

# Agroforestry's Contribution to Climate-Resilient Livelihoods of Community Forest Farmers in Wonogiri Regency, Central Java, Indonesia

Nurya Rufaida Zulfa, Rissa Rahmadwiati\*, Supriyadi, Manggar Arum Aristri, and Malihatun Nufus

Department of Forest Management, Faculty of Agriculture, Universitas Sebelas Maret, 57126 Surakarta, Indonesia

**Abstract.** Community forests with agroforestry systems are a crucial alternative for enhancing farmers' incomes and optimizing land use while maintaining perennial tree cover, which can contribute to climate change mitigation through increased on-farm carbon storage. In addition, the agroforestry system is also an effort to optimize land use in the context of climate change, where a diversified tree-crop system can reduce households' vulnerability to production and income shocks caused by the negative impacts of climate change. This study analyzes the economic value and agroforestry's contribution to the community forest farmers' income in Sumberejo Village, Wonogiri Regency. Data collection methods included observation, questionnaires, interviews, and documentation, which were then analyzed quantitatively. The results showed 21 agroforestry constituent plants in the research location, with a total economic value of IDR 684,800,022.944 per year. The primary livelihood of the people in Sumberejo Village is farming, and the land is managed using an agroforestry system. The types of agroforestry applied are agrosilvopasture, agrosilviculture, and silvopasture. The constituent stands consist of dominant main stands of *Tectona grandis* with an economic value of IDR 19,080,531.36 (2.79%) and dominant annual crops of *Zea mays*, which has the highest monetary value of IDR 512,776,615.38 (74.88%). Agroforestry contributes 60% to farmers' household income. In addition to finding the economic value and contribution of agroforestry, this study also analyzed the income factors of community forest farmers. Multiple linear regression test results indicate that the variables of education (X2) and land area (X4) significantly impact farmers' income (Y), with coefficient values ranging from 0.230 to 0.294. These results can inform policymakers in integrating community-based agroforestry into climate mitigation and rural development strategies, guide extension services in promoting economically viable and climate-smart land-use practices, and support further research on the long-term socio-ecological performance of agroforestry systems.

---

\* Corresponding author: rahmadwiati.r@staff.uns.ac.id

## 1 Introduction

In recent decades, climate change and environmental degradation have risen to the forefront of national and global development agendas, underscoring the need for land-use systems that are both productive and environmentally sustainable. Climate change and broader environmental degradation are increasingly threatening rural livelihoods, particularly in tropical regions where communities depend heavily on land-based resources. Rising temperatures, shifting rainfall patterns, and more frequent extreme weather events can reduce agricultural productivity and intensify pressure on remaining forest areas [1]. Conventional monoculture systems often fail to provide long-term resilience in the face of increasingly unpredictable climatic conditions. Community-based forest management and agroforestry have therefore emerged as essential alternative land-use strategies that integrate trees, crops, and sometimes livestock to maintain ecosystem functions while sustaining household incomes. In this context, nature-based solutions such as community forests and agroforestry systems are gaining prominence as strategies that can simultaneously support local livelihoods, enhance ecosystem services, and contribute to climate change mitigation and adaptation.

Communities and forests have a very close relationship, especially community forests. According to [1], communities rely heavily on ecosystem services and natural resources to support themselves. As much as 70% of the community's timber needs in Java are met by wood from community forests. This means that community forests are the primary source of livelihood for the community. Forests directly support community livelihoods through the use of forest products as necessities, the sale of forest goods, and increased agricultural productivity [2]. In addition, agroforestry also contributes to livelihoods by increasing crop and livestock production through its influence on the availability of groundwater and light [3]. This causes greater pressure on the forest. One solution to reduce this is forest management, which involves the application of agroforestry. Agroforestry is a land-use system based on environmental sustainability, which involves cultivating or combining forestry and crops (plantations and livestock) to improve the economic well-being of farmers in rural areas [14, 15] [4,5].

In the tropics, agroforestry plays a crucial role in the community. Agroforestry can enhance the resilience of local agricultural systems, help farmers adapt to varying circumstances, and provide a broader range of income options [6] [4]. An agroforestry system can also provide a source of income for farmers [7] [5]. Through the use of the agroforestry approach, they anticipate increasing their income and harvesting goods on a regular basis [8] [6]. However, proper management is necessary to increase this income, allowing the agroforestry to run optimally. The growth of farmer empowerment, namely by providing farmers with the information and skills they require, can enhance the ability of agroforestry farmers [9] [7]. Additionally, agroforestry can also be developed as a dryland use with high environmental conservation value. It is expected that the implementation of agroforestry systems can provide benefits to the agricultural and forestry sectors in Indonesia, making them more productive, environmentally friendly, and sustainable.

Wonogiri District is one of the districts in Central Java Province that can develop and implement community forests with agroforestry patterns. Previous studies in Wonogiri have shown that community forests with agroforestry patterns are widely adopted by farmers and supported by diverse stakeholders, and that farmers generally perceive agroforestry-based community forests as necessary for both their livelihoods and environmental functions [10] [8]. Community forests in Wonogiri have been well-managed through the application of agroforestry or other effective management systems. One of the villages in Wonogiri that has implemented an agroforestry system is Sumberejo Village in Batuwarno District. Based on data on the population's composition by livelihood, the majority of the population of

Sumberejo Village works as farmers, either on rice fields or in community forests. The people of Sumberejo Village have implemented an agroforestry system, but do not recognize the term agroforestry; the local terms used are tumpangsari and karang kitri. Recent research in Sumberejo has focused on characterizing soil quality and various agroforestry types, including teak, mahogany, and mixed agroforestry. However, it has not addressed the economic value of these systems or their direct contribution to household income [11] [9].

The contribution to farmers' income from forest land management with agroforestry systems is the presence of agricultural crop yields on a weekly, monthly, or annual basis, depending on the type of crop planted [12] [10]. At the broader Indonesian scale, several studies have quantified the contribution of agroforestry systems to farmer income in different regions and management contexts, generally showing that agroforestry can be an important component of rural livelihood portfolios [12] [10]. However, there is still limited empirical evidence on the extent to which community-forest-based agroforestry contributes to household income at the village level in Wonogiri, particularly in dryland landscapes that are vulnerable to climate variability. This can be more accurately understood by identifying the constituent plant types and calculating the economic value of agroforestry. Given these facts, this study is necessary to ascertain the monetary value and contribution of agroforestry systems to the livelihoods of community forest farmers in Sumberejo Village, as no previous research has specifically evaluated the economic value and income contribution of agroforestry in this village. Additionally, this research provides a novel contribution by (1) quantifying the monetary value of community-forest-based agroforestry and its share in farmers' household income in Sumberejo Village, and (2) analyzing the socio-economic factors that influence farmers' income in an agroforestry-based community forest system, thereby offering village-level evidence that is relevant for designing climate-resilient livelihood strategies.

## 2 Methods

This research was conducted in Sumberejo Village, Batuwarno Subdistrict, Wonogiri Regency, Central Java, in July and August 2024. Sumberejo Village is located in Batuwarno District, Wonogiri Regency, Central Java Province. Sumberejo village is divided into several sub-villages, namely Ngandong, Semawur, Rowo, Rembun, Gembuk, Putuk, Kalinekuk, and Wates. Sumberejo village is situated on the border between the two districts of Batuwarno and Baturetno. Astronomically, Sumberejo Village is located at 7°32'-8°15' S and 110°41'-111°18' E. Sumberejo Village has an area of 552.00 hectares, predominantly consisting of farmland and forest land, each covering an area of 191.00 hectares. The respondents in this study numbered 78, comprising members of the Sumberejo Village Farmer Group.

### 2.1 Data collection

This study used Purposive sampling for data collection. Purposive sampling is a data collection technique that requires specific considerations from the researcher, as it assumes the researcher has access to the necessary information for the research. Purposive sampling is used when interviewing participants who have satisfied the requirements set out by the researchers. Purposive sampling is a data collection technique that requires specific considerations. The data collection techniques used in this study include:

*2.1.1 Observation:* This method can record things related to the research topic directly at the time of the incident. In this study, observations were conducted to assess the condition of community forest land, and interviews were held directly with farmers who are the

landowners. The observation method is conducted to obtain primary data. The primary data needed for this research includes:

- a. Respondent identities include name, age, address, gender, education, main occupation, side job, number of family members, and others.
- b. Components of income from agroforestry management, such as gardens, agriculture, livestock, fisheries, and non-agroforestry, such as laborers, civil servants, traders, and others.
- c. The components of production costs include labor wages, fertilizers, tools, and others.
- d. The types of products planted, both forestry and agricultural types.

*2.1.2 Interviews*, in this study, were conducted using a structured interview system, namely by asking the same questions to each respondent. Interviews, conducted in the form of questionnaires, will be conducted with landowners to gather the necessary information and data for researchers. A questionnaire is a data collection technique that provides a set of questions for respondents to answer.

*2.1.3 Documentation*: All results related to data collection will be documented for later processing in data analysis and also as evidence.

## 2.2 Analysis of data

In this study, the data analysis employed was regression analysis and interactive analysis. The regression analysis used is multiple linear regression, which aims to determine the R Square value, the F-test, the t-test, and the regression equation. Multiple linear regression aims to determine the relationship between the dependent variable and two or more independent variables. Regression analysis in this study used the SPSS version 16 application. The data collected is then tabulated to facilitate processing and determine the economic value and contribution of agroforestry. The following formula is used to find the economic value and contribution of agroforestry:

### 2.2.1 Economic value

Economic value is the value assigned by someone to an economic good based on the benefits that can be obtained from that good. Essentially, the value of a product is determined by its supply, demand, and scarcity. Agroforestry is one of the high-value uses of forest resources. The majority of residents in Sumberejo Village oversee and operate an agroforestry system. The following formula (1) is used to calculate the economic value of agroforestry products by type:

$$NH = TP \times HH \quad (1)$$

Description:

NH: Agroforestry product value per type.

TP: Total collection (unit/year).

HH: Agroforestry product price.

### 2.2.2 Agroforestry contribution

Agroforestry aims to achieve sustainable productivity sustainably. The contribution of agroforestry to the income of respondents was calculated by dividing the income derived from agroforestry by the overall income of respondents, which included both agroforestry and non-agroforestry income. The income in question is net income, which is the result of revenue minus total expenditure. Then, the value generated is converted into a percentage, multiplied by 100%. The following is the formula (2) for calculating the contribution of agroforestry [13] [12]:

$$Kr = \frac{R}{PT} \times 100\% \quad (2)$$

Description:

Kr: Contribution of agroforestry.

R: Farmer income from agroforestry.

PT: Total income of farmer households.

## 3 Results and discussion

### 3.1 Characteristics of respondents

The characteristics of the respondents provide an overview of the socio-economic and demographic profile of community forest farmers involved in agroforestry systems in Sumberejo Village. Understanding these characteristics is crucial for interpreting how various factors, such as age, education, farming experience, and land ownership, may influence farmers' decisions to adopt agroforestry practices and their ability to benefit economically from them. In the context of this study, respondent characteristics also help explain variations in household income and the role of agroforestry in supporting rural livelihoods under changing environmental and climate conditions. The characteristics of the respondents are the criteria provided by the researcher to the research subjects, in this case, the respondents. This is necessary so that the research objectives can be achieved, as the source of information aligns with the researcher's expectations. The results of the respondent characteristics data are presented in Table 1 (Source: Primary Data, 2024).

**Table 1.** Respondent characteristics data.

No.	Characteristics	Total (people)	Percentage (%)
1	<b>Gender and Age</b>		
	Male	61	78
	Female	17	22
	26-35	1	1
	36-45	9	12
	46-55	24	31
	56-65	30	38
	>65	14	18
2	<b>a. Main Occupation</b>		
	Farmer	67	86
	Village official	4	5
	Carpenter	1	2
	Trader	3	4
	Teacher	1	1
	Private employee	1	1
	Labourer	1	1
	<b>b. Side Occupation</b>		
	Farmer	11	14
	Selling vegetables	4	5
	Livestock	15	19
	Labourer	7	9
	Trader	6	8
Handyman	4	5	
Other	6	6	
None	25	32	
3	<b>Access to the Community Forest</b>		
	Motorbike	45	58
	Walking	33	42
4	<b>Number of family members</b>		
	1	2	3
	2	21	27
	3	21	27
	4	21	27
	5	5	11
	6	3	4
7	1	1	
5	<b>Land Area</b>		
	<1 ha	44	56
	1-2 ha	22	28
	2-3 ha	10	13
	>3 ha	2	3
6	<b>Education</b>		
	Not in school	2	1
	Primary school	42	54
	Junior high school	16	20
	Senior high school	17	22
	S1	2	3
7	<b>Income (IDR)</b>		
	<1,000,000.00	10	13
	1,000,000.00-2,000,000.00	32	41
	2,000,000.00-3,000,000.00	30	38
	3,000,000.00-4,000,000.00	6	8

The following is an explanation of the respondent characteristic data shown in Table 1:

### *3.1.1 Gender*

Men were the dominant gender in this study, with 61 people. Work in agriculture requires fairly strong energy, so more men work on the land than women. This is because the productivity of men is higher than that of women [12]. Sumberejo women tend to have easier jobs, such as trading and working from home. However, some women work in the fields to avoid increasing labor costs and reduce expenses.

### *3.1.2 Age*

According to [13], Regulation of the Minister of Manpower of the Republic of Indonesia Number 10 of 2021 concerning the Strategic Plan of the Ministry of Manpower for 2020-2024, the productive age is defined as being between 15 and 64 years old. Based on the classification of respondents by age, the productive age range, from 15 to 64 years, is the dominant age group, accounting for 77% of respondents, or a total of 60 respondents. A person's productive age will impact their physical well-being, which in turn affects their daily activities and overall quality of life. As age increases, physical strength will decrease.

### *3.1.3 Occupation*

Farmers are the primary occupation, with a total of 67 respondents. This is because it has been a hereditary tradition in the family. The people of Sumberejo Village have fields that can be utilized, as evidenced by all respondents having private land (as opposed to rented land), so many people choose to manage these fields rather than seeking other employment opportunities. In addition, with their age limitations, they choose to farm because the distance is not too far and tends to be close to where they live. In addition, agriculture makes a significant contribution by making money relatively quickly. Meanwhile, in the type of side job, the majority of respondents did not have a side job. Most respondents hold side jobs in addition to their farming activities. [14] [13] State that the existence of a side job that a person does is because the income from the main job is not sufficient to meet daily needs.

### *3.1.4 Access to community forests*

Forty-five respondents traveled to the community forest by motorbike, compared to those who walked. Respondents prefer riding motorbikes to save time and energy, especially when they are far from the land. However, at a relatively short distance, respondents chose to walk. One more reason respondents walk is that they lack transportation.

### *3.1.5 Number of family members*

The classification of respondents based on the number of family members is dominated by those with 2, 3, and 4 family members, with 21 respondents falling into this category. The number of members in a family will affect the family's income or expenses. If more than one member is working in a family, the higher the income earned.

### 3.1.6 Land area

The land area of <1 ha was the largest land area managed by respondents, with 44 respondents. The fact that the majority of respondents only own <1 ha of land causes limited crops to be planted because the land owned is not large enough. The smaller the land ownership by farmers, the smaller the profit earned by farmers [14] [13].

### 3.1.7 Education

The respondent's education level is predominantly at the elementary level, with 42 respondents. The type of employment and compensation received will depend on an individual's level of education. The quality of human resources will improve in a region where educational attainment is raised. If the quality of human resources decreases, it will negatively impact productivity and lead to lower income.

## 3.2 Income

The majority of respondents have low incomes, ranging from 1 to 2 million per month. One of the factors causing the low income is the area of land managed. This aligns with the statement by [4, 5]. The factor that affects the income level of agroforestry farmers is the area of land under management, because it has a significant effect on income

### 3.2.1 Economic value

The economic value of staple crops and agroforestry constituent plants is important to know because it can maximize the results of agroforestry patterns. If the community chooses plants with high economic value, the results obtained will increase due to the high selling price of these plants. A similar statement states that farmers who allocate at least 40-50% of their land to plant high-value economic crops will experience a significant increase in income [14]. Economic value can be calculated by multiplying the number of products produced by the average selling price of these products. The following are the results of the calculation of the economic value of agroforestry constituent plants displayed in Table 2.

As shown in Table 2, *Zea mays* is a plant with the highest economic value of IDR 512,776,615.38, accounting for 74.88% of the total. This is evidenced by almost all respondents, specifically 65 out of a total of 78 respondents, who planted corn as a constituent plant in agroforestry. The intensity of the corn harvest in a year is twice, so the results obtained are more than those of plants that are only harvested once a year. Additionally, corn is a plant that exhibits good adaptability, as it can grow in various types of soil, climates, and altitudes ranging from sea level to 2000 meters above sea level. This statement is based on the topography of Sumberejo Village, which is at an altitude of 201-400 masl. In addition to planting food crops, respondents also planted medicinal plants for family use, which is a key component of agroforestry. Rhizome plants, a type of medicinal family plant, are easy to grow and highly popular among the general public due to their numerous health benefits, including types of empon-empon such as turmeric and ginger. In staple crops, the highest economic value is owned by *Tectona grandis* because *Tectona grandis* Linn. f is one of the trading timbers with high economic value due to its high quality. The value reached IDR19,080,531.36. The majority of community land is planted with *Tectona grandis*, whether those trees were planted in the past or are currently growing.

**Table 2.** Economic Value of Crops Comprising Agroforestry in Sumberejo Village.

No.	Type name	Unit	Total collection (per year)	Economic value (IDR)	Percentage (%)
1	<i>Tectona grandis</i>	m <sup>3</sup>	5.28	19,080,531.36	2.79
2	<i>Swietenia macrophylla</i>	m <sup>3</sup>	1.53	4,360,500.00	0.64
3	<i>Paraserianthes falcataria</i>	m <sup>3</sup>	9.29	11,612,500.00	1.70
4	<i>Acacia mangium</i>	m <sup>3</sup>	0.32	310,400.00	0.05
5	<i>Samanea saman</i>	tree	1	1,000,000.00	0.15
6	<i>Parkia speciosa</i>	tree	2	1,700,000.00	0.25
7	<i>Artocarpus heterophyllus</i>	tree	3	135,000.00	0.02
8	<i>Anacardium occidentale</i>	kg	25	375,000.00	0.05
9	<i>Leucaena leucocephala</i>	tree	1	100,000.00	0.01
10	<i>Artocarpus altilis</i>	tree	1	350,000.00	0.05
11	<i>Persea americana</i>	kg	675	14,150,000.00	2.07
		tree	6		
12	<i>Zea mays</i>	kg	122,900	512,776,615.38	74.88
13	<i>Manihot esculenta</i>	kg	11,630	37,880,571.43	5.53
14	<i>Arachis hypogaea</i>	kg	300	1,500,000.00	0.22
15	<i>Curcuma longa</i>	kg	6,290	18,510,571.43	2.70
16	<i>Zingiber officinale</i>	kg	105	1,020,000.00	0.15
17	<i>Kaempferia galanga</i>	kg	15	105,000.00	0.02
18	<i>Oryza sativa</i>	kg	9,060	59,393,333.33	8.67
19	<i>Alpinia galanga</i>	kg	30	90,000.00	0.01
20	<i>Curcuma zanthorrhiza</i>	kg	50	300,000.00	0.04
21	<i>Vigna unguiculata</i>	tie	10	50,000.00	0.01
<b>Total</b>				<b>684,800,022.94</b>	<b>100</b>

Source: primary data (2024)

### 3.2.2 Agroforestry contribution

Contribution can be found by knowing the total income of respondents from various sources of income. Two components are needed to determine income: total income and expenses. Revenue from agroforestry is the result of the application of agroforestry on community land. At the same time, non-agroforestry revenue refers to the income generated by respondents from land that does not involve agroforestry and from other sources of income owned by

respondents. The following are details of the calculation of agroforestry and non-agroforestry revenues (Table 3).

**Table 3.** Result of agroforestry and non-agroforestry’s revenues.

No.	Indicator	Kind of revenue	Total (IDR)	Percentage (%)
1	Agroforestry	Agrosilvopastura	454,687,619.05	25
		Agrisilviculture	244,363,333.33	14
		Silvopastura	19,466,666.67	1
		Other	1,083,000,000.00	60
<b>Total</b>			<b>1,801,517,619.05</b>	<b>100</b>
2	Non Agroforestry	Agriculture	206,084,000.00	23
		Side occupation	708,120,000.00	77
		<b>Total</b>	<b>914,204,000.00</b>	<b>100</b>

Source: primary data (2024)

First, in terms of revenue from agroforestry, the Sumberejo Village community applies three types of agroforestry. The first is agrosilvopastura, an agroforestry planting system that combines staple crops, annual crops, and livestock. In the study, agrosilvopastura was the type of agroforestry with the highest acceptance, with a percentage of 25%, this results showed that applying agrosilvopastura provided a positive indication. Agrisilviculture, as defined by [15] [11], it is an agroforestry system that combines elements from agricultural (non-woody plants) with forestry (woody plants). Meanwhile silvopastura, is an agroforestry planting system that, in its application, combines trees and livestock (such as fodder and livestock) on the same land unit [5].

The next is non-agroforestry revenue. Most non-agroforestry income is generated from other jobs, accounting for 77% of the total. Other types of work done by respondents include traders, teachers, laborers, drivers, artisans, village officials, employees, and individuals with various other occupations. Agricultural products account for the least important non-agroforestry income, at only 23%. The agricultural products in question are plants grown by respondents outside of or not on agroforestry land. The following explanation is the result of the calculation of agroforestry and non-agroforestry expenditures presented in Table 4.

**Table 4.** Result of agroforestry and non-agroforestry spending.

No.	Indicator	Kind of revenue	Total (IDR)
1	Agroforestry	Agriculture	109,254,000.00
		Farm	65,736,000.00
		Food	1,196,400,000.00
<b>Total</b>			<b>1,371,390,000.00</b>
2	Non Agroforestry	Education	196,200,000.00
		Transportation	199,728,000.00
		Water and electricity	152,160,000.00
		Wifi and pulse	71,016,000.00
<b>Total</b>			<b>621,744,000.00</b>

Source: primary data (2024)

Table 4 presents the total spending on agroforestry and non-agroforestry activities. In agroforestry spending, the most significant expenditure is on food, totaling IDR 1,196,400,000. Based on community facts, respondents fulfill their food needs by shopping for daily staples using income from crops. The next spending is non-agroforestry spending. The most significant non-agroforestry expenditure is on transportation needs, amounting to IDR 199,728,000.00. Next, water and electricity expenditure is the second lowest spending.

This is because, especially for water, 13 springs are utilized by the village for PAM (drinking water company), and managed by the Sumberejo village community. After the results of revenue and spending are known, the contribution of agroforestry can be calculated. The following data processing results on the contributions of agroforestry to respondents' income are presented in Table 5.

**Table 5.** Contribution of agroforestry to farmers' income in Sumberejo Village.

No.	Indicator	Revenue (IDR)	Spending (IDR)	Income (IDR)
1	<b>Agroforestry</b>	718,517,619.00	174,990,000.00	543,527,619.05
2	<b>Non Agroforestry</b>	1,997,204,000.00	1,815,504,000.00	181,700,000.00
<b>Total income</b>				<b>725,227,619.05</b>

Source: primary data (2024)

The results showed that in Sumberejo Village, agroforestry contributed 60% of the family income of community forest farmers. According to [5], the 60% contribution percentage is included in the medium contribution. This value indicates that the agroforestry system in Sumberejo Village plays a significant role in the income of community forest farmers, suggesting that the community's dependence on agroforestry in Sumberejo Village is relatively high. The maximum land utilization by community forest farmers influences the value of the agroforestry contribution. Additionally, the community can choose plants with high economic value to be planted, thereby increasing the benefits they receive. The results of this study align with the research by [4, 5], which states that income from agroforestry products makes a significant contribution to the community compared to income from non-agroforestry products. Therefore, it can be stated that the agroforestry system can improve the welfare of people's lives. Then, similar research by [4,5] stated that respondents optimally utilize their land space, resulting in a significant contribution to total income from agroforestry. Additionally, the factor of plants managed by farmers during the productive period is also very influential.

### 3.2.3 Factors influencing income

The analysis of factors affecting respondents' income employs multiple regression analysis, which aims to determine the effect of independent variables (X) on the dependent variable (Y). The independent variables in this study are age (X1), education (X2), family dependents (X3), and land area (X4). Meanwhile, the dependent variable is income (Y). First, the data normalisation test is conducted before the multiple regression test. The data normalisation test used in this study is the Kolmogorov-Smirnov test, which is performed with the SPSS version 16 application (Table 6).

**Table 6.** Normality test results (Kolmogorov-Smirnov) on the SPSS application.

		Unstandardized Residual
N		78
Normal Parameters	Mean	.0000000
	Std. Deviation	.67889714
Most Extreme Differences	Absolute	.091
	Positive	.091
	Negative	-.051
Kolmogorov-Smirnov Z		.804
Asymp. Sig. (2-tailed)		.538

**a. Test distribution is Normal**

The results show that the data are normally distributed, as shown in Table 6. This is because the significance value obtained is more than 0.05, namely 0.538. If the significance value greater than 0.05 indicates that the data is usually distributed. The data have been declared normally distributed, allowing multiple linear regression tests to proceed. After conducting multiple linear regression tests in the SPSS application, the results regarding the R-squared value, F-test, t-test, and multiple linear regression equations are presented in Tables 7, 8, and 9.

**Table 7.** Results of the coefficient of determination (R-squared) on the SPSS application.

Model	R	R Square	Adjust R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.515	.266	.225	.69725	.266	6.600	4	73	.000

- a. Predictors: (Constant), Land are, Age, Education, Family members
- b. Dependent Variable: Income

Table 7 displays the coefficient of determination, or R-squared (R<sup>2</sup>), obtained after the regression test, which is 0.266, or 26.6%, if the research using survey data (primary data), an R-squared value of 0.2 or 0.3 can be considered reasonable.

**Table 8.** Results of the ANOVA test on the SPSS application.

Model		Sum of Squares	df	Mean Square	F	Sig
1	Regression	12.834	4	3.209	6.600	.000137
	Residual	35.489	73	.486		
	<b>Total</b>	<b>48.324</b>	<b>77</b>			

Table 8 presents the results of the ANOVA output, also known as the F-test, that was carried out. The significant (Sig) value obtained in the ANOVA table is 0.000137 (<0.05). Therefore, it may be said that concurrently (together), the variables of age (X1), education (X2), family dependents (X3), and land area (X4) have a significant effect on the income variable (Y).

**Table 9.** Results of the coefficients on the SPSS application.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.716	.750		2.288	.025
	Age	-.013	.009	-.157	-1.347	.182
	Education	.230	.095	.265	2.416	.018
	Family members	.101	.074	.160	1.378	.172
	Land area	.294	.120	.250	2.444	.017

Based on Table 9 above, the multiple linear regression equation (3) may be found as follows:

$$Y = 1,716 - 0,013X1 + 0,230X2 + 0,101X3 + 0,294X4 \tag{3}$$

The results of the multiple linear regression analysis, presented in Table 9, indicate whether the independent variables have a partially significant effect on the dependent

variable. The independent variable is said to affect the dependent variable if it has a p-value  $< 0.05$ . The education variable (X2) obtained a Sig value of 0.018 ( $< 0.05$ ), and the land area variable (X4) obtained a Sig value of 0.017 ( $< 0.05$ ). Therefore, the education and land area variables partially affect the income variable.

## 4 Conclusion

The types of plants that make up agroforestry include *Tectona grandis*, *Swietenia macrophylla*, *Paraserianthes falcataria*, *Acacia mangium*, *Samanea saman*, *Parkia speciosa*, *Artocarpus heterophyllus*, *Anacardium occidentale*, *Leucaena leucocephala*, *Artocarpus altilis*, *Persea americana*, *Zea mays*, *Manihot esculenta*, *Arachis hypogaea*, *Curcuma longa*, *Zingiber officinale*, *Kaempferia galanga*, *Oryza sativa*, *Alpinia galanga*, *Curcuma zanthorrhiza*, and *Vigna unguiculata*. The total economic value of the 21 agroforestry constituent plants was IDR 684,800,022.94 per year. Agroforestry constituent plants that yield the highest economic value are corn, with an economic value of IDR 512,776,615.38 (74.88%). The agroforestry's contribution to the community forest farmers' household income in Sumberejo Village, Wonogiri Regency, resulted in a 60% increase. This means that agroforestry that has been implemented has a significant contribution to the survival of community forest farmers in Sumberejo Village. Factors that influence the income of community forest farmers in Sumberejo Village include the level of education and the size of the cultivated land area.

**Acknowledgement.** The researchers would like to thank Sumberejo Village for permitting us to conduct the research. Thank you to the Head of KTH and field assistants who accompanied and helped with the data collection process. Thanks to the friends who have helped researchers with data collection, and thanks to the entire class of 20 for the prayers and support they have provided to the researchers. This study was funded by the non-budgetary funds of the Universitas Sebelas Maret for the 2025 fiscal year (Number: 371/UN27.22/PT.01.03/2025).

## References

1. Pisanelli, A.M., Bregasi, A., Jupe, and E. Toromani, Research priorities and opportunities within the forestry and agroforestry sectors in Albania. *iForest Biogeosciences and Forestry*. **3**, 1. (2021). doi:10.3832/ifor0534-003.
2. Rasmussen, L.C. Watkins, and A. Agrawal, Forest contributions to livelihoods in Changing agriculture-forest landscapes. *Forest Policy and Economics*. **84**, 1–8. (2017). doi: 10.1016/J.FORPOL.2017.04.010.
3. Muthuri, C.W., S. Kuyah, M. Njenga, A. Kuria, and M.V. Noordwijk, Agroforestry's contribution to livelihoods and carbon sequestration in East Africa: a systematic review. *Tree, Forests and People*. **14**, 1. (2022).
4. A. Anuja, A. Kumar, S. Saroj, and K. Singh, The impact of crop diversification towards high-value crops on the economic welfare of agricultural households in Eastern India. *Current Science*. (2020).
5. Latifah, N.A. Lubis, F.K.A., and A. Purwoko, Contribution of non-timber forest product (NTFP) to households' income in South Tapanuli Regency, Indonesia. *Journal Of Physics: Conference Series*. **1**, 1542. (2020).
6. Hani, Aditya, B. Dendang, and L.A.G. Pieter, Malapari (*Pongamia pinnata* (L.) Pierre) growth on three planting patterns with trichoderma and mycorrhizae application. *Indonesian Journal of Forestry Research*. **8**, 2. (2021).

7. Premono, B.T., and S. Lestari, Financial analysis on agroforestry system of coffee with marrango tree (*Azadirachta Excelsa* Jack.) in Rejang Lebong regency, Bengkulu province, Indonesia. *Indonesian Journal of Forestry Research*. **5**, 1. (2018).
8. Hani, Aditya, and E. Suhaendah, Diversity of soil macro fauna and its role on soil fertility in manglid agroforestry. *Indonesian Journal of Forestry Research*. **6**, 1. (2019).
9. Suyadi, Sumardjo, Z. Uchrowi, and P. Tjitropranoto, Factors affecting agroforestry farmers' capacity surrounding a national park. *Indonesian Journal of Forestry Research*. **6**, 1. (2021).
10. Hudiyani I., Purnaningsih N., Asngari P.S., and Hardjanto H, An analysis of stakeholders in agroforestry community forest management in Wonogiri Regency, Central Java Province, Republic of Indonesia. *International Journal of Sciences: Basic and Applied Research*, **32**(3), 164–185.
11. Prinandhika G. M., Supriyadi S., Purwanto P., & Dewi W. S., Assessing soil quality and identifying key indicators in agroforestry systems in Sumberejo Village, Wonogiri Regency, Indonesia. *International Journal of Design and Nature and Ecodynamics*, **18**(4), 1003–1010. (2023). [doi:10.18280/ij dne.180429](https://doi.org/10.18280/ij dne.180429).
12. Wati M. A., Kaskoyo H., Nurindarwati R., Qurniati R., & Puspasari E., Contribution of agroforestry and factors affecting income of the conservation partnership group at Wan Abdul Rachman Grand Forest Park. *Jurnal Rimba Lestari*, **2**(1), 15–23. (2022).
13. Minister of Manpower of the Republic of Indonesia, Regulation of the Minister of Manpower of the Republic of Indonesia Number 10 of 2021 concerning the Strategic Plan of the Ministry of Manpower for 2020-2024. (2021).
14. Rai, M.B. Paudel, Y. Zhang, N. Khanal, P. Nepal, and H. Koirala, Vegetable farming and farmers' livelihood: insights from Kathmandu Valley, Nepal. *Sustainability*. **1**, 1. (2019). [doi:10.3390/SU11030889](https://doi.org/10.3390/SU11030889).
15. Rosso, Laura, S. Cantamessa, P.M. Chiarabaglio, and D. Coaloa, Competition effects and economic scenarios in an agroforestry system with cereal crops and wood plantations: a case study in the Po Valley, Italy. *iForest Biogeosciences and Forestry*. **14**, 421. (2021). [doi:10.3832/ifor3842-014](https://doi.org/10.3832/ifor3842-014).