

FEASIBILITY ANALYSIS OF MULTI-BUSINESS FORESTRY IN SOCIAL FORESTRY IN FOREST AREAS WITH SPECIAL MANAGEMENT (KHDPK)

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FEASIBILITY ANALYSIS OF MULTI-BUSINESS FORESTRY IN SOCIAL FORESTRY IN FOREST AREAS WITH SPECIAL MANAGEMENT (KHDPK). The concept of multi-business forestry (Mb-F) aims to increase the economic benefits of forests, which have thus far made little contribution, without ignoring their ecological functions. The opportunity to develop multi-business forestry in social forestry (SF) activities within the Forest Area with Special Management (*Kawasan Hutan Dengan Pengelolaan Khusus/ KHDPK*) is huge. With one area management permit, many business activities can be carried out. This study aims to determine the feasibility of multi-business forestry using screening method for social acceptance (community preference), financial feasibility (NPV, B/C Ratio, and IRR), and ecological suitability (soil type, rainfall, and location altitude). The results show that socially, the community accepts and has even implemented the concept of multi-business forestry through agroforestry. However, most permit holders consider it necessary to regulate the number of trees to optimize land use. Economically, all multi-business patterns implemented are feasible, with the presence of aren (*Arenga pinnata*) and sheep being important keys to the sustainability of SF. Ecologically, some NTFPs species cultivated by the community are less suited to local conditions, which can result in suboptimal production. The existence of investors or business entities is very important in the sustainability of forestry multi-businesses, which are mostly based on NTFPs and require high capital.

Keywords: Multi-business forestry, social forestry, social acceptance, financial feasibility, ecological suitability

*ANALISIS KELAYAKAN MULTIUSAHA KEHUTANAN DALAM SKEMA PERHUTANAN SOSIAL PADA KAWASAN HUTAN DENGAN PENGELOLAAN KHUSUS (KHDPK). Konsep Multi Usaha Kebutanan (MUK) dimaksudkan untuk meningkatkan manfaat ekonomi hutan yang selama ini belum banyak memberikan kontribusi, tanpa mengabaikan fungsi ekologisnya. Peluang pengembangan multi usaha kebutanan dalam kegiatan perhutanan sosial (PS) di Kawasan Hutan Dengan Pengelolaan Khusus (KHDPK) sangat besar. Dengan satu izin pengelolaan kawasan, banyak kegiatan usaha yang dapat dilakukan. Penelitian ini bertujuan untuk mengetahui kelayakan multi usaha kebutanan dengan menggunakan metode penyaringan penerimaan sosial (preferensi masyarakat), kelayakan finansial (NPV, B/C Ratio, dan IRR), dan kesesuaian ekologi (jenis tanah, curah hujan, dan ketinggian lokasi). Hasil penelitian menunjukkan bahwa secara sosial masyarakat menerima, bahkan telah melaksanakan, konsep multi usaha kebutanan melalui agroforestri. Namun, sebagian besar pemegang izin menganggap perlu adanya pengaturan jumlah pohon agar lahan dapat dimanfaatkan secara optimal. Secara ekonomi, semua pola usahatani yang telah dilaksanakan layak untuk dijalankan, dengan keberadaan aren (*Arenga pinnata*) dan domba menjadi kunci penting keberlanjutan PS. Secara ekologi, beberapa jenis HHBK yang dibudidayakan oleh masyarakat kurang sesuai dengan kondisi ekologi setempat, sehingga dapat mengakibatkan produksi yang kurang optimal. Keberadaan investor atau badan usaha sangat penting dalam keberlanjutan usahatani kebutanan yang sebagian besar berbasis pada HHBK serta membutuhkan modal yang tinggi.*

Kata kunci: Multi-usaha kebutanan, perhutanan sosial, penerimaan sosial, kelayakan finansial, kesesuaian ekologi

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I. INTRODUCTION

The forestry sector was once Indonesia's mainstay, contributing significantly to GDP after the oil and gas sectors. Conditions have now changed considerably. The forestry sector contributed approximately 3.5% to Indonesia's national income and provided livelihoods for around 15 million people in 1997 (Central Statistics Agency, 2000), but this fell to 2.3% in 2002 (Central Statistics Agency, 2003). However, this contribution has declined due to challenges such as illegal logging and insufficient investment in sustainable practices (Malahayati, 2018; Sahara et al., 2022). According to Nurrochmat et al. (2021), the forestry sector's contribution to Indonesia's GDP is only around 0.6%. This condition certainly makes the forestry business unattractive to investors.

Moreover, while investment in the forestry sector can enhance output and employment, it also raises the demand for raw materials, potentially increasing imports (Sahara et al., 2022). Economic growth and deforestation are complex; improved forest management has been linked to economic development, yet high deforestation rates remain a concern (Malahayati, 2018). Thus, while the forestry sector is vital for Indonesia's economy, its sustainability and future contributions depend on addressing these critical challenges.

In addition, the forestry sector is also considered to have contributed less to the economy of communities around the forest. For this reason, the government runs various community involvement programs in forest management, one of which is through social forestry (SF). Social forestry, an approach that involves community participation in forest management, has garnered significant attention as a sustainable strategy for balancing environmental conservation and local livelihoods. As the global focus shifts towards sustainable development, the sustainability of social forestry becomes crucial.

A more varied and sustainable type of forest management is replacing timber-centric

methods in Indonesia with multi-business forestry (Mb-F) (Suryanto et al., 2023). By combining timber production with non-timber forest products (NTFPs) and environmental services, this idea seeks to maximize the use of forests (Mutaqin et al., 2023). Obstacles to Mb-F implementation include complicated bureaucratic processes, frequent policy changes, and regulatory ambiguity (Pambudi, 2023). However, it also offers better land use, jobs, and biodiversity preservation (Suryanto et al., 2023). To promote sustainable forest management and enhance livelihoods, social forestry initiatives that entail community engagement are being pushed (Pambudi, 2023). Addressing illicit logging and improving forest governance in Indonesia has benefited greatly from international collaboration, such as the Multistakeholder Forestry Programme with the UK (Ridho et al., 2019).

The Forest Area with Special Management (KHDPK) issuance, as a derivative of the Job Creation Law, seeks to optimize the performance of social forestry in Java while improving land rehabilitation. The KHDPK concept also aims to adopt multi-business forestry practices. KHDPK opens up opportunities for the forestry sector to contribute more economically, especially to the community. This opportunity can be realized through multi-business forestry practices, where several business activities exist in one location or the same management permit. The success and sustainability of forestry multi-businesses are influenced by three main factors, namely, 1) social acceptability, 2) financial feasibility, and 3) ecological suitability (Nurrochmat et al., 2021). These factors determine the success of SF implementation.

Social acceptability is crucial in social forestry programs as it influences the effectiveness and sustainability of forest management practices. Research indicates that social acceptability encompasses community trust and values, essential for gaining a social license to operate in forestry contexts (Ford & Williams,

2016). This concept highlights the need for inclusive dialogue to develop a forestry model accommodating diverse stakeholder interests. Furthermore, social forestry is often more culturally and socially acceptable than large-scale forestry, promoting local participation and holistic land use (Santiago et al., 2022). However, challenges such as high initiation costs and the need for community development institutions can impede progress (Santiago et al., 2022). Thus, understanding and integrating social acceptability into forestry initiatives is vital for fostering community support and ensuring long-term success.

Financial feasibility is also an essential aspect of social forestry, with studies showcasing the benefits of small-scale community forestry regarding financial gains and sustainable practices (Hunt, 2002). Understanding the financial implications of forestry practices is essential for evaluating the viability of investments and ensuring long-term economic sustainability (Callaghan et al., 2019). Research has demonstrated that financial support and incentives significantly enhance green total factor productivity in forestry, highlighting the importance of financial mechanisms in promoting sustainable forestry practices (Wu, 2023). Moreover, Astuti et al. (2020) said that social forestry is a program that aims to reduce poverty and inequality in forest use by providing legal access to local communities.

Moreover, land suitability is a fundamental determinant of the ecological sustainability of social forestry. The success of social forestry projects largely depends on selecting the right species and crops that align with an area's specific climatic and soil conditions. Land suitability plays a crucial role in determining the success of social forestry initiatives, especially regarding crop selection and agroforestry patterns (Faadhilah et al., 2023). Moreover, the profitability of environmental activities in forestry enterprises underscores the economic viability of integrating sustainability measures (Zamula et al., 2020).

Integrating farmer acceptance, financial feasibility, and ecological suitability is essential for the comprehensive planning and implementation of social forestry projects. Successful integration can lead to enhanced biodiversity conservation, improved livelihoods, and greater resilience to climate change. For instance, carefully selecting tree species based on land suitability and farmer preferences can enhance ecosystem services such as soil stabilization, water regulation, and carbon sequestration (Kumar & Bhattacharya, 2021). Additionally, economically viable models considering market dynamics can ensure that social forestry remains profitable for local communities.

Previous studies generally only discuss one aspect: economic, social, or environmental. In addition, as a new policy, there has been no research that assesses the three aspects of sustainability in Multi-business Forestry (Mb-F) in Social Forestry in KHDPK. This paper fills these gaps by examining three core aspects of social forestry: social acceptability in the form of farmer preferences for crop species, land suitability, and financial feasibility. Each factor is pivotal in determining social forestry initiatives' long-term success and sustainability. Business sustainability is one of the keys to success in implementing SF in KHDPK.

II. RESEARCH METHOD

A. Research Location

This research was conducted in Ciamis Regency and Pangandaran Regency, West Java Province. The research area in the two districts is the former Ciamis Forest Management Unit (FMU) area, managed by Perum Perhutani as a KHDPK area. KHDPK in West Java Province covers an area of around 338,944 ha, originating from 163,427 ha of Production Forest and 175,517 ha of Protected Forest, with about 8,129 ha located in the former Ciamis FMU (BPKHTL Wilayah XI, 2024). The research was conducted on five farmer groups in Golat Village, Panumbangan Sub-

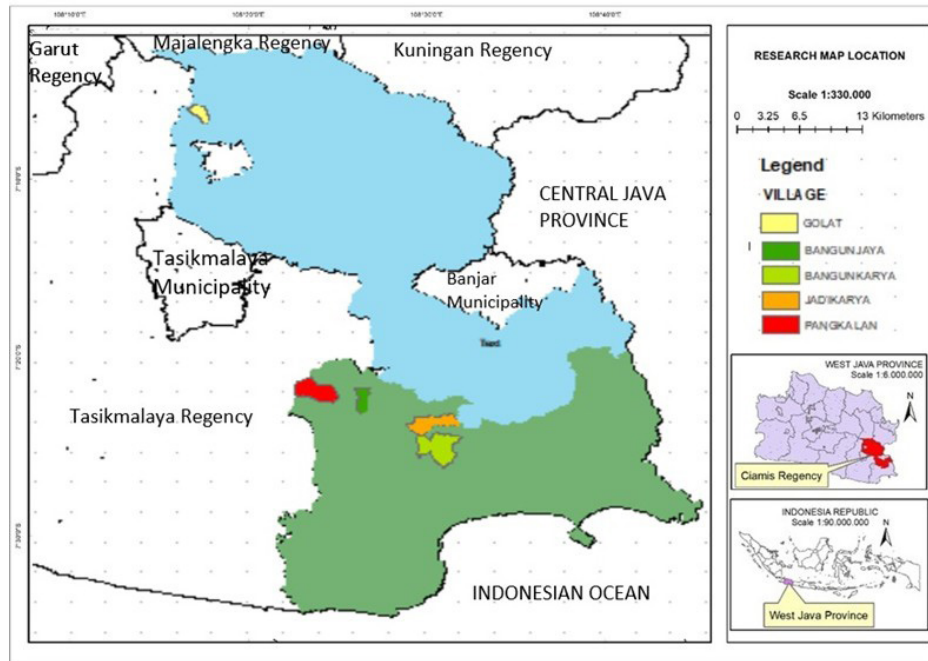


Figure 1. Research locations in Ciamis Regency and Pangandaran Regency

District, Ciamis Regency, Bangunjaya Village, Pangkalan Village, Bangunkarya Village, and Jadikarya Village in Langkaplancar Sub-District, Pangandaran Regency. The SF scheme for the forest farmer group in Jadikarya Village is community forestry (*Hutan Kemasyarakatan/HKm*). In contrast, the other four forest farmer groups use the Village Forest (*Hutan Desa/HD*) SF scheme. The main difference between HD and HKm is in the target community. HKm is intended for communities living around forest areas that depend on these natural resources for their economic needs, such as for agriculture or plantations. The reason for choosing the location is that in the former Ciamis FMU, the five farmer groups have obtained SF management permits at KHDPK. Therefore, the population sampling was carried out by census. The research was conducted for four months, from April to July 2024. The research location can be seen in Figure 1.

Based on the altitude, Golat Village is located on a high altitude between 800-1000 m asl. While the other four villages are at medium and low altitudes. Bangunjaya Village, Pangkalan Village, Bangunkarya Village, and Jadikarya Village, Langkaplancar Sub-district,

are 500 m asl, 600 m asl, 450 m asl, and 350 m asl, respectively.

B. Research Respondents

The farmer groups were selected purposively; five forest farmer groups (*Kelompok Tani Hutan/KTH*) and village forest management institutions (*Lembaga Pengelola Hutan Desa/LPHD*) that had obtained KHDPK permits in the former Ciamis FMU area were taken as the population. Former Ciamis FMU is an area whose management was transferred from Perhutani to MoEF and administratively covers three regencies/cities: Ciamis, Pangandaran, and Banjar. In each farmer group, interviews were conducted with 30 respondents selected by random sampling, so that the total number of respondents was 150 people. Key informants were selected, representing farmer group leaders and local champions. Farmer group champions were farmers who successfully implemented multi-business forestry in the research area. One group champion was taken from each farmer group.

C. Data Collection and Analysis

The multi-forestry business sustainability assessment was carried out using a sustainability

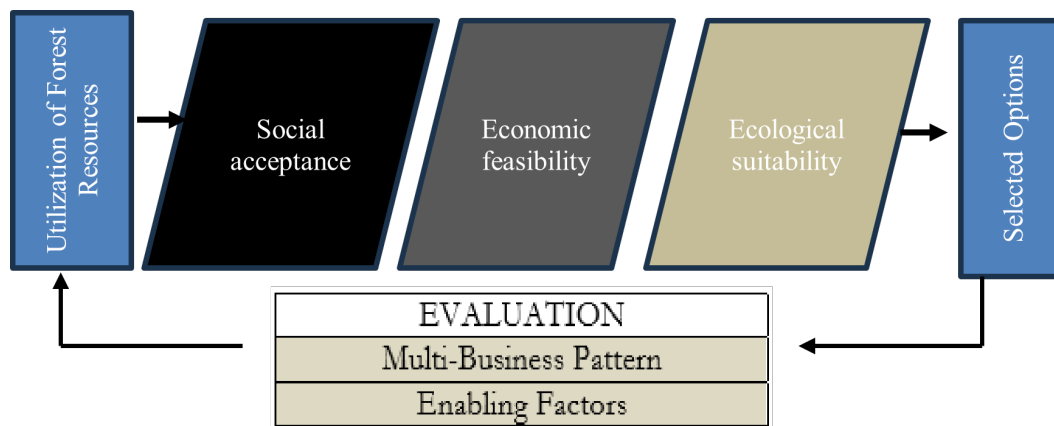


Figure 2. Concepts and stages in forest utilization selection (Nurrochmat et al., 2021)

assessment approach using a screening method, according to Nurrochmat et al. (2021). In using forest areas, this study analyzes social, economic, environmental, and supporting factors that can encourage the implementation of forestry multi-businesses (Nurrochmat et al. 2021). These stages are interrelated, so each process has a significant position, as seen in Figure 2.

The stages in assessing the feasibility of forestry multi-business consist of three stages, namely:

- a) Identifying social acceptability in the form of choices (preferences) of the community and other stakeholders regarding the plant species used in SF activities. These types of plants are wood, multipurpose tree species (MPTS), and intercropping plants. These preferences indicate the community's social acceptance of the SF program.
- b) Identifying the financial feasibility of SF business. The economic feasibility of using multi-business forestry to optimize land use is carried out using the Net Present Value (NPV), Benefit Cost Ratio (BCR), and Internal Rate of Return (IRR) approaches.
- c) Identifying the ecological suitability of their growing locations and biophysical characteristics.

D. Identifying enabling factors

It is vital to consider some auxiliary aspects when applying a model to the field's contextual conditions, such as the institutional, social,

economic, and biophysical (Mutaqin et al., 2023). In keeping with this, this study finds and examines enabling elements that can facilitate the application of knowledge—in this example, forestry multi-business—by the government as policymakers, by actors in the community, or by entrepreneurs. These elements should also inspire business owners and other forestry industry participants to become more aware of the financial landscape and take the initiative to put this forestry multi-business model into practice (Mutaqin et al., 2023).

III. RESULT AND DISCUSSION

Integrating the social forestry scheme or joint forest management with the community in multi-business forestry activities theoretically has a robust economic basis (Nurrochmat, 2021). Multi-business forestry is the implementation of several forestry business activities in the form of area utilization businesses, wood and non-wood forest product utilization businesses, and environmental service utilization businesses to optimize forest areas in protected forests and production forests. Multi-business forestry aims to increase forest value (Ministry of Environment and Forestry, 2023).

The Multi-business Forestry (Mb-F) concept requires cooperation between the government and the community in forest resource management. This condition is due to the government's limited resources to manage forests. According to Nurrochmat (2021), the

initial costs for this activity are significant, but as the area managed increases, it will be efficient. Multi-business forestry in SF in KHDPK can be done through agroforestry patterns. Agroforestry integrates forestry and agricultural plants to accommodate short-, medium-, and long-term economic interests while improving ecological conditions. Agroforestry is vital in social forestry as it enhances community livelihoods, promotes environmental sustainability, and supports biodiversity. It integrates trees with crops, providing alternative income sources and improving food security for rural populations, as evidenced by the management of coffee agroforestry systems in Indonesia, which allows for shade-tolerant crops to thrive under tree canopies.

A. Social Acceptance

Social acceptability is indicated by two things, namely, community participation and the selection of plant species according

to community preferences. Community participation in KHDPK has been realized through community cultivation activities, including granting SF permits in KHDPK. Farmers' preferences for certain species are influenced by two main factors: the suitability of the growing location and the economically profitable types (Widiyanto, 2024). These two factors are also influenced by the experience of farming that has been carried out for generations. However, not all farmers can plant according to their choices because there are limitations regulated in the SF agreement. In addition, not all species have been cultivated by farmers, so sometimes farmers resist certain species. Farmer preferences for crop species significantly influence the sustainability of social forestry. Moreover, understanding these preferences helps in designing programs that meet the needs of local communities, ensuring their active participation and long-term commitment. The selection of plant species at the research location is presented in Table 1.

Table 1. Plant species at the research location

Village	Trees (Perennial)	Multipurpose tree species/non-wood forest product	Annual crops
Golat	<i>Pinus merkusii</i> (Pinus) <i>Eucalyptus</i> sp.(Eucalyptus) <i>Altingia excelsa</i> (Rasamala)	<i>Coffea arabica</i> (Kopi Arabica), <i>Coffea canephora</i> (Kopi Robusta), <i>Arenga pinnata</i> (Aren)	
Bangunjaya	<i>Swietenia mahagoni</i> (Mahoni), <i>Toona sureni</i> (Suren)	<i>Coffea canephora</i> (Kopi Robusta), <i>Arenga pinnata</i> (Aren), <i>Amomum cardamomum</i> (Kapulaga)	<i>Capsicum frutescens</i> (Cabai)
Bangunkarya	<i>Swietenia mahagoni</i> (Mahoni)	<i>Durio zibetinus</i> (Durian), <i>Elettaria cardamomum</i> (Kapulaga)	<i>Capsicum frutescens</i> (Cabai)
Pangkalan	<i>Swietenia mahagoni</i> (Mahoni), <i>Toona sureni</i> (Suren)	<i>Coffea canephora</i> (Kopi Robusta), <i>Arenga pinnata</i> (Aren), <i>Amomum cardamomum</i> (Kapulaga)	<i>Manihot esculenta</i> Crantz (Singkong)

Village	Trees (Perennial)	Multipurpose tree species/non-wood forest product	Annual crops
Jadikarya	<i>Swietenia mahagoni</i> (Mahoni)	<i>Durio zibetinus</i> (Durian),	<i>Manibot esculenta</i> Crantz (Singkong), <i>Capsicum frutescens</i> (Cabai), <i>Nicotiana tabacum</i> L.(tembakau), <i>Vigna unguiculata</i> ssp. <i>Sesquipedalis</i> (kacang panjang)

The selection of tree and plant species in social forestry programs significantly impacts their success. Involving communities in selecting species based on their preferences can enhance the effectiveness of these initiatives. For example, certain species, like coffee plants in agroforestry systems, have been recognized for their contributions to social forestry programs and climate change mitigation (Kusumaningrum et al., 2024). It is crucial to align species selection with community needs and preferences to maximize the impact of social forestry on communities and forest areas (Rinaldi et al., 2024). Choosing species for reforestation in diverse forest communities requires balancing social preferences and ecological suitability (Chechina & Hamann, 2015). Native tree species are recommended for reforestation programs due to their adaptability to the environment, which can reduce the risk of project failure (Lillo et al., 2021). Additionally, when using exotic species in forest management, obtaining social acceptance from local communities is essential for sustainable operations (Rivera et al., 2016).

Farmers' choice of crop species plays a crucial role in the success of social forestry programs by influencing aspects such as carbon storage, biodiversity maintenance, and economic development. Farmers' preferences in selecting crop species and cropping patterns are crucial as they impact the success of land management, the earth's temperature level, and minimizing the effects of global warming

(Novasari et al., 2023b). Diverse agroforestry systems have been identified as a sustainable land use option providing ecosystem services, habitat for biodiversity, and economic development for forest-dwelling communities in Southeast Asia (Willmott et al., 2023). In addition, the diversity of plant species in community forestry initiatives indicates forest conservation and environmental function, with farmer characteristics influencing the selection of plant types and planting patterns (Novasari et al., 2023b).

B. Economic Feasibility

NPV, BCR, and IRR indicators measure economic feasibility. Multi-business forestry activities in social forestry in KHDPK in the two research districts vary widely. However, several business activities are carried out by the community in a particular village. The patterns of multi-business forestry found in the research location can be seen in Table 2.

In this calculation, the main plants (trees), namely pine and mahogany, are assets of Perum Perhutani that are not handed over to the community or the Ministry of Environment and Forestry (MoEF). When conducting business in KHDPK, most of the land already contains these tree stands, although the amount per hectare varies greatly between villages. Despite having the highest NPV and IRR, durian-based SF does not have the highest B/C ratio. This condition is because the durian business requires large capital to purchase and maintain

Table 2. Economic feasibility of multi-business forestry in research location

Village	The multi-business forestry pattern implemented	Economic indicator		
		NPV	B/C Ratio	IRR
Golat	Pine-coffee-aren-sheep	IDR 93,016,474	1.91	25%
Bangunjaya	Mahogany-coffee-sheep-chilli	IDR 85,803,851	1.26	24%
Bangunkarya	Mahogany- durian-cardamom- sheep	IDR 198,742,339	1.52	27%
Pangkalan	Mahogany-aren-cardamom-sheep	IDR 104,734,442	2.04	28%
Jadikarya	Durian-sheep/goat-fish-chili-cassava-vegetables	IDR 970,201,425	1.72	29%

seedlings. The position of the durian plant in KHDPK replaces the role of mahogany. After 5-6 years of age, the durian tree has the same diameter and crown width and functions as other woods, such as mahogany. Among the types of NTFPs, cardamom can be harvested the fastest, namely in the 2nd year, followed by coffee in the 3rd year, durian in the 5th year, and sugar palm (aren) after the 10th year.

Interestingly, businesses that use aren as one of the NTFPs have higher profits than other types of NTFPs. Aren does not require difficult and expensive maintenance. In addition, unlike other NTFPs, almost all parts of the aren plant can also be used, starting from the sap (as a drink or sugar), the fruit, the leaves, the leaf veins, and the stem (Ministry of Agriculture, 2013). The presence of sheep or goats is also important in SF at KHDPK. Before the NTFPs can be harvested, sheep are an important source of income. Land clearing activities are also a feed source, and livestock manure can be organic fertilizer.

Financial feasibility is a crucial component in assessing the sustainability of social forestry. Projects must be economically viable for communities to adopt and sustain them. This includes initial investment costs, potential income from forest products, and the availability of financial support mechanisms

such as subsidies or loans. Studies have shown that monetary incentives and access to markets significantly enhance the economic attractiveness of social forestry (Mankhin et al., 2023). Moreover, generating a steady income from forest products can provide financial security for rural households, reducing their dependency on more destructive land-use practices.

The presence of investors in SF based on NTFPs, such as durian, is an important key to this activity because the price of durian seedlings is high, about IDR 200,000-IDR 500,000. Providing forest farmers with access to resources and capital through programs such as the Revolving Fund Facility (*Fasilitas Dana Bergulir/FDB*) can have a positive impact on their economic well-being and the overall success of social forestry initiatives (Oktoyoki et al., 2023). The selection of crop types by farmers is critical to the success of social forestry programs, as it impacts sustainability, biodiversity, and economic viability within forest farmer groups (Rachmawan et al., 2022).

C. Ecological Suitability

Assessing land suitability for specific crops is essential for optimizing resource use and ensuring the long-term viability of agroforestry systems (Faadhilah et al., 2023). Knowledge,

local practices, and economic considerations influence farmers' preferences for crop types and agroforestry patterns (Novasari et al., 2023b). Understanding these preferences is vital for designing sustainable land management strategies that align with community needs and environmental conservation goals (Novasari et al., 2023b). Additionally, adopting agroforestry practices is contingent upon farmers' perceptions and the compatibility of management practices with local populations (Arage, 2021).

Ecological suitability is assessed based on the suitability of soil type and rainfall. In addition, the research location is in a production and limited production forest, where the slope of the land is generally still suitable for cultivation activities. The results of the ecological suitability were then compared with the types of plants planted by farmers. The ecological suitability of the research location can be seen in Table 3. The types of plants evaluated are the most widely cultivated by the community. The location altitude of Bangunjaya Village, Pangkalan Village, Bangunkarya Village, and

Jadikarya Village, Langkaplancar Sub-district, is 500 m asl, 600 m asl, 450 m asl, and 350 m asl, respectively. The soil type in the four villages is red-yellow podzolic soil that is acidic with a pH value below 6. This acidic soil type tends to have a lower cation exchange capability (CEC) due to the high concentration of hydrogen ions (H⁺).

Red-yellow podzolic soil is formed in areas with high rainfall and high temperatures. This soil is generally formed from the pedogenesis of silicate crystals with poor chemical properties. Rainfall in these four villages ranges from 3500-4500 mm year⁻¹. Golat Village has an altitude of 800-1000 m asl. Meanwhile, the soil type in Golat Village, Panumbangan Sub-district, is the Andisol type. This soil type has high organic matter content, low bulk density, high air retention capacity, and high total porosity. Still, this soil is also loose in consistency, less plastic, and not sticky. Rainfall in this village is +/- 2500 mm year⁻¹ (Central Statistics Agency of Ciamis Regency, 2023; Central Statistics Agency of Pangandaran Regency, 2023).

Table 3. Ecological suitability of main plant species at the Research Location

Main plant species	Optimal growth requirements			Evaluation of suitability at the research location
	Rain intensity (mm/year)	Soil type/ requirement	Altitude (masl)	
<i>Durio</i> spp. (Durian) (Ministry of Agriculture, 2021)	1,500– 2,500	Fertile sandy loam soil	Up to 800 m asl	The altitude is suitable (except for Golat Village), but the rainfall is too high, and the soil type is less appropriate.
<i>Coffea arabica</i> (Kopi Arabica) (Ministry of Agriculture, 2014)	1,500- 4,000	Thick topsoil layer, high nutrient and organic content. The recommended average soil pH is 5-7	>900 m asl	Rainfall, soil conditions, and altitude are suitable for Golat village.
<i>Coffea canephora</i> (Kopi Robusta) (Ministry of Agriculture, 2014)	1,500 -3,500		<700 m asl	Rainfall is higher than optimal. Soil types are less suitable (four villages other than Golat)

Main plant species	Optimal growth requirements			Evaluation of suitability at the research location
	Rain intensity (mm/year)	Soil type/ requirement	Altitude (masl)	
<i>Arenga pinnata</i> (Aren) (Ministry of Agriculture, 2013)	>1,200	Clay, muddy, sandy	9-2,000 m asl	Suitable for all villages
<i>Amomum cardamomum</i> (Kapulaga) (Ministry of Agriculture, 2019)	2,500– 4,000	Soil with a clay texture, clayey loam, sandy loam, silty loam, and sandy clay	300-800 m asl	All villages meet the criteria except Golat Village

The table above shows that, based on the preferences of the types planted by the community in the social aspect, not all are suitable when assessed from an ecological suitability perspective. Of the five main plant species owned by the community, three of them are ecologically suitable, namely *Coffea arabica* (Arabica Coffee) in Golat Village, *Arenga pinnata* (Aren) in Golat Village, Pangkalan Village, and Bangunjaya Village. Two other villages, Bangunkarya and Jadikarya, are also found aren although the amount is not as much as in the other three villages. Farmers prefer to plant durian, which is considered more profitable. Moreover, *Amomum cardamomum* (Cardamom) is in Bangunjaya Village, Pangkalan Village, and Bangunkarya Village. The other two species, *Coffea canephora* (Robusta Coffee) in Golat (due to the altitude), Pangkalan Village (too high rainfall), and *Durio* spp (Durian) in Bangunkarya Village and Jadikarya Village, are categorized as less suitable due to high rainfall and less fertile soil. The unsuitability of these conditions does not mean that the plants do not grow or do not bear fruit. It is just less than optimal. For example, longer fruiting time or lower productivity. Farmers can intervene to overcome this, for instance, by fertilizing or intensive maintenance, although this treatment requires additional costs.

Land suitability plays a critical role in the success of social forestry programs by determining the optimal plant species to

be cultivated based on the bio-geophysical characteristics of the land. The study emphasized the importance of matching land mapping unit (LMU) characteristics with plant growth needs to improve land productivity and community prosperity (Soraya et al., 2022). Evaluating the suitability level of different land uses for agroforestry systems contributes to sustainable land resource management in rural areas, ensuring the preservation of nature reserves from degradation (Chuma et al., 2021). Utilizing multi-criteria decision analysis for land suitability in selecting optimal locations for establishing forest plantations increases the likelihood of success by aligning ecological requirements with soil potential and climate conditions (Hernández-Zaragoza et al., 2019).

D. Identifying Enabling Factors

D.1. Regulatory factors

The existence of multi-forestry businesses, especially in the KHDPK area, is supported by several laws and regulations. The regulations that support multi-forestry businesses in KHDPK include 1) Government Regulation Number 23 of 2021 concerning Forestry Implementation, 2) Regulation of the Minister of Environment and Forestry No. 9 of 2021 concerning Social Forestry Management, 3) Decree of the Minister of Environment and Forestry No. 287 of 2022 concerning KHDPK, and 4) Regulation of the Minister of Environment and Forestry No. 4 of 2023 concerning Social Forestry Management in KHDPK. If the community had only been

Table 4. Activities in social forestry at KHDPK according to applicable regulations

No	Activity categories	Types of supporting activities for forestry multi-enterprise
1	Utilization of wood forest products	1. Tree cultivation (for Community Plantation Forest/HTR scheme) 2. Multipurpose tree (MPTs) cultivation
2	Utilization of non-wood forest products	Utilization and collection of rattan, sago, aren, sap, bamboo, honey, bark, leaves, fruit, seeds, agarwood, energy-producing plants, and other food crops.
3	Area utilization	Cultivation and utilization of medicinal plants, ornamental plants, mushrooms, honey bees, wildlife protection, agroforestry, silvo-pasture, silvo-fishery, and agro-silvo-pasture.
4	Utilization of environmental services	Ecotourism, water management services, carbon sequestration and storage, and other environmental services

allowed to plant seasonal crops using land under the stands in the previous SF scheme in Java, the laws and regulations above would have made the community more flexible in managing the area according to local potential. Several potentials that can be developed by the community in full and already have a legal umbrella can be seen in Table 4.

All potential utilizations have been regulated in regulations that allow the community to be more flexible in SF activities. These activities can be carried out either partially or several simultaneously in the same permit. In addition to the potential for area development, multi-forestry business activities in KHDPK also

open up opportunities for cooperation with wider business entities, such as cooperatives. Even SF management permits in KHDPK can be obtained directly by cooperatives, with certain requirements. This condition opens up opportunities for the growth of multi-forestry businesses in KHDPK.

D.2. Socio-economic and environmental factors

KHDPK opens up greater opportunities in developing environmental service products and HHBK based on local potential (Table 5). Potential can be a supporting factor, especially in increasing community income. Based on field observation, several potentials can be developed at the research location (Table 5).

Table 5. Potential non-timber forest products and environmental services

Village	Potential of NTFPs	Potential of environmental services
Golat	Coffee, sugar palm, rattan, and latex	Nature tourism (pine-based), clean water supplier, carbon absorption, carbon absorption
Bangunjaya	Coffee, honey, sugar palm, bamboo, and rattan	Nature tourism (waterfalls), carbon absorption
Bangunkarya	Durian, bamboo	Cisangkal nature tourism (landscape view), durian village tourism, clean water supplier, carbon absorption

Village	Potential of NTFPs	Potential of environmental services
Pangkalan	Sugar palm, bamboo, coffee, and durian	Nature tourism (waterfalls), clean water supply, carbon absorption
Jadikarya	Durian, bamboo	Durian village tourism, landscape view, carbon absorption

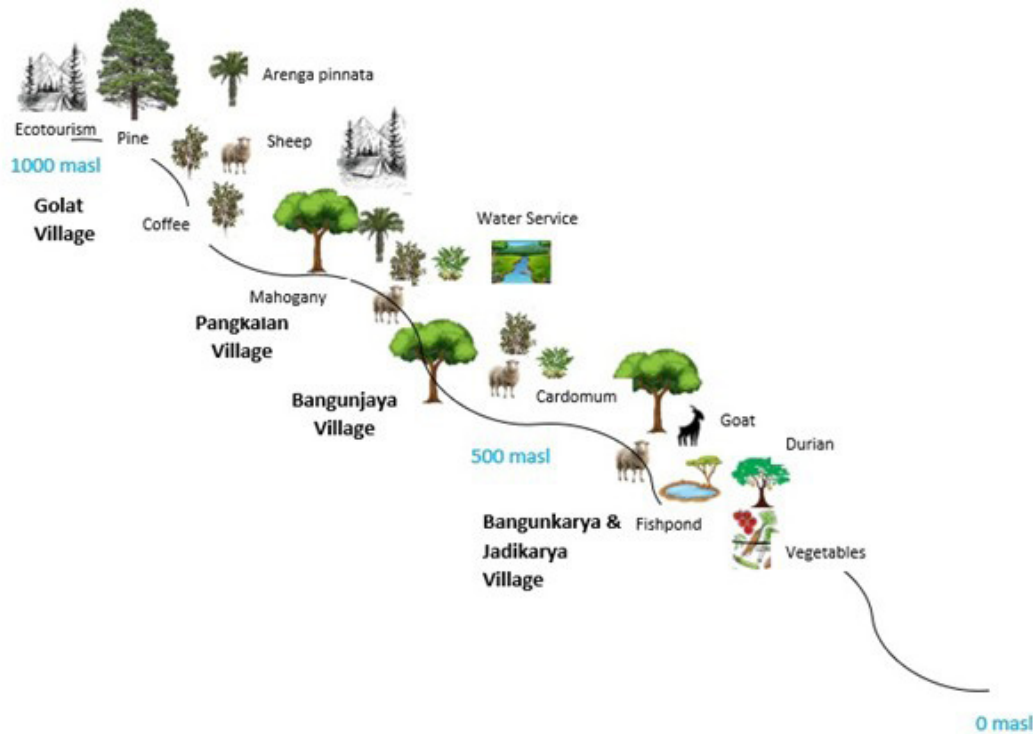


Figure 3. Overview of the multi-business forestry development model based on regional potential

The combination of supporting laws and regulations with the potential of each village is a very important enabling factor in the development of multi-business forestry. Based on the results of Table 4 and Table 5, a multi-business forestry development model can be prepared based on regional potential with an agroforestry pattern for each village in the social forestry scheme in KHDPK, as shown in Figure 3.

The image above shows that the higher a place is, the different types of commodities developed by the community. In lowland areas, people can develop product-based Mb-F, for example, of various animals and plants. While in the highlands, the types of commodities that can be created can be services, especially nature tourism and water sources. Open forest

development has two sides that are sometimes contradictory. On the one hand, it can drive the community's economy.

On the other hand, if not supervised, it can cause environmental degradation. The community's tendency to optimise land productivity makes them more likely to prefer seasonal plants that produce quickly. Mb-F anticipates this by offering more flexible commodities without eliminating the ecological function of a forest area.

The effects of Indonesia's social forestry and forestry decentralization initiatives have been uneven. A lack of community involvement has resulted in decreased public welfare and damage to forest ecosystems, even though it has boosted regional autonomy (Pambudi, 2023; Tolo, 2014). Rapid policy changes and intricate bureaucratic

processes have made it difficult to implement, for example, the Timber Legality Verification Certification (SVLK) policy, which was created to address concerns about unlawful logging (Suryandari et al., 2017). This situation has had a detrimental effect on community forest farmers and micro-industries, endangering the long-term viability of both community forests and the timber sector. To combat illicit logging and enhance wood output and forest management, Indonesia and the UK collaborated on the Multistakeholder Forestry Programme 3 (MFP 3) (Ridho et al., 2019). Stronger institutional support, more community capacity, and better laws are required to strengthen the efficacy of these programs (Pambudi, 2023; Suryandari et al., 2017).

IV. CONCLUSION

The synthesis of research on social forestry (SF) highlights its multifaceted benefits, including conflict resolution, sustainable resource management, financial feasibility, and land suitability. By integrating ecological, economic, and social considerations, SF emerges as a holistic approach to forestry management that addresses the complex challenges of balancing environmental conservation with socio-economic development. Multi-business forestry (Mb-F/MUK) was implemented before the Forest Area with Special Management (KHDPK) policy was inaugurated in 2022. The results of the Mb-F evaluation of SF activities in KHDPK show that the selection of species preferred and accepted by the community is closely related to economic value, as evidenced by five multi-business patterns that are most widely practised by the community, all of which are financially feasible. All multi-business patterns have a positive Net Present Value (NPV), Benefit-Cost Ratio (B/C Ratio) > 1, and Internal Rate of Return (IRR) greater than Bank Indonesia's benchmark interest rate. The main types of community choices, especially fruit types, are not all ecologically appropriate. The community continues to maintain this plant

because it contributes highly economically. In addition, the kinds of NTFPs, especially those from the fruit category, also have ecological functions: water regulators, carbon storage, and other tree functions. The government can encourage the implementation of Mb-F on lands that are in conflict by offering wider access to land use. The Mb-F concept can also be adopted on critical lands, although intensive assistance and treatment must be carried out.

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AUTHOR CONTRIBUTIONS

AW: Data Collection, Writing Original Draft; DRN: Supervision, Writing Final Draft; ST: Supervision; SB: Supervision

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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