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## Factors affecting the participation in community forest conservation in Northern Upland of Laos P.D.R

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**Abstract** Results showed that the variable of household income had a strong degree of association with participation in activities of community forest conservation, and old age households had more opportunities to participate in knowledge dissemination activity than young age households. Men were more participated than women, especially, in forest restoration activities. The educated households were participated more in the activity of forest fire prevention than the uneducated households such as households who lived far from the place of community and were not to be members of social committees and who did not access training activities. In contrast, the getting information was promoted the people to participate more in activities of community forest conservation. The accessibility households of large land-holding had less participated a lot of activities. Households are hold the executive position in social committees who participated more activity of forest conservation, and public relations activity. Moreover, households with long periods of residence are participated in the activity of forest conservation and public relations activity. The results showed that the community forests conservation activities of households were not homogeneous, due to a policy of users who were equal; participated in all activities of community forest conservation.

**Keywords:** Community, Participatory, Forest conservation activity

### Introduction

Community forest management in Laos is complex, and the practice is not systematic, which makes it difficult to manage. The concept of co-management was developed to response with the collaboration of local communities in governance, and to manage the sustainable resource (Noble, 2000), to respond with sustainable forest management, which identified three main models as production forest is managed by state, community forest is managed by village, and model of the use of Non-timber forest products. All models, villagers had to participate in all steps of forest management (Manivong and Sophathilath, 2007). In the context of forest resources

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utilization in Laos, the forests are pointed to be an importance source of living for rural people e.g., it contributes to providing food, fuel wood, medicine, fodder, building materials, etc. In contrast, forests change a lot from the utilization of forest products (Foppes and Ketphanh, 1997; Kashio and John, 2000; Soe and Yeo-Chang, 2019; Sunderlin *et al.*, 2005). Especially, forest products provide empirical utilization to poor families' livelihoods in rural areas, especially, almost all of people in the rural areas depend on forest resources around 50-80% (Lao, 2005; Somsoulivong, 2002; Sophathilath, 2010; Sharma *et al.*, 2015); because, they use the benefit of environmental protection (e.g. biodiversity conservation, water storage, and soil erosion (Lan *et al.*, 2002; Ickowitz *et al.*, 2014; Powell *et al.*, 2013). Non-timber forest products play an essential role in promoting household income in rural areas (Rasmussen, Watkins, and Agrawal, 2017; Gatiso, 2019; Quang and Noriko, 2008; Alam, Mohiuddin, and Basak, 1996; Narendran *et al.* 2001). Nevertheless, the dominant trends of non-timber forest products, resources reduction from commercial species are needed e.g. market demand, and population growth (loss of forest area) (Xayvongsa *et al.*, 2009). A study by Thephavanh *et al.* (2011) revealed that the overall village forest quality and wild resources are degraded and depleted. The forest resources are overused and estimated to be reduced e.g., Fuel wood, timber. Other studies pointed out that community forest is managed and it provided a necessity to local people in communities (Adhikari *et al.*, 2004) e.g. community based co-management project changed the effectiveness of livelihood capital into five classes as the capital of social, human, natural physical, financial, and increasing the averaged income in the family and improving forest conservation. Nevertheless, there are some issues in designing and implementation of the project such as complicated in term of social and politic between the government and community as in terms of benefit and local culture (Chen *et al.*, 2012). Currently, community forest are widely involved with issues of social, economic, political, and environmental factors (Timsina *et al.*, 2004), e.g. forest resource in Nepal declines, due to the policy is not appropriated to guide in development in term of legal, institutional and operation in the forest sector. The most forest policy is not realized on ecological characteristics but it is realized on economic and political characteristics (Chaudhary, 2000). The participatory forest management issues in Ethiopia forest area was established by forest associations to decline forest areas which it was better than the forest areas with not forest association resulted to the villagers who are engaged in utilization (Takahashi and Todo, 2012). Moreover, many studies revealed that factors involved with forest conservation include age, residential year in community, and farm husbandry skills which significantly influenced in forest resources utilization (Ofoegbu *et*

*al.*, 2017), and factors of gender, income, family size, land tenure, and technical assistance are mainly influenced to the program in participatory forest management (Coulibaly-Lingani *et al.*, 2011). Also, many factors are significantly influenced in participation to the community forest conservation, including socio-economic status which depended on forest, and participatory forest management (Wambugu, Obwoyere, and Kirui, 2018), and two main variables (social, and political) are affected participatory forest management in local community (Mekete, 2018). Other factors, the stable of institutional organization is needed and guaranteed that the local people can get information and access benefits from the forest (Mustalahti and Lund, 2009) such as the difference of participation in benefit-sharing between local people group in Sururu forest management e.g. unequal in accessing information, weakness of the legal framework and social position and resources (Wamae, 2013). Moreover, the prospects of sustainable community forest management in Thailand considered that community members had high motivation and are interested in forest protection due to a good awareness of their subsistence without deforestation. The relationships between the nature, tradition and culture of the local community have supported. Non-timber forest products are an empirical contribution in livelihoods of local community and necessary for watershed forest zone protection and promotion in their occupations which were importantly considered and made the spiritual rituals by forest ordination to protect forests (Salam, Noguchi, and Pothitan, 2006).

Phonxay district is one district that lies in the north of LuangPrabang province, total areas are 224.354 hectares, forest covers around 48,479 hectares (21,61%) including evergreen forest 2.443 ha (1, 09 %); mixed forests 39.586 ha (17, 64%), dry dipterocarp forest 1.067 ha (0, 48%); bamboo 5.182 ha (2, 31%); and forest plantation 201 ha (0, 09%). It is a district under the priority plan of the government, resulting from the poverty of households at a high rate of 40% (PAREDD, 2014). The community forest management under the village or communities are not strictly controlled. Many forest areas are decreased each year especially in HOUYKHING County. The forest covers only a remaining 5,142 hectares, accounting for 10.60. The caused communities and neighboring villages encroached on forest areas for benefit of housing material, timber trading, fuel wood, hunting, collection of non- timber forest products, and forest clearing for agricultural products including livestock areas expansion (District, 2019). Moreover, the model of community conservation is still based on a traditional way of practice, paying attention to rules was weak, and the model was established by community revealing to be unclear and unknown to many stakeholders in the areas. Nowadays, HOUYKING County is an area which the government is planning to create a pilot model in development. It is a

good guideline for the development and improvement of a forest conservation model to be consistent with the real local condition which reduce conflict with the community. Therefore, the objectives were to describe the characteristic of socio-economic in HOUYKHING communities and to identify factors affecting community forest conservation of households at Phonxay district, LuangPrabang, Laos using multiple related factors.

## **Materials and methods**

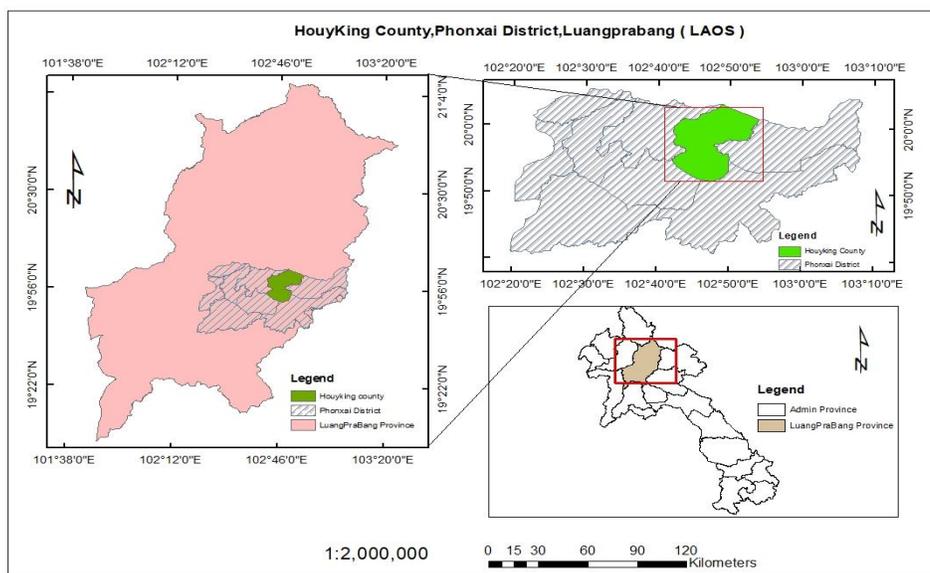
The study was conducted in HOUYKHING County, Phonxai District, Lungprangbang province, which is located in the Northern upland of Laos. This region is around 98 Km far from Luangprabang city (Figure 1). HOUYKHING county is located with longitudes 102°44'33.77" E to 102°50'16.49"E and latitudes 19°52'51.89"N to 20°2'12.84"N. The elevation of the district varies from 333 to 2212 meters and is covered by high slope areas, middle, and valley floors (District, 2019). HOUYKHING County is located 38 km east of the capital city Phonxay. There are 6 villages, a total population of 4.080 people, 2.074 people are male and 2.006 people are female, and it has a total of 661 households including Laoloum 0.98 %, Kumu 57.42%, and Laosoung 42%. The total areas are 31.231hectares including farming land 14.732,2 hectares (paddy field 20,6 ha, upland rice 777 ha), husbandry land 568.75 hectares, and other lands. The average literacy rate at secondary school is 27.77 %. The main occupation of villagers was farming and husbandry (Report, 2020). Almost all of the population 80% relies on agriculture, due to the land being covered by mountains, which resulted in farmers producing upland rice (Sánchez-Moreno, Farshad, and Pilesjö, 2013). HOUYKING community depends on forests resource that is near the National Protected Area in the region of NAMPA, NAMTHER, and HOUYPHA, which is a food source for forest products collected for consumption and sale. The community forest is still a source of herbs, wood usage source, and as well as a source water storage. Moreover, it has value-added in terms of social and local culture (District, 2019).

Multistage sampling methods were used for this study. The household interview was conducted by the questionnaires in 6 villages within 10 kilometers of the community forest of HOUYKING county (a production forest) with a total of 252 households selected in 6 villages including HOUYKING, HOUYTHO, LONGLATH, SAKHOUN, HOUYHA, and PHUKBONG. The study was estimated the sample size by the formula in equations 1 that referred from the equations of Taro Yamane (1967) and the equation is used to calculate the sample size such as the study (Dessie *et al.*, 2019; Israel 1992). The equation is written as below:

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

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N is sample size (N) refer to the population in HOUYKING County (6 Villages), e is significance level at 0.05. Therefore, the sample size used to compute in equation 1.



**Figure 1.** Map of the study area

The value of correlation coefficients is associated between the dependent variable and independent variable. Moreover, the statistic of chi-square was determined the association of dependent variables and independent variables for categorizing the variables. The order logistic regression model was conducted an analysis participation in the activity of forest conservation, reforestation, forest fire prevention, knowledge dissemination, and public relations. The various equations were clarified with analysis information. Participation in activities of community forest conservation was explained independent variables by the equation as below:

$$Y_i = \beta x_i + \mu_i \quad (2)$$

Where,  $y_i^*$  is the latent variable which was not unobserved,  $x_i$  represents explanatory variables;  $\beta$  is parameters and  $\mu_i$  is residual error. Five ranging scales of participation in activities of community forest conservation are

defined as number 1 to 5 which 1 indicating lower participation, 2 = low participation, 3= moderate participation, 4= high participation and 5= highest participation. The equation is determined by  $u_{j-1} < y_i^* < u_j$ , where,  $j = 1, 2, 3, 4, 5$  and  $-\infty$ , by  $u_1 < u_2 < u_3 < u_4 < u_5 = \infty$ . Parameters  $u_i$  are estimated. The cut points are divided by distribution of  $y_i^*$  into five categories thus, response variable Y is a discrete realization of  $y_i^*$ , and the equation is created as below:

$$Y \text{ ?} = \begin{cases} 1 \text{ if } y_i^* \leq u_1 \\ 2 \text{ if } y_i^* \leq u_2 \\ 3 \text{ if } y_i^* \leq u_3 \\ 4 \text{ if } y_i^* \leq u_4 \\ 5 \text{ if } y_i^* \leq u_5 \end{cases} \quad (3)$$

Some values of coefficients (  $\beta$  ) showed that the dependent variable changed by change of the explanatory variable in a unit, and other variable staying constant. The Model was the same practice with each participant in activities of community forest conservation to find affecting on independent variables.

Participation in the activity of community forest conservation was a dependent variable in our equation. Its operationalization was concerned under a lot of activities of community forest conservation. Households were asked on a five-point scale of participation from lower participation to highest participation by coding 1 to 5 identifying the level of participation as a household or other household were replaced coding 1,2,3,4 and 5, if one member within the household was lower participation to be the highest participation in any activity of community forest conservation. The simple statistics in descriptive with all variables that showed in Table 1. The discrete dependent variable was participated in community forest conservation (PCFC). Explanatory variables are discrete and continuous variables are discussed by their justifications in Table 1.

## Results

The results revealed that among sample respondents of the respondents (71.83 %) were male with the range of respondents' age between 31- 40 years, and the average age was around 35.091 years. 8.33 % of respondents were

uneducated and 91.67 % had an educational level of primary school. The average number of household members was 6.738 persons, with a minimum of 2, and a maximum of 12 persons. The main occupation was done farming (98.8%). The respondents' monthly income in agriculture ranged from 15,001 to 30,000 baht, and the average income was 29,322.38 baht. It is indicated that the average land ownership size of respondents was 3.888 hectares. The period of residence within the village was more than 10 years, and the average period of residence was 18.376 years. 85.32 % of respondents had never been trained about activities of community forest conservation. Nevertheless, they had gotten information about community forests, and the independent variables described with statistics are shown in Table 1. Moreover, the results of correlation coefficients of continuous independent variables are shown in Table 2. Chi-square with was analyzed the discrete independent variables which shown in Table 3. It was obvious that the key findings of the analysis in the model of order logistic regression on participation in activities of community forest conservation is shown in Table 4. Five ranging scales of participation were statistically significant differed with its value less than 0.0. It was obvious that the explanatory variables had higher power in explaining the regression model which the independent variables were related. Results of log-likelihood showed that dependent variables were appropriated for data with good explanatory variables in each model.

**Table 1.** Sample statistics explaining all the variables in the statistical model

Variable	Mean	Standard deviation	Minimum	Maximum
PCFC (conservation, reforestation, forest fire prevention, knowledge dissemination, and public relations).				
Sex (Dummy for gender)	0.285	0.452	0	1
Age (age of household, continuous)	35.091	9.738	19	65
Status (marital status in society)	0.920	0.270	0	1
Education level (educational attainment of household)	0.083	0.276	0	1
Household size (number of members of a household)	6.738	1.917	2	12
Occupation (main occupation of households)	0.988	0.108	0	1
Household income (total income of households)	29322.38	17840.25	6329.114	110759.5
Size of landholding (Land size of landowners, 0.5 hectares)	3.888	2.028	1	12
Period of residence (the residence within more than 10 years)	18.376	10.447	2	50
Social committees (social group membership within the village)	0.226	0.419	0	1
Training (training about community forest conservation)	0.146	0.354	0	1
Information (community forest information received)	0.571	0.495	0	1
Utilization (community forest utilization)	172.160	91.814	6	518

**Table 2.** Relationship of independent variables with participation in the activity of forest conservation, forest reforestation, forest fire-prevention, knowledge dissemination, and public relations (N=252)

Independent variable	Correlation coefficients				
	Forest Conservation	Forest Restoration	Forest fire prevention	Knowledge dissemination	Public relations
Age	0.095	0.104	0.048	0.148*	0.127*
Household size	0.022	-0.019	0.007	-0.009	0.020
Household Income	0.137*	0.182*	0.158*	0.288*	0.233*
Size of Landholding	0.270*	0.087	0.184**	0.203*	0.211*
Period of residence	-0.025	0.242*	0.020	0.127*	0.055
Utilization	-0.067	0.140*	0.087	-0.015	0.063

\* Statistically Significant value at 5% level

**Table 3.** Chi-square compare independent variables, and participatory in the activity of forest conservation, reforestation, forest fire prevention, knowledge dissemination, and public relations (N=252)

Independent variable	Forest Conservation		Forest Restoration		Forest fire prevention		Knowledge dissemination		Public relations	
	$\chi$	P	$\chi$	P	$\chi$	P	$\chi$	P	$\chi$	P
	Sex	33.854	0.111	31.138	0.003*	36.172	0.007*	38.084	0.002*	44.210
Status	24.828	0.472	24.007	0.031*	19.079	0.387	16.424	0.494	7.176	0.970
Education Level	16.777	0.890	7.814	0.855	19.081	0.387	17.308	0.434	9.027	0.912
Occupation	23.551	0.545	4.302	0.988	11.797	0.858	14.016	0.666	13.030	0.671
Social committees	58.751	0.000*	38.133	0.000*	33.255	0.016*	38.575	0.002*	73.811	0.000*
Training information	76.431	0.000*	21.166	0.070	41.146	0.001*	66.962	0.000*	67.098	0.000*
	54.645	0.001*	71.862	0.000	24.285	0.146	37.200	0.003*	36.898	0.002*

\* Statistically Significant value at 5% level

**Table 4.** Factors affecting participation in the activities of forest conservation, forest reforestation, forest fire-prevention, knowledge dissemination, and public relations

Independent variable	Forest Conservation		Forest restoration		Forest fire prevention		Knowledge dissemination		Public relations	
	B	Std.error	B	Std.error	B	Std.error	B	Std.error	B	Std.error
Sex	-.457	.311	-.743*	.387	.221	.322	-.689**	.300	-.781**	.307
Age	.031**	.014	.021	.016	.019	.014	.020	.013	.038***	.014
Status	-.258	.507	.655	.859	.156	.527	-.367	.458	-.449	.491
Education Level	-1.010 *	.528	-.180	.608	1.533***	.515	-.338	.462	.101	.499
Household size	-.100	.070	-.091	.075	-.070	.071	-.167**	.066	-.096	.067
Occupation	.754	1.376	.922	1.589	2.465**	1.257	-1.071	1.304	.446	1.441
Household Income	2.64e-06	8.80e-06	.000	9.44e-06	.000	8.74e-06	.000***	8.84e-06	.000*	8.57e-06
Size of Land holding	.326 ***	.076	-.012	.078	.096	.077	.086	.070	.030	.071
Period of residence	-.015	.012	.028**	.013	-.004	.012	.007	.011	-.002	.012
Social committees	1.292 ***	.380	.456	.375	.126	.394	.000	.364	.989***	.373
Training information	1.562 ***	.468	-.663	.435	1.728***	.484	1.562***	.489	1.149***	.443
Utilization	-1.235 ***	.290	2.106***	.341	-.638**	.300	.372	.275	-.386	.279
<b>cut1</b>	-.001	.001	.002*	.001	.002	.001	-.000	.001	.001	.001
<b>cut2</b>	.338	1.657	4.241	2.020	1.220	1.573	-2.492	1.609	.463	1.706
<b>cut3</b>	1.941	1.658	6.147	2.038	4.573	1.595	-.472	1.603	2.756	1.716
<b>cut4</b>	5.656	1.728	9.488	2.163	7.330	1.648	2.326	1.614	5.082	1.753
	7.925	1.972	-	-	-	-	5.037	1.746	7.536	2.000
	LR chi2(13) = 86.14		LR chi2(13) = 91.49		LR chi2(13) = 39.79		LR chi2(13) = 61.90		LR chi2(13) = 57.95	
	Prob > chi2= 0.000		Prob > chi2= 0.000		Prob > chi2= 0.000		Prob > chi2= 0.000		Prob > chi2= 0.000	

\* Statistically Significant value at \*=p&lt;0.05; \*\*=p&lt;0.01

## Discussion

The results revealed that a lot of respondents were participated the activity of knowledge dissemination, and public relations when compared with the activity of forest conservation, forest restoration, and forest fire prevention. There was a positive relationship between age and participation in the activity of knowledge dissemination. It implies that old people participated in activities more than younger people, and knowledge dissemination involved with forests was more required in activities of community forest conservation. These factors may increase in participation among older persons. The result of the study was similar to many studies (Dolisca *et al.*, 2006) who stated that age is negatively associated with participation in forestry management programs, which the age of respondents are not related in activities of participation to contribute in decision-making with forestry development programs. On the other hand, elder respondents are interested in forest resources utilization. Nevertheless, Apipoonyanon *et al.* (2020) stated that knowledge of community forest management (CFM) was positively influenced the programs in community forest participation, it implies that if respondents know information about community forest conservation, they are more likely to participate in activities, especially old people who have forest-related knowledge.

Gender was a variable factor that had significantly related with the activity of forest restoration. The men participated more in forest restoration activities than women because the work involved in using power, forest restoration required more physical strength which were more likely to participate in these activities. In contrast, the study of Agarwal (2009) pointed out that women were the key group with a high proportion in main decision making to improve in the forest condition. In addition, Coulibaly-Lingani *et al.* (2011) stated that benefit-sharing equitably of user groups and participation of women was very important to enhance in success of participatory forest management program, and gender was significantly influenced in participation. In contrast, in the activity of public relations, gender was a negatively significant relationship with participation. It implied that public relations structure was less likely to influence. Males were participated less in the activity of public relations.

The education level showed a significantly positive regression coefficient with participation in the activity of forest fire prevention. Overall, the educated people participated more in the activity of forest fire prevention than the uneducated people. These results are similar to the study of Savari *et al.* (2020) which revealed that education level had a positive significant influence on sustainable forest management of local communities and almost

82 % of the literate respondents were actively participated in community forest management when compared with 46 % of the illiterate, which was similar to report of Kugonza *et al.* (2009). On the other hand, the educational variable was negatively significant depending on forests. It was educated households better opportunities to earn money inside or outside the village than the uneducated households (Bhandari and Jianhua, 2017). Moreover, the study of Sapkota *et al.* (2015) indicated that variables of strengthening social capital, forming, and enforcing forest fire management rules were important in empowering people to participate in forest fire management practice. It is due to forest fire harm with the structure and composition of forests e.g. tropical evergreen and seasonal evergreen forest tree species are sensitive to fire (Cochrane, 2009). Almost 90% of forest fire in Lao PDR is caused by clearing agricultural production area and other from wild hunting (Bouschet, 1999).

The results of regression analysis showed that the size of the household had a negative relationship with the activity of knowledge dissemination. Generally, large households were participated more in activities of community forest conservation than the others. The results of the study were similar to the study of Jana *et al.* (2014), who indicated that the size of households was an important variable that influenced the changes in participatory forest management (Coulibaly-Lingani *et al.*, 2011). According to the study by Paudyal *et al.* (2018) who observed that higher levels of participation in a larger family size were statistically significant predictors of forest conservation. A larger family had more opportunities to participate in the activity of knowledge dissemination from community forest conservation than the others.

Holding an occupation had positively associated with forest fire prevention. Households with holding an occupation were participated more in the activity of forest fire prevention than the households without someone holding an occupation. The results are similar to the study of Jannat *et al.* (2020) who pointed out that a forest-related occupation is positively aligned with forest dependency. In contrast the occupation of the household head was negatively intensively influenced the utilization of forest products (Olunga *et al.*, 2015). The forest products were utilized by people and had affected on the management regime, whereas occupation was the crucial factor in accessibility using forest products in all forest types (Coulibaly-Lingani *et al.*, 2009). Therefore, the people's forest-related occupation gave more opportunities to participate in the activity of forest fire prevention. They may get information and training about community forest conservation more than people who were not lived in forest-related occupations.

Household income showed a significantly positive correlation with participation in all activities of community forest conservation, as the average

annual income was 29322.38 baht (US\$ 900), and the maximum value was 110759.5 baht, and the minimum value was 6329.114 baht. Results were similar to many studies (Jannat *et al.*, 2020) who identified that the income people get from forests was positively significant to forest dependency. In contrast, income was negatively influenced the use of community forest in toward forest conservation (Olunga *et al.*, 2015). Therefore, forest conservation can be enhanced and benefits-shared to the local community by creating awareness, and training them in all activities of community forest conservation. Moreover, income source influenced in the program in participatory forest management (Coulibaly-Lingani *et al.*, 2011), and it revealed that income source was a statistically significant predictor of the level of participation (Tadesse, Woldetsadik, and Senbeta, 2017). The respondents had a lot to benefit from forest products, and they were actively participated in the implementation of the program.

The size of landholding showed significantly positive correlated with participation in the activity of forest conservation, forest fire-prevention, knowledge dissemination, and public relations. Moreover, the correlation between the size of landholding and participation in the activity of forest restoration were positively significant differed. It showed a positive significance with participation in the activity of forest conservation. Nevertheless, it was not significant with participation in the activity of forest restoration, forest fire-prevention, knowledge dissemination, or the activity of public relations. These findings revealed that respondents with accessibility to large land size participated less in activities of community forest conservation because households with large land size choose more time in their landholding than time in activities of community forest conservation. Results were similar to Jana *et al.* (2014) who stated that landholding size was an important variable to explain the changes in levels of participation in joint forest management. The landholding size was negatively associated with participation in the contribution of forest management to improve subsistence. Increasing of landholding size of respondents are decreased with the contribution in forest management practice. The households with small cultivation land depended on forest products more than households which had a large cultivation farmlands (Gashu and Aminu, 2019).

The results of Chi-square revealed that social committees had significantly related with participation in all activities of community forest conservation. However, the results of regression analysis showed that social committees influenced participation in the activity of forest conservation and public relations at a positively significant coefficient. The households in the executive position of social committees had more participated in the activity of

forest conservation and public relations. Results were similar to the study of Baral (2012) who pointed out that the overall assessment of committee members for the agency's performance was a variable in influencing the confidence with community forests, and the number of forest committee meetings was an important variable to explain variation in participation levels of joint forest management (Jana *et al.*, 2014)

Period of residence showed positively related with participation in the activity of forest restoration and knowledge dissemination. Specifically, the results of regression revealed that the period of residence was significantly positive influenced in the activity of forest restoration, It was obvious that households who had a long period of residence with more opportunities to participate in all activities when compared with households with a short period of residence. The results were similar to Ofoegbu *et al.* (2017) who stated that almost 97% of respondents predominantly depended on forest resources due to low cost for utilization of socio-economic characteristics of households e.g. residence around 53–65 years in the community which significantly influenced in forest resources utilization. Moreover, the study by Bray *et al.* (2008), indicated that the degree and length of human residence were significant factors for correlation with deforestation.

A training variable showed that participation in the activity of forest conservation, forest fire-prevention, knowledge dissemination, and public relations were significantly associated to each other. The regression results showed that participation in the activity of forest conservation, forest fire-prevention, knowledge dissemination, and public relations had significantly positive associated. These activities may be due to people being higher educated, especially those who lived near the place of dominant activity of community forest conservation. In contrast, poor people who live far from the place of activity of community forest conservation particularly did not include in social committee member, and these people might access training activities. Results were similar to the study of Sookngam, Wongchantra, and Bunnaen (2021) who stated that the concept of environmental education training course for ethics volunteers of King Rama IX in Thailand indicated that after training courses, there was higher knowledge about forest conservation. Moreover, the study by Kemkratoke *et al.* (2012) pointed out that the training model about participation in medicinal plant species diversity conservation in the community was enhanced the knowledge, opinions and behaviors of biodiversity as well as a self-help group to preserve the medicinal plant's biodiversity.

The information showed significantly related with participation in forest conservation, forest restoration, knowledge dissemination, and public relations.

The results revealed a significantly negative influence of information on forest conservation and forest fire prevention. In contrast, the regression between information and participation in the activity of forest restoration was positively influenced. These findings suggested that respondents who received information were participated more in activities of community forest conservation than the households who did not get information. These results were similar to the study of Conde *et al.* (2017) who identified that information concerned with the natural resource in local communities e.g. the information in terms of using, knowledge, and abundance were developed into conservation strategies in the area and improved the moving forward to generate the conservation plan, and sustainable utilization in their community forest. It was similar to the study of Lestari, Kotani, and Kakinaka (2015) who stated that providing information was positive associated with an important policy implication e.g. The information in terms of benefit-sharing mechanism indicated that the given advice is affected in promoting people to participate at a nominal level as well as active participation in the program. However, the degree of information and policy acceptance behavior had a positive significant relationship which the degree of information in policy acceptance behavior is increased. Therefore, providing information was related to the environment in community forests which was influenced in success and the sustainability of community forest management in the characteristic of society and environment. Absolutely, the information was a channel to help the people to get knowledge for understanding and led to improve the model of the community forest management. The local knowledge should improve and integrate with scientific knowledge for forest conservation methods and these issues should enhance into a key priority in improving for moving forward. Moreover, Banjade, Schanz, and Leeuwis (2006) argued about information sources. who indicated that while the information has a key role, nevertheless, it depends on the characteristics the perspectives of users e.g. the different social status characteristics determining economic class, such as gender, education and accessibility, ethnicity, caste, and executive position. Pong-ngamchuen *et al.* (2017) also argued that local people and community members who received information which related to the environment, not only had a positive attitude toward community forest management but also, they were still willing to contribute to related activities

It is concluded that participation in activities of community forest conservation was significantly associated. Determinants are affected by participation in activities, including factors of gender, age, education, household size, occupation, income, and size of land holding, period of residence, social committees, training, and information. The variable of

household income had a strong degree of association with the community forest conservation activity as the higher-income households participated more in all activities of community forest conservation. Specifically, old age households had more opportunity to participate in the activity of knowledge dissemination than young age households, and men were more likely to participate than women, especially in the activity of forest restoration. The educated households participated more in the activity of forest fire prevention than the uneducated households as people who lived far from the place and were not members of social committees who did not access the training activities. Also, the getting information led to more participation in a lot of activities of community forest conservation. The households had a large land size and were less participated in the activities. The households had a large land size and using more time with their landholding than time with the activities. Households holding with an executive position in social committees were more likely to participate in the activity of forest conservation and public relations activities. Moreover, a long period of residence also led to participate in the activity of forest conservation and public relations activities. Overall, the study was shown that all activities of community forests conservation were not homogeneous. Nevertheless, a policy of benefit-sharing was determined equal for each activity, and everyone can participate. Therefore, it is necessary to enhance the participation of households in terms of determinants affecting community forests conservation activity to discuss with empirical evidence.

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