

SOCIAL CAPITAL, LEADERSHIP, AND FOREST PARTICIPATION ACROSS ELEVATION GRADIENTS IN UPPER BENGAWAN SOLO

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ABSTRACT

The Upper Bengawan Solo Watershed is one of Indonesia's priority river basins and faces severe land degradation, much of which occurs on privately owned smallholder land. Private forests have become an important strategy for land rehabilitation, yet farmers' participation in forest management remains uneven. This study examines the roles of social capital, local leadership (symbolic power), and shared knowledge in shaping participation in private forest management across elevation strata in Wonogiri Regency, Indonesia. A quantitative survey was conducted with 210 private forest farmers, and data were analyzed using the Kruskal–Wallis test and multiple linear regression. The results show significant differences in trust, shared knowledge, and the overall social capital index across elevation strata. However, the effects of social capital dimensions on participation are inconsistent. In contrast, symbolic power ($\beta = 0.221$, $p < 0.05$) and shared knowledge ($\beta = 0.198$, $p < 0.05$) positively and significantly influence participation, emerging as stronger predictors than trust, networks, and norms. Elevation strata are not significantly associated with participation, indicating that ecological conditions serve primarily as a socio-ecological context rather than direct drivers of collective action. These findings suggest that social capital alone is insufficient to promote participation unless activated through legitimate local leadership and shared understanding among farmers. Strengthening local leadership and collaborative learning processes may therefore enhance participation and support sustainable private forest management.

Keywords: Community Participation; Private Forest; Shared Knowledge; Social Capital; Symbolic Power

INTRODUCTION

Forests play a crucial role in maintaining global ecosystem balance and providing livelihoods for millions of people in developing countries (Angelsen *et al.*, 2014; FAO, 2020; Lee *et al.*, 2023). However, ongoing deforestation, land degradation, and climate change continue to threaten the sustainability of forest ecosystems and their functions (Pacheco & Meyer, 2022; Parmesan *et al.*, 2022). In Indonesia, community-based forest management, particularly through the community forest system “*Hutan Rakyat*”, has emerged as an important strategy for addressing these challenges while supporting the rehabilitation of degraded lands, many of which are located on privately owned smallholder land (Baynes *et al.*, 2015; van Noordwijk, 2021). The success of this approach largely depends on the extent of community participation in various management activities, including forest protection, conservation, and the collective utilization of forest resources (Pretty, 2003; Purwanti *et al.*, 2022; Situmorang, 2023).

One form of community-based forest management in Indonesia is private forest management, which contributes not only to increasing household income but also to rehabilitating degraded land (Baynes *et al.*, 2015; Kandari *et al.*, 2020; van Noordwijk, 2021). The success of private forest management is strongly influenced by community participation in activities related to forest protection, conservation, and collective land management (Pretty, 2003; Purwanti *et al.*, 2022; Situmorang, 2023). Therefore, understanding the factors that influence community participation is essential for supporting the sustainability of private forest management.

Wonogiri Regency and parts of Pacitan Regency in the Upper Bengawan Solo Watershed are areas facing serious land degradation problems. Most of the critical land in these regions is privately owned, making the development of private forests an important strategy for land rehabilitation (CDK-XI, 2024; Kurniawan *et al.*, 2018; Rendrarpoetri *et al.*, 2024). The biophysical characteristics of the Upper Bengawan Solo Watershed are also marked by variations in elevation, which influence land-use patterns, accessibility, and the socio-economic conditions of local communities (Rasul *et al.*, 2019). Previous studies have shown that ecological and geographical differences can shape livelihood strategies, levels of dependence on natural resources, and community engagement in forest management activities (Baynes *et al.*, 2015).

In the study of common resource management, social capital is often regarded as a key factor in promoting collective action through trust, social networks, and shared norms (Coleman, 1988; Putnam *et al.*, 1994; Woolcock & Narayan, 2000). High levels of trust can strengthen cooperation, while social networks facilitate information exchange and access to resources (Fukuyama, 2002; Jalil *et al.*, 2021). In the context of private forests, social capital plays an important role in encouraging community involvement in conservation activities and sustainable forest management (Adger, 2010; Pretty, 2003; Riyanto *et al.*, 2026). However, social capital does not automatically translate into collective action. Its effectiveness depends on social mechanisms that can mobilize and transform cooperative potential into collective action (Ostrom, 2000; Woolcock & Narayan, 2000).

In this regard, symbolic power and shared knowledge are assumed to play important roles in strengthening community participation. Local leaders who possess social legitimacy can mobilize communities to engage in collective action (Bourdieu, 2011; Wardani *et al.*, 2024), while shared knowledge enables the development of common understanding regarding the objectives and practices of forest management (Ostrom & Ahn, 2009; Pretty, 2003). Although many studies have examined the relationship between social capital and community participation, most still treat social capital as a homogeneous variable and have paid limited attention to the role of activating factors such as symbolic power and shared knowledge, particularly within the socio-ecological context of watersheds in Indonesia (Adger, 2010; Ostrom, 2000).

Based on these considerations, this study aims to analyze the influence of social capital, symbolic power, and shared knowledge on community participation in private forest management across different elevation strata in the Upper Bengawan Solo Watershed. This study is expected to provide empirical contributions to the development of socio-ecological approaches in community-based forest management.

METHODS

Study Area

This study was conducted in the upstream area of the Bengawan Solo Watershed, Central Java Province, Indonesia, particularly within the catchment area flowing into the Gajah Mungkur Reservoir. The area was selected due to its considerable variation in ecological conditions and land-use patterns. To capture socio-ecological variation, the study area was divided into three

elevation strata: Stratum I (137–424 m above sea level), Stratum II (425–712 m above sea level), and Stratum III (713–1,000 m above sea level). Elevation gradients are recognized as important factors influencing both ecological and socio-economic conditions, including land productivity, accessibility, and local livelihood strategies (Adger, 2010; Körner, 2007; Sarkar *et al.*, 2025). Six villages were purposively selected to represent each elevation stratum, namely Pondoksari and Ngadipiro (Stratum I), Dawungan and Ngelo (Stratum II), and Setren and Slogoretno (Stratum III), all located in Wonogiri Regency. The study was conducted from January to April 2025. The study location is shown in Figure 1.

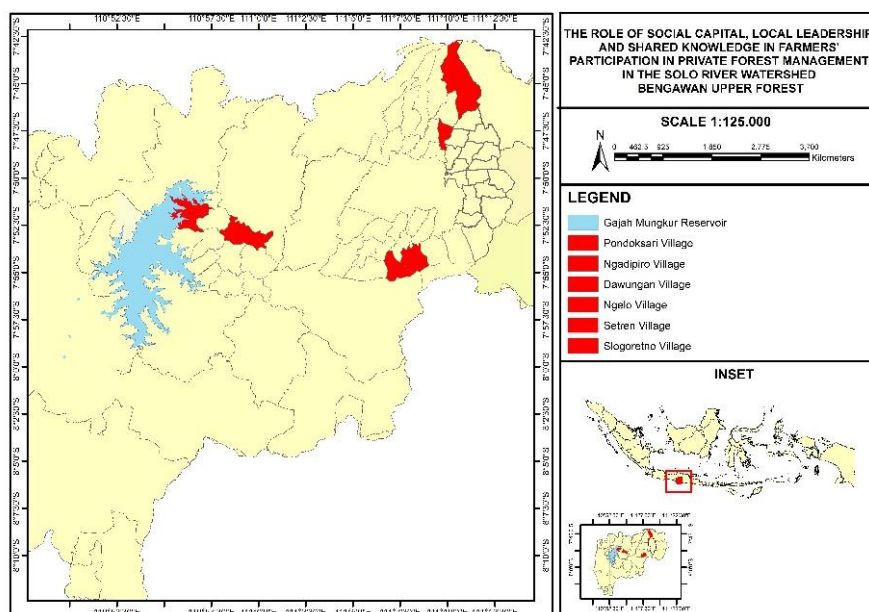


Figure 1. Study Site

Research Design and Sampling

This study employed a quantitative approach using a cross-sectional survey design (Creswell, 2017). The unit of analysis consisted of smallholder farmers involved in private forest management. A total of 210 respondents were selected using proportional sampling, with each village represented by 35 respondents. Within each village, respondents were selected through simple random sampling based on a list of farmers engaged in private forest management obtained from village authorities. This sample size was considered adequate based on Green (1991) rule of thumb for multiple regression analysis, which requires a minimum of $N \geq 50 + 8m$, where m is the number of predictor variables. With six predictor variables in the regression model, the minimum required sample was 98 respondents, making our sample of 210 respondents sufficient for the analysis. This approach was intended to ensure adequate representation across the different elevation strata (Babbie & Edgerton, 2023).

Data Collection

Primary data were collected through structured interviews using a questionnaire. The instrument was designed to measure social capital and community participation in private forest management. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), which is commonly used to assess perceptions and attitudes in social research. Prior to data collection, respondents were informed about the objectives of the study, and informed consent was obtained voluntarily. Respondents' identities were kept confidential to ensure anonymity and research ethics compliance.

Variable Measurement

Social capital was conceptualized as a multidimensional construct consisting of trust, social networks, and norms that facilitate cooperation and collective action (Coleman, 1988;

Fukuyama, 2002; Putnam *et al.*, 1994). In addition, this study incorporated symbolic power and shared knowledge as variables that may activate social capital. Symbolic power refers to the ability of actors or local leaders to influence community actions and perceptions through socially recognized legitimacy (Bourdieu, 2011). Meanwhile, shared knowledge reflects the extent of common understanding among community members regarding the objectives, values, and practices of resource management, which is essential for supporting coordination and collective action (Ostrom & Ahn, 2009; Wulandari *et al.*, 2025).

Community participation was measured based on involvement in forest protection, conservation, utilization, and collective activities related to private forest management (Pretty, 2003). All indicators were adapted from previous studies and adjusted to the local context of private forest management in the Bengawan Solo watershed. The indicators were selectively chosen based on their theoretical relevance and field applicability, enabling them to adequately represent the constructs being measured. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The complete measurement instruments are presented in Table 1.

Table 1. Variable Measurement

Variable	Dimension	Code	Indicator	Scale Likert
1. Social Capital	Trust	SC1	Mutual cooperation in private forest management	1–5
		SC2	Fairness in group decision-making	1–5
		SC3	Support from village authorities	1–5
	Networks	SC4	Participation in farmer/forest groups	1–5
		SC5	Information exchange among farmers	1–5
		SC6	Access to extension services	1–5
	Norms	SC7	Existence of informal rules	1–5
		SC8	Responsibility toward sustainability	1–5
		SC9	Importance of cooperation	1–5
2. Symbolic Power (Leadership)	Legitimacy & Influence	SP1	Trust in local leaders in forest management	1–5
		SP2	Leaders encourage community participation	1–5
3. Shared Knowledge	Knowledge & Understanding	SK1	Knowledge sharing among farmers	1–5
		SK2	Shared understanding of forest management objectives	1–5
	Forest Protection	CP1	Involvement in preventing forest degradation	1–5
4. Community Participation	Conservation	CP2	Participation in tree planting activities	1–5
	Utilization	CP3	Utilization of forest products for livelihoods	1–5
	Social Participation	CP4	Attendance at community meetings	1–5
	Contribution	CP5	Contribution of resources	1–5
	Social Influence	CP6	Encouraging others to participate	1–5

Source: Processed by author, 2026

Validity and Reliability Testing

Reliability testing was conducted using Cronbach's alpha to assess the internal consistency among items within each variable. All variables showed Cronbach's alpha values above 0.70, indicating that the research instrument was reliable (Hair *et al.*, 2019). Validity testing was performed using item-total correlation analysis, where all items had correlation values above 0.30. The item-total correlation coefficients ranged from 0.41 to 0.78, indicating that all indicators possessed adequate validity and were suitable for further analysis.

Data Analysis

Data analysis was conducted in several stages using STATA version 17. First, descriptive analysis was used to describe the characteristics of the respondents. Second, the Kruskal–Wallis test was applied to examine differences in ordinal variables across elevation strata, while the Chi-square test was used for categorical data. Furthermore, multiple linear regression analysis was employed to examine the associations of social capital and activating variables on community participation (Hair *et al.*, 2019). The regression model was formulated as follows:

$$CP_i = \beta_0 + \beta_1 Trust_i + \beta_2 Networks_i + \beta_3 Norms_i + \beta_4 SP_i + \beta_5 SK_i + \beta_6 Stratum_i + \varepsilon_i$$

Description:

CP _i	: community participation;
Trust, Networks, and Norms	: dimensions of social capital;
SP _i	: symbolic power;
SK _i	: shared knowledge;
Stratum	: a dummy variable for elevation category; and
ε _i	: the error term.

Classical assumption tests confirmed normality of residuals (Kolmogorov–Smirnov, $p > 0.05$), no multicollinearity (VIF < 5), and no heteroscedasticity (Glejser, $p > 0.05$).

RESULTS AND DISCUSSION

Respondent Characteristics

The results presented in Table 2 indicate that the demographic characteristics of respondents were relatively homogeneous across elevation strata. Age (mean = 50.2 years) and gender composition (80.6% male) did not differ significantly among strata ($p = 0.734$; $p = 0.642$), suggesting that variations in community participation were not primarily influenced by basic demographic factors. This provides a strong basis for linking differences in participation to other social and contextual factors (Ostrom & Ahn, 2009). A significant difference was found in household size ($p = 0.012$), with Stratum II having the highest average number of household members (3.8 persons). This finding indicates differences in household labor capacity that may influence involvement in collective activities. Households with more members tend to have greater flexibility in participating in community-based activities (Adger, 2010; Miller *et al.*, 2021).

Table 2. Socio-Economic and Institutional Characteristics of Respondents across Elevation Strata

Variable	Stratum I	Stratum II	Stratum III	Total	p-value
Demographic Characteristics					
Age (years)	50.8	49.6	50.3	50.2	0.734
Male (%)	78.6	80.0	83.1	80.6	0.642
Household size (persons)	3.2	3.8	3.3	3.4	0.012*
Economic Characteristics					
Household income (million IDR/month)	3.08	3.12	3.21	3.14	0.148
Landholding size (ha)	0.52	0.58	0.47	0.52	0.421
Perceived household welfare (1–5)	3.58	3.42	3.49	3.50	0.039*
Socio-Ecological Context					
Perceived food security (1–5)	3.71	3.78	3.62	3.70	0.027*
Perceived soil fertility (1–5)	3.05	2.88	4.12	3.35	<0.001***
Institutional and Access Factors					
Farmer group membership (%)	42.9	48.6	40.0	43.8	0.051
Access to financing (%)	45.7	33.5	30.8	36.7	0.013*
Access to extension services (%)	45.0	38.7	41.2	41.6	0.362
Availability of seedlings (%)	41.4	62.8	66.9	57.0	<0.001***

Source: Analysis Result, 2026

Notes: Values represent means or percentages (%). Perception variables were measured using a five-point Likert scale (1–5). Statistical tests were conducted using the Kruskal–Wallis test (ordinal/non-parametric data) and Chi-square test (categorical data). Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Total respondents: $n = 210$ (each stratum $n = 70$).

From an economic perspective, household income (ranging from IDR 3.08–3.21 million per month) and landholding size (0.47–0.58 ha) did not differ significantly across strata ($p = 0.148$; $p = 0.421$). However, perceived welfare showed significant differences among strata ($p = 0.039$), with the lowest value recorded in Stratum II (3.42) and the highest in Stratum I (3.58). This finding suggests that subjective perceptions may play an important role in shaping motivation for participation (Mansuri *et al.*, 2023; Pretty, 2003).

More pronounced variation was observed in socio-ecological and institutional aspects. Perceptions of food security ($p = 0.027$) and soil fertility ($p < 0.001$) differed significantly among strata, reflecting variations in environmental conditions. In particular, soil fertility was perceived to be considerably higher in Stratum III (4.12) compared to Stratum I (3.05) and Stratum II (2.88). In addition, differences in access to financing ($p = 0.013$; highest in Stratum I at 45.7%) and

seedling availability ($p < 0.001$; increasing from 41.4% in Stratum I to 66.9% in Stratum III) indicate unequal access to resources that may affect community capacity in private forest management (Agrawal, 2001).

Overall, these findings suggest that although respondents shared relatively similar basic characteristics, variations in socio-ecological and institutional contexts played an important role in shaping the dynamics of community participation.

Social Capital, Symbolic Power, and Shared Knowledge across Elevation Strata

The results presented in Table 3 indicate that the dimensions of social capital did not develop uniformly along the elevation gradient. Although several variables showed an increasing trend, the observed pattern was not entirely linear, suggesting that social dynamics within communities are influenced not only by ecological conditions but also by more complex social interactions (Sarkar *et al.*, 2025).

Table 3. Differences in Social Capital, Symbolic Power, and Shared Knowledge across Elevation Strata (Post-hoc Test)

Variable	Stratum I (n = 70)	Stratum II (n = 70)	Stratum III (n = 70)	p-value	Interpretation
Trust	3.21 ^a	3.45 ^{ab}	3.70 ^b	0.041	Significant
Social Networks	3.10 ^a	3.35 ^a	3.32 ^a	0.114	Not significant
Norms	3.25 ^a	3.50 ^a	3.48 ^a	0.067	Not significant
Social Capital Index	3.19 ^a	3.42 ^{ab}	3.60 ^b	0.039	Significant
Local Leadership (Symbolic Power)	3.05 ^a	3.38 ^a	3.35 ^a	0.058	Not significant
Shared Knowledge	3.12 ^a	3.30 ^{ab}	3.55 ^b	0.047	Significant

Source: Analysis Result, 2026

Notes: Superscript letters within the same row indicate the results of the post-hoc test. Values sharing the same superscript letter are not significantly different ($p > 0.05$), while values with different superscript letters are significantly different ($p < 0.05$). Values represent mean scores measured using a five-point Likert scale (1–5).

The trust dimension showed a significant increase from Stratum I (3.21) to Stratum III (3.70), with a p-value of 0.041 (significant difference between Stratum I and Stratum III). This finding indicates that in certain environmental settings, interpersonal relationships among community members tend to be stronger, thereby increasing the level of trust within the community. From the perspective of social capital theory, trust is a key element that can reduce transaction costs and strengthen coordination in collective action (Coleman, 1988; Kharmylliem & Kipgen, 2026; Putnam *et al.*, 1994; Qurniati *et al.*, 2017). The higher level of trust observed in the upper strata may also be associated with more intensive social interactions within relatively homogeneous communities (Adger, 2010; van Noordwijk, 2021).

However, not all dimensions of social capital showed similar patterns. Social networks did not differ significantly across elevation strata ($p = 0.114$), with relatively stable values in Stratum I (3.10), Stratum II (3.35), and Stratum III (3.32). Similarly, norms did not show significant differences ($p = 0.067$), although there was a slight increase from Stratum I (3.25) to Stratum II (3.50), followed by a marginal decline in Stratum III (3.48). These findings suggest that social networks and social norms tend to be relatively stable and are not directly shaped by variations in ecological conditions. In many cases, social networks are formed through long-term relationships that are not easily altered within a short period of time (Babbie & Edgerton, 2023; Woolcock & Narayan, 2000), while social norms are often latent in nature and may not always be reflected in observable behavior (Fukuyama, 2002; Habib *et al.*, 2023).

The overall social capital index showed significant differences across strata ($p = 0.039$), with values increasing from Stratum I (3.19) to Stratum II (3.42) and Stratum III (3.60). Nevertheless, the pattern was not entirely linear, as significant differences were observed only between Stratum I and Stratum III. This finding indicates that, at an aggregate level, social capital remains influenced by socio-ecological contexts, although each dimension may respond differently.

These results support the view that social capital is a multidimensional construct that cannot be understood as a homogeneous entity (Colfer *et al.*, 2021; Ostrom & Ahn, 2009).

Regarding the activating variables, symbolic power showed a marginal effect ($p = 0.058$), with relatively higher values in Stratum II (3.38) compared to Stratum I (3.05) and Stratum III (3.35). This pattern suggests that local leadership does not necessarily develop linearly in response to ecological conditions, but rather depends on the internal social dynamics of the community (Sembiring *et al.*, 2021). From Pierre Bourdieu's theoretical perspective, symbolic power reflects social legitimacy that enables certain actors to influence collective action. The variation observed across strata indicates that such legitimacy is shaped not only by environmental context but also by social structures and power relations at the local level (Riyanto *et al.*, 2026).

Meanwhile, shared knowledge showed significant differences across elevation strata ($p = 0.047$), with an increasing trend observed in the higher strata (Wulandari *et al.*, 2025). This finding indicates that a shared understanding of forest management objectives and practices tends to develop more strongly under conditions that facilitate more intensive information exchange. In the context of common resource management, shared knowledge is considered an essential prerequisite for creating coordination and alignment in collective action (Barletti *et al.*, 2022; Ostrom & Ahn, 2009; Pretty, 2003).

Overall, these findings suggest that although several dimensions of social capital and activating variables tended to increase across strata, the observed patterns were not entirely consistent. This indicates that socio-ecological factors do not directly determine the level of social capital, but rather operate through more complex interactions within communities (Rendrarpoetri *et al.*, 2024; Yudono *et al.*, 2024). Therefore, strengthening community participation cannot rely solely on enhancing social capital in general, but must also consider variations among its dimensions as well as the role of factors capable of activating cooperative potential within communities (Mansuri *et al.*, 2023; Miller *et al.*, 2021).

Community Participation across Elevation Strata

The results presented in Table 4 indicate that the level of community participation in private forest management did not develop uniformly along the elevation gradient. Although several dimensions showed an increasing trend, the observed pattern was not entirely linear, suggesting that ecological factors are not the sole determinants of participatory behavior within communities (Sarkar *et al.*, 2025). The conservation and social influence dimensions showed significant differences across elevation strata. Participation in conservation activities, such as tree planting, was higher in Stratum II (3.60) and Stratum III (3.55) compared to Stratum I (3.20; $p = 0.031$). This finding suggests that involvement in conservation activities tends to increase under conditions where social interaction and the need for resource management become more intensive. In the context of community-based resource management, participation in conservation activities is often influenced by collective awareness and social learning processes that develop within communities (Barletti *et al.*, 2022; Ostrom & Ahn, 2009; Pretty, 2003).

Similarly, the social influence dimension showed a significant increase in the higher strata (3.10 in Stratum I, 3.52 in Stratum II, and 3.60 in Stratum III; $p = 0.018$). This reflects the presence of individuals or groups capable of mobilizing other community members to engage in collective activities. From the perspective of collective action theory, actors with strong social influence can strengthen coordination and accelerate the diffusion of participatory behavior within communities (Miller *et al.*, 2021; Rogers *et al.*, 2014; Suharti *et al.*, 2016). This finding is also consistent with the role of socially legitimate local leadership in encouraging community participation (Sembiring *et al.*, 2021; Wulandari *et al.*, 2025).

Table 4. Differences in Community Participation across Elevation Strata (Post-hoc Test)

Variable	Stratum I (n = 70)	Stratum II (n = 70)	Stratum III (n = 70)	p-value	Interpretation
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Forest Protection	3.22 ^a	3.48 ^a	3.40 ^a	0.057	Not significant
Conservation	3.20 ^a	3.60 ^b	3.55 ^b	0.031	Significant
Utilization	3.35 ^a	3.50 ^a	3.42 ^a	0.084	Not significant
Social Participation	3.15 ^a	3.28 ^a	3.30 ^a	0.132	Not significant
Resource Contribution	3.18 ^a	3.10 ^a	3.38 ^a	0.069	Not significant
Social Influence	3.10 ^a	3.52 ^b	3.60 ^b	0.018	Significant
Participation Index	3.20 ^a	3.42 ^b	3.44 ^b	0.040	Significant

Source: Analysis Result, 2026

Notes: Superscript letters within the same row indicate the results of the post-hoc test. Values sharing the same superscript letter are not significantly different ($p > 0.05$), while values with different superscript letters are significantly different ($p < 0.05$). Values represent mean scores measured using a five-point Likert scale (1–5).

In contrast, several other dimensions of participation did not show significant differences across elevation strata. The dimensions of forest protection (3.22–3.48; $p = 0.057$), utilization (3.35–3.50; $p = 0.084$), social participation (3.15–3.30; $p = 0.132$), and resource contribution (3.10–3.38; $p = 0.069$) showed relatively small and inconsistent variations. In the forest protection dimension, for example, Stratum II recorded a higher value than Stratum III, indicating that community involvement does not necessarily increase in line with changes in ecological conditions. This finding suggests that participation is more strongly influenced by contextual factors such as local needs, resource pressures, household capacity, and institutional dynamics rather than elevation alone (Adger, 2010; Agrawal, 2001; Habib *et al.*, 2023; Rendrarpoetri *et al.*, 2024).

Social participation also showed relatively similar levels across all strata. This finding indicates that involvement in group activities has become a relatively embedded social practice within the community and is not strongly affected by environmental variation. From the perspective of social capital theory, this type of participation is generally driven by relatively stable social norms that are deeply internalized within community life (Colfer *et al.*, 2021; Putnam *et al.*, 1994).

Overall, the participation index showed significant differences across strata (3.20^a, 3.42^b, 3.44^b; $p = 0.040$), although the pattern was not entirely linear. Stratum II and Stratum III exhibited relatively higher levels of participation compared to Stratum I, but the differences were not always statistically significant. These findings indicate that community participation in private forest management is multidimensional and is shaped more by a combination of social, economic, and institutional factors than by ecological conditions alone (Mansuri *et al.*, 2023; Yudono *et al.*, 2024). Therefore, efforts to strengthen community participation should consider not only the biophysical characteristics of the area but also the social mechanisms that support the formation of collective action within communities (Ostrom & Ahn, 2009; Pretty, 2003; Suharti *et al.*, 2016; van Noordwijk, 2021).

The Influence of Social Capital, Local Leadership, and Shared Knowledge on Community Participation

The regression analysis results presented in Table 5 indicate that not all dimensions of social capital were significantly associated with community participation. Trust showed a tendency toward a positive association with community participation, although the relationship did not reach the conventional level of statistical significance ($p = 0.062$). Social networks and norms were not significantly associated with community participation. In contrast, local leadership and shared knowledge were positively and significantly associated with community participation. In addition, elevation strata were not significantly associated with community participation in the regression model.

The results of the study indicate that not all dimensions of social capital exert the same influence on community participation in private forest management. Among the three tested dimensions of social capital, only trust shows a marginal association ($p = 0.062$), while social networks and norms are not statistically significant. In contrast, symbolic power and shared knowledge have

positive and statistically significant effects ($p < 0.05$), with relatively larger coefficients. This condition suggests that, in the context of private forest management, community participation is influenced more strongly by local leadership capacity and shared understanding among farmers than by the mere existence of social networks.

Table 5. The Influence of Social Capital, Local Leadership, and Shared Knowledge on Community Participation

Independent Variables	Coefficient (β)	Std. Error	t-value	p-value	Interpretation
Trust	0.152	0.081	1.88	0.062	Marginal (+)
Social Networks	0.118	0.075	1.57	0.119	Not significant
Norms	0.095	0.073	1.30	0.196	Not significant
Symbolic Power	0.221	0.089	2.48	0.014*	Significant (+)
Shared Knowledge	0.198	0.084	2.36	0.019*	Significant (+)
Elevation Strata (dummy)	-0.028	0.047	-0.60	0.551	Not significant
Constant	1.102	0.138	7.98	<0.001	—

Source: Analysis Result, 2026

Notes: * $p < 0.05$; Goodness of Fit: $R^2 = 0.47$; Adjusted $R^2 = 0.44$; F-statistic = 22.31 ($p < 0.001$).

Field observations show that farmer groups led by active chairpersons tend to exhibit higher levels of participation, particularly in conservation and land management activities. This influence does not arise solely from the formal position of the group leader, but also from social trust and the leader's ability to facilitate communication among members. In several cases, group leaders function as information brokers, drivers of collective activities, and actors who encourage farmers to remain engaged in private forest management. This condition demonstrates that social capital does not automatically translate into collective action without the presence of factors that can activate and channel cooperative potential at the community level (Ostrom, 2000; Sembiring *et al.*, 2021; Suharti *et al.*, 2016; Woolcock & Narayan, 2000).

The role of symbolic power as a significant factor highlights the importance of locally legitimate leadership in mobilizing communities. From Pierre Bourdieu's theoretical perspective, symbolic power enables certain actors to influence the perceptions and actions of others through socially recognized legitimacy. This finding is consistent with the results in Table 4, where the social influence dimension shows significant differences across elevation strata. It indicates that the presence of influential actors within the community plays an important role in encouraging collective engagement.

The study by Wardani *et al.* (2024) on women farmer forest communities in the northern Kendeng Mountain slopes provides empirical evidence supporting this finding. They demonstrate that social leadership built through the accumulation of social capital—particularly trust and networks—can foster active participation even under limited access to formal resources. In this context, local leaders with social legitimacy act as a bridge between forest management policies and field-level practices, as well as motivators who transform social capital potential into collective action. This is consistent with our regression results (Table 5), where symbolic power shows a positive and significant coefficient ($\beta = 0.221$; $p = 0.014$), confirming that the influence of local leadership is stronger than other social capital dimensions such as networks or norms.

Furthermore, shared knowledge was found to be significantly and positively associated with community participation. This variable reflects the level of common understanding regarding forest management objectives and practices, which serves as a foundation for coordinating collective action. This finding is consistent with the results in Table 3, which show that shared knowledge tends to increase in certain strata. From the perspective of common-pool resource management, shared understanding plays a crucial role in reducing potential conflicts and improving the effectiveness of cooperation among community members (Ortiz-Riomalo *et al.*, 2023; Ostrom & Ahn, 2009).

Field observations indicate that farmer groups with a better understanding of forest management techniques and conservation benefits tend to exhibit higher levels of participation. In several study locations, this knowledge developed through discussions among farmers, practical experience in land management, and informal learning processes within farmer groups. Such shared understanding facilitates coordination of activities and encourages greater involvement in private forest management.

In contrast, the social capital dimensions of social networks and norms did not show a significant influence on community participation. This suggests that the mere existence of social relations and collective norms within a community does not necessarily translate into individual engagement in collective action. This finding is consistent with the results in Table 3, which show that both dimensions are relatively stable and do not differ significantly across elevation strata. In many cases, social networks may remain passive and are not always mobilized for collective purposes, while social norms are often latent and not fully internalized in actual behavior (Fukuyama, 2002; Woolcock & Narayan, 2000).

Field evidence shows that farmer groups with relatively strong social ties do not always demonstrate active participation in private forest management. In some groups, social relationships among members function more as routine interaction rather than as a mechanism for coordinating collective action. Community members tend to become more actively involved when there are local leaders or farmer group chairpersons who are able to direct activities, build motivation, and provide a shared understanding of forest management practices that are considered appropriate to local land conditions and farmers' needs.

The insignificance of the elevation strata variable in the regression model provides important implications for understanding the relationship between ecological factors and community participation. Although the descriptive results in Tables 3 and 4 show variations across strata, these effects do not appear to be direct. This indicates that ecological factors function more as a contextual background shaping social dynamics rather than as the primary determinants of participation. In other words, environmental conditions may influence patterns of social interaction and resource distribution, but their effect on participation operates through social mechanisms that emerge within the community (Adger, 2010; Ostrom & Ahn, 2009).

Moreover, the non-significance of elevation strata may also be related to the relatively homogeneous social characteristics of the study area. Although the villages differ in elevation strata, the geographical distance between them is not substantial and they are still located within the same regency. As a result, social characteristics such as interaction patterns, community norms, and forest management practices tend to be relatively similar. Similar observations have been highlighted in community-based natural resource management studies, which emphasize that communities are often more socially homogeneous than ecological classifications alone would suggest (Agrawal & Gibson, 1999). Consequently, ecological variation across strata is not sufficiently strong to generate statistically significant differences in community participation.

CONCLUSION AND RECOMMENDATIONS

This study shows that community participation in private forest management is not directly determined by social capital or ecological factors such as elevation strata. Although several dimensions of social capital exhibit variation across strata, their effects on community participation are not consistent when tested simultaneously. In contrast, symbolic power and shared knowledge demonstrate a stronger and more dominant influence in driving community participation. These findings indicate that community engagement is more strongly shaped by the presence of locally legitimate leadership and shared understanding among farmers regarding private forest management.

Furthermore, the non-significant effect of elevation strata suggests that ecological factors do not act as direct determinants of participation, but rather serve as a contextual background shaping social dynamics within the community. In the context of the Bengawan Solo Hulu watershed, which is relatively socially homogeneous, strengthening social relations alone is insufficient to foster collective action without active local leadership and ongoing processes of shared learning at the community level. Based on these findings, efforts to enhance community participation should not focus solely on strengthening social capital in general, but should also prioritize the development of local leadership capacity and the expansion of knowledge-sharing platforms among farmers to support more sustainable private forest management.

REFERENCES

- Adger, W. N. (2010). Social capital, collective action, and adaptation to climate change. In *Der klimawandel: Sozialwissenschaftliche perspektiven* (pp. 327-345). Springer.
- Agrawal, A. (2001). Common property institutions and sustainable governance of resources. *World development*, 29(10), 1649-1672.
- Agrawal, A., & Gibson, C. C. (1999). Enchantment and disenchantment: the role of community in natural resource conservation. *World development*, 27(4), 629-649.
- Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N. J., Bauch, S., Börner, J., Smith-Hall, C., & Wunder, S. (2014). Environmental income and rural livelihoods: a global-comparative analysis. *World development*, 64, S12-S28.
- Babbie, E., & Edgerton, J. D. (2023). *Fundamentals of social research*. Cengage Canada.
- Barletti, J. P. S., Cronkleton, P., & Vigil, N. M. H. (2022). Using Q-methodology to bridge different understandings on community forest management: lessons from the Peruvian Amazon. *Ecology and Society*, 27(4).
- Baynes, J., Herbohn, J., Smith, C., Fisher, R., & Bray, D. (2015). Key factors which influence the success of community forestry in developing countries. *Global Environmental Change*, 35, 226-238.
- Bourdieu, P. (2011). The forms of capital.(1986). *Cultural theory: An anthology*, 1(81-93), 949.
- CDK-XI. (2024). *Cabang Dinas Kehutanan XI (CDK XI):Pengembangan HHBK Melalui Jejaring Kerja Pentahelix di Wilayah Kerja CDK XI*
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American journal of sociology*, 94, S95-S120.
- Colfer, C. J. P., Prabhu, R., & Larson, A. M. (2021). *Adaptive collaborative management in forest landscapes: Villagers, bureaucrats and civil society*. Routledge.
- Creswell, J. W., J David. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- FAO. (2020). *State Of The World's Forests 2020: Forestry, Biodiversity and People*. FOOD & AGRICULTURE ORG.
- Fukuyama, F. (2002). Trust: kebajikan sosial dan penciptaan kemakmuran. *Language*, 19(563p), 24cm.
- Green, S. B. (1991). How many subjects does it take to do a regression analysis. *Multivariate behavioral research*, 26(3), 499-510.
- Habib, N., Ariyawardana, A., & Aziz, A. A. (2023). The influence and impact of livelihood capitals on livelihood diversification strategies in developing countries: a systematic literature review. *Environmental Science and Pollution Research*, 30(27), 69882-69898.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis.
- Jalil, A., Yesi, Y., Sugiyanto, S., Puspitaloka, D., & Purnomo, H. (2021). The role of social capital of Riau women farmer groups in building collective action for tropical peatland restoration. *Forest and Society*, 5(2), 341-351.
- Kandari, A. M., Khairun, K., Rosmarlinasiah, R., Kasim, S., Midi, L. O., Inda, W. O., & Mardhatillah, S. (2020). Tingkat partisipasi Pengelolaan dan Analisis Finansial Hutan Rakyat dengan Sistem Tunda Tebang di Kabupaten Konawe Selatan. *Jurnal Belantara*, 3(2), 128-138.

- Kharmylliem, B., & Kipgen, N. (2026). Social Capital and the Traditional Institutions: Water Governance in the East Khasi Hills, Meghalaya. *Sociological Bulletin*, 75(1), 106-126.
- Körner, C. (2007). The use of 'altitude' in ecological research. *Trends in ecology & evolution*, 22(11), 569-574.
- Kurniawan, T., Mayasari, I., & Prasajo, U. (2018). Private forest as a model in critical land reconstruction in upstream area, Indonesia. IOP Conference Series: Earth and Environmental Science,
- Lee, H., Calvin, K., Dasgupta, D., Krinner, G., Mukherji, A., Thorne, P., Trisos, C., Romero, J., Aldunce, P., & Barret, K. (2023). *IPCC, 2023: Climate change 2023: Synthesis report, summary for policymakers. Contribution of working groups I, II and III to the sixth assessment report of the intergovernmental panel on climate change [core writing team, h. Lee and j. Romero (eds.)]. IPCC, geneva, Switzerland.*
- Mansuri, G., Palaniswamy, N., Rao, V., & Shrestha, S. A. (2023). Money versus Kudos: The impact of incentivizing local politicians in India. *Journal of Public Economics*, 224, 104922.
- Miller, D. C., Mansourian, S., Gabay, M., Hajjar, R., Jagger, P., Kamoto, J. F., Newton, P., Oldekop, J. A., Razafindratsima, O. H., & Shyamsundar, P. (2021). Forests, trees and poverty alleviation: Policy implications of current knowledge. *Forest Policy and Economics*, 131, 102566.
- Ortiz-Riomalo, J. F., Koessler, A.-K., & Engel, S. (2023). Fostering collective action through participation in natural resource and environmental management: An integrative and interpretative narrative review using the IAD, NAS and SES frameworks. *Journal of environmental management*, 331, 117184.
- Ostrom, E. (2000). Collective action and the evolution of social norms. *Journal of economic perspectives*, 14(3), 137-158.
- Ostrom, E., & Ahn, T.-K. (2009). The meaning of social capital and its link to collective action. *Handbook of social capital: The troika of sociology, political science and economics*, 17-35.
- Pacheco, A., & Meyer, C. (2022). Land tenure drives Brazil's deforestation rates across socio-environmental contexts. *Nature communications*, 13(1), 5759.
- Parmesan, C., Morecroft, M. D., Trisurat, Y., & Mezzi, D. (2022). *Climate change 2022: Impacts, adaptation and vulnerability* GIEC; IPCC].
- Pretty, J. (2003). Social capital and the collective management of resources. *Science*, 302(5652), 1912-1914.
- Purwanti, N., Rahim, S., & Hamidun, M. S. (2022). Partisipasi masyarakat dalam kegiatan rehabilitasi hutan dan lahan (RHL) Di Kabupaten Bone Bolango. *Jurnal Belantara*, 5(1), 72-80.
- Putnam, R. D., Nanetti, R. Y., & Leonardi, R. (1994). Making democracy work: Civic traditions in modern Italy.
- Qurniati, R., Febryano, I. G., & Zulfiani, D. (2017). How trust influence social capital to support collective action in agroforestry development? *Biodiversitas Journal of Biological Diversity*, 18(3), 1201-1206.
- Rasul, G., Saboor, A., Tiwari, P. C., Hussain, A., Ghosh, N., & Chettri, G. B. (2019). Food and nutrition security in the Hindu Kush Himalaya: Unique challenges and niche opportunities. In *The Hindu Kush Himalaya assessment: Mountains, climate change, sustainability and people* (pp. 301-338). Springer.
- Rendrarpoetri, B. L., Rustiadi, E., Fauzi, A., & Pravitasari, A. E. (2024). Sustainability Assessment of the Upstream Bengawan Solo Watershed in Wonogiri Regency, Central Java Province, Indonesia. *Sustainability*, 16(5), 1982.
- Riyanto, S., Ismaila, M. H., & Bidina, S. (2026). Social capital as power resource in forest governance networks: A systematic review.
- Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of innovations. In *An integrated approach to communication theory and research* (pp. 432-448). Routledge.
- Sarkar, B. C., Shahina, N., Shukla, G., Nath, A. J., & Chakravarty, S. (2025). Altitudinal influence on homegarden composition and livelihood contributions in the Darjeeling Himalayas. *Agroforestry Systems*, 99(8), 1-14.

- Sembiring, F. R., Sundawati, L., & Nugroho, B. (2021). The failure factors of collective action in promoting the recognition of customary forest: case of c Rumbio Customary Forest in Riau Province.
- Situmorang, R. (2023). Comparison of social capital of different community forest managements and their impact on community participation in the Social Forestry (SF) Program in Indonesia. IOP Conference Series: Earth and Environmental Science,
- Suharti, S., Darusman, D., Nugroho, B., & Sundawati, L. (2016). Strengthening social capital for propelling collective action in mangrove management. *Wetlands ecology and management*, 24(6), 683-695.
- van Noordwijk, M. (2021). Agroforestry-Based ecosystem services: Reconciling values of humans and nature in sustainable development. *Land*, 10(7), 699.
- Wardani, R., Widiyanto, W., Nurhaeni, I. D. A., & Listyawati, A. (2024). Sustainable Forest Management: A Social Capital Approach for Women Forest Farmers on The Slopes of Mount Kendeng North, Central Java. *GeoEco*, 10(2), 287-302.
- Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank Research Observer*, 15(2), 225-249.
- Wulandari, C., Puspasari, E., & Budiono, P. (2025). Correlation Of Knowledge And Community Participation In Land Conservation-Based Agroforestry: A Case Study In Tanjung Agung Village, Lampung. *Jurnal Belantara*, 8(2), 217-225.
- Yudono, A. R. A., Suntoro, S., Danisworo, C., & Ikhsan, C. (2024). Environmental Degradation Analysis of Former Bengawan Solo River Lake Ecosystem. *Indonesian Journal of Geography*, 56(3).