



(RESEARCH ARTICLE)



## Community participation in Mat Forest Watershed conservation at Meung Kham District, Xieng Khouang Province, Lao PDR

Bounxian Phetlumphon \*, Somsack Nanthavong and Hor Manythong

*Department of Forest Resources, Faculty of Agriculture and Forest Resources, Souphanouvong University, Luang Prabang, Lao PDR, postal: 06000*

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### Abstract

This study examined community participation in Mat Forest Watershed Conservation at Meung Kham District, Xieng Khouang Province, Lao PDR, and analyzed socioeconomic factors associated with that participation. A structured interview survey was conducted with 167 randomly selected households from three villages — Ban Yodkeo, Ban Xam, and Ban Viengkham — using the Taro Yamane formula (1973) at 95% confidence level. Four conservation activities were assessed: forest management planning, forest boundary demarcation, tree planting, and forest patrol. Data were analyzed using descriptive statistics and Pearson Chi-square tests at a 0.05 significance level. Results showed that most households participated in tree planting (85.00%) and forest boundary demarcation (74.30%), while forest patrol (34.10%) and planning activities (14.40%) had lower participation rates. Chi-square analysis revealed that age and education level were significantly associated with patrol participation ( $p < 0.05$ ), and monthly income was significantly associated with both boundary demarcation and patrol activities. Gender, occupation, and ethnicity showed no significant association with any conservation activities. The study concludes that targeted awareness campaigns, financial support, and capacity-building programs for community members — particularly focusing on older and less-educated groups — would improve overall participation in watershed forest conservation.

**Keywords:** Community Participation; Watershed Conservation; Forest Protection; Xieng Khouang; Lao PDR

### 1. Introduction

Lao PDR is endowed with abundant natural resources that form the economic foundation of rural communities. The majority of rural households depend on forest resources for timber, fuelwood, traditional medicine, and food. Forest conservation and watershed protection are therefore critical not only for biodiversity but also for sustaining rural livelihoods and water supply for agricultural and domestic use.

Mat Forest Watershed (Nam Mat Watershed Protection Forest) in Meung Kham District, Xieng Khouang Province, was formally established by Decision No. 1482/DX.XK on July 31, 2020, covering 228,231 hectares across the entire province, of which 73 hectares fall within Meung Kham District. The watershed encompasses three study villages — Ban Yodkeo, Ban Xam, and Ban Viengkham — where multi-ethnic communities including Lao Loum, Khmu, and Hmong groups practice subsistence agriculture and depend heavily on forest ecosystem services.

Despite legal designation as a protected watershed, enforcement capacity remains limited and community participation in conservation activities is uneven. Understanding the factors that influence household participation is essential for designing effective community-based forest management (CBFM) interventions. Previous studies in Lao PDR (Ministry

\* Corresponding author: Bounxian PHETLUMPHUN

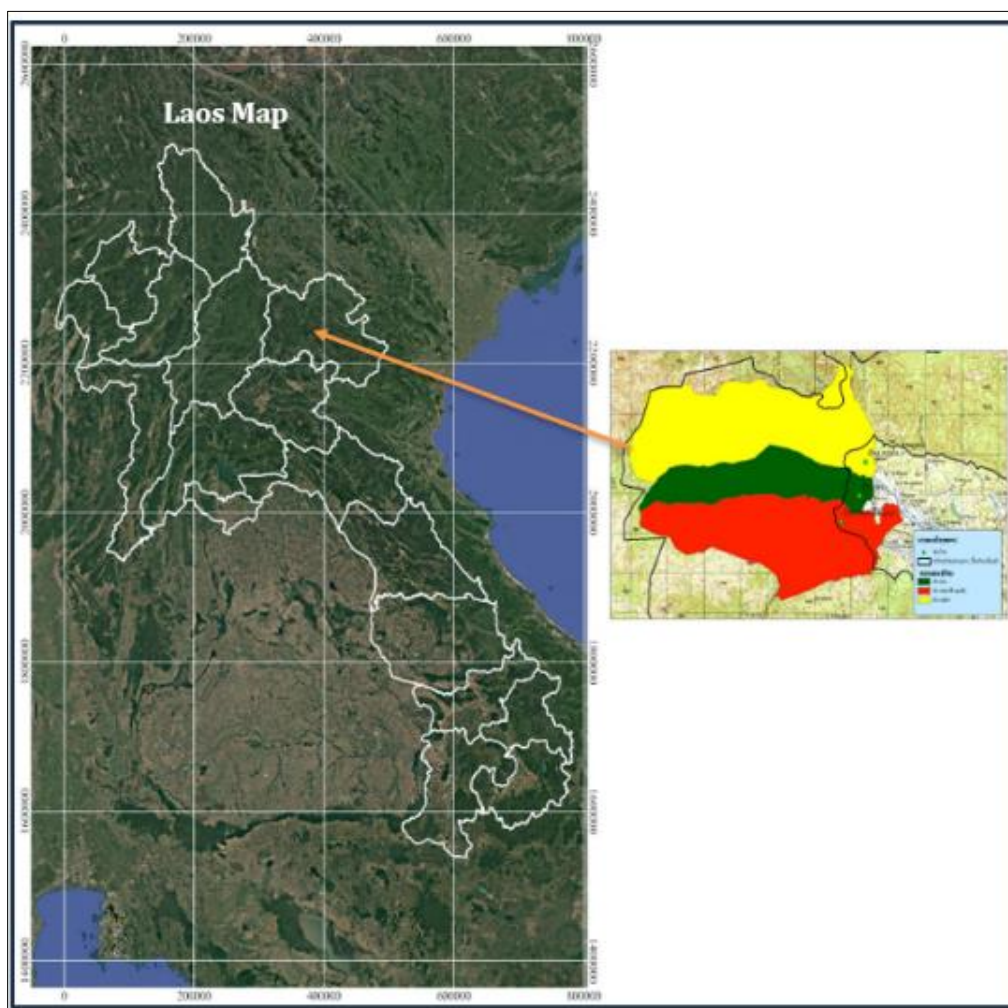
of Agriculture and Forestry, 2000; Manokhay Oupasith, 2001) have demonstrated that participatory approaches involving local communities are more effective and sustainable than top-down enforcement models.

This study therefore aimed to: (1) assess the level of community participation in four key conservation activities in the Mat Forest Watershed; and (2) identify socioeconomic factors significantly associated with participation, as a basis for evidence-based CBFM policy recommendations

## 2. Materials and Methods

### 2.1. Study Area

The study was conducted in three villages adjacent to the Mat Forest Watershed Protection Area in Meung Kham District, Xieng Khouang Province, Lao PDR: Ban Viengkham (159 households; 746 persons; 4,926 ha total area; 3 ethnic groups — Lao Loum, Khmu, Hmong), Ban Xam (60 households; 247 persons; 23,224 ha total area; 1 ethnic group — Tai Dam), and Ban Yodkeo (68 households; 511 persons; 3,600 ha total area; 3 ethnic groups — Tai Dam, Khmu, Hmong). All three villages lie approximately 10–13 km from the district capital. Primary livelihoods include subsistence farming and livestock rearing.



**Figure 1** Location of the Study Area in the Kham District, Xieng Khouang Province, Laos

### 2.2. Sample Size Determination

The total population comprised 287 households across the three villages. The required sample size was calculated using the Taro Yamane (1973) formula at a 95% confidence level ( $p < 0.05$ ):

$$n = N / (1 + Ne^2) = 287 / (1 + 287 \times 0.05^2) = 167 \text{ households}$$

Proportional stratified random sampling was applied within each village, yielding: Ban Yodkeo = 40 households, Ban Xam = 35 households, and Ban Viengkham = 92 households.

### 2.3. Data Collection

Primary data were collected through structured household interviews conducted between February and April 2022. The interview instrument covered: (1) sociodemographic characteristics (gender, age, education level, occupation, monthly income, ethnicity); (2) participation in four conservation activities over the preceding three years (2018–2021): forest conservation planning, forest boundary demarcation, tree planting, and forest patrol; and (3) perceived constraints and recommendations for improvement.

Secondary data were obtained from relevant publications, official reports of the Ministry of Agriculture and Forestry, and previous graduation theses at Souphanouvong University.

### 2.4. Data Analysis

Descriptive statistics (frequency and percentage) were used to characterize respondent profiles and participation levels. Pearson Chi-square tests were applied to assess associations between each sociodemographic variable and participation in each of the four conservation activities, at a 0.05 significance level. All analyses were performed using SPSS for Windows.

## 3. Results

### 3.1 Respondent Characteristics

Of the 167 sampled households, 85.60% were headed by males. The largest age group was above 50 years (45.80%), followed by the 41–50 year group (26.50%). Education was predominantly at lower secondary level (50.90%), with 43.10% having less than primary education. Agriculture was the primary occupation of 95.80% of respondents. Monthly household income below 500,000 LAK was reported by 69.50% of households. Lao Loum was the dominant ethnic group (88.50%). Most households (85.50%) were original village residents. None of the 167 households reported having received information on forest conservation or tree planting promotion in the preceding three years.

**Table 1** Selected sociodemographic characteristics of respondents (n = 167)

Variable	Category	Households (n)	Percentage (%)
Gender	Male	143	85.60
	Female	24	14.40
Age (years)	20–30	5	3.00
	31–40	41	24.70
	41–50	44	26.50
	> 50	76	45.80
Education	Below primary	72	43.10
	Lower secondary	85	50.90
	Upper secondary/vocational	7	4.20
	Bachelor and above	3	1.80
Monthly income (LAK)	< 500,000	116	69.50
	500,001–1,000,000	51	30.50
Occupation	Agriculture	159	95.80
	Trade/business	3	1.80
	Government/other	5	2.40

### 3.2 Community Participation in Conservation Activities

Results showed wide variation in participation rates across the four activities. Tree planting recorded the highest participation (85.00%), followed by forest boundary demarcation (74.30%), forest patrol (34.10%), and conservation planning (14.40%).

**Table 2** Community participation in Mat Forest Watershed conservation activities

Conservation Activity	Participated (n)	Participated (%)	Did Not Participate (n)	Did Not Participate (%)
Forest conservation planning	24	14.40	143	85.60
Forest boundary demarcation	124	74.30	43	25.70
Tree planting	142	85.00	25	15.00
Forest patrol	57	34.10	110	65.90

### 3.3 Factors Associated with Participation

Pearson Chi-square tests were conducted for six sociodemographic variables (gender, age, occupation, ethnicity, education level, and monthly income) against participation in each of the four conservation activities. Results are summarized in Tables 3–8.

Gender was not significantly associated with any of the four conservation activities (all  $p > 0.05$ ). Age was significantly associated only with forest patrol (Chi-square = 11.166,  $p = 0.025$ ), but not with planning, demarcation, or tree planting. Occupation showed no significant association with any activity. Ethnicity was significantly associated only with conservation planning (Chi-square = 0.000,  $p = 0.000$ ), but not with other activities. Education level was significantly associated with forest patrol (Chi-square = 9.489,  $p = 0.050$ ). Monthly income was significantly associated with boundary demarcation (Chi-square = 3.888,  $p = 0.049$ ) and forest patrol (Chi-square = 5.458,  $p = 0.019$ ).

**Table 3** Chi-square results: Sociodemographic factors vs. conservation activity participation

Factor	Conservation Planning		Boundary Demarcation		Tree Planting		Forest Patrol	
	$\chi^2$	p	$\chi^2$	p	$\chi^2$	p	$\chi^2$	p
Gender	0.169	0.681	2.025	0.155	0.063	0.801	3.803	0.051
Age	1.191	0.880	2.403	0.662	6.108	0.191	11.166	0.025*
Occupation	0.044	1.000	2.375	0.667	8.302	0.081	1.269	0.867
Ethnicity	0.000	0.000*	2.487	0.288	3.570	0.168	3.257	0.196
Education	0.971	0.914	3.021	0.554	1.916	0.751	9.489	0.050*
Income	0.442	0.506	3.888	0.049*	1.539	0.215	5.458	0.019*

\* Significant at  $p \leq 0.05$ .  $\chi^2$  = Pearson Chi-square value.

## 4 Discussion

The high participation rate in tree planting (85.00%) reflects the effectiveness of organized community forestry activities in Lao PDR, where tree planting events are commonly mobilized through village governance structures. Similarly, forest boundary demarcation (74.30%) benefits from its tangible, one-time nature, making participation easier than recurring activities such as patrol.

The low participation in conservation planning (14.40%) is consistent with findings by Soulidsana Vilavong (cited in Khamkeng Lasongtho, 2019), who noted that communities are typically informed of decisions rather than actively engaged in planning processes. This top-down dynamic limits the sense of ownership and long-term commitment needed for sustainable watershed management.

The significant association between age and forest patrol participation suggests that older household heads are more likely to participate in patrol activities, possibly due to stronger community ties and a greater sense of responsibility for protecting traditionally-used forest areas. Similarly, the significant association between education level and patrol participation suggests that more educated community members better understand the ecological and legal obligations around watershed protection.

The significant association between monthly income and boundary demarcation and patrol participation reflects opportunity cost constraints. Households with lower incomes may face greater trade-offs between participating in unpaid conservation activities and engaging in income-generating work. This finding supports the recommendation to introduce incentive mechanisms, such as small payments for ecosystem services (PES) or provision of agricultural inputs, to encourage participation among lower-income households.

Compared to a study by Sonjitmani Joun (2021) on watershed management at Kwangsi Waterfall, Luang Prabang, which found significant associations between gender, age, education, and occupation with conservation participation, the present study found only age, education, and income to be significant factors. These differences may reflect distinct socioeconomic contexts and community governance structures between the two study areas.

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## 5 Conclusion

This study demonstrated that community participation in Mat Forest Watershed conservation activities varies substantially across activity types and is influenced by age, education level, and monthly income. Tree planting and forest boundary demarcation achieved high participation, while forest patrol and conservation planning remained low. The lack of conservation awareness and extension services — reported by 100% of respondents — represents a critical gap.

The following recommendations are proposed: (1) the Department of Agriculture and Forestry should implement at least two community training sessions per year on watershed conservation; (2) public awareness campaigns should be conducted at least three times per year; (3) financial support or in-kind incentives should be provided for patrol activities, particularly targeting low-income households; and (4) participatory planning processes should be adopted to increase household engagement in conservation decision-making.

Future research should examine the ecosystem service benefits derived from the Mat Forest Watershed and evaluate the cost-effectiveness of different incentive mechanisms for sustaining community participation.

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## Compliance with ethical standards

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### *Disclosure of Conflicts of Interest*

The authors declare no conflict of interest.

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