THE ROLE OF TRADITIONAL FARMER MANAGEMENT ON THE PERFORMANCE OF PRIVATELY OWNED FORESTS: CASE STUDY IN CIAMIS REGENCY, WEST JAVA, INDONESIA

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THE ROLE OF TRADITIONAL FARMER MANAGEMENT ON THE PERFORMANCE OF PRIVATELY OWNED FORESTS: CASE STUDY IN CIAMIS REGENCY, WEST JAVA, INDONESIA. Privately owned forests (POF) play an important role in Indonesia's social, economic, and environmental spheres. The success of optimizing their roles relies on the traditional management practices carried out by farmers. Therefore, this study aimed to explore POF traditional management by farmers, POF performance, and their influencing factors. Respondents included 170 farmers selected by simple random sampling and key informant. This study was conducted in three villages across Ciamis Regency, West Java, in 2022. Data was collected through structured questionnaires, in-depth interviews, and field observations. The collected data was tabulated, graphic, categorized, and descriptively analyzed. The results showed that although the knowledge about POF management was constantly developing, not all farmers applied their knowledge. POF management practices were found to be closely related to marital status, farming experience, land area, distance from home, number of parcels, and income. Furthermore, traditional management practices were reflected in POF performance; the higher the management level, the better the performance, and vice versa. Equitability and efficiency were high across all locations; productivity was low, while sustainability was only high in Kalijaya Village. The different conditions of each element of POF, show that although POF might not be optimal in terms of economic contribution, its sustainability provides environmental benefits. This study has many limitations as it only looks at factors within POF farmers that influence POF management and performance. Further research into external factors that can influence POF performance and encourage an increased economic role for POFs can be explored in more depth.

Keywords: Knowledge, productivity, sustainability, equitability, efficiency

PERAN PENGELOLAAN TRADISIONAL PETANI PADA PERFORMANSI HUTAN RAKYAT: STUDI KASUS KABUPATEN CIAMIS, JAWA BARAT, INDONESIA. Hutan rakyat memainkan peran penting secara sosial, ekonomi, dan lingkungan di Indonesia. Keberhasilan peran hutan rakyat bergantung pada praktik pengelolaan yang dilakukan petani. Oleh karena itu, penelitian ini bertujuan untuk mengetahui pengelolaan hutan rakyat secara tradisional oleh petani, performansi hutan rakyat, dan faktor-faktor yang mempengaruhinya. Responden dalam penelitian ini adalah petani yang dipilih secara simple random sampling sebanyak 170 orang dan beberapa informan kunci. Penelitian ini dilakukan di tiga desa di Kabupaten Ciamis, Jawa Barat, pada tahun 2022. Pengumpulan data dilakukan melalui wawancara terstruktur dengan menggunakan kuesioner, wawancara mendalam, dan observasi lapangan. Data yang diperoleh diolah dengan tabulasi, grafik, kategorisasi, dan dianalisis secara deskriptif. Hasil penelitian menunjukkan bahwa pengetahuan tentang pengelolaan hutan rakyat terus berkembang, namun tidak semua petani menerapkan pengetahuannya.

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Praktik pengelolaan hutan rakyat berkaitan erat dengan pengalaman usaha tani, luas lahan, jarak dari rumah, jumlah persil lahan, dan pendapatan. Praktik pengelolaan tradisional tercermin pada performansi hutan rakyat, semakin baik tingkat pengelolaan maka semakin baik performansinya, begitu pula sebaliknya. Unsur keadilan dan efisiensi performansi hutan rakyat tergolong tinggi sedangkan unsur produktivitas rendah di semua lokasi. Sementara itu, unsur keberlanjutan hanya tinggi di Desa Kalijaya. Perbedaan kondisi elemen performansi hutan rakyat menunjukkan bahwa meskipun hutan rakyat tidak selalu memberikan hasil yang optimal secara ekonomi, namun tetap memberikan manfaat bagi lingkungan. Penelitian ini memiliki banyak keterbatasan karena hanya melihat faktor internal petani yang mempengaruhi pengelolaan dan performansi hutan rakyat. Penelitian lanjutan mengenai faktor eksternal yang dapat mempengaruhi performansi hutan rakyat dan mendorong peningkatan peran ekonomi hutan rakyat dapat dieksplorasi lebih mendalam.

Kata kunci: *Pengetahuan, produktivitas, keberlanjutan, keadilan, efisiensi*

I. INTRODUCTION

Privately owned forests (POFs) in Indonesia are reported to have undergone substantial development over an extended period (Achmad et al., 2022). The progression is closely linked to government support aimed at fostering diverse vegetation through initiatives such as reforestation, Karang Kitri, and Rakgantang (Gandrung Tatangkalan) programs (Awang et al., 2007; Hardjanto et al., 2022). Furthermore, POF as private property rights built on privately-owned land have continued to follow market trends naturally without intervention from any party (Hardjanto et al., 2022; Hardjanto & Patabang, 2019; Nugroho & Tiryana, 2014; Parlinah et al., 2020). All management practices including planting, maintenance, harvesting, and marketing rest solely on the individual or family, guided by autonomous decisions based on personal needs (Trison, 2012). The decision-making of landowners regarding their land is influenced by place-attachment values, land and wildlife management beliefs, the purpose of resource ownership (Balukas et al., 2019), economic and environmental factors (Rahmani et al., 2021, 2022), attitude towards risk (Wang et al., 2022), as well as market and policies (Matilainen et al., 2023; Nurrochmat et al., 2021).

Farmers can manage POF based on knowledge (Awang et al., 2007; Pynnönen et al., 2019). Adequate knowledge is needed to actualize the purpose of POF for farmers and industry (Awang et al., 2007; Pynnönen et al., 2019). However, Floress et al. (2019) stated that knowledge is not the only important determinant of farmer behavior in forest management, but it contributes economically to farmers' income, provides an opportunity to reduce unemployment by absorbing labor in the village, and plays a role in maintaining environmental sustainability. The success of management is intrinsically linked to the local knowledge possessed by the farmers. Local knowledge can also have significant changes along with the development of information technology

POF are closely related to their owners, hence, villagers' patterns of cultivation, use, and interactions vary depending on soil fertility conditions, community culture, and local policies (Awang et al., 2007). According to Suharjito et al. (2000), the existence of POF is shaped not only by natural interactions between botanical components, microorganisms, soil minerals, water, and air but also by the role of humans and culture. Anen (2017) stated that cultural habits and local knowledge influenced the development of POF. Local resource users can dynamically combine traditional and oral knowledge (Joa & Schraml, 2020). The planting pattern often follows monoculture and agroforestry approaches. However, the selection of both timber and non-timber plant

types is adapted to local biophysical (ecological), social, cultural, and economic factors.

The development of POFs will be reflected in their performance, and the performance of POFs depends on their management practices. There have been many studies related to POF management in different aspects, but not related to the performance of POFs. There have been many studies related to POF management in different aspects, but not related to the performance of POFs. A lot of different things are looked at in these studies, such as farmer involvement in POF management (Hudiyani, 2015; Sudrajat et al., 2016), farmer motivation (Nurdina et al., 2015; Suherdi et al., 2015), marketing ((Kusuma et al., 2020; Purwawangsa et al., 2021), the role of POFs (Irawanti et al., 2012b; Oktalina, 2015; dan Achmad et al., 2015), institutions (Nugroho, 2010); Ruhimat, 2016), and (Purbawiyatna et al., 2011; Sukwika et al., 2018; Maryudi and Nawir, 2017). Research on the performance of POFs by Anen (2017) is only concerned with management conditions and POF performance; it does not explain the connection between the two and the various other factors that affect them. This study not only examines POF management practices and performance but also to explaining how management and performance relate using (Conway, 1987) performance concept approach. This study aimed to knows POF traditional management by farmers, POF performance, and their influencing factors.

II. MATERIAL AND METHOD

A. Location

This study was conducted in Ciamis Regency, West Java, Indonesia, geographically located between 108°19'–108°43' East Longitude and 7°40'30"- 7°41'30" South Latitude. The established boundaries of the regency are as follows: North-Majalengka and Kuningan; West-Tasikmalaya/Tasikmalaya Municipality; South-Pangandaran; East-Banjar Municipality and Cilacap. Covering a total area of 1,597.67 km^2, the regency is located 124 km away from the capital of West Java Province, Bandung Municipality. The administrative region is divided into 27 subdistricts, and 258 villages (Badan Pusat Statistik Kabupaten Ciamis, 2022a).

The consideration for the selection of the research site is that Ciamis Regency is one of the areas in West Java Province with the most significant representation of POF (Siarudin et al., 2022). POF now covers more than 30% of the total area of Ciamis Regency (Siarudin et al., 2022). Ciamis Regency is also known to have considerable POF potential as seen from the POF area and the growth of wood-based industries from POF (Cabang Dinas Kehutanan Wilayah VII Provinsi Jawa Barat, 2019; Siarudin et al., 2022; Suhartono, 2021).

Three villages were selected by purposive sampling, each representing a different geographic area and range of altitudes. The lowest plain ('lowlands') was represented by Kalijaya Village, Banjaranyar Subdistrict, in the south, while the intermediate plains ('midlands') were marked by Mekarjaya Village, Baregbeg Subdistrict, in the central area. Finally, the highest plain ('highlands') was represented by Hujungtiwu Village, Panjalu Subdistrict, in the north. Kalijaya Village has an area of 712 ha with an average altitude of less than 200 m above sea level (m asl), Mekarjaya Village has an area of 399 ha with an altitude of 200-500 m asl and Hujungtiwu Village has an area of 712 ha with an altitude of over 500 m asl (Badan Pusat Statistik Kabupaten Ciamis, 2022b, 2022c, 2022d). A map of the study location is presented in Figure 1.

B. Methods

The population studied were farmers who owned and managed POF. Data were collected through structured questionnaires, in-depth interviews, and field observations. Structured interviews were conducted with 170 farmers selected with simple random sampling. The number of farmers in each village was 55 in Hujungtiwu, 55 in Mekarjaya, and 60 in Kalijaya. This number of respondents represented the

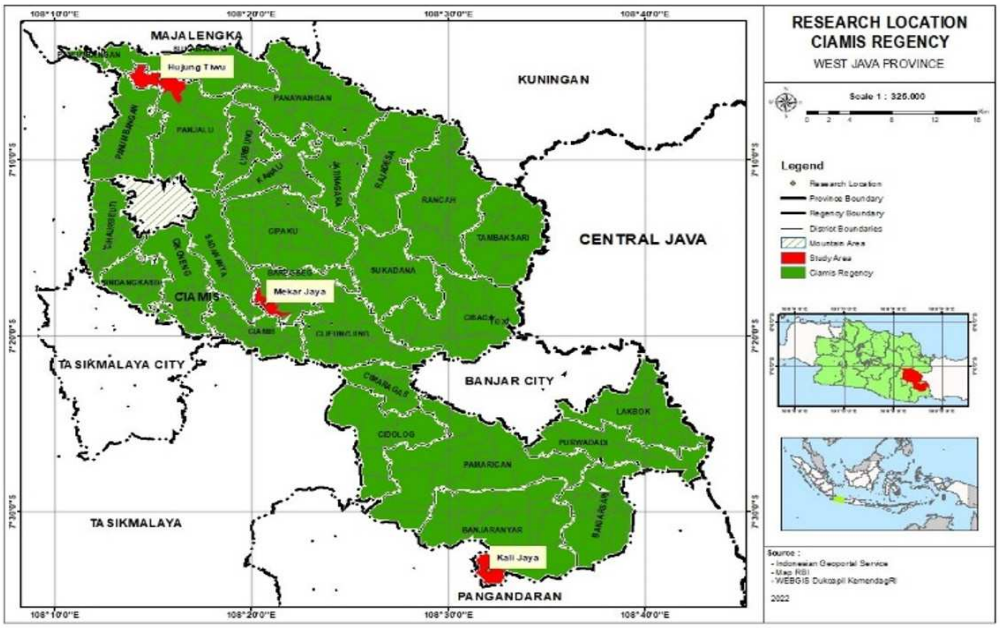


Figure 1. Study location in Ciamis Regency

population of POF farmers in the study area. This approach aligns with Cohen et al. (2007) who suggest that while a larger sample size is preferable, the minimum number should be 30. In-depth interviews were conducted with several farmers who had a deeper understanding of POF management. To ensure that the informants had an in-depth understanding to answer the questions, the researcher sought information and advice from local extension workers and village officials. Field observations were conducted through observation and documentation of several farmer-owned POFs. The data collected included respondent and POF characteristics, POF management practices, and POF performance.

POF management included three sub-systems, namely production, processing, and marketing. POF performance comprised productivity, sustainability, equitability, and efficiency (Conway, 1987). In this study, we have defined each element of POF performance based on the modified Conway concept. Productivity was defined as the yield or income of products owned/produced by farmers per unit area per year. Sustainability refers to the efforts to maintain POF including planting intensity, rejuvenation, and maintenance. Furthermore, equitability was defined as the equitable distribution of benefits from POF, measured by the number of parties benefiting. Data to measure efficiency were in the form of input (production costs) and output (production value) of farms. Efficiency is the lowest cost in managing a POF business while generating the highest income. It was measured based on the business unit level calculated on the input-output basis of production (profit from POF business income minus capital).

This study also collected a land use map for the last 20 years (2000-2020), to look at the land use (land cover) at the research site. The data was obtained from the Directorate General for Forestry Planning and Environmental Governance (Ministry of Environment and Forestry).

C. Analysis

The collected data was tabulated, graphic, and categorized. The land use data were processed using Arc View GIS software. All processed data were then descriptively analyzed according to the research objectives.

Each management activity stage and

performance element of POF was rated from 1 to 3 based on the frequency distribution intervals of the data generated from the field, as shown in Table 1 and Table 2.

The data on each stage of POF management activities and four performance elements were then grouped into three categories: low, medium, and high. The class interval was calculated using the formula (GeeksforGeeks, 2023; Widoyoko, 2015):

$$Class\ interval = \frac{highest\ score - lowest\ score}{number\ of\ classes}$$

The categories of POF management conditions and performance elements were grouped as follows; 1). low (score 1 - 1.67), 2). medium (score >1.67-2.33), and 3). high (score >2.33-3). Data were processed and analyzed using the Spearman correlation statistical test with SPSS 27 IBM for Windows to determine the correlation between farmer characteristics, POF management, and performance.

III. RESULT AND DISCUSSION

A. Characteristics of Farmers and POF

The characteristics of farmers and POF in the study areas are shown in Table 3. The table showed that the average age was over 50 years, and the education level was predominantly primary school. In addition to formal education, some farmers also receive non-formal education, such as advice and training from agricultural/ forestry extension workers, so that they have a good knowledge of POF management. Moreover, most respondents were indigenous villagers whose main livelihood was agriculture with an average farming experience of 29.1 years in all study locations. Thus, the farmers in the three research sites are dominated by farmers of productive age and with sufficient education to manage POF. This condition was found in the sub-district of Tulang Bawang by Anatika et al. (2019) who mentioned that the POF farmers are characterized by a productive age, sufficient education (formal and nonformal education), an average number of family dependents, and sufficient experience in farming.

The average land area was 1.81 ha, 0.39 ha, and 0.58 ha in Kalijaya, Mekarjaya, and Hujungtiwu Villages, respectively. When grouped into three strata, the land area was dominated by narrow land ownership with many scattered parcels. This land area was also directly proportional to income from POF, where the average in Mekarjaya Village was the lowest. Furthermore, this condition was related to land accessibility, both the distance from

Table 1. Rating of POF management

POF management stages	Parameter	Rating		
		1	2	3
Production	Activity frequency	Low	Medium	High
Processing	Activity frequency	Low	Medium	High
Marketing	Activity frequency	Low	Medium	High

Table 2. Rating of POF performance

POF performance	Parameter	Rating		
		1	2	3
Productivity	Income	Low	Medium	High
Sustainability	Maintenance activity	Low	Medium	High
Equitability	Number of beneficiaries	Low	Medium	High
Efficiency	Percentage of production cost	Low	Medium	High

Table 3. Characteristics of POF farmers in the study areas

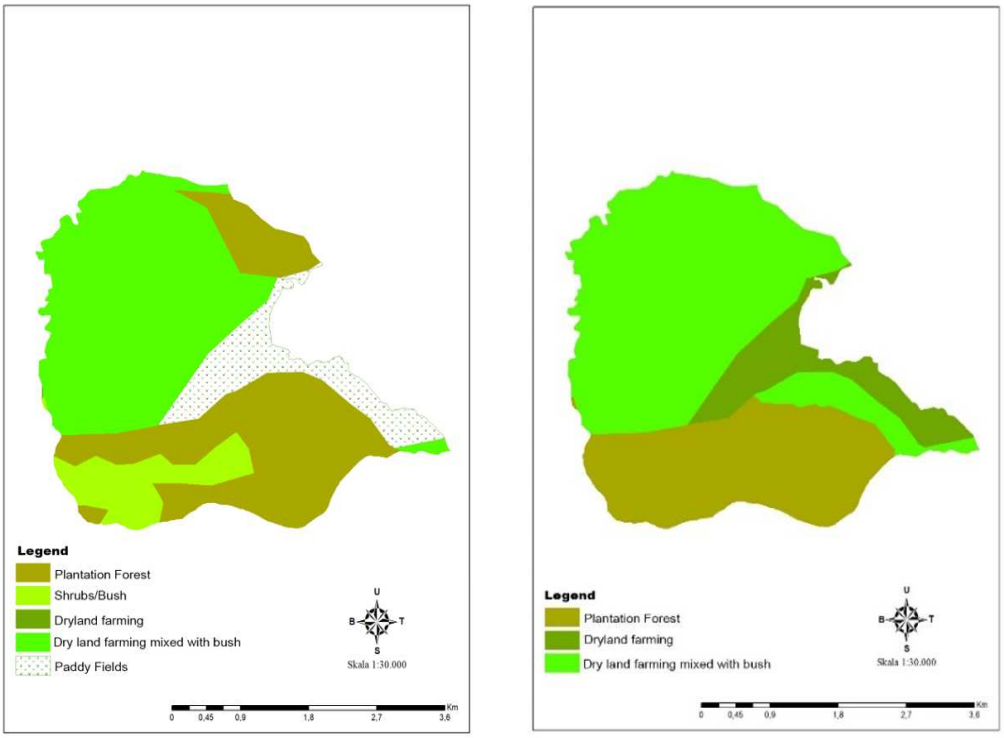
Characteristics		Percentage of respondent		
		Kalijaya	Mekarjaya	Hujungtiwu
Farmer characteristics				
Gender (%)	Male	81.67	80.00	89.10
	Female	18.33	20.00	10.90
Age (years)	Average	53.80	62.60	55.00
	Min	24.00	39.00	35.00
	Max	85.00	86.00	83.00
Education (years)	Average	7.20	8.00	7.30
	Min	2.00	1.00	5.00
	Max	16.00	18.00	19.00
Number of family dependent (person)	Average	2.00	1.50	2.10
	Min	0.00	0.00	0.00
	Max	4.00	5.00	6.00
Length of stay (years)	Average	50.20	58.80	50.40
	Min	15.00	2.00	12.00
	Max	78.00	86.00	73.00
Farming experience (years)	Average	31.70	34.53	21.11
	Min	2.00	1.00	2.00
	Max	73.00	65.00	52.00
POF characteristic				
POF land area (ha)	Average	1.81	0.39	0.58
	Min	0.14	0.04	0.01
	Max	7.79	1.43	4.09
Number of POF land parcels	Average	4.27	3.03	2.27
	Min	1.00	1.00	1.00
	Max	10.00	16.00	6.00
Distance of POF from home (km)	Average	1.98	0.67	0.83
	Min	0.01	0.01	0.05
	Max	14.00	4.00	5.00
Income of POF (IDR/years)	Average	34,274,852	5,023.264	10,768.364
	Min	2,130,000	902,000	900,000
	Max	238,700,000	31,960,000	300,750,000

their homes and access to land. The average land distance from residence was 1.31 km, with most travel modes being by foot or motorbike. The characteristics of the farmer and the POF will provide different motivations for POF management (Anatika et al., 2019).

POF is the most dominant land use in the three study areas. Based on the land use analysis for two decades, POF has increased as shown in Figures 2, 3, 4, and Table 4. In Kalijaya and Mekarjaya Villages, the increase in POF was caused by the practice of land conversion from paddy fields to POF, while in Hujungtiwu Village it was caused by the reduction of dryland farming. Land conversion in Java occurs almost every year, especially in paddy fields (Daris et al., 2018).

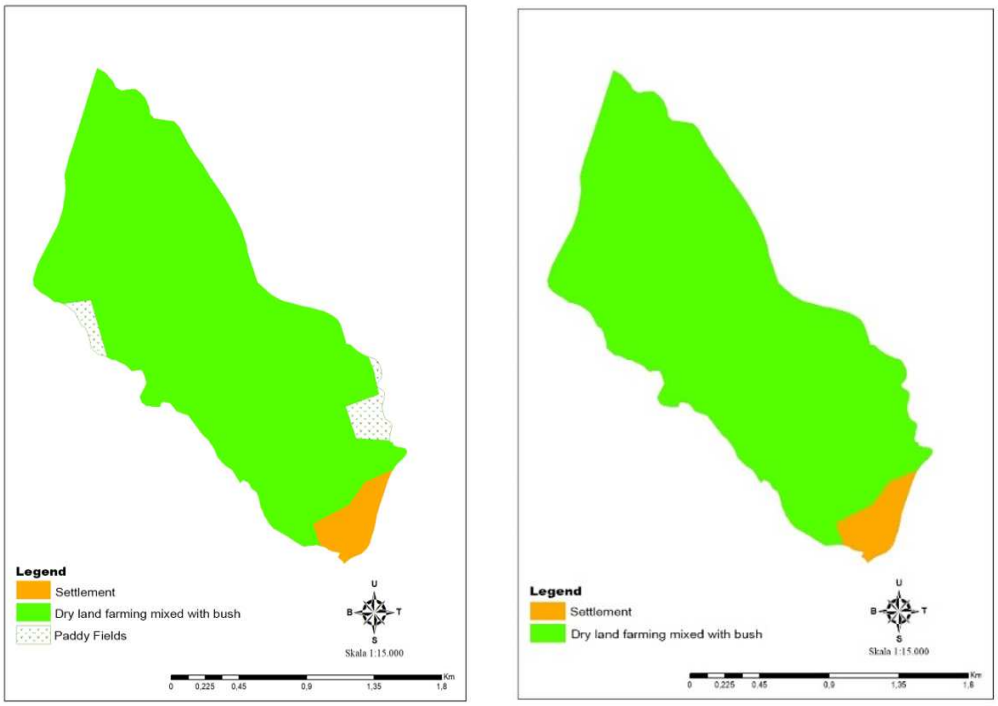
B. Traditional Knowledge and Practices in POF Management

According to many stakeholders, traditional knowledge in POF management is highly effective. Diverse forms of knowledge exist, including science-based, as well as indigenous



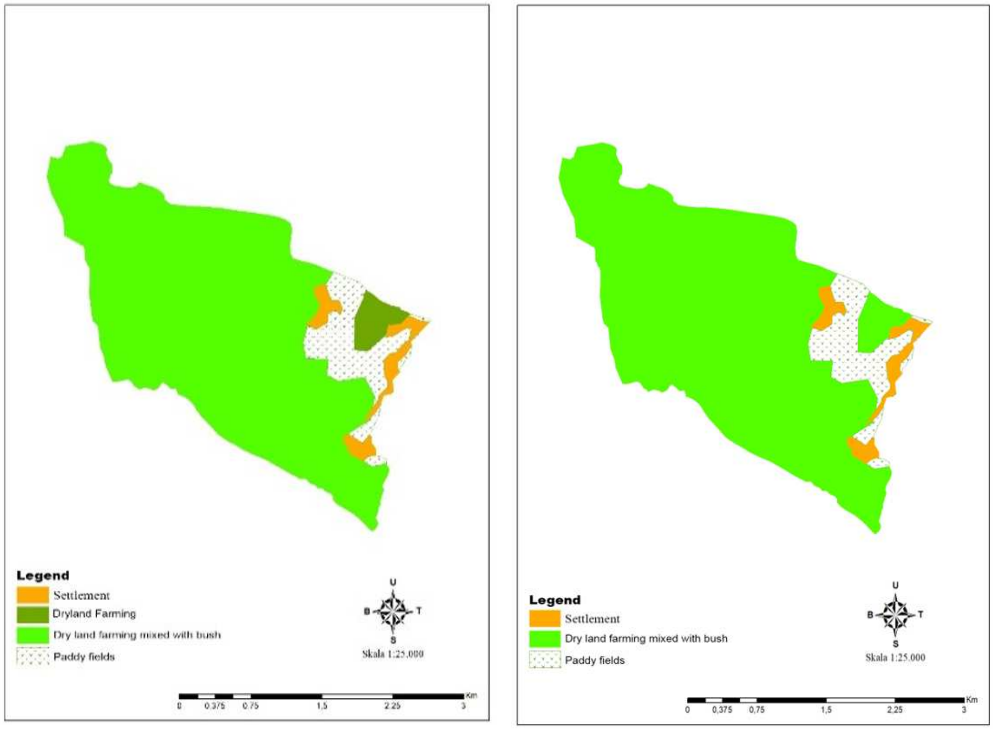
Note: POF is considered the same as dryland mixed with bush

Figure 2. Land use map in Kalijaya Village in 2000 and 2020



Note: POF is considered the same as dryland mixed with bush

Figure 3. Land use map in Mekarjaya Village in 2000 and 2020



Note: POF is considered the same as dryland mixed with bush

Figure 4. Land use map in Hujungtiwu Village in 2000 and 2020

Table 4. Land use change in research site

Land use	Land area (ha)								
	Kalijaya			Mekarjaya			Hujungtiwu		
	2000	2020	Change	2000	2020	Change	2000	2020	Change
Plantation forest	475.59	445.03	-30.56			0.00			0.00
Shrub	128.84		-128.84			0.00			0.00
Settlement			0.00	13.46	13.46	0.00	26.64	26.64	0.00
Dryland farming	0.18	166.87	166.69			0.00	19.47		-19.47
Dryland farming mixed with bush	657.52	817.10	159.58	309.95	320.57	10.63	628.14	647.61	19.47
Paddy field	166.87	0	-166.87	10.63		-10.63	63.29	63.29	0.00

Note: POF is considered the same as dryland mixed with bush.

or local (Eriksson & Fries, 2020; Hurlbert et al., 2019; IPBES, 2013). Farmers gain experience over the years by cultivating their land and achieving optimal economic, social, and ecological results (Anatika et al., 2019). This study has three subsystems in POF management: production, product processing, and marketing. Local knowledge in POF management involved understanding the types of plants suitable for the land, planting methods, preservation of certain trees, and appropriate time for harvesting. Knowledge about POF management has evolved with the development of technology and information. According to Suharjito et al. (2000), cultural habits and local knowledge influence management practices in different places. Alterations in these practices may have future consequences, affecting employment opportunities and household income (Hilsenroth et al., 2021).

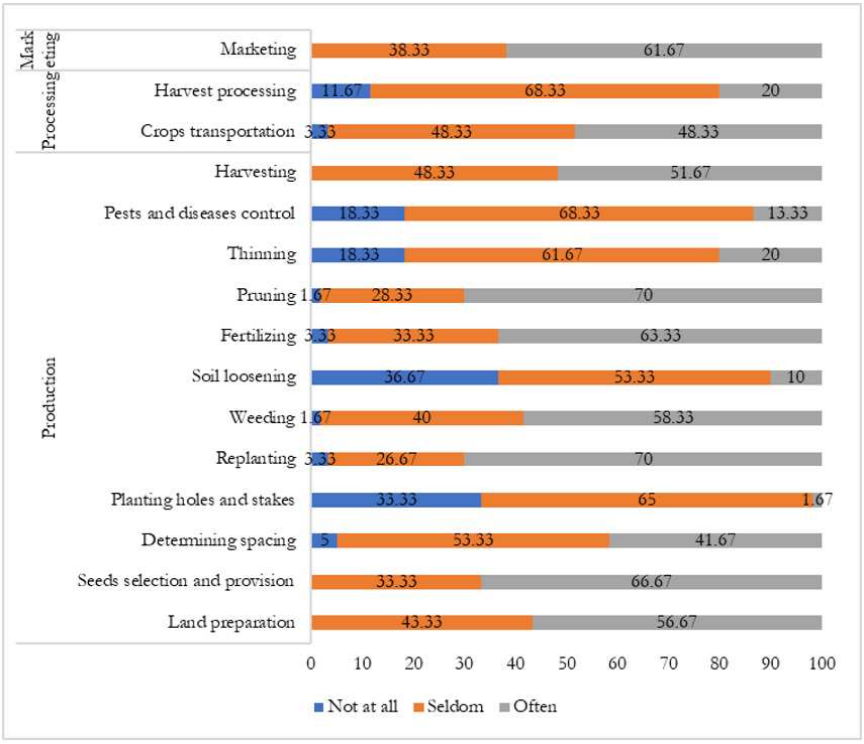


Figure 5. POF management by farmers in Kalijaya Village (%)

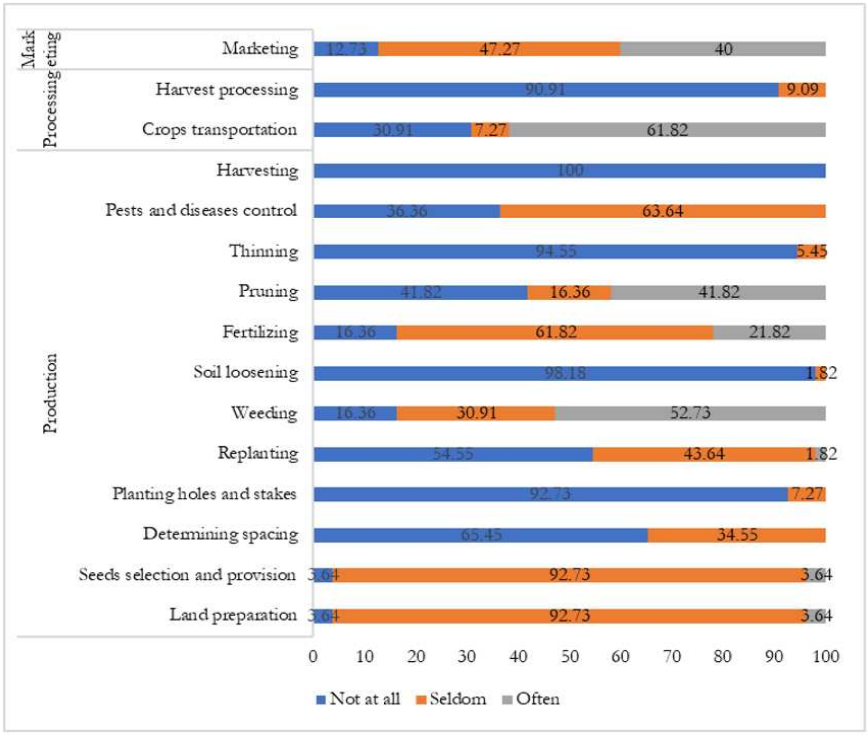


Figure 6. POF management by farmers in Mekarjaya Village (%)

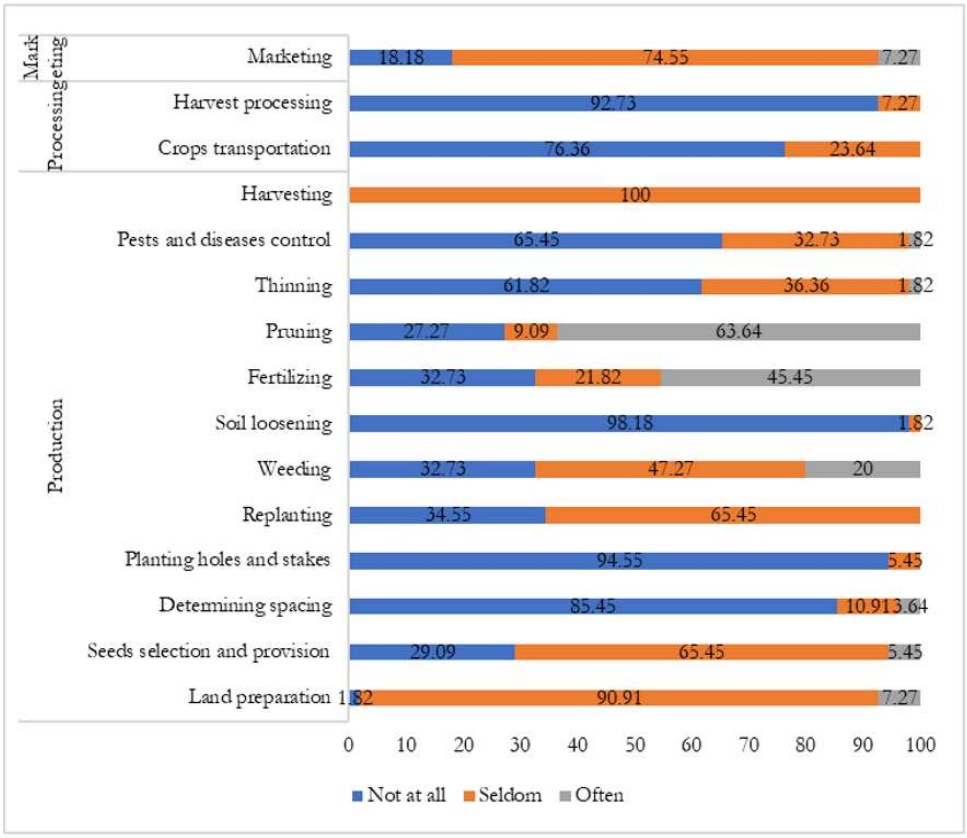


Figure 7. POF management by farmers in Hujungtiwu Village (%)

The application of knowledge and practices by farmers in POF management was found to be entirely dependent on owners. POF management in Kalijaya, Mekarjaya, and Hujungtiwu is shown in Figures 5, 6, and 7, respectively.

POF's production subsystem included planting, maintenance, and harvesting. Planting began with land preparation, selecting and providing seedlings, determining the planting spacing, making planting holes, and setting stakes. With the development of information and technology and the ease of access, farmers can also increase their knowledge of POF management, specifically on species selection, quality seed, and maintenance. However, in line with Trison (2012), not all farmers applied their knowledge to land management in this study location. The main reason why farmers do not apply their knowledge in POF management is economic constraints (capital). Farmers only carry out management activities that are considered very necessary and ignore other activities. Economic limitations also cause farmers not to make plans to manage POF land (Kurniawan, 2020). Sustainable management of forests for multiple purposes requires multifaceted socio-technical knowledge.

The selection of plants comprising POF was made according to the preferences and considerations of the landowner. Sukadaryati et al. (2018) mentioned that the planting pattern of POF management in Ciamis Regency consisted of homogeneous plants (same tree species), alongside a mixture of various timber and fruit-producing trees. The choice of cropping patterns was guided by the knowledge acquired independently or from their parents and fellow farmers. Table 5 shows that most respondents have mixed and agroforestry patterns.

The POF was mainly a type of forest ecosystem commonly established by villagers, so silvicultural prescriptions were relatively limited and carried out according to the community's

Table 5. POF cropping pattern

Cropping patterns	Percentage of respondent		
	Kalijaya	Mekarjaya	Hujungtiwu
Timber (monoculture)	3.33	1.82	7.27
Timber + MPTs	50	29.09	40
Timber + annual crops/understorey plants	23.33	67.27	45.45
Timber + MPTs + annual crops/understorey plants	21.67	0	5.45
MPTs + annual crops/understorey plants	1.67	1.82	1.82

reference (Wirabuana et al., 2021). Interestingly, most communities prefer to plant trees because of their potential financial benefits (Wirabuana et al., 2021). However, this is not entirely true as in other areas, including the study location, many farmers combine timber with non-timber crops, whether on large, medium, or small land areas.

The dominant timber species planted were sengon (*Falcataria moluccana*), teak (*Tectona grandis*), and mahogany (*Swietenia* sp.), while fruit-producing plants were diverse, including avocado (*Persea americana*), durian (*Durio zibethinus*), mangosteen (*Garcinia mangostana*), dog fruit (*Archidendron pauciflorum*), and stink bean (*Parkia spesiosa*). The most common understorey plants included banana (*Musa paradisiasa*), cardamom (*Amomum cardamomum*), and turmeric (*Curcurma longa*). Meanwhile, the most dominant annual crops were maize (*Zea mays*), peanuts (*Arachis hypogaea*), sweet potato (*Ipomoea batatas*), and cassava (*Manihot esculenta*).

Farmers mostly practiced timber monoculture on land far from their homes. The diversity of cropping patterns and management practices adopted by the farmers showcased their pragmatic approach to adapting to different conditions and desired needs. Farmers with limited land tended to use a variety of cropping patterns to secure daily livelihoods (subsistence). Some farmers also opted for monoculture cropping patterns of annual crops or agroforestry with very little wood composition. Meanwhile, those with large areas tended to use mixed models, combining annual crops with multipurpose plants (MPTs), or establishing mixed plantations such as rubber (*Hevea brasiliensis*), cocoa (*Theobroma cacao*), cardamom, and coffee (*Coffea*), aiming to meet their subsistence needs and commercial purposes. Differences in cropping patterns and crop types led to yield variations and affected incomes.

Maintenance activities included replanting, weeding, soil loosening, fertilizing, pruning, thinning, and pest and disease control. Farmers mostly did not undertake any specific maintenance for timber plants in the three surveyed villages, while weeding, hoeing, and fertilizing were often carried out for non-timber plants. Pest and disease control was rarely practiced in the study areas. The maintenance intensity was also highly dependent on the distance of the land from home and the type of plantation.

Harvesting activities in POF were implemented for timber and other plants in the three villages. Harvesting activities in POFs were generally irregular or referred to as "need cycles" (Awang et al., 2007), and were carried out at specific times namely during celebrations and school children seasons. This practice is consistent across various POFs in Indonesia including Lampung (Anatika et al., 2019). Farmers fell timber independently or through the buyer and wholesale purchasing system. According to Sukwika et al. (2018), farmers rarely use timber harvesting technology despite the wide access. Instead, middlemen often take charge of timber harvesting processes, which include felling, skidding, and transportation to the wood processing industry. Regarding non-timbers, harvesting methods were adapted to the characteristics and cycle of each crop, for instance, in Kalijaya Village, fruit crops were typically sold through a proof and wholesale

system. Meanwhile, understorey plants such as cardamom and turmeric were harvested by farmers themselves and sold to collectors in both wet and dry forms.

Most farmers did not engage in post-harvest processing, except for some non-timber crops, such as cardamom and turmeric. This process involved drying and bagging the crops for sale. Other plants were usually sold in their fresh state, as this was considered more profitable and simpler than undergoing processing.

Farmers in three study villages in the marketing subsystem had already established a presence in selling POF products. The marketing of POF products has become more open with the development of price information and marketing channels. Moreover, the increased knowledge of farmers culminated in a better bargaining position. Farmers had no difficulty in selling products harvested from POF, including timber and non-timber. The sale and purchase transaction occurred on the farm or at home, depending on the agreement with the buyers. POF products were usually sold temporarily to buyers who offered the best price.

Based on the management practices adopted by the farmers, POF management in the study location can be grouped into five typologies, as shown in Table 6.

The first typology mainly consisted of farmers with small landholdings, assuming the roles of owners, managers, and tenants. This category generally possessed enough family labor to manage their land, but silvicultural techniques were not fully implemented due to limited capital. Silvicultural techniques were majorly confined to understorey or annual crops, which constituted the main target of their activities. Farmers with small, medium, and large size areas practiced the second typology. Farmers managed their land to obtain both timber and non-timber products. Hence, the application of silviculture was directed towards both categories. Due to the limited capital, these farmers often relied on family labor, occasionally hiring additional labor for certain activities such as land preparation and weeding. The third typology was mainly composed of farmers with medium and large holdings. Farmers invest in land, but not in other capital. Therefore, planting was carried out without implementing proper silvicultural practices.

The fourth typology consists of farmers who invest in land and other capital but do not fully implement silvicultural practices due to the belief that trees do not need constant maintenance. Finally, the fifth typology comprises farmers who invest, have objectives, and apply silvicultural practices. All typologies of POF management existed in the three surveyed villages, but the first typology was most common in Mekarjaya and Hujungtiwu Villages. Given that narrow and medium-sized parcels of land make up the majority of land ownership in the three research sites, the first typology is prevalent there. The small size of the land, coupled with economic constraints, makes it difficult for farmers to apply all silvicultural techniques in the management of POFs. This condition also leads farmers to use only family labor in POF management and not aim for commercial yields. Based on the

Table 6. Typology of POF management in study location

No.	Typology of POF management	Land ownership
1.	Partial implementation of silvicultural practices, investment in family labor, no specific end yield	Small, Medium
2.	Implement silvicultural practices, invest in family labor, invest in capital	Small, Medium
3.	The owner invests only in land, has no yield target, does not apply silvicultural practices	Large
4.	The owner invests capital and has yield objective, but does not always apply silvicultural practices	Small, Medium, Large
5.	The owner invests capital, has yield objectives, and applies silvicultural practices	Medium, Large

explanation of each stage of POF management by farmers in each village, the condition of POF management in Kalijaya Village is classified as high. In contrast, it is classified as medium in the other two villages, as shown in Table 7. High POF management shows that farmers carry out the stages of activities that should be carried out in POF management.

In Kalijaya Village, the production and processing subsystems are classified as medium, while the marketing subsystem is classified as high. This is because most farmers in Kalijaya Village are involved in the production, processing, and marketing of POF products. In the other two villages, many farmers are only involved in some POF management activities, particularly maintenance. Due to low yields, many farmers do not process and sell POF products, but only use or consume them themselves (subsistence)

C. POF Performance

Performance measurement was carried out as a basis for policymakers to determine whether forest management was moving in the desired direction (Serafeim, 2020). POF performance was considered in terms of four elements, namely productivity, sustainability, equitability, and efficiency. The distribution of respondents according to these four elements is shown in Table 8. Although choosing indicators used as performance indices is important, the outcome depends on the management alternatives being compared (Pukkala, 2021).

Productivity is an important element that shows the ability of the forest to produce outputs. In all villages, most respondents had POF productivity in the low category. Table 7 shows that the distribution of respondents with high sustainability was observed in Kalijaya, while medium and low levels dominated the other two villages. The maintenance practices of POF used by most farmers in Kalijaya promote high sustainability.

The principle of equitability, as used in this study, involves treating everyone in the same situation without discrimination. The existence of POF provides a high level of equitability; the benefits provided were not only limited to owners but also buyers, hired labor,

Table 7. Management conditions of POF at the study location

POF subsystem	Score of POF management					
	Kalijaya		Mekarjaya		Hujungtiwu	
	Score	Category	Score	Category	Score	Category
Production	2.31	Medium	1.72	Medium	1.62	Low
Processing	2.08	Medium	1.09	Low	1.07	Low
Marketing	2.61	High	2.27	Medium	1.89	Medium
Total	2.34	High	1.69	Medium	1.68	Medium

Table 8. Distribution of respondents based on POF performance elements

POF performance element	Parameter/ Criteria*	Rating	Respondent distribution (%)		
			Kalijaya	Mekarjaya	Hujungtiwu
Productivity	Income (Rp/years)				
Low	900,000-100,850,000	1	95	100	98.2
Medium	100,850,000-200,800,000	2	0	0	0
High	200,800,000-300,700,000	3	5	0	1.8
Sustainability	Maintenance activity				
Low	Never (no maintenance)	1	0	25.5	21.8
Medium	Rarely (1-2 activity)	2	5	60	69.1
High	Often (more than three activity)	3	95	14.5	9.1

Table 8. Continued

POF performance element	Parameter/ Criteria*	Rating	Respondent distribution (%)		
			Kalijaya	Mekarjaya	Hujungtiwu
Equitability	Number of beneficiaries				
Low	Owner- farmers only	1	0	0	0
Medium	Farmers and buyers	2	3.3	25.45	14.55
High	Many parties (farmer, buyer, close family, distant family, neighbours, etc.)	3	96.7	74.55	85.45
Efficiency	Percentage of production cost (%)				
Low	>34.22-48.67	1	13.3	9,1	1,8
Medium	>19.78-34.22	2	28.3	30.9	30.6
High	5.33-19.78	3	58.3	60	65.5

Remark: *Based on interview data from the field

Table 9. POF performance

Performance elements	Score of POF performance					
	Kalijaya		Mekarjaya		Hujungtiwu	
	Score	Category	Score	Category	Score	Category
Productivity	1.10	Low	1	Low	1.04	Low
Sustainability	2.95	High	1.89	Medium	1.87	Medium
Equitability	2.97	High	2.75	High	2.85	High
Efficiency	2.45	High	2.51	High	2.64	High
Total	2.37	High	2.04	Medium	2.10	Medium

families, neighbors, and even the surrounding community.

POF efficiency was measured by the level of business units, calculated based on production input-output (profit from POF business income minus cost); most farmers do not allocate any specific capital (cost) to the management of POF. Typically, only maintenance and seedling costs are included in the first year of planting. Therefore, despite the low productivity, more than 60% of farmers were classified as having high efficiency in POF management. Overall, the POF performance value in Kalijaya was in the high (good) category, while Mekarjaya and Hujungtiwu were included in the medium as shown in Table 9. This difference is due to the different socio-economic and cultural conditions under which farmers manage POFs. Farmers in Kalijaya village have, on average, larger land holdings than those in other villages. Many farmers in Kalijaya village use POFs as their main source of livelihood, so they are better at managing POFs. Although productivity is still low, farmers' activities in maintaining POFs promote sustainability, equity, and high efficiency.

Based on the element of POF performance, the productivity in the three surveyed villages was low, suggesting that the yield or income generated by farmers was not optimal. Despite the low productivity, the sustainability of POF in Kalijaya and Mekarjaya was rated as high and medium, respectively. Maintaining the sustainability of POF is crucial for both the livelihoods of farmers and the environment (Puspita et al., 2021). The majority of farmers used practices that promoted sustainability, such as providing sufficient seeds for planting or replanting and harvesting with selective logging.

The sustainability of POF was also influenced

by the adequate availability of seedlings for replanting (Safe'i et al., 2019). The community usually obtained seedlings in two ways namely natural seedlings in the garden and surrounding areas, and purchasing from traders. Factors that influenced seedling provision included age, experience of the farmer, and extension practices (Sudrajat et al., 2016). Seedlings were obtained through various channels including self-purchase, coppice, and ex-felled trees, or government support (Listiyawan et al., 2022). Farmers also usually replant tree species on ex-felled land, showing a growing adherence to sustainability principles in timber production. The high demand for timber must be balanced with good management to avoid threatening the sustainability of POFs (Fauzan et al., 2019).

Other important elements that served as indicators of POF performance were equitability and efficiency. According to Feliciano et al. (2017), farmers have diverse objectives in POF management, with equitability being a central pillar. The high scores of equitability in Table 8 show that POF can provide benefits to many parties, extending beyond the landowners (Sagita et al., 2019). POF in the three villages also showed high-efficiency scores, suggesting most farmers incurred low costs in the course of POF management. This was because many stages of the activities were carried out by the farmers themselves, thereby reducing labor costs.

D. Correlation Between Farmer and POF Characteristic, Management, and Performance

POF knowledge and management practices may be influenced by farmer characteristics. Table 10 shows that marital status is negatively significantly correlated with POF management. This correlation is an indication that POF management by married farmers was actually on the decrease because farmers have jobs in other sectors to meet their family needs, so their focus is not on POF management. Together with other factors such as education level, farming experience, and land ownership, marital status is the main driver of household decision-making and participation in land management (Mohammed et al., 2017; Okon et al., 2019).

In contrast to marital status, farming experience, POF land area, distance from home, number of parcels, and income is strongly positively correlated with POF management practices. Farmers with a longer farming experience, larger areas, close the POF distance, any number of parcels, and high income showed better POF management. According to Anatika et al. (2019), productive age, adequate level of education, land area, as well as social, environmental, and economic motivation influence POF management. Novais & Canadas (2010) mentioned that the land area, dominant species, availability of family labor, allocation of equipment, physical proximity to residences, age, gender, and occupation affected the management practices in different typologies.

Management practices were found to affect POF performance significantly. Table 11 shows that POF management practices carried out by farmers correlated positively with performance (the calculated correlation value was 0,554 at 0,01 significance level, 2-tailed). Therefore, good management practices culminate in optimal performance, and vice versa. High (good) POF performance was marked by several indicators such as high productivity, sustainable management, equitable practices, and efficient costs (Anen, 2017; Suharjito et al., 2000). In part, POF management is only strongly correlated with sustainability and equitability. The better the POF management, the higher the sustainability and equitability, but this is not always the case for productivity and efficiency. Even well-managed POF do not necessarily have high productivity and efficiency.

According to Suharjito et al. (2000), POF performance was influenced by the management system, business orientation, and product diversity. The management practices are related to the system of control and decision-making, whether individual or communal.

Table 10. Correlation between farmer characteristics, POF characteristic, and POF management

Farmer and POF characteristics	Correlation with POF management		
	Correlation coefficient	Sig. (2-tailed)	N
Gender	-0.037	0.636	170
Age	-0.137	0.075	170
Marital status	-0.184*	0.017	170
Education	-0.099	0.197	170
Number of family dependents	0.071	0.357	170
Length of stay	-0.148	0.055	170
Farming experience	0.202**	0.008	169
POF land area	0.446**	0.000	170
Number of land parcels	0.335**	0.000	170
Distance of POF from home	0.481**	0.000	170
Income of POF	0.544**	0.000	170

Remarks: * Correlation is significant at the 0,05 level (2-tailed).
**Correlation is significant at the 0,01 level (2-tailed).

Table 11. Correlation between POF management and POF performance

Spearman's rho correlations		Productivity	Sustainability	Equitability	Efficiency	POF performance
POF management	Correlation coefficient	0.146	0.667**	0.246**	-0.123	0.554**
	Sig, (2-tailed)	0.000	0.058	0.001	0.110	0.000
	N	170	170	170	170	170

Remarks: * Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

The tenure system and management decision-making influence the responsiveness to the market economy and social economic models. Landowning farmers played an important role in the decision-making regarding POF land management. According to Sukwika et al. (2018), family farmers predominantly determine whether their land would be maintained as POF or used for other agricultural activities including rice fields, or ponds.

The results showed that the management system in the three sites was entirely individual, both on small, medium, and large plots. Therefore, all decisions in managing POF land were primarily dependent on owners and POF performance was influenced by the behavior of farmers towards land management. While some managed their land casually, others adopted new knowledge and innovations.

Business orientation refers to the motive behind POF cultivation, whether for subsistence or commercial purposes, and the degree of subsistence and commercialization measures responsiveness to the market economy. Furthermore, the orientation of farmers in managing POFs varies. Most farmers were oriented towards meeting their daily needs (Achmad et al., 2022), while some perceived POF as a means to get savings for urgent needs. Sukadaryati et al., (2018) found that POF in Ciamis Regency was often treated as savings and harvested to fulfill personal needs or sold to address urgent financial obligations.

Commercial orientation was predominantly observed among farmers with significant land ownership. The planting of timber and fruit trees by several large landowners in Hujungtiwu village was targeted at making large profits.

Farmers with a commercial orientation tended to carry out more planned land management, from preparation to future marketing plans. Therefore, the performance of POF yielded good economic and ecological outcomes.

POF performance can also be influenced by the type and diversity of products consumed or marketed, which is a response to market needs. Regarding the type and diversity of products, farmers with small landholdings and intensive management tended to plant annual crops, with less than 50% timber. Farmers with medium and large land areas planted a mixture of annual crops and timber, while those having large land areas cultivated timber and fruit trees (MPTs). Crop diversification is one of the strategies to overcome narrow land tenure (Musdi et al., 2020). Furthermore, community culture as manifested in diverse cropping patterns also affected POF management, particularly in sustaining performance. This approach aimed to ensure that the use of forest resources provided benefits in a productive, sustainable, equitable, and efficient manner (Anen, 2017).

IV. CONCLUSION

There has been a lot of research on POF management in terms of participation, motivation, marketing, contribution, institutions, and policies, while research on POF performance is still limited. This study aimed to know POF traditional management by farmers, POF performance, and their influencing factors. This study concludes that knowledge concerning POF management was constantly developing, but not all farmers applied this knowledge in the production, processing, and marketing subsystems. In Kalijaya Village, where the condition of the POF is better, the POF management looks better than in the other village. Management practices were closely related to marital status, farming experience, and POF conditions such as POF land area, distance from home, number of land parcels, and income. The traditional management practices of farmers were reflected in POF performance. High POF performance ideally includes high POF productivity, sustainable POF management, equitable benefits of management rules, and efficient POF management costs. The POF in Kalijaya Village was included in the high-performance category, but the high elements of POF performance were only equitability, efficiency, and sustainability, while productivity was low. In contrast to Kalijaya Village, POF performance in Mekarjaya and Hujungtiwu Villages was moderate, with high elements of equitability and efficiency, low productivity, and moderate sustainability. The differences in the performance of the POFs in the three locations are related to differences in the socio-economic conditions and management conditions of the POFs. The different conditions of each element, in particular productivity and sustainability, show that although POF might not be optimal in terms of yield for significant economic contribution, its sustainability provides environmental benefits. This study has many limitations as it only looks at factors within POF farmers that influence POF management and performance. Further research into external factors such as institutions, stakeholder involvement, and policies that can influence the performance of POFs and promote increased productivity and the economic role of POFs can be explored in more depth.

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REFERENCES

Achmad, B., Diniyati, D., Fauziyah, E., & Widyaningsih, T. S. (2015). Analisis faktor-faktor penentu dalam peningkatan kondisi sosial ekonomi petani hutan rakyat di Kabupaten Ciamis. *Jurnal Penelitian Hutan Tanaman*, *11*(3), 63–79.

Achmad, B., Sanudin, B., Siarudin, M., Widiyanto, A., Diniyati, D., Sudomo, A., Hani, A., Fauziyah, E., Suhaendah, E., Widyaningsih, T. S., Handayani, W., Maharani, D., Suhartono, D., Palmolina, M., Swestiani, D., Budi Santoso Sulistiadi, H., Winara, A., Nur, Y. H., Diana, M., … Ruswandi, A. (2022). Traditional subsistence farming of smallholder agroforestry systems in Indonesia: A Review. *Sustainability (Switzerland)*, *14*(8631), 1–33. doi://10.3390/su14148631.

Anatika, E., Kaskoyo, H., Febryano, I. G., & Banuwa, I. S. (2019). Pengelolaan hutan rakyat di Kabupaten Tulang Bawang Barat. *Jurnal Sylva Lestari*, *7*(1), 42–51. http://jurnal.fp.unila.ac.id/index.php/JHT/article/view/2947/2379.

Anen, N. (2017). Performansi hutan rakyat di Kelurahan Selopuro Kecamatan Batuwarno Kabupaten Wonogiri. *Jurnal Nusa Sylva*, *17*(1), 45–53.

Awang, S. A., Wiyono, E. B., & Sadiyo, S. (2007). *Unit manajemen hutan rakyat: Proses konstruksi pengetahuan lokal*. Yogyakarta: Banyumili Art.

Badan Pusat Statistik Kabupaten Ciamis. (2022a). *Kabupaten Ciamis dalam Angka 2022*. Ciamis: Badan Pusat Statistik Kabupaten Ciamis.

Badan Pusat Statistik Kabupaten Ciamis. (2022b). *Kecamatan Banjaranyar dalam Angka 2022*. Ciamis: Badan Pusat Statistik Kabupaten Ciamis.

Badan Pusat Statistik Kabupaten Ciamis. (2022c). *Kecamatan Baregbeg dalam Angka 2022*. Ciamis: Badan Pusat Statistik Kabupaten Ciamis.

Badan Pusat Statistik Kabupaten Ciamis. (2022d). *Kecamatan Panjalu dalam Angka 2022*. Ciamis: Badan Pusat Statistik Kabupaten Ciamis.

Balukas, J. A., Bell, K. P., & Bauer, D. M. (2019). Classifying private landowners to improve understanding of management decisions and conservation opportunities in urbanizing forested landscapes. *Journal of Environmental Management*, *232*, 751–758. doi://10.1016/j.jenvman.2018.11.128.

Cabang Dinas Kehutanan Wilayah VII Provinsi Jawa Barat. (2019). Data Hutan Rakyat. Cabang Dinas Kehutanan Wilayah VII Jawa Barat.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Method in Education*. Routledge Taylor & Francis Group.

Conway, G. R. (1987). The properties of agroecosystem. *Agricultural Systems*, *24*(2), 95–117.

Daris, E., Aminudin, I., & Feriansyah, A. (2018). Determinants of paddy fields conversion in Java Island, Indonesia. *Advances in Intelligent Systems Research (AISR)*, *149*, 95–98. doi://10.2991/icosat-17.2018.22.

Eriksson, L., & Fries, C. (2020). The knowledge and value basis of private forest management in Sweden: Actual knowledge, confidence, and value priorities. *Environmental Management*, *66*(4), 549–563. doi://10.1007/s00267-020-01328-y.

Fauzan, H., Sulistyawati, E., & Lastini, T. L. (2019). Strategi pengelolaan untuk pengembangan hutan rakyat di Kecamatan Rancakalaong, Kabupaten Sumedang. *Jurnal Sylva Lestari*, *7*(2), 164–173. doi://10.23960/jsl27164-173.

Feliciano, D., Bouriaud, L., Brahic, E., Deuffic, P., Dobsinska, Z., Jarsky, V., Lawrence, A., Nybakk, E., Quiroga, S., Suarez, C., & Ficko, A. (2017). Understanding private forest owners' conceptualization of forest management: Evidence from a survey in seven European countries. *Journal of Rural Studies*, *54*, 162–176. doi://10.1016/j.jrurstud.2017.06.016.

Floress, K., Huff, E. S., Snyder, S. A., Koshollek, A., Butler, S., & Allred, S. B. (2019). Factors associated with family forest owner actions: a vote-count meta-analysis. *Landscape Urban and Planning*, *188*, 19–29. doi://10.1016/j.landurbplan.2018.08.024.

GeeksforGeeks. (2023). *Class Interval*. https://www.geeksforgeeks.org/class-interval/

Hardjanto, H., Hero, Y., & Patabang, M. (2022). Bentuk dan ketersediaan pangan dari hutan rakyat untuk mendukung ketahanan pangan di pedesaan. *Jurnal Penelitian Hutan Tanaman*, *19*(1), 11–28. doi://10.20886/jpht.2022.19.1.11-28.

Hardjanto, & Patabang, M. (2019). Application of the Brandis method for yield regulation of pine private forest in Tana Toraja. *Jurnal Manajemen Hutan Tropika*, *25*(2), 82–92. doi://10.7226/jtfm.25.2.82.

Hilsenroth, J., Grogan, K. A., Crandall, R. M., Bond, L., & Sharp, M. (2021). The impact of COVID-19 on management of non-industrial private forests in the Southeastern United States. *Trees, Forests and People*, *6*(100159), 1–8. doi://10.1016/j.tfp.2021.100159.

Hudiyani, I. (2015). Partisipasi petani dalam pengelolaan hutan rakyat di Desa Benteng Kabupaten Bogor Provinsi Jawa Barat. *Jurnal Penyuluhan*, *9*(2), 132–145. doi://10.25015/penyuluhan.v9i2.9902.

Hurlbert, M., Krisnaswamy, J., Davin, E., Johnson, F. X., Mena, C. F., Morton, J., Myeong, S., Viner, D., Warner, K., Wreford, A., Zakieldeen, S., & Zommers, Z. (2019). Risk management and decision-making about sustainable development. In P. R. Shukla, J. Skea, E. C. Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. P. Pereira, P. Vyas, E. Huntley, … J. Malley (Eds.), *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. doi://10.1525/9780520959316-013.

IPBES. (2013). *Decision IPBES-2/4: Conceptual framework for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Annex Conceptual framework for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services A. Introd* (pp. 1–9). https://www.ipbes.net/sites/default/files/downloads/Decision IPBES_2_4.pdf.

Irawanti, S., Prawesti Suka, A., & Ekawati, S. (2012). Peranan kayu dan hasil hutan bukan kayu dari hutan rakyat pada pemilikan lahan sempit: Kasus Kabupaten Pati. *Jurnal Penelitian Sosial Dan Ekonomi Kehutanan*, *9*(3), 113–125. doi://10.20886/jsek.2012.9.3.113-125.

Joa, B., & Schraml, U. (2020). Conservation practiced by private forest owners in Southwest Germany – The role of values, perceptions and local forest knowledge. *Forest Policy and Economics*, *115*(102141), 1–13. doi://10.1016/j.forpol.2020.102141.

Kusuma, R.B.; Kaskoyo, H.; Qurniati, R. (2020). Efisiensi pemasaran kayu sengon (Falcataria moluccana di areal hutan rakyat Pekon Lengkukai, Kabupaten Tanggamus, Provinsi Lampung. *Jurnal Penelitian Hutan Tanaman*, *17*(2), 101–116.

Listiyawan, D., Syaukat, Y., & Falatehan, A. F. (2022). Pola pengelolaan hutan rakyat melalui program pinjaman tunda tebang di Kabupaten Wonogiri, Provinsi Jawa Tengah. *Forum Agribisnis*, *12*(1), 60–75. doi://10.29244/fagb.12.1.60-75.

Maryudi, A.; Nawir, A. . (2017). Hutan Rakyat: Merangkai Fakta dan Mengurai Mitos. Yogyakarta: Gadjah Mada University Press.

Matilainen, A., Andersson, E., Lähdesmäki, M., Lidestav, G., & Kurki, S. (2023). Services for what and for whom? A literature review of private forest owners' decision-making about forest-based services. *Small-Scale Forestry*, *22*(3), 511–535. doi://10.1007/s11842-023-09541-3.

Mohammed, J., Osei-Fosu, A. K., & Yusif, H. (2017). Factors influencing households' participation in forest management in the northern region of Ghana. *Independent Journal of Management & Production*, *8*(4), 1324–1340. doi://10.14807/ijmp.v8i4.631.

Novais, A., & Canadas, M. J. (2010). Understanding the management logic of private forest owners: A new approach. *Forest Policy and Economics*, *12*(3), 173–180. doi://10.1016/j.forpol.2009.09.010.

Nugroho, B. (2010). Institutional development for community forest revolving fund. *Jurnal Manajemen Hutan Tropika*, *XVI*(3), 118–125.

Nugroho, B., & Tiryana, T. (2013). Implications of the private property right to the community forest businesses formalization through the certification policy. *Jurnal Manajemen Hutan Tropika*, *XIX*(3), 178–186. doi://10.7226/jtfm.19.3.178.

Nurdina, I.F.; Kustanti, A.; Hilmanto, R. (2015). Motivasi petani dalam mengelola hutan rakyat di Desa Sukoharjo 1 Kecamatan Sukoharjo Kabupaten Pringsewu. *Sylva Lestari*, *3*(3), 51–62.

Nurrochmat, D. R., Pribadi, R., Siregar, H., Justianto, A., & Park, M. S. (2021). Transformation of agro-forest management policy under the dynamic circumstances of a two-decade regional autonomy in Indonesia. *Forests*, *12*(419), 1–17. doi://10.3390/f12040419.

Okon, U. E., Essien, U. A., & Udousoro, I. A. (2019). Drivers of households' decision-making in agroforestry practices in Akwa Ibom State, Nigeria. *Advances in Social Science and Culture*, *1*(1), 90–100. doi://10.22158/assc.v1n1p90.

Oktalina, S. N. (2015). Strategi petani hutan rakyat dan kontribusinya terhadap penghidupan di Kabupaten Gunungkidul. *Jurnal Kawistara*, *5*(3), 221–328. doi://10.22146/kawistara.10058.

Parlinah, N., Nugroho, B., Buce Saleh, M., & Hendrayanto, H. (2020). Implikasi hak kepemilikan dan konversi hutan rakyat: Studi kasus Daerah Tangkapan Air Waduk Jatigede. *Jurnal Penelitian Sosial dan Ekonomi Kehutanan*, *17*(2), 137–151. doi://10.20886/jpsek.2020.17.2.137-151.

Pukkala, T. (2021). Measuring the social performance of forest management. *Journal of Forestry Research*, *32*(5), 1803–1818. doi://10.1007/s11676-021-01321-z.

Purwawangsa, H.; Oktaviarini, M.; Mutaqin, F. (2021). Analisis pemasaran kayu hutan rakyat di Kabupaten Bogor. *Journal of Tropical Silviculture*, *12*(2), 51–59.

Puspita, E. N., Safe'i, R., Hari Kaskoyo, & Rudi Hilmanto. (2021). Penilaian indikator kesehatan hutan rakyat pada pola tanam agroforestry. *Indonesian Journal of Conservation*, *10*(1), 27–33. doi://10.15294/ijc.v10i1.28894.

Pynnönen, S., Salomaa, A., Rantala, S., & Hujala, T. (2019). Technical and social knowledge discontinuities in the multi-objective management of private forests in Finland. *Land Use Policy*, *88*(104156), 1–12. doi://10.1016/j.landusepol.2019.104156.

Rahmani, T. A., Nurrochmat, D. R., Hero, Y., Park, M. S., Boer, R., & Satria, A. (2021). Evaluating the feasibility of oil palm agroforestry in harapan rainforest, Jambi, Indonesia. *Forest and Society*, *5*(2), 458–477. doi://10.24259/FS.V5I2.10375.

Rahmani, T. A., Nurrochmat, D. R., Park, M. S., Boer, R., Ekayani, M., & Satria, A. (2022). Reconciling conflict of interest in the management of forest restoration ecosystem: A strategy to incorporate different interests of stakeholders in the utilization of the Harapan Rainforest, Jambi, Indonesia. *Sustainability*, *14*(13924), 1–16. doi://10.3390/su142113924.

Ruhimat, I. S. (2016). Faktor kunci dalam pengembangan kelembagaan agroforestry pada lahan masyarakat. *Jurnal Penelitian Sosial dan Ekonomi Kehutanan*, *13*(2), 73–84. doi://10.20886/jpsek.2016.13.2.73-84.

Safe'i, R., Wulandari, C., & Kaskoyo, H. (2019). Analisis kesehatan hutan dalam pengelolaan hutan rakyat pola tanam agroforestri di wilayah Kabupaten Lampung Timur. *Talenta Conference Series: Agricultural and Natural Resources (ANR)*, *2*(1), 97–103. doi://10.32734/anr.v2i1.579.

Sagita, M. N., Akhbar, & Muis, H. (2019). Partisipasi petani dalam pengelolaan hutan kemasyarakatan di Desa Labuan Toposo Kecamatan Labuan Kabupaten Donggala. *Jurnal Warta Rimba*, *7*(2), 1–10.

Serafeim, G. (2020). Social-impact efforts that create real value. Harvard Business Review. https://hbr.org/2020/09/social-impact-efforts-that-create-real-value.

Siarudin, M., Awang, S. A., Sadono, R., & Suryanto, P. (2022). The pattern recognition of small-scale privately-owned forest in Ciamis Regency, West Java, Indonesia. *Forest and Society*, *6*(1), 104–120. doi://10.24259/fs.v6i1.17997.

Sudrajat, A., Hardjanto, H., & Sundawati, L. (2016). Partisipasi petani dalam pengelolaan hutan rakyat lestari: Kasus di Desa Cikeusal dan Desa Kananga Kabupaten Kuningan. *Jurnal Silvikultur Tropika*, *7*(1), 8–17.

Suharjito, D., Khan, A., Djatmiko, W. A., Sirait, M., & Evelyna, S. (2000). *Karakteristik pengelolaan hutan berbasiskan masyarakat. Kerjasama FKKM-Ford Foundation*. Aditya Media.

Suhartono. (2021). Komoditas unggulan potensial jenis empon-empon untuk meningkatkan produktivitas hutan rakyat di Ciamis Jawa Barat. *Ulin :Jurnal Hutan Tropis*, *5*(2), 116–121.

Suherdi, S., Amanah, S., & Muljono, P. (2015). Motivasi petani dalam pengelolaan usaha hutan rakyat Desa Cingambul, Kecamatan Cingambul, Majalengka. *Jurnal Penyuluhan*, *10*(1), 85–93. doi://10.25015/penyuluhan.v10i1.9916.

Sukadaryati, S., Yuniawati, Y., & Dulsalam, D. (2018). Pemanenan kayu hutan rakyat (Studi kasus di Ciamis, Jawa Barat). *Jurnal Ilmu Kehutanan*, *12*(2), 142. doi://10.22146/jik.40144.

Sukwika, T., Darusman, D., Kusmana, C., & Nurrochmat, D. R. (2018). Skenario kebijakan pengelolaan hutan rakyat berkelanjutan di Kabupaten Bogor. *Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan*, *8*(2), 207–215. doi://10.29244/jpsl.8.2.207-215.

Trison, S. (2012). *Kinerja petani hutan rakyat dan penyuluh Kehutanan di Kabupaten Ciamis, Jawa Barat dan Kabupaten Purworejo, Jawa Tengah*. Bogor: Institut Pertanian Bogor.

Wang, H., Adusumilli, N., Blazier, M., & Pathak, S. (2022). Risk aversion and timber harvest strategies: A case study of nonindustrial private forest management in Louisiana. *Small-Scale Forestry*, *21*(2), 275–295. doi://10.1007/s11842-021-09498-1.

Widoyoko, E. P. (2015). *Teknik Penyusunan Instrumen Penelitian*. Yogyakarta: Pustaka Pelajar.

Wirabuana, P. Y. A. P., Setiahadi, R., Sadono, R., Lukito, M., & Martono, D. S. (2021). The influence of stand density and species diversity into timber production and carbon stock in community forest. *Indonesian Journal of Forestry Research*, *8*(1), 13–22. doi://10.20886/IJFR.2021.8.1.13-22.