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CONTRIBUTION OF AGROFORESTRY TO FARMERS' INCOME AND WELFARE IN JUJUN VILLAGE KERINCI REGENCY

Eva Achmad; Maria Ulfa*; Fazriyas; Rike Puspitasari Tamin

Department of Forestry, Faculty of Agriculture, Universitas Jambi, Jambi, Indonesia

* Corresponding author: maria.ulfa@unja.ac.id

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ABSTRACT

Jujun Village is located in Kerinci Regency and is one of the Integrated Laboratory Villages fostered by Jambi University. Jujun Village is known to have the largest area in Keliling Danau District, and most of its residents work as farmers and have cultivated land. The agroforestry cropping pattern approach has begun to be carried out by the community, especially since the benefits of agroforestry for the community were explained again from an ecological and economic perspective. In the journey of the agroforestry system in Jujun Village, it is necessary to know what its contribution is to community income. Specifically, this study seeks to analyze the contribution of agroforestry to the income and welfare of farmers in Jujun Village. This study ran for 8 months from April to November 2024 and was carried out in Jujun Village. This study uses quantitative and qualitative descriptive methods with an analysis focused on farmers' income and welfare. The results of the study show that farmers have implemented agroforestry on their land with a combination of various types of agricultural and forestry crops. The analysis carried out provides an overview of the contribution of agroforestry to farmers' income in general with varying levels of contribution. The average contribution of agroforestry to total farmer income is 51.97%. The average contribution of agroforestry to total farmer income is 51.97%. Meanwhile, the level of farmer welfare ranges from almost poor (33.33%), sufficient (26.67%) to decent living (23.33%).

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INTRODUCTION

Agriculture is a fundamental interaction between humans and the environment, utilizing more natural resources than any other human activity (Barrios et al., 2018). As the global population continues to grow, the agricultural sector faces increasing pressure to produce sufficient food (Waldron et al., 2017; Tschora & Cherubini, 2020). To meet these demands, agricultural practices often

intensify, resulting in soil degradation and the conversion of forested areas into farmland (Henders et al., 2018; Kopittke et al., 2019). This deforestation leads to biodiversity loss, disruption of ecosystem functions, and greater ecological vulnerability (Paitva et al., 2020). Additionally, climate change intensifies these issues by raising temperatures, altering precipitation patterns, and increasing drought frequency, all of which pose significant threats to agricultural productivity (Altieri et al., 2015). Addressing the dual challenge of feeding a growing population and combating climate change requires the implementation of sustainable agricultural practices, including organic farming, sustainable intensification (Salvini et al., 2016), and nature-inclusive approaches (Runhaar, 2017).

The production of staple foods like grains, vegetables, and meat is essential for human nutrition (Keatinge et al., 2010). However, conventional agricultural practices have led to significant environmental and social challenges, including climate change, biodiversity loss, and ecosystem degradation (Godfray et al., 2010; Waldron et al., 2017). This is often due to an overreliance on chemical fertilizers, excessive water use, and mechanization (Pretty & Barucha, 2014). Furthermore, the conversion of forests into agricultural land disrupts natural water infiltration processes and contributes to both local and global climate change (Suprayogo et al., 2020; Ellison et al., 2017). These detrimental effects have spurred a shift toward sustainable, multifunctional agriculture, which aims to balance environmental, economic, and social benefits while maintaining or improving productivity (Bernard et al., 2014). This approach is instrumental in promoting sustainable development by enhancing food production alongside positive social and environmental outcomes (Wezel et al., 2014).

Agroforestry significantly contributes to farmers' annual income through a combination of agricultural crops, forestry products (timber), and livestock. Key crops such as cocoa, coffee, cloves, rice, and fruits generate substantial income, largely due to regular harvests. These crops often include fast-growing, high-value plants, providing farmers with a steady income to meet their daily needs (Tiwari et al., 2017). Despite the well-documented benefits of agroforestry, its adoption remains limited in many tropical regions (Meijer et al., 2015; Jepma, 2013). Agroforestry plays a significant role in farmers' livelihood strategies, with smallholder forests often serving as a primary income source and even elevating landowners' social status. The economic returns from agroforestry systems frequently depend on land size, as larger areas tend to generate higher income (Parikesit et al., 2021). Moreover, agroforestry adoption can improve livelihoods by diversifying income streams and boosting overall earnings (Nöldeke et al., 2021).

As part of Jambi Province, Kerinci Regency is known to have interesting and characteristic topography and landscape conditions, thus providing great development opportunities in accordance with these conditions and characteristics. Jujun Village, which is part of Kerinci Regency, also has a character that represents Kerinci Regency and is an integrated experimental village of Jambi University. Jujun Village is known to be the largest village among the 32 villages in Keliling Danau District, with an area of 2,080.5 hectares or 5.39% of the total area of Keliling Danau District (385.99 km2). Most of the population works and has a main livelihood as farmers (Badan Pusat Statistik, 2023). Moreover, Jujun Village borders directly on a large conservation forest area (Kerinci Seblat National Park/TNKS) and has a lot of

potential. Jujun Village with an area of 2,080.5 hectares has a majority of farmers. In addition to being dominated by agricultural land of cinnamon, the people of Jujun Village grow citrus fruits where the citrus commodities produced are honey oranges, gerga oranges and tangerines. The community's orange orchards have been managed with a similar planting system and agroforestry system and are one of the village's potentials and advantages.

The results of recent research from many researchers discussing the contribution of agroforestry to farmers' income indicate that the income of farmers who use the agroforestry system tends to be greater when compared to monoculture planting that can be carried out by farmers (Asmi et al., 2013; Olivia et al., 2015; Aprianto et al., 2016; Syofiandi et al., 2016; Kholifah et al., 2017). However, the economic contribution of the agroforestry system cannot be generalized. Other studies state that the comparison and ratio of the contribution of the agroforestry system will differ and have characteristics from various regions depending on the various aspects that can influence it (Wanderi et al., 2019). In Jujun Village itself, the agroforestry system has not been the main choice for village farmers and is only carried out as a hedge plant. The agroforestry system was only encouraged again after the PPM (community service) implementation team of the Forestry Department of Jambi University carried out activities in the village. A study on the contribution of agroforestry to the income of Jujun village farmers needs to be conducted to provide an overview of the extent to which agroforestry has benefited the community economically. It is hoped that the community will be increasingly motivated to implement the agroforestry system in their agricultural and plantation lands so that it provides positive benefits for the ecology, environment and economy of Jujun Village in the future.

RESEARCH METHOD

Data collection was conducted in Jujun Village, Kerinci Regency for 8 months in April-November 2024. The study used a quantitative analysis approach to examine the contribution of agroforestry to farmers' income and welfare. Respondents were selected using purposive sampling technique with predetermined characteristics. Using these criteria, a total of 30 respondents were selected for analysis.The data collected included land area, types of commodities planted, income from both agroforestry and non-agroforestry, and routine expenditures, both food and other expenses. The contribution of agroforestry to farmers' income is determined by the total income from agroforestry divided by the total income of farmers (Paulina et al., 2023). Meanwhile, the level of farmer welfare refers to the Sajogyo welfare indicator table (Sajogyo, 1997) which formulates that the level of farmer welfare can be measured from per capita expenditure per year divided by the price of rice per kilogram.

RESULT AND DISCUSSION

General Condition of Jujun Village

Jujun Village is one of 16 villages in Keliling Danau District, with an area of 2,080.5 hectares, consisting of settlements, plantations, rice fields and fields, rivers and production forests. Although located in the South of Jambi Province, this village

still has good coordination with the sub-district and district governments. This is because the access road connecting the sub-district and district and province is relatively easy using concrete and asphalt. With an area of 2,080.5 Ha, this village has a population of around 729 people with a male population of 368 people and a female population of 363 people, and a number of Family Cards of 268 families, which are then divided into 3 (three) Hamlets, namely Hamlet 1 called Dusun Lamo, Hamlet 2 called Dusun Baru, and Hamlet 3 called Dusun Talang Banjir. The population of Jujun Village is the Malay ethnic group who are the native population of Kerinci Regency, with the majority of the community being Muslim. Most of the residents of Jujun village work in the agricultural sector, the rest are traders, civil servants, honorary teachers, village midwives, retirees, drivers and fishermen.

Variety of Plants Planted in Agroforestry

Based on the results of interviews and surveys to agroforestry locations, it can be seen that farmers plant cinnamon as the main crop. Cinnamon is then combined with various agricultural crops such as chili, galangal, ginger, cardamom, banana, orange and coffee. Meanwhile, forestry plants found include durian, surian, mangosteen, avocado, candlenut and rubber. Details of the types of plants planted in agroforestry activities are presented in Figure 1.

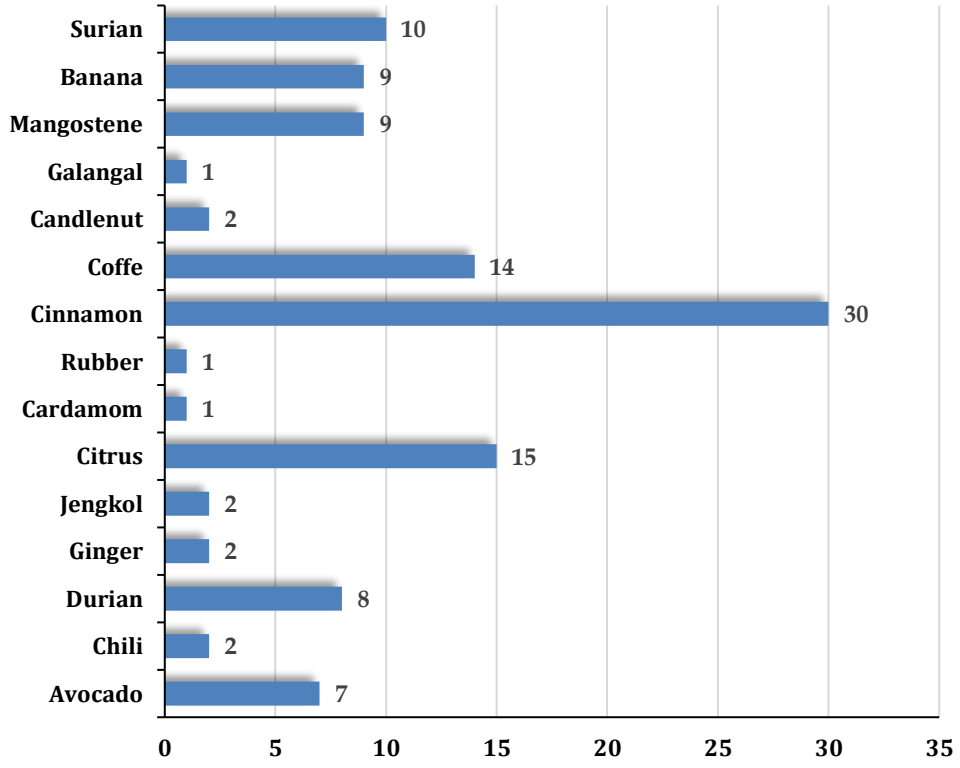

Figure 1.
Plants Species in Agroforestry

From Figure 2. it can be seen that cinnamon is planted by all respondents on their land. The reason farmers plant cinnamon is because it is easy to plant and does not require intensive maintenance and the results are profitable at harvest time. Based on the latest literature and data, Kerinci Regency is known as the largest cinnamon producer in Indonesia (Menggala & Damme, 2018; Permadi et al., 2021). So it is not surprising that the community and farmers in Jujun Village are very familiar with the practice of planting cinnamon on their land. Cinnamon, derived from the bark of *Cinnamomum* plants, is a versatile spice commonly used to enhance the flavor and aroma of food and beverages. Additionally, it is a key ingredient in natural medicines and perfumes, with significant trade in both domestic and international markets. Leading cinnamon-producing countries include Indonesia, China, Vietnam, Sri Lanka, India, and Madagascar (Ravindran et al., 2004).

The combination of planting cinnamon with various types such as durian, Surian and coffee is also commonly known in Kerinci. Even other village communities outside Kerinci district also study and adapt the pattern (Hariyadi & Ticktin, 2012). Several farmers and researchers also tried combining cinnamon with patchouli (Permadi et al., 2021), but this was not found in the respondents of this study. Similar to cinnamon, the reason farmers plant other types of plants in agroforestry systems on their land is based on low maintenance costs and promising profit potential in the future. Because cinnamon can only be harvested once the trees are over eight years old, farmers need other commodities that can produce in a faster time (Fujisawa et al., 2012). Cinnamon can be planted up to 7,000 per hectare assuming monoculture. However, with the agroforestry model, cinnamon and other plants can be planted with a ratio of 3:2 (Hariyadi & Ticktin, 2012).

Farmer's Income from Agroforestry

In this study, farmers' income is divided into 2 large parts, namely income from the agroforestry sector and income from the non-agroforestry sector. The agroforestry sector includes total income from agroforestry minus total costs in the agroforestry process. While income from the non-agroforestry sector includes all farmer income outside agroforestry including side and main jobs outside farming. The results of the analysis related to farmers' income from the agroforestry sector are presented in Table 1.

Table 1. Farmers' Income from Agroforestry

Variables	Unit	Average
Land Area	Ha	1.25
Revenue	IDR/Year	44,484,000.00
Cost	IDR/Year	7,587,750.00
Income	IDR/Year	37,009,316.67

Based on Table 1. several things can be known. With an average land area of 1.25 ha, farmers can receive an average of 44 million/year. Meanwhile, if the costs incurred for agroforestry activities are reduced, farmers ultimately have an average income of IDR 37 million/year. The survey results show that the lowest income of farmers from agroforestry is IDR 1,260,000/ year, while the highest is IDR 126,600,000/year. The survey results show that farmers with the highest income have

a variety of agricultural and forestry crops that are all in a position to produce and profit sustainably. Meanwhile, farmers with the lowest income from agroforestry stated that their land was relatively newly planted so that the types of crops that produce high profits have not yet produced and are only agricultural crops that have not been harvested in large quantities.

Farmers' income from agroforestry looks quite large. However, it must be remembered that cinnamon as the main crop only produces after it is over 8 years old. This means that farmers will only get big profits in the eighth or ninth year. While before that, farmers will only get minimal profits from the combination of plants planted on land with an agroforestry pattern. The price of cinnamon is also quite fluctuating and greatly affects the economy of Kerinci Regency in general (Permadi et al., 2021). Elmanora et al., (2012) research shows that cinnamon farmers only get small profits even though cinnamon is an export commodity. The small profits are estimated to be due to unsustainable harvest patterns and prices that tend to be unstable (Thomas & Kuruvilla, 2012). The combination with coffee, citrus and other agricultural crops has been proven to increase farmers' overall profits from their land.

Contribution of Agroforestry for Farmer's Income

In theory, the contribution of agroforestry is obtained from the total income of farmers from agroforestry divided by the total income of farmers multiplied by 100%. From the results of data analysis, it was found that the average total income of farmers from agroforestry was IDR 37,009,016.67/year. While the total income of farmers was IDR 60,874,316.67/year. Following the existing formula, it can be seen that the contribution of agroforestry to farmers' income was 51.97%.

The finding that agroforestry contributed 51.97% of total household income indicates that agroforestry is not merely a supplementary activity in Jujun Village, but rather a core livelihood strategy for many farming households. This proportion suggests a substantial degree of economic dependence on tree-based mixed farming systems, particularly those centered on cinnamon as the dominant crop. In practical terms, more than half of total household income is derived from agroforestry, which demonstrates that the system plays an important buffering role against uncertainty in off-farm and non-agricultural income sources. This is especially relevant in rural settings where income diversification is essential for reducing vulnerability to market and climatic shocks.

The relatively high contribution of agroforestry in this study can be explained by several interrelated local factors. First, cinnamon is a culturally and economically embedded commodity in Kerinci, and farmers in Jujun Village are already familiar with its cultivation, management, and long-term economic value. Second, the agroforestry systems observed are not limited to cinnamon alone but combine cinnamon with other productive species such as citrus, coffee, banana, ginger, galangal, durian, avocado, and candlenut, thereby creating temporal income layering. Annual and short-cycle crops can generate more immediate cash flow, while perennial and timber-oriented species function as medium- to long-term assets. This pattern reflects a classic agroforestry livelihood mechanism in which crop diversity helps smooth household income over time.

These results are broadly consistent with previous studies showing that agroforestry contributes significantly to household income and livelihood security.

For example, the contribution observed in this study is comparable to the 54% contribution of coffee-based agroforestry reported by Suyanto et al. (2007), suggesting that the magnitude found in Jujun Village is not anomalous but falls within the upper range of commercially oriented smallholder agroforestry systems. Likewise, studies by Tiwari et al. (2017), Quandt et al. (2018), and Nöldeke et al. (2021) emphasize that agroforestry improves household resilience by diversifying income sources and reducing exposure to production risk. The present findings support that broader literature, while also reinforcing the argument made by Wanderi et al. (2019) that agroforestry outcomes are highly context-specific and shaped by local crop composition, land size, market access, and the maturity of perennial crops.

Analysis of Farmers' Welfare Level

According to Sajogyo (1997), household expenditure per capita per year refers to the total yearly expenses of farmer households, encompassing both food and non-food items, divided by the number of household members. This method has been also adopted by Hastuti, et al., (2021), Baruwadi, et al., (2021), and Hartoyo, et al., (2021) This expenditure is then expressed in terms of rice equivalents per kilogram to evaluate poverty levels. The results of processing and analysis of farmer expenditure data from Jujun Village are presented in the Table 2.

Table 2. Expenditure of Jujun Village Farmers

	Number of Family Members	Household Expenditure (IDR/Year)		Total Expenditure	Total Expenditure per capita
		Food Expenditure	Non-Food Expenditure		
Total	104	443,916,000	925,128,000	1,369,004,000	235,806,400
Average	4	7,398,600	30,387,600	38,236,200	9,559,050

Based on the Table 2., it can be seen that the average per capita expenditure level of farming families is at IDR 9,559,050. This figure is obtained by dividing the total expenditure in a year by the total number of family members (104 people). From Table 2 it can also be seen that food expenditure is much less than non-food expenditure. The percentage of food expenditure of only around 19.35% is very far when compared to Suandi's research (2010) which found that the percentage of family food expenditure in Kerinci was 48%. This phenomenon is estimated to occur due to several things including the eating habits of farmers in the village and technological developments. Eating habits in the village usually rely on natural resources in the surrounding area, especially since Jujun Village is located on the edge of Lake Kerinci so that fish and other aquatic side dishes are easy to get and tend to be cheaper. Meanwhile, technological developments are very rapid and affect people's appetite for things other than food such as furniture, telecommunications costs including buying mobile phones and children's school fees which tend to increase (Aufadina & Irfansyah, 2021).

Table 3. Farmer Welfare Levels

Welfare Indicators	Per Capita Expenditure Equivalent to Kilograms of Rice Per Year (kg)	Number of Families	Percentage (%)
Poorest	<180	1	3.33
Very Poor	180-240	1	3.33
Poor	240-320	3	10
Nearly Poor	320-480	10	33.33
Sufficient	480-960	8	26.67
Decent Living	>960	7	23.33

This per capita expenditure figure per year (IDR 9,559,050/year) then divided by the price of rice per kilogram (IDR 12,500) to obtain the level of farmer welfare in Jujun village so that we get a number of 765 kg/year. Based on the Sajogyo welfare indicator table, the figure is in the "sufficient" range, which means that on average the level of farmer welfare in Jujun village is in the sufficient category. The level of welfare of farmers in Jujun village is completely presented in Table 3.

The welfare analysis shows that the average per capita expenditure of farmer households was equivalent to 765 kg of rice per year, placing the average household in the "sufficient" category according to the Sajogyo indicator. In addition, 83.33% of respondents were above the poverty line, with the largest proportions concentrated in the nearly poor (33.33%), sufficient (26.67%), and decent living (23.33%) categories. These findings suggest that, overall, agroforestry households in Jujun Village have attained a moderate level of economic well-being, although many remain close to the lower threshold of vulnerability.

These welfare findings are consistent with previous studies that identify agroforestry as a mechanism for improving livelihood security and reducing rural poverty (Tiwari et al., 2017; Mukhlis et al., 2022; Keprate et al., 2024). However, the results also nuance that literature by showing that even in a village where agroforestry contributes more than half of household income on average, welfare gains remain unevenly distributed. This underscores the importance of moving beyond aggregate income indicators and considering household heterogeneity when evaluating agroforestry's social impact.

CONCLUSION

Agroforestry is basically expected to be able to increase land productivity and farmer income. In this study, agroforestry contributed significantly to farmer income in Jujun Village, Kerinci Regency with a value of 51.97%. This high contribution indicates that agroforestry is indeed beneficial to improving the standard of living of farming communities. Agroforestry activities also directly or indirectly affect the improvement of the welfare of the Jujun Village community. In general, Jujun Village farmers are in the sufficient category. Although not the highest category, it can already approach a decent life. Further research related to agroforestry in Jujun village needs to be continued with more specific discussions. Including the most

profitable agroforestry combination and the most suitable for the characteristics of Jujun village.

AUTHOR CONTRIBUTION STATEMENT

[Author 1]: research designed, research supervision, the initial manuscript draft; [Author 2]: data collection, data analysis, edited the manuscript; [Author 3]: research conceptualization, research designed, analytical guidance; [Author 4]: data collection, addressed reviewer's comments. All authors reviewed and approved the final version of the article.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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ETHIC STATEMENT

Ethical review and approval were waived for this study as it did not involve any intervention and posed minimal risk to participants. Nevertheless, informed consent was obtained from all respondents prior to participation, and all data were anonymized and kept confidential.

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