



Efforts to Increase Community Participation in Agroforestry Land Conservation on the Slopes of Mount Muria

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Abstract

Background: The slopes of Mount Muria serve as a water catchment area, a habitat for biodiversity, and a source of community livelihoods through agroforestry. However, land-use conversion, non-conservation-oriented cultivation practices, erosion, and landslides threaten the sustainability of these areas.

Objective: This study aims to describe community activities on agroforestry land, identify the forms and assess the levels of community participation, and formulate strategies to strengthen participation in agroforestry land conservation in Colo Village, Dawe Subdistrict, Kudus Regency.

Methods: A descriptive quantitative approach with a cross-sectional survey design was employed. From a population of 454 coffee farmers, 46 respondents were selected through proportional random sampling. Data were collected using questionnaires, observations, interviews, and documentation and were analyzed using descriptive percentages based on *Abu Huraerah's* forms of participation and *Arnstein's Ladder of Citizen Participation*.

Results: Community participation was classified as good, with a score of 78.57%. Material contributions (85.76%) and labor contributions (81.30%) were dominant, while skills contributions (74.13%) required further strengthening. The level of participation was also categorized as good, with an overall score of 70.96%, comprising *Nonparticipation* (77.81%), *Citizen Power* (71.06%), and *Tokenism* (66.30%). Among the indicators, *Information* received the lowest score (60.51%). These findings demonstrate that conservation outcomes depend on the quality of community involvement throughout the land-management process.

Conclusion: The study supports a community-empowerment-based conservation education approach and recommends strengthening farmer-group institutions, participatory extension services, technical skills, and information transparency to improve community participation in agroforestry land conservation.

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INTRODUCTION

In Indonesia, natural resources have been used both to support economic needs and to sustain ecological functions. During recent decades, however, increasingly intensive exploitation has damaged the environment and weakened its ecological capacity. Stronger conservation measures are therefore necessary to prevent natural resources from being depleted before their potential can be used optimally (Marsono, 2004; Pramudiyanti, 2026).

The slopes of Mount Muria, located in the Central Java region of Indonesia, face various environmental problems that have serious impacts on ecosystem conditions. One prominent issue is extensive deforestation, in which uncontrolled logging activities result in the loss of vegetation cover that plays a crucial ecological role. This condition makes the soil on the slopes of Mount Muria more susceptible to erosion, especially during high-intensity rainfall. Soil erosion not only threatens vegetation and wildlife habitats but also increases the risk of landslides and flooding in surrounding areas.

Field observations indicate that communities on the slopes of Mount Muria are converting agroforestry land into monoculture agricultural land or plantations. This condition is influenced by household economic pressures and communities' limited understanding of the ecological value of forests from a cultural perspective, resulting in fluctuations and an overall decline in the area of production forests, particularly in peripheral areas adjacent to settlements (Banowati et al., 2025).

Unsustainable farming practices constitute another major source of environmental degradation on the slopes of Mount Muria. Excessive applications of chemical fertilizers and pesticides may contaminate soil and water and disrupt the balance of local ecosystems. Moreover, cultivation practices that do not follow soil-conservation principles, including overly intensive tillage, increase erosion risk and reduce soil fertility. Addressing these problems requires cooperation between government institutions and local communities in implementing sustainable measures, including reforestation, prudent water-resource management, and increased environmental awareness, so that the ecosystem of the Muria slopes remains viable for future generations.

Located in Central Java, Indonesia, the Muria Mountains form a range with considerable historical, cultural, and natural significance for neighboring communities. Geographically, the range extends across the northern part of the province and encompasses areas within Jepara, Kudus, and Pati Regencies.

The Muria volcanic complex lies in northern Java within the Sunda back-arc zone and comprises a group of volcanic features. Mount Muria is the largest and highest volcano in the complex, rising to 1,625 meters above sea level (Astjario & Kusnida, 2007; Pramudya et al., 2026). Astjario and Kusnida (2007) state volcanic processes have shaped the area's plains, hills, and mountains (Astjario & Kusnida, 2007; Pramudya et al., 2026). The plains occur along the western, northern, and eastern coastal sectors and include the Kudus-Pati Plain to the south. Their lithology is dominated by weathered lahar deposits and alluvium, with pyroclastic deposits and lava occurring at several locations (Widjanarko, 2013; Widjanarko et al., 2022).

Hilly landforms occupy the foothills and lower slopes of Mount Muria, the vicinity of Mount Genuk, and the Mount Pati Ayam area. These zones are composed mainly of lava, lahar, and pyroclastic materials. The mountainous zone encompasses the summit areas of Mount Muria and Mount Genuk, which function as eruption centers, and contains lava, intrusive rocks, and pyroclastic breccia (Widjanarko, 2013; Widjanarko et al., 2022).

Part of the forest area on Mount Muria is managed by Perum Perhutani through KPH Pati, with a total area of 10,107.40 ha. This area consists of production forest covering 149.90 ha, limited production forest covering 3,529.00 ha, and protected forest covering 6,428.50 ha. The working area of KPH Pati's forest management covers the administrative regions of Pati, Jepara, and Kudus Regencies. In its implementation, forest management in KPH Pati is divided into three Forest Management Sections (*Bagian Kesatuan Pemangkuan Hutan* [BKPH]), namely, BKPH Gajah Biru, with an area of 2,165.20 ha; BKPH Muria Pati Ayam, covering 2,931.20 ha; and BKPH Ngarengan, covering 1,332.10 ha. In addition, there is a conservation area in the form of protected forest covering 1,402.80 ha, managed by the Pati Territorial Agro-Ecology Section of the West Java Natural Resources Conservation Agency and located in the border area of Pati and Jepara

Regencies (Widjanarko, 2013; Widjanarko et al., 2022).

Land protection and preservation play an important role in maintaining ecosystem balance. One measure that can be applied to prevent environmental degradation is conservation. The implementation of conservation should not depend solely on top-down approaches, such as government policies, but should also be driven by local communities at the grassroots level. This is because local communities are among the groups most vulnerable to the direct impacts of environmental degradation. Therefore, local community involvement is a crucial element in addressing various environmental problems. Natural resource management systems based on community participation have the potential to strengthen ecological sustainability because communities are actively involved in environmental protection through conservation practices and the preservation of local values (Prabandani & Astuti, 2025; Setyowati et al., 2017). Naharuddin (2018) states that increasing land-use efficiency while controlling erosion rates can be achieved through the integrated application of conservation measures using both civil-engineering (mechanical) and vegetative methods, such as terracing combined with multiple-cropping patterns, including agroforestry systems (Putra, 2026).

Agroforestry tree stands contribute to the restoration and improvement of land quality. Dense vegetation reduces evaporation and moderates solar radiation, thereby creating a microclimate favorable to microorganisms and plant growth, particularly during the dry season. In addition, multilayered canopies formed by trees and seasonal crops, together with litter on the ground, reduce the kinetic energy of raindrops reaching the soil and help maintain the microclimate by increasing surface cover (Atmojo, 2008; Ritnawati et al., 2026).

Based on field observations, the forestry plants cultivated by communities and Perhutani in the Muria Mountains area include sengon (*Falcataria moluccana*), teak (*Tectona grandis*), and mahogany (*Swietenia mahagoni*). In addition, kapok randu (*Ceiba pentandra*) trees are still found in several areas because this commodity was formerly a leading product in the Muria Mountains area, known as Java kapok. MPTS (multi-purpose tree species), or non-forestry perennial plants, commonly found in this area include coffee (*Coffea* sp.), avocado (*Persea americana*), and pomelo (*Citrus maxima*). These plant species have become widely established because they are suitable for local environmental conditions and currently provide relatively good economic value for communities. Food and secondary crops, such as rice (*Oryza sativa*), cassava (*Manihot esculenta*), and corn (*Zea mays*), are also widely distributed and generally cultivated throughout various areas of the Muria Mountains. However, problems arise when these plants are cultivated in unsuitable locations, such as on cliffs or steeply sloping land. Therefore, the application of agroforestry technology in this area needs to consider conservation principles, particularly by avoiding indiscriminate planting of seasonal or annual food crops.

In the Muria Mountains area, rhizomatous plants commonly cultivated by communities include ginger (*Zingiber officinale*), cardamom (*Amomum compactum*), kencur (*Kaempferia galanga*), and turmeric (*Curcuma longa*). Meanwhile, for forage crops, many communities cultivate setaria grass (*Megathyrsus maximus*). In addition to being used as animal feed, setaria grass is also used for slope stabilization and as a protective plant along field edges. Thus, the application of agroforestry in the Muria Mountains needs to be adapted to regional characteristics and available resource potential so that efforts to prevent and control land degradation can be carried out more effectively.

Colo, Japan, Kajar, and Kuwukan Villages are classified as areas with considerable disaster risk. This classification corresponds to field conditions characterized by relatively steep terrain and land cover dominated by forests (Pradhita et al., 2022). On degraded land, community- and institution-based revegetation can enhance environmental carrying capacity while reducing further land degradation (Prajanti et al., 2020; Seid, 2025).

Steep upland areas require land-use arrangements adapted to local conditions to minimize erosion and landslide hazards (Juhadi et al., 2020; Saputra et al., 2026). Local communities occupy a central position in terrestrial and aquatic conservation, including the protection of plant and animal diversity (Supriatna, 2021; Zianti et al., 2026). Their active involvement must be accompanied by adequate conservation knowledge and practical skills, which can be strengthened through community-based nonformal education. Environmental protection is a shared responsibility, and broader stakeholder involvement is expected to increase

the success of conservation initiatives. In agricultural landscapes, conservation is shaped by farmer capacity, extension support, and communities' understanding of its long-term benefits (Juhadi et al., 2019; Saputra et al., 2026).

Based on the background described above, this study is entitled "Efforts to Increase Community Participation in Agroforestry Land Conservation on the Slopes of Mount Muria," with problem identification including the need to increase local communities' awareness of and participation in agroforestry land conservation; the limited dissemination of information about ongoing conservation activities; the role of stakeholders in providing conservation education to communities; the attractiveness of plant diversity to the general public and agroforestry enthusiasts; and the influence of agroforestry land sustainability on the Colo Village community, both ecologically and economically. The scope of the study is limited to community activities and participation in agroforestry land-conservation activities. The general problem formulation concerns community participation in efforts to conserve agroforestry land on the slopes of Mount Muria and is elaborated into three research questions: (1) What are the community activities on agroforestry land? (2) What are the forms of community participation in agroforestry land conservation? and (3) What efforts can be undertaken to increase community participation in agroforestry land conservation in the area?

Consistent with the research questions, this study examines community activities on agroforestry land, the forms of participation undertaken by residents, and measures for strengthening their involvement in conserving agroforestry land on the slopes of Mount Muria. The findings are expected to offer theoretical and practical value. Theoretically, they extend the discussion of agroforestry conservation and conservation education, particularly community-based land-conservation theory. Practically, they provide academics with information about agroforestry conservation, community groups with strategies for engaging local farmer organizations, and stakeholders with a basis for designing and establishing conservation policies.

METHOD

A descriptive quantitative approach was adopted to systematically portray the activities of coffee farmers, the forms of their participation, and their degree of involvement in agroforestry land conservation in Colo Village, Dawe Subdistrict, Kudus Regency. This approach was appropriate because the research questions focused on how the phenomenon occurred rather than on causal testing among variables (Sugiyono, 2023). Spatial organization analysis (Arum, 2026; Yunus, 2010) was also applied to explain the interaction of physical, social, economic, and institutional elements, including steep terrain, proximity to forests, farmer groups, the village administration, and Perhutani, in supporting conservation activities. The population comprised 454 coffee farmers affiliated with farmer groups in Pandak, Colo, and Panggang Hamlets. Proportional random sampling at 10% of the population in each hamlet produced 46 respondents (Arikunto, 2019, 2023; Sugiyono, 2023): 21 of 212 farmers from Pandak, 12 of 118 from Colo, and 13 of 124 from Panggang. The variables covered forms of participation (thought, labor, material assets, skills and expertise, and social participation) and levels of participation (manipulation, therapy, informing, consultation, placation, partnership, delegated power, and citizen control). Primary data were obtained from farmer-group members, village officials, community elders, the head of the farmer-group association, the Dawe Subdistrict agricultural extension officer, and Peka Muria; secondary sources included village monographs, journal literature, and data from BPS (Statistics Indonesia) for Kudus Regency.

Four methods were used to obtain the data. Documentation provided information on community characteristics and the area's geographical and biophysical conditions; a checklist questionnaire measured the forms and levels of participation on a four-point scale ranging from 4 ("strongly agree") to 1 ("strongly disagree"); direct observations were conducted at the study site; and structured interviews were conducted with community leaders and relevant stakeholders. Item validity was assessed using the Product Moment correlation test, with an item considered valid when the calculated r value exceeded the tabulated r value at the 5% significance level. Reliability was assessed using the Alpha formula, and the instrument was considered reliable when the calculated reliability coefficient met the required criterion at a 5% significance level (Arikunto, 2019, 2023). Frequency distributions and descriptive percentage analysis were

used for quantitative analysis, applying the formula $DP = (\text{actual score} / \text{ideal score}) \times 100\%$. With the maximum and minimum percentages set at 100% and 25%, respectively, an interval of 18.75 percentage points produced four classifications: Very Good (81.26–100.00%), Good (62.51–81.25%), Poor (43.76–62.50%), and Very Poor (25.00–43.75%). The resulting values were presented in tables and interpreted using qualitative descriptions to address the research questions.

RESULTS AND DISCUSSION

Respondent Description

The study involved 46 coffee farmers from Pandak, Colo, and Panggang Hamlets in Colo Village, Dawe Subdistrict, Kudus Regency. Table 1 summarizes their age, educational attainment, and farming experience.

Table 1

Characteristics of Research Respondents (n = 46)

Characteristic	Category	Frequency	Percentage (%)
Age (years)	24--31	5	10.87
	32--39	2	4.35
	40--47	7	15.22
	48--55	9	19.57
	56--63	14	30.43
	64--71	7	15.22
	72--79	2	4.35
Education	No School	1	2.17
	Elementary/equivalent	22	47.83
	Junior High/equivalent	8	17.39
	Senior High/equivalent	11	23.91
	D3	1	2.17
	S1	3	6.52
Farming Experience (years)	< 5	1	2.17
	5--10	12	26.09
	11--15	6	13.04
	16--20	6	13.04
	> 20	21	45.65

Source: Research Results, 2026

Table 1 shows that respondents were concentrated in the older age groups, with the largest proportion in the 56–63-year range (30.43%) and the smallest proportions in the 32–39- and 72–79-year ranges (4.35% each). In terms of education, the majority of respondents had an elementary school/equivalent educational background (47.83%), whereas respondents with D3 qualifications and those with no formal schooling represented the smallest groups (2.17% each). Regarding farming experience, most respondents (45.65%) had been engaged in coffee farming for more than 20 years, whereas only 2.17% had less than 5 years of experience. This profile indicates that the respondents were generally experienced farmers who had long been involved in managing coffee agroforestry land on the slopes of Mount Muria.

Community Activities on Agroforestry Land

Questionnaire and observational data from 46 farmers indicated that coffee had long been cultivated in Colo Village under a traditional agroforestry system. Coffee trees more than 20 years old were owned by 38 farmers (82.6%). All gardens contained shade trees: 27 farmers maintained more than two species, 14 maintained two species, and 5 maintained one species, predominantly avocado, *petai*, durian, jackfruit, and mahogany. Routine management practices included replanting, reported by 45 farmers; manual weeding two or three times annually, reported by 36 farmers, with the removed vegetation used as natural mulch; combined organic and inorganic fertilization twice annually, reported by 37 farmers; and pruning one to three times per year. Only

4 farmers used supplemental irrigation because rainfall generally provided sufficient water. Pest control was applied according to the intensity of pest attacks rather than according to a fixed schedule, and 40 farmers applied pest-control treatments only once per year. After harvest, 38 farmers sold their produce directly to local middlemen, whereas 8 sorted the wet coffee beans before sale. Thus, local coffee management already incorporates conservation practices through the retention of shade trees, vegetative weed management, and limited chemical use.

Forms of Community Participation

Table 2 presents the descriptive percentage results for the different forms of community involvement in agroforestry land conservation.

Table 2

Forms of Community Participation in Agroforestry Land Conservation on the Slopes of Mount Muria

No.	Indicator	Score (%)	Criteria
1	Thought	77.28	Good
2	Labor	81.30	Very Good
3	Material Assets	85.76	Very Good
4	Skills	74.13	Good
5	Social	74.35	Good
	Variable Criteria	78.57	Good

Source: Research Results, 2026

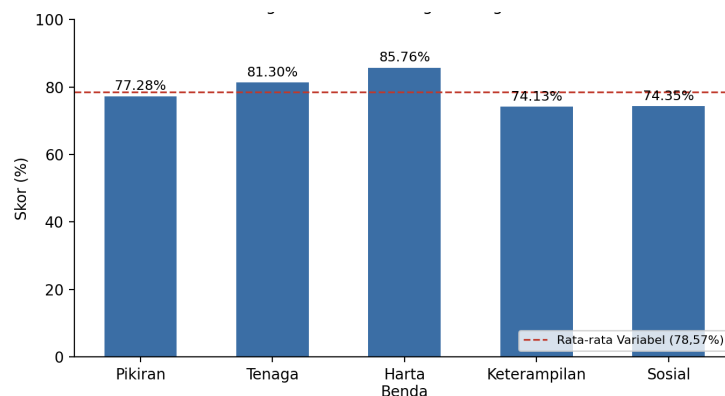


Figure 1. Diagram of Forms of Community Participation in Agroforestry Land Conservation

Table 2 and Figure 1 show that the overall form of community participation was in the good category, with a variable score of 78.57%. The material assets indicator recorded the highest score (85.76%, very good), followed by labor (81.30%, very good), whereas skills recorded the lowest score (74.13%, good, but close to the lower boundary of the category). For the thought indicator, all subindicators (providing ideas, proposing solutions to problems, planning, decision-making, and evaluation) were dominated by the good category, with the highest scores for problem solving and planning (80.43% each). For the labor indicator, the emergency-response subindicator reached 63.04% in the very good category, whereas land preparation reached 86.96% in the good category. For the material assets indicator, contributions in the form of facilities and equipment reached 63.04% (very good), while financial contributions reached 50.00% (very good). Conversely, for the skills indicator, the subindicators concerning environmentally friendly pest control and postharvest handling showed a relatively higher proportion of respondents in the poor category than did the other subindicators.

Level of Community Participation

Community participation levels, as measured using Arnstein's (1969) Ladder of Participation (Arnstein, 2025), are summarized in Table 3.

Table 3

Level of Community Participation in Agroforestry Land Conservation on the Slopes of Mount Muria

No.	Tier / Indicator	Score (%)	Criteria
<i>Main Tiers</i>			
1	Non-participation	77.81	Good
2	Tokenism	66.30	Good
3	Citizen Power	71.06	Good
<i>Eight Indicators</i>			
1	Manipulation	78.62	Good
2	Therapy	76.99	Good
3	Information	60.51	Poor
4	Consultation	68.30	Good
5	Placation	70.11	Good
6	Partnership	65.40	Good
7	Delegated Power	72.46	Good
8	Citizen Control	77.45	Good
Variable Criteria		70.96	Good

Source: Research Results, 2026

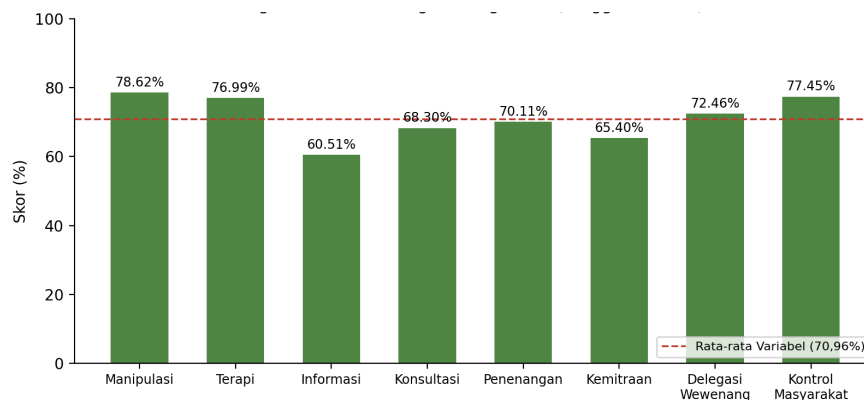


Figure 2. Diagram of Level of Community Participation in Agroforestry Land Conservation (Arnstein's Ladder)

Table 3 and Figure 2 show that the overall level of community participation was in the good category, with a variable score of 70.96%. Among the main tiers, Nonparticipation recorded the highest score (77.81%), followed by Citizen Power (71.06%) and Tokenism (66.30%). Among the eight indicators, Information recorded the lowest score and was the only indicator in the poor category (60.51%), particularly in the subindicators of transparency and access to information, each of which fell within the 45.65–50.00% range and was classified as poor. Meanwhile, Manipulation (78.62%) and Citizen Control (77.45%) recorded the highest scores.

Taken together, the score for forms of participation (78.57%) exceeded that for the level of participation (70.96%). Although coffee farmers in Colo Village contributed substantially through ideas, labor, material resources, skills, and social interaction, they did not yet exercise equal authority over conservation decisions. This condition is evident in the high Nonparticipation score and the weak Information indicator. Accordingly, the findings answer the research questions by showing that participation was quantitatively active, whereas power remained unevenly distributed within conservation decision-making. Progress is therefore needed from procedural involvement toward substantive citizen power.

Discussion

The finding that the form of community participation was in the good category (78.57%), with labor and material assets representing the most dominant contributions, indicates that coffee farmers in Colo Village were not merely objects of conservation programs but active actors who integrated conservation into their daily cultivation practices. The fact that the majority of

coffee plants were more than 20 years old, combined with sustainable maintenance practices such as gradual replanting, manual weeding that utilized removed vegetation as mulch, and scheduled fertilization and pruning, indicates that the sustainability of the agroforestry system is determined more by the consistency of management than by stand age alone. The presence of multispecies shade trees in all respondents' gardens also confirms that the agroforestry system on the slopes of Mount Muria simultaneously combines ecological and economic functions, in line with the findings of Ulya et al. (2023), who reported that the sustainability of coffee agroforestry is determined by a balance between economic productivity and the preservation of the land's ecological functions.

The strong scores for labor (81.30%) and material assets (85.76%) support the Cohen and Uphoff framework, in which physical and material inputs represent tangible forms of participation in community-based development. This pattern corresponds with Djufry et al. (2022), who reported that farmers' engagement in soil and water conservation techniques strongly shapes the adoption of climate-smart practices among Indonesian coffee producers. Voluntary contributions of funds and assets, particularly for organic fertilizer and terracing facilities, also support Duffy et al. (2021), who linked agroforestry success to farmers' willingness to invest resources in land management, and Widiarta et al. (2023), who highlighted the social dimension of sustainable coffee agroforestry (Indra, 2026). Nevertheless, the lower skills score (74.13%), particularly for environmentally friendly pest management and postharvest practices, reveals a technical-capacity gap that may constrain economic value creation and the long-term performance of conservation efforts.

In the dimension of the level of participation, a variable score of 70.96%, with Nonparticipation (77.81%) scoring higher than Citizen Power (71.06%), indicates that community involvement still contains procedural elements, such as attendance and symbolic support for programs designed by external parties, rather than substantive involvement in determining policy direction. The weakness of the Information indicator (60.51%), particularly with regard to transparency, is a critical point that hinders the shift from tokenism toward citizen power because adequate access to information is a fundamental prerequisite for meaningful public involvement in natural resource management (Junaenah et al., 2022).

The finding regarding the dominance of labor participation and the social capital of mutual cooperation in this study is consistent with Murniati, Suharti, Yeny, et al. (2022), who found that the success of cocoa agroforestry in conservation forest areas is highly dependent on farmers' involvement in operational field activities, including land preparation and maintenance. Alignment is also evident with Anugrahsari et al. (2020), who emphasized that the effectiveness of community-based conservation partnerships is influenced by participatory involvement from the planning stage through the establishment of mutual trust among stakeholders (Massiri et al., 2025). This condition is only partially reflected in Colo Village, given the Tokenism score and the weak transparency of information. Meanwhile, compared with Palmolina (2019), who reported that community participation in jambang agroforestry demonstration plots was largely determined by direct economic incentives, this study shows that, in Colo Village, participation is not driven solely by economic incentives but also by a sense of collective ownership of inherited land and deeply rooted social capital based on mutual cooperation (Mukhtiya, 2023). This difference confirms that the character of community participation in agroforestry is highly contextual and is influenced by the type of commodity, local institutional structure, and land-management history of each region (Mukhtiya, 2023).

Several practical consequences follow from these results. Local and village governments, *Perhutani*, and agricultural extension personnel can use the strong labor and material participation scores as social capital for expanding community-based conservation initiatives. At the same time, the weak information and transparency scores call for improved two-way communication through measures such as program information boards, regular farmer-group forums, and publicly accessible implementation reports. Farmer groups and extension personnel should also address deficiencies in environmentally friendly pest management and postharvest skills by expanding field schools and technical mentoring, thereby enabling the economic value of coffee to increase without compromising conservation principles.

Conceptually, the results of this study reinforce the relevance of combining Huraerah's (2011) theory of forms of participation with Arnstein's (1969) Ladder of Participation as complementary analytical frameworks (Maryam et al., 2026). Huraerah's (2011) theory effectively maps the various forms of citizen involvement Maryam et al. (2026), whereas Arnstein's (1969) Ladder reveals the power dimension that is not apparent when participation is measured only by the diversity of forms of involvement (Arnstein, 2025). The finding that the score for forms of participation (78.57%) was higher than the score for the level of participation (70.96%) shows that high quantitative involvement does not necessarily correlate directly with the level of community power in decision-making. This proposition enriches the study of conservation education and community education as means of empowerment that increase knowledge, critical awareness, and citizen control over the land resources they manage.

Three limitations should be considered. First, the sample comprised only 46 coffee farmers from three hamlets in Colo Village; consequently, caution is required when extending the findings to the entire slopes of Mount Muria or to other Indonesian coffee agroforestry settings. Second, the cross-sectional descriptive quantitative design cannot explain causal effects or temporal changes in participation. Third, participation was assessed primarily through questionnaire-based perceptions and self-reports, which may introduce subjective bias despite the use of observations and interviews for triangulation.

Future studies should therefore include a larger group of respondents and cover either the broader slopes of Mount Muria or other coffee agroforestry regions. Longitudinal or mixed-methods designs could investigate how community participation relates over time to land biophysical conditions, agroforestry productivity, and farmer welfare. Further inquiry may also address how community education, social capital, local leadership, environmental literacy, and institutional arrangements shape the quality of participation in agroforestry conservation.

CONCLUSION

Based on the research findings and discussion, community activities on agroforestry land on the slopes of Mount Muria demonstrate a management pattern that integrates conservation practices into routine coffee cultivation. These practices include maintaining multispecies shade trees, conducting gradual replanting, using manually removed weeds as mulch, applying scheduled fertilization and pruning, and implementing selective pest control. Community participation in agroforestry land conservation is classified as good, with a score of 78.57%. Contributions in the form of labor (81.30%) and material assets (85.76%) are the most dominant, whereas skills-related contributions (74.13%), particularly in environmentally friendly pest control and postharvest handling, still require improvement.

Community participation levels likewise fell within the good category (70.96%) and showed a relatively strong score for Citizen Power (71.06%). Nevertheless, the high Nonparticipation score (77.81%) and the weak Information and transparency indicator (60.51%) show that improvements are required in information openness, participatory extension, technical agroforestry instruction, farmer-group institutional capacity, and stakeholder partnerships. Conservation performance on the slopes of Mount Muria consequently depends not only on the range of community contributions but also on residents' ability to exert meaningful influence over land-management decisions. This interpretation accords with the analytical perspectives provided by Abu Huraerah's participation theory and Arnstein's Ladder of Participation.

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AUTHOR CONTRIBUTION STATEMENT

Sigit Pamukti was responsible for conceptualizing the research, collecting and analyzing the data, and drafting the initial manuscript. Dewi Liesnoor Setyowati and Eva Banowati

supported conceptual refinement, methodological direction, interpretation, supervision, and substantive manuscript revision. Each author examined and approved the final manuscript.

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