



Agroforestry Value Creation and Farmer Welfare in Madayin Village, East Lombok

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Abstract: This study aimed to analyze the relationship among agroforestry stand production, value creation, and farmers' welfare in Madayin Village, Sambelia District, East Lombok Regency. A mixed-methods approach was employed, involving 10 purposively selected farmers and five agroforestry land units. Data were collected through field observations, stand measurements, interviews, and questionnaires, and were analyzed using descriptive statistics, percentage analysis, and thematic analysis. The results showed mean stand volumes of 4.02 m³ for white teak (*Gmelina arborea*), 2.00 m³ for teak (*Tectona grandis*), and 4.18 m³ for mahogany (*Swietenia mahagoni*). Interview and questionnaire findings indicated that farmers perceived agroforestry as generating economic benefits through enterprise diversification and more efficient land use, social benefits through cooperation and livelihood security, and environmental benefits through land conservation and the maintenance of vegetation cover. The quantitative and qualitative findings were integrated to formulate the Agroforestry Value Creation Model, a conceptual framework linking stand production with economic, social, and environmental value creation and farmers' welfare. These findings highlight the potential of agroforestry to support the strengthening of local value chains, although their interpretation is limited to the case-study context of Madayin Village.

Keywords: Agroforestry; farmer welfare; value creation; stand production; local value chain

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INTRODUCTION

Agroforestry is a land-use system that integrates forestry and agricultural components within a single production unit. This system has become increasingly relevant to sustainable agricultural and forestry development because it can enhance land productivity, strengthen farmers' livelihoods, and maintain ecological functions. The integration of multiple production components within a single land-use system is an important element of sustainable food and agricultural systems (Borrello et al., 2022). Agroforestry also contributes to the social–ecological resilience of rural communities, particularly in areas where land resources constitute the primary basis of livelihood (Sari et al., 2023). Moreover, the sustainability of the agro-industrial sector depends largely on the capacity of production systems to generate economic, social, and environmental benefits simultaneously (Ahmed et al., 2024).

At the farm-household level, agroforestry functions not only as a production system but also as a livelihood strategy that can reduce economic vulnerability. The combination of timber stands and agricultural crops enables farmers to diversify their income sources over both the short and long term. Timber stands can serve as productive assets that provide future economic value, whereas agricultural crops can help meet daily household needs. Previous studies have shown that agroforestry practices can contribute to improved rural welfare through income diversification, strengthened livelihood strategies, and enhanced household resilience (Manda et al.,

2023; Cogné & Lescuyer, 2024; Hiola et al., 2024). Thus, agroforestry can improve land productivity, broaden income sources, and reduce farmers' dependence on a single commodity.

Agroforestry development can also be understood through the concept of value creation. This concept emphasizes that the success of a production system should not be assessed solely by the volume of output generated, but also by its ability to create benefits for producers, communities, and the environment. Geissdoerfer et al. (2023) argued that sustainable production systems should generate economic, social, and environmental value in an integrated manner. Within value-chain systems, the welfare of producers is strongly influenced by their ability to create and retain value throughout the production and distribution processes in which they participate (Gereffi & Lee, 2016). Accordingly, agroforestry can be viewed not merely as a commodity-producing system, but as a value-creation process that may contribute to farmers' welfare.

From the perspective of sustainable agro-industry, value creation extends beyond income generation to include the strengthening of social capacity and the sustainability of natural resources. Acerbi and Taisch (2024) emphasized that value creation in agro-industrial systems should encompass economic, social, and environmental dimensions. This perspective is reinforced by Esposito et al. (2024), who argued that sustainable production systems should generate multidimensional benefits for both society and the environment. Agroforestry development is also closely related to climate-smart agriculture because it can address social and environmental challenges through land conservation, increased vegetation cover, and more sustainable production systems (Zuza et al., 2023). Therefore, agroforestry has strategic potential as a land-based production system that links productivity, sustainability, and farmer welfare through value-creation mechanisms.

In Indonesia, agroforestry is widely practiced on community-managed land, including community forest areas. In Madayin Village, Sambelia District, East Lombok Regency, farmers manage land within the East Rinjani Forest Management Unit (KPH Rinjani Timur) by combining forest stands with cultivated crops. A previous study conducted at the same location reported that agroforestry contributed to stand production and farmer welfare (Maulana, 2025). However, those findings did not explain the mechanism through which stand production is translated into the economic, social, and environmental benefits perceived by farmers. This issue is important because household welfare depends not only on the amount of production generated, but also on the capacity of the land-use system to transform resources and production outputs into benefits that can be sustained over time.

The research gap addressed in this study lies in the limited number of studies that integrate stand production, value creation, and farmer welfare within a single analytical framework. Previous research has more commonly examined agroforestry productivity, income diversification, or welfare as separate dimensions (Manda et al., 2023; Cogné & Lescuyer, 2024; Hiola et al., 2024). In contrast, the literature on value chains and sustainable agrifood systems emphasizes the importance of understanding how production processes are converted into economic, social, and environmental benefits (Cahyadi et al., 2024; Syukur et al., 2025). Therefore, this study uses value creation as a conceptual mechanism linking stand production with farmer welfare, rather than treating these two elements as independent outcomes.

Based on this gap, this study aimed to analyze agroforestry stand production, identify forms of economic, social, and environmental value creation, and explain their relationship with farmer welfare in Madayin Village. The novelty of the study lies in the formulation of the Agroforestry Value Creation Model, a conceptual framework

describing the pathway from stand production → economic, social, and environmental value creation → farmer welfare. This model is expected to broaden the discussion of agroforestry beyond a narrow focus on production or income by emphasizing the processes through which multidimensional benefits are created and their implications for strengthening local value chains.

METHOD

Study Location and Period

The study was conducted in Madayin Village, Sambelia District, East Lombok Regency, West Nusa Tenggara Province, on community-managed agroforestry land located within the management area of the East Rinjani Forest Management Unit (KPH Rinjani Timur). The study site was selected purposively because the integration of forest stands and cultivated crops had already been practiced on farmers' land and was therefore suitable for examining stand production, value creation, and farmer welfare. The social unit of analysis consisted of farmers managing agroforestry systems, whereas the biophysical observation units comprised five agroforestry plots used for stand measurements.

Field data were collected from May to August 2024, while data analysis and preparation of the study were conducted from January to June 2026. These periods were selected to accommodate field observations, stand measurements, respondent interviews, and subsequent data analysis.

Research Design and Approach

This study employed a mixed-methods approach integrating quantitative and qualitative methods. The quantitative component was used to describe farmer characteristics, stand production, and farmer welfare indicators. The qualitative component was used to interpret the value-creation processes associated with the agroforestry system, particularly across the economic, social, and environmental dimensions.

The mixed-methods approach enabled the study not only to describe empirical conditions using numerical data but also to capture the meanings and benefits of agroforestry as experienced by farmers. This approach was therefore considered appropriate for providing a more comprehensive understanding of the relationship among stand production, value creation, and farmer welfare (Paul et al., 2021; Krippendorff, 2022).

Study Population and Sample

The study population consisted of farmers managing agroforestry land in Madayin Village. Ten farmers were selected purposively based on their direct involvement in agroforestry management and their willingness to provide information, while five land units were selected for stand observation and measurement. The number of respondents was determined to obtain in-depth information within a locally focused case-study design rather than to generate statistically representative estimates for the wider farmer population.

Purposive selection enabled the study to focus on respondents with direct experience in agroforestry practices and on land units that were relevant to the research objectives. Under this design, the quantitative findings were treated as descriptive representations of the observed respondents and land units, whereas the qualitative findings were used to provide deeper explanations of the forms of value creation identified. Accordingly, the findings were intended to support analytical

understanding of the Madayin Village case rather than statistical generalization to broader populations (Mengist et al., 2020; Snyder, 2022).

Data Collection Techniques

Primary data were collected using four complementary techniques: field observation, stand measurement, interviews, and questionnaires. Field observations were used to document general land conditions, stand composition, management patterns, and cultivation practices. Stand measurements provided data on tree species and stand volume across the five observation units. Interviews were conducted to explore farmers' experiences regarding the economic, social, and environmental benefits of agroforestry, while questionnaires were used to record respondent characteristics, farming experience, landholding, perceptions of agroforestry benefits, and their relationship with household welfare. The use of multiple data-collection techniques was intended to triangulate information obtained from field conditions, stand measurements, and respondent accounts.

Stand measurements focused on the three dominant tree species identified within the observation units: white teak (*Gmelina arborea*), teak (*Tectona grandis*), and mahogany (*Swietenia mahagoni*). The measurements were used to determine stand volume for each species and were subsequently summarized as mean, maximum, and minimum values. Because the study was descriptive and did not inferentially test differences in growth among species, comparisons of stand volume were interpreted as descriptions of conditions across the five observed land units rather than as evidence of species-driven differences in productivity.

Interview and questionnaire data were collected from the same respondents so that information on household characteristics, management practices, and perceived benefits could be interpreted in an integrated manner. Information consistency was assessed by comparing respondent statements with field observations and with patterns emerging across other respondents. Secondary data were used to strengthen the study context and interpretation of the findings and included documents from the East Rinjani Forest Management Unit, previous studies, and scientific publications relevant to agroforestry, value creation, value chains, and farmer welfare.

Research Variables and Indicators

This study examined four main components: the agroforestry system, stand production, value creation, and farmer welfare. The agroforestry system was analyzed based on the pattern of integration between forest stands and cultivated crops on farmers' land. Stand production was assessed based on tree species and stand volume within the observation units.

Value creation was analyzed through three main dimensions: economic, social, and environmental value. Economic value included income, enterprise diversification, and land productivity. Social value included cooperation among farmers, livelihood security, and support from local institutions. Environmental value included land conservation, increased vegetation cover, and resource sustainability. Farmer welfare was assessed using economic and social indicators obtained through questionnaires and respondent interviews.

This analytical framework was used to explain how stand production within agroforestry systems may generate economic, social, and environmental value that, in turn, contributes to farmer welfare (Geissdoerfer et al., 2023; Acerbi & Taisch, 2024).

Data Analysis

Quantitative data were analyzed using descriptive statistics and percentages. Respondent characteristics were presented as frequencies and percentages, while

stand data were summarized as mean, maximum, and minimum volumes for each species. These analyses were used to describe the conditions of the 10 respondents and five observed land units. No inferential statistical tests were conducted to establish causal relationships between stand production and farmer welfare.

Qualitative data were analyzed thematically in three stages. First, information from the interviews was grouped according to recurring issues in farmers' experiences. Second, response patterns were organized into three main themes predetermined by the analytical framework: economic value, social value, and environmental value. Third, each theme was interpreted by comparing information across respondents and with field observations. This analysis was intended to identify patterns of meaning in farmers' experiences rather than to quantify the magnitude of statistical effects (Krippendorff, 2022).

The quantitative and qualitative findings were subsequently integrated during the interpretation stage. Stand-volume data were used to describe the production base, while interview and questionnaire findings were used to explain the economic, social, and environmental benefits that farmers associated with agroforestry practices. This integration formed the basis for developing the Agroforestry Value Creation Model. The resulting model is conceptual and exploratory because it was developed from a case study involving a limited number of respondents and land units; therefore, it is not intended to represent a statistically validated causal model (Esposito et al., 2024).

RESULTS AND DISCUSSION

Characteristics of Agroforestry Farmers

Farmer characteristics are important factors influencing agroforestry management capacity, farm decision-making, and the use of land resources. The respondent characteristics examined in this study included sex, age, education level, farming experience, and landholding size. These characteristics are summarized in Table 1.

Table 1. Characteristics of agroforestry farmer respondents in Madayin Village

Characteristic	Category	Number of respondents	Percentage (%)
Sex	Male	9	90
	Female	1	10
Age	< 40 years	3	30
	40–59 years	4	40
	≥ 60 years	3	30
Education	Elementary school	5	50
	Senior high school	5	50
Farming experience	11 years	1	10
	12 years	1	10
	13 years	8	80
Landholding size	< 1 ha	4	40
	≥ 1 ha	6	60

Most respondents were male, accounting for 9 farmers or 90% of the sample, whereas only 1 respondent, or 10%, was female. This pattern indicates that

agroforestry management in Madayin Village is predominantly undertaken by male farmers, particularly for physically demanding activities such as planting, stand maintenance, land clearing, and harvesting. Nevertheless, the participation of female farmers indicates that agroforestry management also involves broader household roles.

In terms of age, respondents were distributed across three groups: 30% were younger than 40 years, 40% were 40–59 years old, and 30% were 60 years or older. The 40–59-year age group represented the largest proportion, suggesting that most respondents were within a productive age range. Productive age is generally associated with physical work capacity, accumulated experience, and decision-making ability in farm management. In agroforestry, these attributes are particularly important because the management of tree stands and agricultural crops requires long-term planning, continuous maintenance, and the capacity to manage production risks (Nugraha et al., 2025).

Educational attainment was evenly distributed between elementary school and senior high school graduates, each accounting for 50% of respondents. Education can influence farmers' ability to access information, understand cultivation technologies, manage farming activities, and identify market opportunities. Although some respondents had only basic formal education, their long farming experience may provide substantial practical knowledge for agroforestry management. The quality of human resources is an important factor in the success of value creation within sustainable production systems (Acerbi & Taisch, 2024).

Most respondents, or 80%, had managed agroforestry land for 13 years. This indicates a relatively long period of experience in understanding local land conditions, crop characteristics, stand growth patterns, and farm-management dynamics. Such experience constitutes both technical and social capital for maintaining land productivity and supporting the sustainability of agroforestry systems. Farming experience may also strengthen farmers' capacity to adapt management practices to environmental conditions and household economic needs (Ahmed et al., 2024).

Regarding landholding size, 60% of respondents managed at least 1 ha of land, whereas 40% managed less than 1 ha. Relatively larger landholdings provide greater opportunities to combine forest stands and agricultural crops within a single production system. From a value-creation perspective, land is a productive asset that can generate economic, social, and environmental benefits when managed effectively. Greater land-management capacity may also provide more opportunities for commodity diversification, increased production, and strengthened household economic resilience (Geissdoerfer et al., 2023; Gereffi & Lee, 2016).

Overall, the agroforestry farmers in Madayin Village were characterized by substantial farming experience, relatively adequate landholdings, and active involvement in land management. These characteristics provide an important foundation for developing agroforestry as a production system that not only generates tree stands but also creates economic, social, and environmental value that may contribute to farmer welfare.

Stand Production in Agroforestry Systems

Stand production is an important indicator of agroforestry system performance because it reflects the capacity of land to generate biomass, timber assets, and potential long-term economic value. In agroforestry systems, tree stands function not only as production components but also as ecological elements that support soil conservation, vegetation cover, and long-term land-resource sustainability. Stand-

production measurements from agroforestry land in Madayin Village are presented in Table 2.

Table 2. Stand production in agroforestry systems in Madayin Village

Tree species	Mean volume (m ³)	Maximum volume (m ³)	Minimum volume (m ³)
White teak (<i>Gmelina arborea</i>)	4.02	4.9	3.3
Teak (<i>Tectona grandis</i>)	2.00	2.8	1.2
Mahogany (<i>Swietenia mahagoni</i>)	4.18	4.6	0.4

Measurements across the five land units identified three principal tree species: white teak (*Gmelina arborea*), teak (*Tectona grandis*), and mahogany (*Swietenia mahagoni*). Their mean stand volumes were 4.02 m³, 2.00 m³, and 4.18 m³, respectively. These values describe stand conditions within the observed land units and were not used to infer causal differences in growth among species.

White teak (*Gmelina arborea*) had a mean volume of 4.02 m³, with a maximum of 4.9 m³ and a minimum of 3.3 m³. Descriptively, this range indicates that white teak represents an important stand component on the respondents' land. In an agroforestry context, integrating timber trees with cultivated crops extends the function of land from providing short-term yields to also serving as a source of longer-term productive assets. This interpretation is consistent with studies that view component diversification in agroforestry as part of livelihood strategies and risk reduction among farmers (Manda et al., 2023; Cogné & Lescuyer, 2024).

Teak (*Tectona grandis*) had a mean volume of 2.00 m³, with a maximum of 2.8 m³ and a minimum of 1.2 m³. This mean was lower than those recorded for white teak and mahogany in the observed plots. However, the difference should not be interpreted directly as evidence of lower biological productivity because the study did not inferentially control for stand age, density, site quality, or management practices. Accordingly, the result primarily reflects variation in stand composition. Agroforestry literature emphasizes that component diversity can support social–ecological resilience and reduce dependence on a single commodity (Sari et al., 2023; Borrello et al., 2022).

Mahogany (*Swietenia mahagoni*) had a mean volume of 4.18 m³ and a maximum volume of 4.6 m³, making it descriptively the species with the highest mean volume across the five observed land units. This finding indicates the contribution of mahogany to the observed stand stock, but it is insufficient to conclude that mahogany is more productive than the other species without controlling for age, density, and site conditions. Within the value-creation framework, timber stands can be regarded as productive assets that potentially generate economic benefits while maintaining vegetation cover on agroforestry land (Geissdoerfer et al., 2023).

Overall, the stand data indicate that agroforestry systems in Madayin Village maintain several timber species within a single farming landscape. This finding is conceptually consistent with agroforestry studies emphasizing livelihood diversification, household resilience, and social–ecological functions, although direct numerical comparisons with other studies were not made because of differences in species composition, stand age, land-unit size, and measurement methods (Manda et al., 2023; Sari et al., 2023; Cogné & Lescuyer, 2024). Therefore, stand volume in this study was treated as a production base that was subsequently linked to forms of value creation identified through interviews and questionnaires.

Value Creation in Agroforestry Systems

Value creation in agroforestry refers to the capacity of a production system to generate benefits that extend beyond economic output to include social and environmental value. In this study, value creation was examined across three main dimensions: economic, social, and environmental value. These dimensions emerged through the management of white teak, teak, and mahogany stands integrated with agricultural activities on farmers' land. The dimensions of agroforestry value creation are presented in Table 3.

Table 3. Dimensions of value creation in agroforestry systems

Value-creation dimension	Indicator	Form of value generated
Economic	Income	Long-term income source
	Enterprise diversification	Reduced business risk
	Land productivity	More efficient land use
Social	Farmer cooperation	Strengthened social capital
	Livelihood security	Greater household resilience
	Local institutions	Support for agroforestry management
Environmental	Land conservation	Reduced land degradation
	Vegetation cover	Improved ecological function
	Resource sustainability	Sustainable land management

The economic value of agroforestry is reflected in the capacity of land to produce multiple outputs that may increase income opportunities and strengthen household economies. Timber stands provide the potential for long-term income, while agricultural crops offer more immediate and recurring economic benefits. This combination enables farmers to diversify income sources compared with farming systems that depend on a single commodity. Agroforestry can also enhance land-use efficiency because a single land unit can produce more than one type of commodity. These conditions illustrate how agroforestry can generate economic value through income opportunities, enterprise diversification, and more efficient land utilization (Ahmed et al., 2024).

Social value is created through strengthened farmer cooperation, knowledge exchange, and improved livelihood security. Long-term agroforestry management encourages interaction among farmers in cultivation, stand maintenance, and product management. Such interactions can strengthen community social capital and support the continuity of land management. In addition, timber stands may provide farmers with a greater sense of security because they can function as productive assets or future economic reserves. Thus, agroforestry can serve not only as a production system but also as a livelihood strategy that supports household social resilience (Borrello et al., 2022).

Environmental value is generated through the contribution of agroforestry to land conservation, vegetation cover, and the sustainability of natural resources. Trees on agricultural land can help maintain soil quality, reduce erosion risk, increase vegetation cover, and improve ecological functions. Farmers also perceived that tree stands helped maintain land conditions, thereby supporting more sustainable production. Consequently, agroforestry generates environmental value that is important for livelihood sustainability because farm productivity depends heavily on the quality and continuity of land resources (Geissdoerfer et al., 2023; Ahmed et al., 2024).

Overall, agroforestry systems in Madayin Village generated multidimensional value through the integration of economic, social, and environmental benefits.

Economic value was associated with income and enterprise diversification, social value with cooperation and livelihood security, and environmental value with the sustainability of land resources. These dimensions are mutually reinforcing and provide a conceptual basis for understanding how agroforestry may contribute to farmer welfare (Borrello et al., 2022; Geissdoerfer et al., 2023).

Agroforestry and Farmer Welfare

Interview findings and respondent assessments indicated that farmers associated agroforestry practices with economic, social, and environmental benefits. In this study, these findings were interpreted as respondents' perceptions and experiences regarding the contribution of agroforestry to welfare rather than as causal evidence that agroforestry directly improves all dimensions of welfare.

From an economic perspective, agroforestry can increase income opportunities through commodity diversification within a single land unit. The combination of forest trees and agricultural crops allows farmers to derive economic benefits from multiple sources. Timber stands function as long-term assets, whereas agricultural crops can support short-term household needs. This arrangement can reduce dependence on a single commodity and strengthen household economic stability. These findings reflect economic value creation, namely the creation of economic benefits through the advantages farmers derive from agroforestry systems (Ahmed et al., 2024; Acerbi & Taisch, 2024).

From a social perspective, agroforestry encourages farmer participation in group activities, information exchange, and cooperation in land management. Interactions among farmers can strengthen social capital, expand access to knowledge, and improve farmers' capacity to manage land resources. The presence of tree stands as productive assets may also enhance farmers' sense of livelihood security. These conditions represent social value creation, in which social value emerges through stronger social relations, increased community capacity, and enhanced livelihood security (Borrello et al., 2022; Gereffi & Lee, 2016).

From an environmental perspective, agroforestry contributes to land conservation and the sustainability of natural resources. Mixed-cropping systems that include tree stands can help maintain soil quality, increase vegetation cover, and reduce the risk of land degradation. Farmers also demonstrated awareness that sustainable production depends on maintaining land conditions. Agroforestry therefore provides not only productive benefits but also environmental value that supports the continuity of farming systems. These benefits reflect environmental value creation through improvements in ecological land functions and production-system sustainability (Geissdoerfer et al., 2023; Ahmed et al., 2024).

Overall, the qualitative data revealed a consistent pattern in which farmers perceived agroforestry as a source of multidimensional benefits. Economic value was associated with diversified income sources and land use; social value with cooperation and livelihood security; and environmental value with the maintenance of land conditions. This pattern supports the use of the value-creation concept to explain the relationship between the production base and farmer welfare. However, the strength of this relationship was not tested causally or inferentially (Geissdoerfer et al., 2023; Borrello et al., 2022).

Agroforestry Value Creation Model

The findings indicate that agroforestry systems in Madayin Village generate benefits beyond stand production by creating economic, social, and environmental value. Stand production, consisting primarily of white teak, teak, and mahogany,

represents an important basis of value formation because these trees function as productive assets, potential long-term income sources, and ecological components of land management.

The economic value generated by agroforestry is reflected in greater income opportunities, enterprise diversification, and more productive land use. At the same time, agroforestry generates social value through stronger cooperation among farmers, improved livelihood security, and support from local institutions. Environmentally, tree stands contribute to land conservation, vegetation cover, and the sustainability of natural resources. Together, these dimensions form the value-creation process linking stand production and farmer welfare (Geissdoerfer et al., 2023; Ahmed et al., 2024).

Based on the integration of the findings, this study proposes the following conceptual pathway:

agroforestry system → stand production → economic, social, and environmental value creation → farmer welfare

This pathway is not intended to represent a statistically tested causal sequence. Rather, it serves as an interpretive framework for explaining how the production base may be connected to the benefits reported by farmers. Value creation is therefore positioned as a conceptual mechanism linking stand production with farmer welfare.

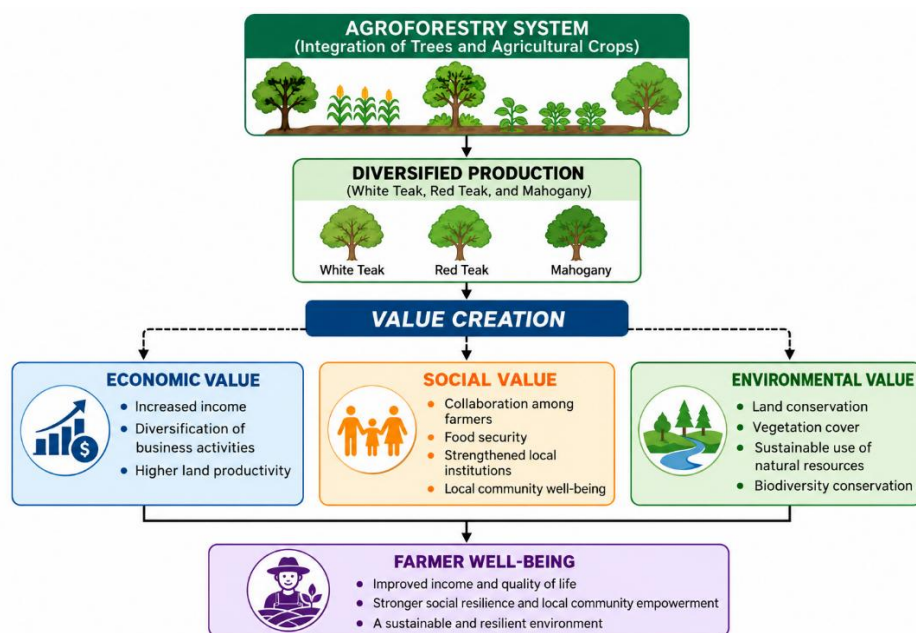


Figure 1. Conceptual model of agroforestry value creation and farmer welfare

Figure 1 presents the conceptual model developed through the integration of stand data, interviews, questionnaires, and the theoretical framework. The model positions economic, social, and environmental value as three benefit pathways connecting agroforestry production systems with farmer welfare. This framework is consistent with the view that sustainable production systems should generate benefits beyond economic outputs alone (Borrello et al., 2022; Gereffi & Lee, 2016). However, the model has not yet been validated through causal analysis, statistical testing, or application in other locations.

The novelty of this study lies in the formulation of the Agroforestry Value Creation Model, which integrates the stand-production base, three dimensions of value creation, and farmer welfare within a single conceptual framework. In contrast to approaches that examine production or income separately, this model emphasizes the process

through which multidimensional benefits are generated. Because it was developed from a case study, its primary contribution is to provide a conceptual proposition that can be tested further using larger samples and in different agroforestry contexts.

Table 4. Contribution of value creation to farmer welfare

Value-creation dimension	Form of value generated	Implication for welfare
Economic	Income from tree stands, enterprise diversification	Increased household income
Social	Farmer cooperation, social networks	Strengthened livelihood security
Environmental	Land and vegetation conservation	Sustained production
Integrated value	Economic–social–environmental integration	Improved farmer welfare

Table 4 summarizes the conceptual relationships between value-creation dimensions and farmer welfare based on patterns identified in respondents' accounts. Economic value was associated with income sources and enterprise diversification, social value with cooperation and livelihood security, and environmental value with the sustainability of the production base. The integration of these three dimensions provides a framework for interpreting welfare as a multidimensional construct. Because these relationships were derived from descriptive and thematic analyses, the table should not be interpreted as estimating the magnitude of the effect of each dimension.

Implications for Local Value-Chain Development

The findings suggest that agroforestry in Madayin Village has the potential to serve as a foundation for local value-chain development. The production of white teak, teak, and mahogany provides a resource base that could be linked to maintenance, harvesting, processing, marketing, and the utilization of timber products. However, because this study did not directly measure the performance of each actor or stage in the value chain, these implications are presented as potential development pathways derived from the identified production and value-creation patterns (Gereffi & Lee, 2016).

From a value-chain perspective, agroforestry begins with production inputs, including land, labor, farmer knowledge, seedlings, and natural resources. These inputs are managed through agroforestry practices to generate tree stands and agricultural products. Production can then create economic value through increased income opportunities, enterprise diversification, and improved land productivity. The resulting value may subsequently contribute to improved farmer welfare, with farmers positioned as the primary actors in the agroforestry value chain (Acerbi & Taisch, 2024).

In addition to generating direct economic benefits, agroforestry may strengthen the sustainability of local value chains through social and environmental benefits. Local institutions, cooperation among farmers, and land-conservation practices support the continuity of production over the long term. This indicates that agroforestry value-chain development depends not only on production but also on the system's ability to sustain social relationships and natural resources. Accordingly, local agroforestry value chains should be understood as systems that integrate production, value creation, and farmer welfare in a sustainable manner (Syukur et al., 2025).

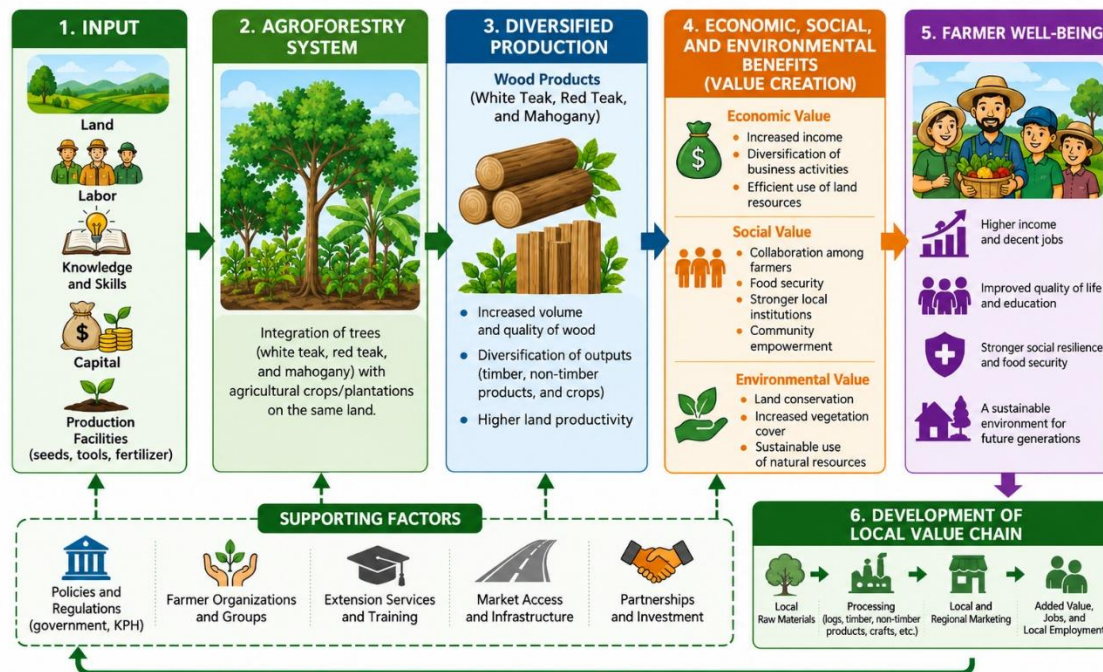


Figure 2. Local agroforestry value chain

Conceptually, the local agroforestry value chain in Madayin Village can be described as follows:

production inputs → agroforestry management → stand production → value creation → farmer welfare → local economic strengthening

This sequence is an interpretive framework rather than the result of a complete mapping of actors, transactions, margins, and value-chain governance. Future development should therefore verify the relationships among these stages by mapping actors, product flows, prices, costs, market access, and the distribution of benefits.

Overall, this case study demonstrates the potential of agroforestry to connect the production base with value creation and farmer welfare. Its practical implications include the need to strengthen farmer institutions, market access, product processing, and locally based value-added strategies. Further research should map value-chain actors and the distribution of benefits so that the concept of the local agroforestry value chain can be empirically tested (Gereffi & Lee, 2016).

CONCLUSION

This study demonstrates that agroforestry in Madayin Village provides a production base consisting of white teak, teak, and mahogany stands, which farmers associate with economic, social, and environmental benefits. The integration of quantitative and qualitative findings supported the formulation of the Agroforestry Value Creation Model, a conceptual framework that positions value creation as the link between stand production and farmer welfare. The main contribution of this study is to extend the discussion of agroforestry beyond production outputs toward the mechanisms through which multidimensional benefits are generated. Because the model was developed from a case study involving a limited number of respondents and land units, its broader generalizability and causal relationships cannot yet be established. Further testing is therefore needed using larger samples, measurable welfare indicators, and more comprehensive value-chain mapping.

RECOMMENDATION

The development of agroforestry in Madayin Village should focus on strengthening farmers' technical capacity, improving stand management, expanding access to market information, and reinforcing local institutions. Local government agencies and the Forest Management Unit should prioritize technical assistance for cultivation practices, facilitate access to planting materials, improve production record-keeping, and strengthen access to price and market information so that production potential can be translated into more measurable economic benefits.

Future studies should test the proposed conceptual model using larger numbers of respondents and land units, quantitatively measured welfare indicators, and comprehensive mapping of actors, costs, prices, margins, and product flows within the value chain. Such approaches would help determine the extent to which economic, social, and environmental value creation contributes to farmer welfare.

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The authors used AI-assisted technologies solely to improve the readability and language quality of the manuscript. The authors reviewed and edited the final content and take full responsibility for the manuscript.

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