Ministry of Environment and Forestry issued special regulation on the social forestry program in the Perum Perhutani Working Area, ministerial regulation No. P.39/MENLHK/SETJEN/KUM.1/6/2017. By this regulation, the government permits the people to manage the forests for 35 years and evaluates this permit every 5 years. Under this regulation, since 2017/18, a few LMDHs in South Bandung Forest Management Unit have been provided with the Forest Utilization Permit. Most of the LMDH were still collaborating with the Perum Perhutani, under the PHBM scheme.

With the implementation of the new Social Forestry program, several questions arise regarding the outcome of the new program on forest conservation and the socio-economic conditions of people. The sustainability of forest management under the new paradigm is important to study.

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Informed Consent Statement: This study is a non-interventional study. We conducted interviews, observations, and household surveys. We explained to all the informants and households participating in the study about the research and asked for their permission and willingness to participate in this research.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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Appendix A

Table A1. Transition probability matrix of land cover change from 1999 and 2003.

	Rasamala	**Pine**	**Mixed-Garden**	**Bareland**	**Shrubs**
Rasamala	0.750	0	0	0.125	0.125
Pine	0.118	0.588	0	0.118	0.176
Mixed-garden	0	0	0	0	0
Bareland	0.071	0.357	0	0.571	0
Shrubs	0.063	0.438	0	0	0.5

Table A2. Transition probability matrix of land cover change from 2003 and 2017.

	Rasamala	**Pine**	**Mixed-Garden**	**Bareland**	**Shrubs**
Rasamala	0.750	0	0.125	0	0.125
Pine	0.121	0.576	0.121	0	0.182
Mixed-garden	0.067	0.400	0.533	0	0
Bareland	0	0	0	0	0
Shrubs	0.063	0.438	0	0	0.5

Table A3. Transition probability matrix of land cover change from 2017 and 2021.

	Rasamala	**Pine**	**Mixed-Garden**	**Bareland**	**Shrubs**
Rasamala	0.894	0	0.074	0	0
Pine	0.032	0.894	0.063	0	0.011
Mixed-garden	0.052	0.107	0.829	0	0.012
Bareland	0	0	0	0	0
Shrubs	0	0.250	0.188	0	0.563

Table A4. Forest stand composer plants.

Family	No.	Local Name	Scientific Name
Actinidiaceae	1	Ki leho	*Saurauia bracteosa* DC.
Altingiaceae	2	Rasamala	*Altingia excelsa* Noronha
Araliaceae	3	Cerem	*Macropanax dispermus* (Blume) Kuntze
Araucariaceae	4	Damar	*Agathis dammara* (Lamb.) Rich. & A. Rich.
Cannabaceae	5	Kurai	*Trema orientalis* (L.) Blume
Cyatheaceae	6	Paku tiang	*Cyathea contaminans* (Wall. ex Hook.) Copel.
Elaeocarpaceae	7	Tebe	*Sloanea sigun* (Blume) K. Schum.
	8	Kareumbi	*Homalanthus populneus* (Geiseler) Pax.
	9	Manggong	*Macaranga rhizinoides* (Blume) Mull. Arg.
Euphorbiaceae	10	Mara	*Macaranga tanarius* (L.) Mull. Arg.
	11	Waru gunung	*Homalanthus giganteus* Zoll. & Moritzi
	12	Hiur sapu	*Castanopsis javanica* (Blume) A. DC.
	13	Kiriung	*Castanopsis acuminatissima* (Blume) A. DC.
	14	Pasang beureum	*Quercus lineata* Blume
	15	Pasang gebod	*Lithocarpus indutus* (Blume) Rehder
	16	Pasang jambe	*Quercus gemelliflora* Blume
Fagaceae	17	Pasang mempening	*Quercus argentata* Korth.
	18	Pasang taritih	*Lithocarpus elegans* (Blume) Hatus. ex Soepadmo
	19	Saninten	*Castanopsis argentea* (Blume) A. DC.
	20	Tunggereuk	*Castanopsis tungurrut* (Blume) A. DC.
Hammelidaceae	21	Ki tambaga	*Distyllum stellare* Kuntze
	22	Huru minyak	*Litsea resinosa* Blume
Lauraceae	23	Huru perak	*Phoebe grandis* (Ness) Merr.
	24	Ki teja	*Cinnamomum iners* Reinw. ex Blume
Magnoliaceae	25	Baros	*Magnolia sumatrana* var. *glauca* (Blume) Figlar & Noot.
	26	Kedoya	*Dysoxylum gaudichaudinum* (A. Juss.) Miq.
	27	Mindi	*Melia azedarach* L.
Meliaceae	28	Pisitan monyet	*Dysoxylum alliaceum* (Blume) Blume
	29	Suren	*Toona sureni* (Blume) Merr.
	30	Beunying	*Ficus fistulosa* Reinw. ex Blume
	31	Hamerang	*Ficus padana* Burm. f.
Moraceae	32	Kondang	*Ficus variegata* Blume
	33	Walen	*Ficus ribes* Reinw. ex Blume
	34	Ki bodas	*Eucalyptus urophylla* S. T. Blake
	35	Ki beusi	*Rhodamnia cinerea* Jack
Myrtaceae	36	Ki salam	*Syzygium lineatum* (DC.) Merr. & L. M. Perry
	37	Salam hutan	*Syzygium polyanthum* (Wight) Walp.
Pinaceae	38	Pinus	*Pinus merkusii* Jungh. & de Vriese

Table A4. *Cont.*

Family	No.	Local Name	Scientific Name
Piperaceae	39	Seuseureuhan	*Piper aduncum* L.
	40	Jamuju	*Dacrycarpus imbricatus* (Blume) de Laub.
Podocarpaceae	41	Ki putri	*Podocarpus neriifolius* D. Don
Rhamnaceae	42	Manii	*Maesopsis eminii* Engl.
	43	Kikopi	*Canthium aciculatum* Ridl.
Rubiaceae	44	Ki cengkeh	*Urophyllum arboreum* (Reinw. ex Blume) Korth.
Sapindaceae	45	Huru kapas	*Acer laurinum* Hassk.
Theaceae	46	Puspa	*Schima wallichii* Choisy
Urticaceae	47	Nangsi	*Oreocnide rubescens* (Blume) Miq.

Table A5. Types of plants that make up forest floor coverings.

Family	No.	Local Name	Scientific Name
Acanthaceae	1	Bubukuan	Strobilanthes cernua Blume
Apiaceae	2	Pegagan	Centella asiatica (L.) Urb.
	3	-	Arisaema sp.
Araceae	4	Suweg	Amorphophallus spectabilis (Miq.) Engl.
	5	Bingbin	Pinanga coronata (Blume ex Mart.) Blume
Arecaceae	6	Bubuay	Plectocomia elongata Mart. ex Blume
	7	Sarai	Caryota mitis Lour.
Aspleniaceae	8	Paku sarang burung	Asplenium sp.
	9	Begonia	Begonia bracteata Jack
Begoniaceae	10	Begonia	Begonia muricata Blume
	11	Hariang	Begonia isoptera Dryand. ex Sm.
Campanulaceae	12	-	Codonopsis javanica (Blume) Hook. f. & Thomson
Cannabaceae	13	Ki tamiang	Celtis timorensis Span.
Commelinaceae	14	-	Amischotolype mollissima (Blume) Hassk.
	15	-	Chromolaena odorata (L.) R. M. King & H. Rob.
Compositae	16	Kirinyuh	Eupatorium inulifolium Kunth
	17	Teklan	Ageratina riparia (Regel) R. M. King & H. Rob
Costaceae	18	Pacing	Cheilocostus speciosus (J. Konig) C. Specht
Cyperaceae	19	Areuy	Cyperus sp.
	20	Paku harupat	Nephrolepis sp.
Davalliacaeae	21	-	Davallia sp.
Euphorbiaceae	22	Waru gunung	Homalanthus giganteus Zoll. & Moritzi
Gesneriaceae	23	-	Cyrtandra pendula Blume
Gleicheniaceae	24	Paku andam	Dicranopteris linearis (Burm. f.) Underw.
Hypoxidaceae	25	Daun congkok	Molineria capitulata (Lour.) Herb.
	26	Carulang	Spatholobus ferrugineus (Zoll. & Moritzi) Benth.
Leguminosae	27	Jeunjing laut	Falcataria mollucana (Miq.) Barneby & J. W. Grimes

Table A5. *Cont.*

Family	No.	Local Name	Scientific Name
	28	Kaliandra	Calliandra calothyrsus Meisn.
Loranthaceae	29	Benalu belimbing	Macrosolen cochinchinensis (Lour.) Tiegh.
Malvaceae	30	Hantap	Sterculia rubiginosa Zoll. ex Miq.
Marantaceae	31	-	Phyrnium sp.
	32	Harendong	Astronia macrophylla Blume
	33	Harendong	Melastoma malabathricum L.
Melastomataceae	34	Harendong bulu	Clidemia hirta (L.) D. Don
	35	Parijoto	Medinilla speciosa Blume
Myrtaceae	36	Salam hutan	Syzygium polyanthum (Wight) Walp.
Oleandraceae	37	-	Oleandra pistillaris (Sw.) C. Chr.
Pandanaceae	38	Pandan hutan	Pandanus furcatus Roxb.
	39	Katuk	Sauropus androgynus (L.) Merr.
Phyllanthaceae	40	Ki seueur	Antidesma montanum Blume
	41	-	Breynia sp.
Phytolaccaceae	42	Buah tinta	Phytolacca americana L.
Piperaceae	43	-	Peperomia laevifolia (Blume) Miq.
Polygalaceae	44	-	Polygala venenosa Juss. ex Poir.
Primulaceae	45	-	Ardisia villosa Roxb.
	46	Paku	Pteris sp.
Pteridophytes	47	-	Dipteris conjugata Reinw.
	48	Hareueus	Rubus buergeri Miq.
Rosaceae	49	Kawoyang	Prunus arborea (Blume) Kalkman
Rubiaceae	50	-	Mycetia cauliflora Reinw.
	51	-	Ophiorrhiza longiflora
	52	Ki cengkeh	Urophyllum arboreum (Reinw. ex Blume) Korth.
Rutaceae	53	Ki jeruk	Acronychia pedunculata (L.) Miq.
Salicaceae	54	Rukem	Flacourtia rukam Zoll. & Moritzi
Selaginellaceae	55	Rane	Selaginella sp.
	56	Canar	Smilax leucophylla Blume
Smilacaceae	57	Canar	Smilax macrocarpa Blume
Solanaceae	58	Terong belanda	Solanum betaceum Cav.
Symplocaceae	59	Jirak	Symplocos ramosissima Wall. ex G. Don
	60	-	Elatostema sp.
	61	-	Gonostegia hirta (Blume ex Hassk.) Miq.
Urticaceae	62	Pohpohan	Pilea melastomoides (Poir.) Wedd.
	63	Pulus	Dendrocnide sinuata (Blume) Chew
	64	Jalatong	Dendrocnide stimulans (L. f.) Chew
	65	Totongoan	Debregeasia longifolia (Burm. f.) Wedd.
Verbenaceae	66	Saliara	Lantana camara L.
Zingiberaceae	67	Tepus	Etlingera coccinea (Blume) S. Sakai & Nagam.

Table A6. Types of cultivated plants.

Family	No.	Local Name	Scientific Name
Anacardiaceae	1	Jambu mete	*Anacardium occidentale* L.
	2	Kedondong	*Spondias dulcis* L.
	3	Limus	*Mangifera foetida* Lour.
	4	Mangga	*Mangifera indica* L.
	5	Sarikaya	*Annona squamosa* L.
Annonaceae	6	Sirsak	*Annona muricata* L.
	7	Tapakdara	*Catharanthus roseus* (L.) G.Don
Apocynaceae	8	Talas	*Caladium* sp.
Arecaceae	9	Aren	*Arenga pinnata* Merr.
Asteraceae	10	Sintrong	*Crassocephalum crepidioides* Hiern.
Athyriaceae	11	Paku Sayur	*Diplazium esculentum* Sw.
Balsaminaceae	12	Pacar air	*Impatiens balsamina* L.
Bombacaceae	13	Duren	*Durio zibethinus* L.
Caricaceae	14	Pepaya	*Carica papaya* L.
Brassicaceae	15	Kubis	*Brassica oleracea* L.
Euphorbiaceae	16	Singkong	*Manihot esculenta* Crantz
	17	Asam jawa	*Tamarindus indica* L.
Fabaceae	18	Petai	*Parkia peciosa* Hassk.
	19	Kacang Tanah	*Arachis hypogaea* L.
Lamiaceae	20	Kemangi	*Ocimum* x *citriodorum*
Lauraceae	21	Alpukat	*Persea americana* Mill.
Laxmanniaceae	22	Hanjuang	*Cordyline fruticosa* A. Chev.
Marsileaceae	23	Semanggi	*Marsilea crenata* C. Presl
Mimosaceae	24	Lamtoro	*Leucaena lecocephala* de Wit
Moraceae	25	Nangka	*Artocarpus heterophyllus* Lam.
Musaceae	26	Pisang	*Musa* x *paradisiaca*
	27	Jambu batu	*Psidium guajava* L.
Myrtaceae	28	Jambu air	*Syzigium aquea* Alston
Piperaceae	29	Seureuh	*Piper betle* L.
Poaceae	30	Kaso	*Saccharum spontaneum* L.
Rubiaceae	35	Kopi	*Coffea arabica* L.
Rutaceae	36	Jeruk purut	*Citrus hystrix* DC.
Sapindaceae	37	Lengkeng	*Dimocarpus longan* Lour.
Sapotaceae	38	Sawo	*Manilkara zapota* P. Royen
	39	Cabai rawit	*Capsicum frutescens*
	40	Terong	*Solanum melongena* L.
Solanaceae	41	Leunca	*Solanum nigrum* L.
	42	Takokak	*Solanum rudepandum* G. Forst.
	43	Kentang	*Solanum tuberosum* L.
	44	Combrang	*Etlingera aelatior* R. M. Sm.
	45	Jahe	*Zingiber officinale* Roscoe
Zingiberaceae	46	Kapolaga	*Amomum compactum* Soland ex Maton

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