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The Effectiveness of Extension Services in Enhancing Farmers' Capacity to Support the Success of the Social Forestry Program in the Nanga-Nanga Papalia Protection Forest

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Abstract

The Social Forestry Program positions local communities as the primary actors in sustainable forest management; however, its success depends on their capacity in terms of perceptions, attitudes, and participation. In the Nanga-Nanga Papalia Protection Forest, Kendari City, the Nanga-Nanga Hijau and Puncak Harapan Farmer Groups still have limited understanding of the concepts of Social Forestry and sustainable forest management. Therefore, this study aims to evaluate the effectiveness of extension services in enhancing farmers' capacity and to analyze the influence of internal factors on their perceptions, attitudes, and participation. The method employed was structured extension services conducted on September 21, 2025, through the stages of preparation, implementation, and evaluation. Assessment was conducted before and after the extension activities. A follow-up evaluation was conducted three weeks after the extension activities involving the same 20 respondents, who were selected purposively. The data were measured using a Likert scale, consisting of 6 items for perceptions, 10 items for attitudes, and 23 items for participation, and were analyzed descriptively. The effect of the extension activities was tested using a Paired Samples t-test, while the effects of age, education, number of dependents, income, and farming experience were examined using multiple linear regression. The results showed a significant increase following the extension activities, with the mean perception score increasing from 16.60 to 21.10, attitude from 28.25 to 34.20, and participation from 67.55 to 83.15. The paired-samples t-test yielded a significance value of 0.000 < 0.05, with large effect sizes of d = 1.18, 0.95, and 1.35. The regression results showed that age, education, and number of dependents had positive effects, but their effects on perceptions, attitudes, and participation were not statistically significant. Meanwhile, income and farming experience had negative effects and were not statistically significant. It can be concluded that extension services are effective in improving farmers' capacity; therefore, continuous assistance and mentoring are necessary.

Keywords: *attitudes; extension effectiveness; participation; perceptions; social forestry*

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INTRODUCTION

Forests are one of the natural resources that must always be conserved and sustainably maintained, given their highly strategic role in maintaining the balance of ecosystems on Earth. Jo et al. (2024) and Kandari et al. (2024) stated that forests provide various benefits, including oxygen production, carbon sequestration, hydrological regulation, serving as buffer zones, catchment areas, maintaining soil fertility, providing sources of genetic resources, and forming and influencing the microclimate within the broader forest ecosystem. However, rapid population growth has increased pressure on forests, both in terms of quantity and quality (Zhunusova et al., 2025; Alam et al., 2024).

Quantitative pressure on forests is reflected in the decreasing extent of forest areas due to land-use changes, while qualitative pressure is characterized by declining biodiversity resulting from the loss of various flora and fauna species within forest areas (Santoro et al., 2023; Kandari et al., 2020; Owens et al., 2025; Kandari, 2025a). This situation indicates that forest management cannot rely solely on forest conservation approaches but also requires a social approach that positions communities as an essential component in maintaining the sustainability of forest ecosystems.

Forest degradation also occurs in the Nanga-Nanga Papalia Protection Forest, Kendari City. The area is characterized by hilly terrain with slope gradients ranging from 15° to 60°. The soil is predominantly sandy clay, with soil pH ranging from 5.5 to 6.5. The area with potential for management covers approximately 350 ha, but only about 150 ha has been utilized to date. The high demand for agricultural land resulting from population growth is one of the factors that may increase pressure on forest areas if they are not managed through an appropriate management system.

Most communities surrounding the Nanga-Nanga Papalia Protection Forest depend on the agricultural sector for their livelihoods. Members of farmer groups involved in managing the forest area range in age from 35 to 65 years, with educational backgrounds varying from elementary school graduates to university graduates (Hamzah, 2025). These socioeconomic conditions indicate the community's dependence on land resources, necessitating a forest management approach that can accommodate the economic interests of local communities while maintaining the ecological functions of the forest area.

Field conditions indicate a reality that differs from what is expected. According to Kandari (2025b) and Ainurrohmah and Sudarti (2022), forest areas continue to experience degradation, resulting in increasing global temperatures and triggering climate change. One of the main factors driving this condition is rapid population growth, which has led to a declining ratio of agricultural land ownership, expansion of residential areas, and increasing demand for food, firewood, construction timber, and livestock feed crops (Kandari, 2024a; Mando et al., 2020a). Consequently, this situation may encourage illegal logging and encroachment of forest areas by local communities, as well as widespread conversion of forests into agricultural land and non-forest areas (Duguma et al., 2019; Amalia et al. 2022; Shapiro et al., 2023; Kandari et al., 2019).

One approach developed by the government to address these problems is the Social Forestry Program. This program is a sustainable forest management strategy that provides communities with legal access to manage forest areas while maintaining their ecological functions. Based on Government Regulation of the Republic of Indonesia No. 23 of 2021, Social Forestry is a sustainable forest management system implemented in State Forests as well as Private Forests and Customary Forests by local communities or customary law communities as the primary actors. The program aims to improve community welfare, maintain environmental balance, and support social and cultural dynamics through various schemes, including Village

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Forests, Community Forests, Community Plantation Forests, Customary Forests, and Forestry Partnerships (Government of the Republic of Indonesia, 2021).

The implementation of the Social Forestry Program in the Nanga-Nanga Papalia Protection Forest is an important strategy for reducing tenure-related issues while increasing community involvement in maintaining the sustainability of the forest area. Through a legal management scheme, communities not only gain greater certainty in utilizing forest areas but are also encouraged to develop productive activities through the utilization of non-timber forest products and environmental services without altering the primary function of the area as a protection forest.

Nevertheless, the existence of management permits under the Social Forestry scheme does not fully guarantee the success of the program envisioned by the government. Based on field conditions, communities belonging to the Nanga-Nanga Hijau Farmer Group and the Puncak Harapan Farmer Group have been managing land within the forest area since 2018 but still have limited knowledge of the concept of Social Forestry, the status and functions of the forest area, sustainable forest management, climate change adaptation, and the role of institutions in supporting the sustainability of the program. This limited understanding may affect community perceptions, attitudes, and levels of participation in implementing the Social Forestry Program. Therefore, extension and mentoring activities are needed to enhance community capacity as the primary actors in forest area management. Extension services function not only as a means of knowledge transfer but also as an empowerment instrument to raise community awareness of the importance of maintaining the ecological functions of forests while increasing the economic benefits of legally and sustainably managing forest areas. According to Ullah et al. (2022), access to extension services can increase community awareness of the importance of conservation and encourage changes in attitudes and behavior toward collaborative forest management.

Based on these problems, this community service activity aims to improve community knowledge, attitudes, and participation in supporting the implementation of the Social Forestry Program in the Nanga-Nanga Papalia Protection Forest, Kendari City. In addition, this activity aims to evaluate changes in community perceptions, attitudes, and participation before and after the extension activities as indicators of the success of the community service program.

METHOD

This community service program was implemented through a structured and systematic extension approach to improve community understanding and participation in the implementation of Social Forestry. The activities consisted of the following stages: 1) Preparation, 2) Implementation, and 3) Evaluation. A more detailed description of the problem-solving stages in the 2025 Internal Community Service Program of the Faculty of Forestry and Environmental Sciences, Halu Oleo University (FFES, UHO), is presented in Figure 1.

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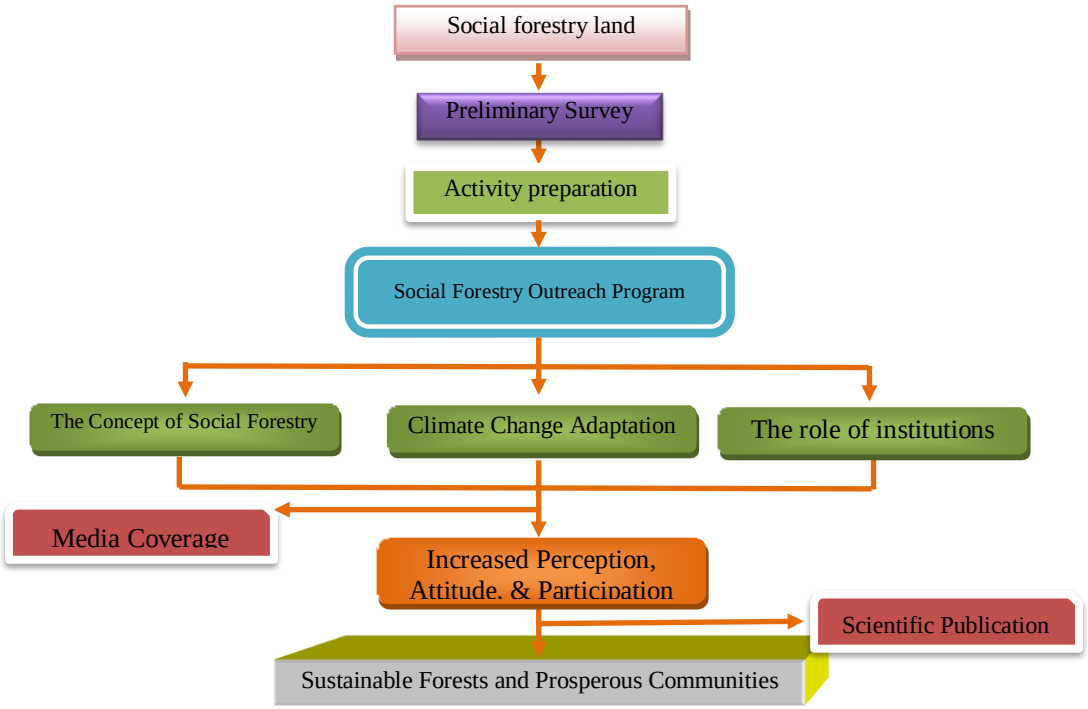


Figure 1. Problem-Solving Framework of the 2025 Internal Community Service Program at FFES UHO

The preparation stage was carried out through coordination with farmer groups and other stakeholders, a preliminary survey, preparation of equipment and materials for the extension activities, and other necessary preparations. Coordination with the farmer groups was conducted to discuss the agenda and their participation in the extension activities. Coordination was also carried out with other stakeholders, including the Head of the Gularaya Forest Management Unit (FMU), the Head of the Kendari City Agriculture Office and Agricultural Extension Officers, the Babinsa and Babinkantibmas of Abeli Subdistrict, as well as journalists. The preliminary survey was conducted to identify the conditions of the area that had obtained a Social Forestry permit and to interview 20 purposively selected farmers to determine their socioeconomic and demographic characteristics, perceptions, attitudes, and participation regarding the Social Forestry Program, particularly in the protection forest area. The preparation of equipment and materials involved the use of a laptop, projector, mobile phone, megaphone, and stationery. The prepared material consisted of questionnaire sheets.

Implementation Stage. The extension activity was conducted on Sunday, September 21, 2025. The activity was divided into two segments, namely the delivery of extension materials and a discussion session. The extension materials covered three main topics: (1) The Concept of Social Forestry, (2) Climate Change Adaptation, and (3) The Role of Institutions. Subsequently, the discussion session was conducted through a question-and-answer process between the presenters and the participants or farmers. Furthermore, to ensure that the activity could reach a broader audience, it was considered necessary to disseminate information about the activity through television, print, and online media.

Evaluation Stage. Three weeks after the extension activity was conducted, follow-up interviews were carried out with the same 20 respondents from the Nanga-Nanga Hijau Farmers' Group and the Puncak Harapan Farmers' Group. The respondents were selected purposively based on the consideration that the farmers were directly involved in implementing the Social Forestry program in the field. Therefore, they were considered relevant for assessing changes in the perceptions, attitudes, and levels of participation of farmers' group members in the Social Forestry program.

The subsequent data analysis was conducted by assigning weights to each variable, using a modified Likert scale ranging from 1, 2, 3, 4, and 5 for each question within each variable. The Likert scale is a psychometric instrument widely used to measure attitudes, opinions, or perceptions. This scale presents respondents with a series of statements accompanied by symmetrical response options, typically ranging from "Strongly Disagree" to "Strongly Agree" (Koo and Yang, 2025). The perception variable consisted of 6 questions, the attitude variable consisted of 10 questions, and the participation variable consisted of 23 questions. To determine the respondents' conditions for each variable, class intervals were established using the formula applied by Nazir (1998, as cited in Mando et al., 2020b), as follows. For further details, see Table 1.

$$\text{Interval (I)} = \frac{\text{Measurement Distance (MD)}}{\text{Number of Classes}} \quad \ldots\ldots\ldots\ldots (1)$$

$$= \frac{\text{Highest Score} - \text{Lowest Score}}{\text{Number of Classes}} \quad \ldots\ldots\ldots\ldots (2)$$

Table 1. Criteria for Assessing Farmers' Capacity in Relation to the Success Rate of Extension Services among Social Forestry Farmer Groups in the Nanga-Nanga Papalia Protection Forest, 2025

Variable	Number of Questions	Highest Score	Lowest Score	Class Interval	Mean Score	Remarks
Perception	6	30	6	$\frac{30-6}{5} = \frac{24}{5} = 5$	1) 26 – 30 2) 21 – 25 3) 16 - 20 4) 11 - 15 5) 6 – 10	1) VG 2) G 3) N 4) P 5) VP
Attitude	10	50	10	$\frac{50-10}{5} = \frac{40}{5} = 8$	1) 42 – 50 2) 34 – 41 3) 26 - 33 4) 18 - 25 5) 10 – 17	1) VG 2) G 3) N 4) P 5) VP
Participation	23	115	23	$\frac{115-23}{5} = \frac{92}{5} = 18$	1) 95 -115 2) 77 - 94 3) 59 - 76 4) 41 - 58 5) 23 – 40	1) VG 2) G 3) N 4) P 5) VP

Notes: VG = Very Good, G = Good, N = Neutral, P = Poor, VP = Very Poor

Further analysis was conducted to determine the effect of the extension program on farmers' perceptions, attitudes, and participation in the social forestry program using the Paired Sample t-test. Prior to this analysis, a normality test was performed to ensure that the data met one of the basic assumptions of the parametric test, namely that the differences between the pre-test and post-test scores were normally distributed.

Furthermore, in addition to the influence of counseling, other factors also need to be analyzed for their relationship with perception, attitude, and participation. These internal characteristics include: Age, level of education, number of family dependents, income level, and farming experience of the respondents. Therefore, it needs to be analyzed using multiple linear regression, preceded by classical assumption tests which include residual normality test, multicollinearity test, and heteroscedasticity test to ensure that the model meets the assumptions of linear regression. Furthermore, the F-test, t-test, and analysis of the coefficient of determination (Adjusted R^2) will be conducted.

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RESULTS AND DISCUSSION

The results of the preliminary survey indicated that prior to the extension activities, farmers' perceptions in both the Puncak Harapan and Nanga-Nanga Hijau Farmer Groups toward the Social Forestry program were categorized as moderate or neutral, with a mean score of 16.60. In addition, the average attitude score of farmers was 28.25, which also fell within the neutral category. Similarly, farmers' participation in the Social Forestry Program was classified as moderate or neutral, with a mean score of 67.55. Further details are presented in Table 2.

Table 2. Farmer Capacity Before the Extension Activities in Farmer Groups of the Social Forestry Program in the Nanga-Nanga Papalia Protected Forest, 2025

Varible	Score	Total (Persons)	Mean Score	Remarks
Perception	26 – 30	1	1,50	VG
	21 – 25	6	6,90	G
	16 – 20	4	3,65	N
	11 – 15	6	3,65	P
	6 – 10	3	6,00	VP
	Total	20	16,60	N
Attitude	42 – 50	0	0,00	VG
	34 – 41	6	11,95	G
	26 – 33	5	7,50	N
	18 - 25	6	6,55	P
	10 - 17	3	2,25	VP
	Total	20	28,25	N
Participation	95 -115	0	0,00	VG
	77 - 94	5	23,50	G
	59 - 76	6	22,45	N
	41 - 58	5	14,25	P
	23 - 40	4	7,35	VP
	Total	20	67,55	VG

Source: Primary data, processed in 2025

The perception, attitude, and participation scores fall into the neutral category due to limited knowledge and experience in implementing the Social Forestry Program. In fact, they have been managing land in the Nanga-Nanga Protected Forest Area, which has already obtained a Social Forestry permit under the community forestry scheme. Therefore, it is considered essential to conduct extension activities on Social Forestry, covering both theory and practice, to support forest conservation and improve the welfare of communities in the surrounding area. Accordingly, the extension materials must be appropriate and delivered by professionals as follows: the first material, entitled "The Role of Social Forestry in Maintaining Climate Stability," presented by Prof. Dr. Ir. Aminuddin Mane Kandari, M.Si.; the second material, entitled "Social Forestry for Farmers' Welfare and Forest Sustainability," presented by La Ode Agus Salim Mando, S.Hut., M.Sc.; and the third material, entitled "The Role of Institutions as Drivers of Forest Management Activities Based on Social Forestry," presented by Hafidah Nur, SP., M.Si. Further details are presented in Figure 2.

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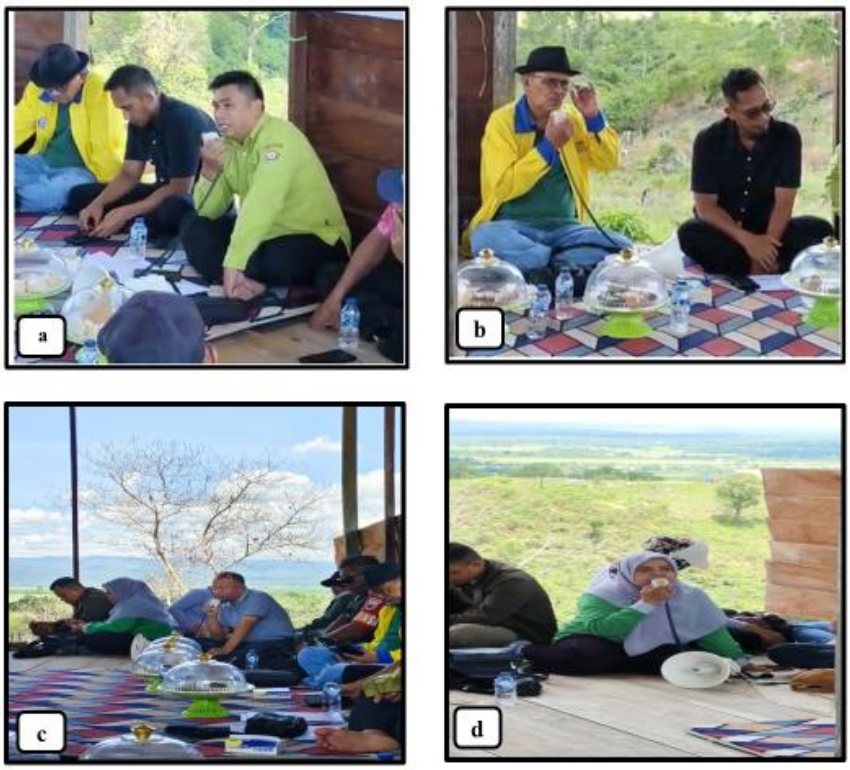


Figure 2. Atmosphere of the Extension Material Presentation, with the following details: (a) Opening remarks and official opening of the activity by the Acting Head of Gularaya KPHP, (b) 1st Speaker; (c) 2nd Speaker, and (d) 3rd Speaker

However, the results of follow-up interviews conducted approximately three weeks after the material presentation showed a substantial increase in the aspects of community perception, attitude, and participation. For the perception variable, the average score before the extension activity was 16.60 (Neutral), but after the extension activity it increased to 21.10 (Good). Similarly, for the attitude variable, the initial average score was 28.25 (Neutral) and has now become 34.20 (Good). This was also followed by the participation variable, where the initial average score of 67.55 (Neutral) increased to 83.15 (Good). Further details are presented in Table 3.

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Table 3. Farmer Capacity After the Extension Activities in Farmer Groups of the Social Forestry Program in the Nanga-Nanga Papalia Protected Forest, 2025

Varible	Score	Total (Persons)	Mean Score	Remarks
Perception	26 – 30	4	5,90	VG
	21 – 25	6	7.20	G
	16 – 20	6	5,45	N
	11 – 15	4	2,55	P
	6 – 10	0	0,00	VP
	Total	20	21,10	G
Attitude	42 – 50	3	7,40	VG
	34 – 41	7	14,20	G
	26 – 33	5	7,00	N
	18 – 25	4	4,60	P
	10 – 17	1	1,00	VP
	Total	20	34,20	G
Participation	95 -115	3	17,10	VG
	77 – 94	6	28,20	G
	59 – 76	6	23,20	N
	41 – 58	4	12,60	P
	23 – 40	1	2,05	VP
	Total	20	83,15	G

Source: Primary data, processed in 2025

The effect of extension activities on perception, attitude, and participation in the social forestry program was analyzed using a Paired Sample t-test. The results showed a Sig. (2-tailed) value of 0.000 < 0.05 for all variables, indicating a significant difference between pretest and posttest scores. Thus, the extension activities significantly improved respondents' perception, attitude, and participation. Further details are presented in Table 4.

Table 4. Effect of Extension Activities on Farmer Capacity in the Implementation of the Social Forestry Program in the Nanga-Nanga Papalia Protected Forest, 2025

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper			
Pair 1	Perception_Pre - Perception_Pos	-4,50000	3,81824	0,85378	-6,28699	-2,71301	-5,271	19	0,000
Pair 2	Attitude_Pre - Attitude_Pos	-5,95000	6,26162	1,40014	-8,88053	-3,01947	-4,250	19	0,000
Pair 3	Participation_Pre - Participation_Pos	-15,60000	11,53211	2,57866	-20,99719	-10,20281	-6,050	19	0,000

Source: Primary data, processed in 2025

Based on Table 4 above, the effect of extension activities on farmers' perception was obtained from: Cohen's d = (Mean difference) / (Std. Deviation) = (-4.50) / 3.82 = -1.18 = 1.18. Since this value is ≥ 0.80, it indicates that the extension activities had a large effect on farmers' perception. Similarly, using the same method, the extension activities on the attitude and participation variables each had d = 0.95 and d = 1.35 ≥ 0.80, which means that the extension activities had a large effect on respondents' attitude and participation.

In addition to the effect of extension, there are also other factors that influence the level of perception, attitude, and participation, namely: age (X1), education level (X2), number of dependents (X3), income (X4), and farming experience (X5). Based on the results of multiple regression analysis, the equations for perception (Y1), attitude (Y2), and participation (Y3) are as follows:

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$Y1 = 3.664 + 0.319X1 + 1.740X2 - 0.417X3 - 1.554X4 - 0.171X5;$
$Y2 = -37.755 + 0.827X1 + 9.065X2 + 3.730X3 - 3.707X4 - 1.360X5;$
$Y3 = 27.720 + 1.119X1 + 7.961X2 + 5.133X3 - 1.709X4 - 1.490X5.$

Based on the multiple regression equations, the factors influencing farmers' perception of the acceptance of the social forestry program are age and education because they have positive values. Meanwhile, number of family dependents, income, and farming experience are considered to have no effect or a negative effect. For the attitude variable: age, education level, and number of family dependents have a positive effect, whereas income and farming experience have a negative effect. The participation variable is also influenced by age, education, and number of family dependents. However, it should be noted that these values do not yet determine the strength of the influence of the independent variables on the dependent variables, as other tests are still required.

Table 5. Internal Characteristics Affecting Farmer Capacity in the Implementation of the Social Forestry Program in the Nanga-Nanga Papalia Protected Forest Area, 2025

Perception									
Variabel Dependent	Model Summary			ANOVA		Coefficients			
	R	R^2	Adjusted R^2	F	(Uji F)	B	β	t	Sig.
1	0,453	0,205	-0,078						
Regression				0,724	0,617				
(Constant)						3,664		0,192	0,850
Age						0,319	0,267	1,192	0,253
Education						1,740	3,300	0,527	0,606
Household_Dependents						-0,417	1,706	-0,244	0,810
Monthly_Income						-1,554	0,000	-0,274	0,788
Farming_Experience						-0,171	0,596	-0,286	0,779
Attitudes									
1	0,631	0,318	0,183						
Regression				1,852	0,167				
(Constant)						-37,76		-1,310	0,211
Age						0,827	0,900	2,045	0,060
Education						9,065	0,441	1,818	0,090
Household_Dependents						3,73	0,419	1,464	0,165
Monthly_Income						-.3,71	0,121	0,432	0,672
Farming_Experience						-1,360	0,647	-1,511	0,153
Participation									
1	0,446	0,199	-0,087						
Regression				0,695	0,636				
(Constant)						27,720		0,440	0,667
Age						1,119	0,643	1,267	0,226
Education						7,961	0,204	0,730	0,477
Household_Dependents						5,133	0,301	0,911	0,378
Monthly_Income						-1,709	-0,295	-0,911	0,378
Farming_Experience						-1,490	0,374	-0,757	0,461

Source: Primary data, processed in 2025

The correlation coefficient for the perception variable showed an R value of 0.453, which means that age, education, number of dependents, income, and farming experience have a positive influence, but the strength is categorized as moderate. The coefficient of determination $R^2 = 0.205$

indicates that 20.5% of the variation in perception can be explained by the variables of age, education, number of family dependents, income, and farming experience included in the regression model. Meanwhile, 79.5% of the variation in perception is influenced by other factors outside the research model. The Adjusted R^2 value of −0.078 indicates that after adjusting for the number of independent variables and sample size, the regression model is not yet able to explain the variation in perception well. Further details of the multiple regression analysis results are presented in Table 5.

The R value of 0.631 indicates that there is a strong positive relationship between the independent variables simultaneously and the attitude variable toward the Social Forestry Program. Based on the classification by Sugiyono (2019), a correlation coefficient value in the interval of 0.60–0.799 is included in the strong category. The R^2 value of 0.318 indicates that 31.8% of the variation in farmers' attitudes toward Social Forestry can be explained by the independent variables simultaneously. Meanwhile, 68.2% of the variation in attitude is influenced by other factors outside the research model. The Adjusted R^2 value of 0.183 indicates that after adjusting for the number of independent variables and sample size, the regression model is still able to explain 18.3% of the variation in farmers' attitudes.The R value of 0.446 in the participation column indicates that there is a positive relationship with a moderate level between the independent variables simultaneously and farmers' participation in the Social Forestry Program. Based on the classification by Sugiyono (2019), a correlation value in the interval of 0.40–0.599 is included in the moderate category. The R^2 value of 0.199 indicates that the independent variables together are able to explain 19.9% of the variation in farmers' participation in the Social Forestry Program. The Adjusted R^2 value of −0.087 indicates that given the number of independent variables used in the model and the sample size, the model's ability to explain the variation in participation is classified as very low.Based on the results of the simultaneous test (F-test), the calculated F value was 0.724 with a significance value of 0.617. This significance value is greater than the 5% significance level (0.05), so it can be concluded that the variables of age, education, number of family dependents, income, and farming experience simultaneously do not have a significant effect on farmers' perception of the Social Forestry Program. The same assessment also applies to the attitude and participation variables, which are not influenced by the independent variables.

The age of the farmer respondents from the Nanga-Nanga Hijau Farmer Group and the Puncak Harapan Farmer Group ranged from 40 to 60 years. This result is consistent with other studies. The Beta coefficient was 0.267 with a calculated t-value of 1.192 and a significance of 0.253. Since the significance value of 0.253 > 0.05, age does not have a significant effect on farmers' perception of the Social Forestry Program. The positive Beta coefficient indicates that the direction of the relationship between age and perception is positive. This means that, by tendency, an increase in farmers' age is followed by an increase in perception scores, although the effect is not statistically strong enough. The same explanation also applies to the attitude and participation variables, where the age variable does not have a significant effect on attitude and participation.

In a global meta-analysis combining 66 cases from 47 studies, Bhusal et al. (2025) showed that the age of the household head is positively related to the level of participation in community forestry institutions, although the magnitude of the effect depends on the type of institution and research location. Age not only influences a person's involvement in physical activities and utilization of forest resources, but also influences perception, attitude, and level of participation in forest management (Salimath et al., 2024).

The education level of farmers in the Nanga-Nanga Protected Forest Area varied, ranging from junior high school graduates, senior high school graduates, to university graduates. It was

also found that education had a positive influence on farmers' perception, attitude, and participation, although it was not significant. Based on the linear regression test results above, the education level variable had a Beta coefficient of 3.300 with a calculated t-value of 0.527 and a significance level of 0.606. The significance value of 0.606 > 0.05 indicates that H0 is accepted. Thus, education level does not have a statistically significant effect on farmers' perception in the implementation of the Social Forestry Program. This finding indicates that both farmers with low and high levels of education have relatively similar perceptions of the program. This is likely because extension and mentoring from the program implementers have been able to equalize understanding among all farmers regardless of their educational background.

The same explanation also applies to the relationship between education level and attitude and participation, because the Beta values, t-values, and significance levels provide the same statistical conclusion that education level has a positive but not significant effect. The explanation and meaning of the relationship between education level and farmers' attitude and participation in the implementation of the Social Forestry Program based on the multiple linear regression test indicate that education has a positive relationship with attitude and participation, but it is not significant. This is slightly different from Lestari et al. (2015), who stated that socioeconomic variables, such as education level and income, influence the level of community participation in community-based forest management, although the magnitude of the effect varies at each level of participation.

The number of household members of farmers in the social forestry area of the Nanga-Nanga Protected Forest was quite varied, but generally most had more than three dependents. The presence of the number of family dependents in relation to perception, attitude, and participation based on the test results in the table above indicates that the size of the number of family dependents is not a determining factor in shaping farmers' perception of the implementation of the Social Forestry Program. These results differ from Bista et al. (2022), who reported that statistical analysis showed household size was positively related to the likelihood of community members participating in community forest management and in the decision-making process. A recent meta-analysis also noted that from 248 predictor variables tested in 66 cases across 18 countries, factors such as demographic characteristics, number of household members, and landholding size were the variables most frequently influencing community participation in forest management (Bhusal et al., 2025).

The internal characteristic of farming income based on the results of multiple linear regression analysis showed that it did not have a significant effect on farmers' perception, attitude, and participation, because it had a sig value > 0.05, although it had a positive relationship. This research result is in line with several previous studies. Samosir (2023) found that socioeconomic characteristics such as income were not correlated with KTH members' participation in Community Forest management. The same finding was also expressed by Hikmawati et al. (2021), who stated that income did not have a partial effect on farmers' knowledge and decision-making. Both high-income and low-income farmers have equal opportunities to obtain information and form perceptions. Thus, farmers' perception is more influenced by factors such as extension, access to information, and perceived benefits rather than by economic factors alone.

Similarly, for farming experience, among farmers in the Nanga-Nanga Protected Forest it did not have a significant effect on perception, attitude, and participation in the implementation of the Social Forestry Program. This research result is in line with the study by Azwar et al. (2016) on oil palm cooperatives, which found that farming experience had no relationship with farmers' perception. A similar finding was also reported by Stephani et al. (2019) on Community Forests (HKm) in Jambi, who stated that overall there was no significant relationship between socioeconomic factors and members' participation in HKm activities. This is likely because in the

Social Forestry Program, farmers' perception and participation are more influenced by external factors such as the intensity of extension, access to information, and perceived program benefits, rather than by the length of farming experience.

The improvement of farmers' capacity in the form of perception, attitude, and participation in the Social Forestry Program has shown significant changes after extension activities were conducted. In addition, the farmers greatly depend on the land they currently manage to meet their livelihood needs. However, farmer mentoring and education must continue to be maintained so that the Social Forestry Program does not fail. According to Ullah et al. (2022), access to extension services can increase community awareness of the importance of conservation and shift community attitudes and behavior toward collaborative forest management.

CONCLUSION

This community service research proves that extension activities have a significant effect on improving farmers' capacity to support the Social Forestry Program in the Nanga-Nanga Papalia Protected Forest. Three weeks after the extension, the average scores of farmers' perception, attitude, and participation increased significantly from 16.60 to 21.10, from 28.25 to 34.20, and from 67.55 to 83.15, respectively. The results of the Paired Sample t-test showed a significant difference with a Sig. value of 0.000 < 0.05 and a large effect size for the three variables, namely d = 1.18, 0.95, and 1.35. Multiple linear regression analysis showed that farmers' internal factors in the form of age, education level, number of dependents, income, and farming experience did not have a significant effect on perception, attitude, and participation. This indicates that the improvement of farmers' capacity is more influenced by external factors, particularly the intensity of extension and access to information. Although an improvement has occurred, there are still farmers in the neutral to poor category, thus continuous mentoring is required. Therefore, it is recommended that stakeholders conduct extension activities regularly and strengthen farmer group institutions to ensure the success and sustainability of the Social Forestry Program.

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AI Disclosure

Generative Artificial Intelligence (AI) and AI-assisted technologies were used solely to improve the readability and organization of the manuscript. All outputs generated through these tools were carefully reviewed, edited, and validated by the author to ensure accuracy, completeness, and alignment with the study's original content. The author assumes full responsibility and accountability for the integrity of the work, including its analysis, interpretation, and conclusions. AI tools were not used for data generation, data analysis, or as a substitute for scholarly judgment, and are not listed as authors or co-authors of this study.

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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