XV WORLD FORESTRY CONGRESS
Building a Green, Healthy and Resilient Future with Forests
2–6 May 2022 | Coex, Seoul, Republic of Korea

Title

The effects of socio-economic characteristics on Willingness to pay for conservation of community forest, Myanmar

Myo Min Latt[1,2], Sabine Schlüter[3], Hartmut Gaese[3], Byung Bae Park[1*]

[1][Department of Environment and Forest Resources, College of Agriculture and Life Sciences, Chungnam National University, Daejeon, Republic of Korea]
[2][Department of Natural Resources Management, University of Forestry and Environmental Science, Yezin, Myanmar, E-mail: minlatt.myo@gmail.com]
[3][Institute for Technology and Resources Management in the Tropics and Subtropics (ITT), TH Köln - University of Applied Science (CUAS), Germany. Email: sabine.schlueter@th-koeln.de; ha.gaese@gmx.de]
[*][Corresponding author: bbpark@cnu.ac.kr; Tel.: +82-42-821-5747; Fax: +82-42-825-7850]

Abstract

In poor and developing countries, rural people rely on the forest resources for their livelihood. Thus, their participation in forest management activities and their demographic characteristics are vital for achieving sustainable development objectives, particularly within the context of co-management of forest resources. This study was carried out to investigate the influence of socio-demographic characteristics on willingness to pay (WTP) for conservation of forest and to assess the benefits contributes by community forestry to members of forest user group. It was a case study of Maing-thauk community forest (MTCF), which was selected based on the following criteria: official certification, > 10 years' forest management experience, with one forest consisting of different users and watershed conservation practices. Using the semi-structured questionnaire, responses on socio-demographic, willingness and expectation of forest management for long term questions were obtained from randomly selected households (i.e., 35% of the total households who are involved in the management of MTCF). The distance from forest and purposes of extraction of forest products and services significantly influence on WTP for conservation of forest. The significant influence of Ethnicity, gender and education level of forest users varied depending on the onetime payment and long-term payment. The results of this study provide important information to promote sustainable forest management with people participation reducing poverty and conflicts between forest users and authorized organizations in management of forest area and resources.

Keywords: community forestry, willingness to pay, socio-demographic characteristics, people participation, Myanmar

Introduction, scope and main objectives

Participation of local people in the forest and resources management is very important to me sustainable goal for long-term forest conservation (Ahammad, et al., 2014) and for alleviating poverty (Islam et al, 2012). However, rapidly increasing population and over extraction of forest resources (Conchie and Cheng, 2003), the rapid deforestation and forest degradation are historically long-term issue solved by developing countries' government (Manzoor Rashid et al., 2013). The alarming driver is high dependency of the people on the forest for their livelihoods (Chowdhury and Koike, 2010).

Forest resources play a crucial role to contribute the household incomes of local people living in and around the forest (Melaku, et al., 2014). There is relationship between the sustainability of natural resources management and knowledge and dependency (Baiyegunhi, et al., 2016) of rural people who settle near the resources. Participatory management practices (Moradi et al., 2017), decentralized forest governance (Gupta and Shaw, 2017) and co-management approach (Chowdhury and Koike, 2010) may solve the conflicts coming from community and improving forest resources management. Different countries have been adopting different relevant participatory forest management systems such as co-management approach in Bangladesh (Chowdhury and Koike, 2010) and in China (Ming-hai and Shuang-ling, 2004), joint forest management (JFM) in India (Gupta and Shaw, 2017), community forestry (CF) in Nepal (Acharya, 2002), participatory forest management programs in the People's Republic of Burkina Faso (Coulibaly-Lingani et al., 2014). Anup et al. (2018) stated that community forest management is effective to reduce deforestation and socioeconomic characters need to be considered for forest conservation and management.

Some of the literatures stated that the socio-demographics characters such as income sufficiency (Khalyani et al., 2014), ethnicity (Lingani et al., 2014) should be considered to meet sustainable forest conservation. Furthermore, forest dependents' willingness to pay are also important because their willingness is related to taxes and donations (Jo, et al., 2021), socioeconomic characteristics such as gender, education, household incomes (Bamwesigye, et al., 2020), occupation and age (Chukwuone and Okorji, 2008), payment mechanism (Endalew, et al., 2020), family size and distance from the forest (Getachew, 2018), bid values (Gordilloa, et al., 2019). Those parameters are main factors to drive the community-based forest management.

In Myanmar, community-based forest management was initiated as CF since 1996 after issuing community forestry instruction (CFI) in 1995 according to Myanmar forest policy and law. Our main goal of our research of area study was to promote CF in conservation of forest ecosystem and services. We would like to hypothesize that there is influence of the socio-demographic characteristics and benefits from forest on the forest users' willingness to pay (WTP) the forest conservation. Viana et al. (2012) recommended that CF can be an efficient and effective strategic option to address some of the main causes of deforestation and degradation and to promote important social and environmental co-benefits. Therefore, this study was carried out with the objective (i) to investigate the effect of the forest users' socio-demographic characteristics on WTP for conservation of forest ecosystem services, (ii) to assess the contribution of CF practice on household expenditure and income of the forest users and (iii) to examine the effect of the benefits contributed by CF on the forest user's WTP for conservation of forest ecosystem services.

Methodology/approach

1- Selection of community forest

Among 7 States and 7 Regions in Myanmar, Shan state was selected as a priority region because CF was pioneered in Shan state after CF instruction (CFI) in 1995. Of 478 community forests officially allowed by the Forest Department in Shan State, Maing-thauk Community Forest (MTCF) was selected based on the criteria (a) having official certificate, (b) having at least 10-years experiences, (d) involving different communities in forest management, (e) contributing some benefits of forest in kind of products and services, and (f) adopting forest protection and rehabilitation.

2- General socio-economic characteristics of the respondents

Maing-thauk Community Forest (MTCF) is under the collective management of four villages; Lay-ein-gon (LEG), Myaunggyi (MG), Taung-zay-bar (TZB) and Pay-bin-gone (PBG). The questionnaire survey was randomly carried out to (116) household leaders based on semi-structural form including ethnicity, family size, household leaders' education background, land holding, occupation, annual income, annual expenditure and, expectation and willingness for forest management. Socio-demographics characteristics of household leaders regarding ethnicity, gender, family size, education level, occupation, income sufficiency, landholding, annual household income and expenditure were elicited. The condition of forest levels was categorized into four levels and their willingness to improve (WTI) the condition of forest was asked. Their willingness to be member of FUG, willing to pay (WTP) membership fee, WTP regular contribution to the fund of forest management for long-term and preferred payment schedules were interviewed.

3- Data processing and Analysis

Data entry was arranged in Microsoft office excel and analysis was conducted by using Statistical Package for the Social Sciences (SPSS) verion-26. Total annual expenditure of households (Exp. 1) includes total expenditure for basic need and the monetary value of timber and non-timber forest products they extracted from their community forest. Annual expenditure of household for their basic needs of each household (Exp.2) were consists only the annual costs of basic needs for food, health, clothes, education of their children. Annual net income of each household without adopting CF (ANI-1) was calculated by subtracting the annual total expenditure of each household for basic needs from the total income of different occupation and agricultural production. Annual net income of household adopting CF (ANI-2) was calculated by subtracting the annual total expenditure of household from the total annual total income from occupation, agricultural production and forest products.

Paired sample t-test was applied to assess the mitigation of annual household expenditure and contribution of annual net household income by adopting CF according to right mentioned in CFI of Myanmar. Pearson Chi-square method was applied to find the association between socio-demographic characteristics and WTI condition of forest. Normality was checked by using Kolmogorov-Smirnov test and Shapiro-Wilk test based on the voluntary payments of household leaders. As a result of non-normality distribution, Kruskal-Wallis H test Mann Whitney U test were applied to investigate the influence of socio-demographic characteristics and extraction of forest products WTP for conservation of forest ecosystem for long-term.

Results

1- Association between socio-demographic characters and willingness levels of forest condition

Figure-1 showed the Percentage component of willingness of the respondents who are involving in community forest management as members of Forest user group (FUG) regarding the condition of their forest ecosystem. Generally, most of the respondents were willing the forest to improve twice more than the current status of forest depending on their socio-demographic characteristics in Fig-1 (a-h), exception the respondents who did not will to pay for forest conservation in Fig-1 (i-k).

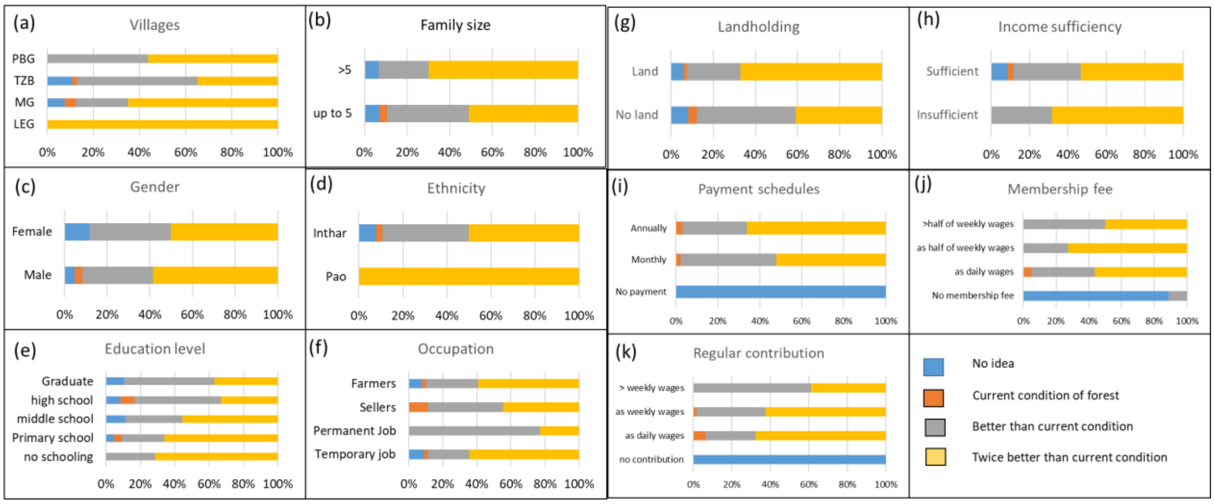

Fig. 1: Percentage component bar chart showing the willing status of forest condition addressed by socio-demographics characteristics and willingness to pay (WTP)

Table-1 revealed that the association of respondents' willingness to improve (WTI) their forest ecosystem with their socio-demographics characteristics and willingness to pay (WTP) for conservation of forest. Under socio-demographics characteristics, the strongly significant association of willingness of conservation of forest was stated with distance of villages from the forest, ethnicity, landholding, extraction of forest production and use of water. Their willingness for forest conservation were highly associated with their WTP as preferred payment schedules, membership fee and regularly contribution to the fund of forest management.

Tables-1: Association of socio-demographic characteristics with WTI the forest ecosystem

Socio-demographic characteristics		Chi-square test (N=116)			
		χ2	df	ρ (-/+)	p-values
Socio-demographic	Distance of villages from forest*	25.03	9	-	0.003
	Ethnicity *	12.49	3	-	0.006
	Gender	3.41	3	-	0.333
	Education levels	13.81	12	-	0.313
	Landholding *	8.25	3	+	0.041
	Family size	3.92	3	+	0.271
	Occupation	16.8	9	-	0.052
	Household Income sufficiency	3.35	3	-	0.341
	extractions of forest products*	16.06	6	+	0.013
	Use of water*	11.92	3	-	0.008
WTP	Payment schedules*	118.76	6	+	0.000
	Membership fee*	107.31	9	+	0.000
	Regular contribution*	124.46	9	+	0.000

* significant at $p < 0.05$

2. Influence of socio-demographics characteristics on WTP for forest conservation

Table-2 represents the WTP on membership fee for conservation of forest influenced by the socio-demographic characteristics of household leaders who are members of FUG according to Man Whitney U test and Kruskal Wallis H test. The ethnicity, gender, location of villages from forest and education levels by significantly influenced on WTP membership fee for conservation of their forest.

Landholding, income sufficiency, family size and occupation of household leaders had no significant effect on WTP membership fee for conservation of their forest although their mean rank values were slightly different.

Table-2: Influence of socio-economic characteristics on WTP membership fee for conservation of forest (N=116)

Socio-demographic Characteristics		Mann-Whitney U Test			
		Mean Rank	U	Z-value	p-value
Ethnicity	Pao	91.39	253.5	-3.99	0.000*
	Inthar	53.99			
Gender	Male	64.10	935.00	-2.85	0.004*
	Female	45.00			
Landholding	No land	54.11	1856.5	1.23	0.219
	Land	61.71			
Income	Insufficient	63.32	928.00	-0.764	0.124
	Sufficient	57.37			
Family size	up to 5	58.64	1278.00	-0.08	0.938
	>5	58.10			
		Kruskal-Wallis H Test			
		Mean Rank	**H**	**df**	**p-value**
Location of Villages	LEG (Within)	91.39	16.53	3	0.001*
	MG (150 m)	54.39			
	PBG (250 m)	59.09			
	TZB (750 m)	51.86			
Education Level	No schooling	69.64	13.21	4	0.010*
	Primary school	63.01			
	Middle school	52.48			
	High school	74.29			
	Graduate	69.64			
Occupation	Temporary job	61.94	2.28	3	0.516
	Permanent Job	66.31			
	Small stores	53.44			
	Farmers	54.19			

p-value = Asymp. *Significant (2-sided) at the 0.05 level

Table-3 elaborates the effect of socio-demographic characteristics on WTP to regularly contribution to the fund of forest management in accord with Mann Whitney U test and Kruskal Wallis H test. There was significant difference in WTP regular contribution to the fund of forest management depending on the location of villages from forest. Other socio-demographics characteristics; ethnicity, gender, landholding, income sufficiency, family size, education level and occupation of household leaders have no significant effect on WTP regular contribution to the fund of forest management.

Table 3: Influence of socio-economic characteristics on WTP regular contribution to fund of forest management for conservation of forest (N=116)

Socio-demographic Characteristics		Mann-Whitney U Test			
		Mean Rank	U	Z-value	p-value
Ethnicity	Pao	49.82	835.50	1.03	0.301
	Inthar	59.69			
Gender	Male	58.05	1431.00	0.23	0.822
	Female	59.59			
Landholding	No land	61.61	1489.00	-0.86	0.392
	Land	56.22			
Income	Insufficient	52.77	1160.0	0.891	0.373
	Sufficient	59.84			
Family size	up to 5	59.54	1200.5	-0.567	0.571
	>5	55.52			
		Kruskal-Wallis H Test			
		Mean Rank	H	df	p-value
Location of Villages	LEG (Within)	49.82	11.01	3	0.012*
	MG (50 m)	46.74			
	PBG (250 m)	70.38			
	TZB (750 m)	67.24			
Education Level	No schooling	56.43	2.34	4	0.674
	Primary school	54.91			
	Middle school	56.48			
	High school	66.50			
	Graduate	66.16			
Occupation	Temporary job	56.86	2.15	3	0.543
	Permanent Job	63.65			
	Small stores	72.11			
	Farmers	56.14			

p-value = Asymp. *Significant (2-sided) at the 0.05 level

3- Opportunity cost supported by adopting community forestry

Figure-4 revealed the annual expenditure per household from for villages, LEG, MG, TZB and PBG and effect of adopting of CF on opportunity cost of households. Adopting CF is significant effective on the annual expenditures per household in LEG village [M ± SD=1113.46±637.54 USD Hh/yr, t(13, n=14)=6.54, p=0.000], in MG village [M ± SD=6934.68 ± 3102.22 USD/Hh/yr, t(39, n=40)=14.14, p=0.000] and in PGB village [M ± SD= 1085.07 ± 1445.15 USD/Hh/yr, t(15, n=16)=3.00, p=0.009] but not significant effective on the expenditure of household in TZB because its p-values greater than 0.05 at 95% CI.

Figure-5 revealed that CF supported the annual net income to the household. Each household from LEG, MG, TZB and PBG village gained annual net income (M±SD) 1112.09 ± 637.31, 75.73 ± 126.71, 13.31 ± 29.69 and 63.32 ± 63.75 USD/Hh/yr respectively adopting CF more than not adopting CF. The result showed that adopting CF was significantly effective on means annual net income per household according to right and access to use of forest products mentioned in CFI because of LEG [t (13, N=14)=6.53, p=0.000], MG[t (39, N=40)=3.78, p=0.001], TZB [t (45, N=46)=3.04, p=0.004] and PBG [t (15, N=16)=3.97, p=0.001] < 0.05 at 95% CI.

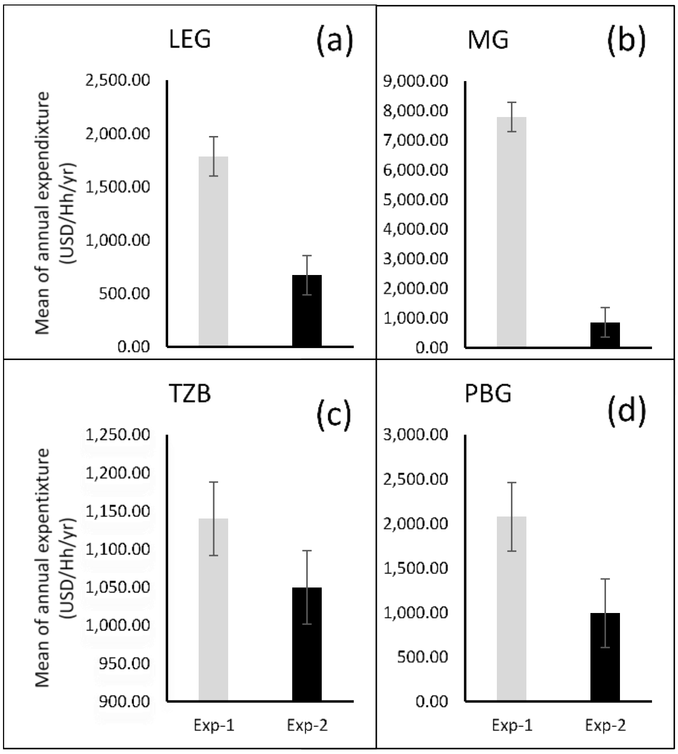

Fig. 4: Effect of adopting CF on the expenditure of households in (a)Lay-ein-gone (LEG), (b) Myaung-gyi (MG), (c) Taung-zay-bar (TZB) and Pay-bin-gone (PBG) village; Exp. 1=Annual total expenditures of household (USD/Hh/yr) including cost for forest products, Exp. 2=Annual total expenditure of household (USD/Hh/yr) without cost for forest products

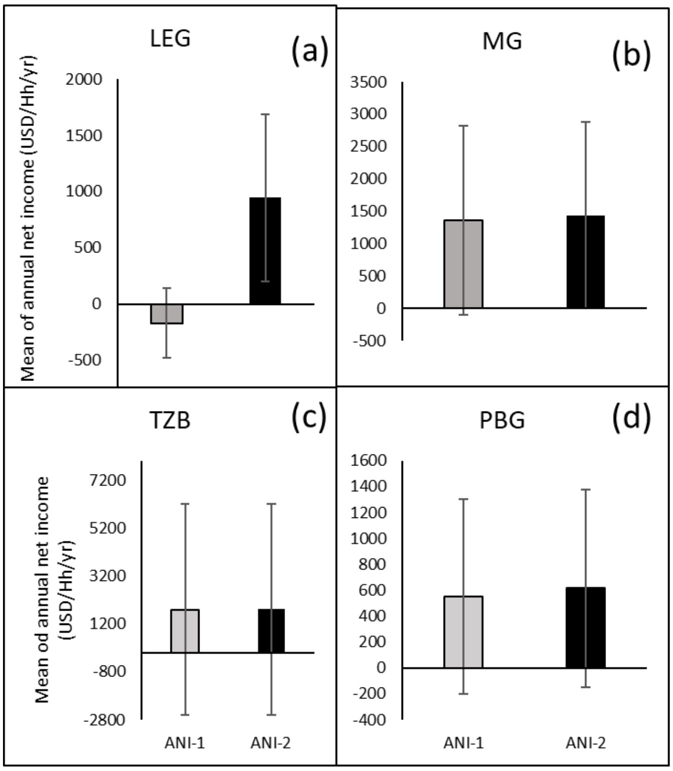

Fig-5: the benefit of community forest contributing to annual net income of households (USD/household/year); in (a) Lay-ein-gone (LEG), (b) Myaung-gyi (MG), (c) Taung-zay-bar (TZB) and Pay-bin-gone (PBG) village; ANI-1=annual net income of each household without income from forest products, ANI-2=annual net income of each household adding income from forest products

4. Influence of use of forest ecosystem services on WTP for forest conservation

Table-4 explained the difference in WTP membership fee for conservation of community forest among different users of forest products and water. Use of water marginally impact on WTP membership fee for conservation of watershed forest because of slightly higher WTP of use of forest spring water than user of underground water. Purposes of extraction of forest products significantly influence on WTP.

Table-4: Influence of purposes of use of forest ecosystem services on of WTP fee for conservation of forest (N=116)

Use of Forest Ecosystem services		Mann-Whitney U test			
		Mean Rank	U	Z-value	p-value
Water resources	Forest spring water	63.13	1251.00	-1.94	0.05*
	Underground water	50.93			
		Kruskal-Wallis H Test			
		Mean Rank	H	df	p-value
Purposes of extraction of forest products	No extraction	51.38	16.87	2	0.000*
	Subsistence	55.39			
	Commercial	90.67			

p-value = Asymp. *Significant (2-sided) at the 0.05 level

Table-5 explained the difference in WTP regular contribution to the fund of forest management among different users of forest products and water. Purposes of extraction of forest products do not significantly influence on WTP. However, use of water more or less affects WTP membership fee for conservation of watershed showing slightly higher mean WTP of use of forest spring water than use of underground water.

Table 5: Influence of purposes of use of forest ecosystem services on WTP regular contribution to fund of forest management for conservation of forest (N=116)

Use of Forest Ecosystem services		Mann-Whitney U test			
		Mean Rank	U	Z-value	p-value
Water resources	Forest spring water	53.81	1922.00	1.93	0.05*
	Underground water	66.18			
		Kruskal-Wallis H Test			
		Mean Rank	H	df	p-value
Purposes of extraction of forest products	No extraction	49.30	1.54	2	0.463
	Subsistence	58.49			
	Commercial	61.80			

p-value = Asymp. *Significant (2-sided) at the 0.05 level

Discussion

The significant willingness to improve condition of forest was directly expressed from their heart depending on ethnicity, landholding, distance of villages from the forest, purposes of extraction of forest products, use of water but not associated with gender, education level, family size, occupation of household leaders and household income. Some previous study found that there was contradict significant association between willingness of forest conservation and socio-demographic characteristics in term of study sites (Chukwuone and Okorji, 2008, Endalew, et al., 2020, Bamwesigye, et al., 2020, Jo, et al., 2021).

In spite of being association, our study found different influence of socio-demographic characteristics on WTP for conservation of forest in term of types of payments. The effect of distance to forest on both WTP membership fee and regular contribution to the fund might implicated with ability of forest management. Low land ethnic(Inthar), male and higher educated person expressed the higher WTP membership for forest management. In this study, no significant effect of landholding, household income sufficiency and family size of forest users on both WTP for forest ecosystem services seem to show their same expectation of condition of forest. According to previous literature, the effect of socio-demographic characteristics may vary depending on regions and ethnicity (Chukwuone and Okorji, 2008, Endalew, et al., 2020, Bakaki and Bernauer, 2016; Getachew, 2018, Obeng and Aguilar, 2021).

This study resulted positive economic contribution by adopting CF to households' expenditure and net income as well as the significant effect of use of forest products and water on both WTPs for conservation of forest. According to CFI, any household or any person have no right and access to use and extract any forest products from the community forest if they do not adopt CF and not involve as a member. The performance benefit from forest (Lingani et al., 2014) and contribution of income and benefits from the forest to households (2014) influence on WTP for conservation of forest ecosystem. Maharjan, et al. (2009) hinted that adopting CF is one of the solutions to reduce the poverty in Nepal. Consequently, it can be assumed that the benefits contribute to the households' expenditure and net income of households may be better incentives to stimulate WTP for forest conservation.

The influence of socio-demographic characteristics exception the distance to forest might vary with types of WTPs. The forest users seem to prefer onetime payment more than annual contribution to fund of forest management. It would be important consideration for long-term forest management involving local people especially for community forest in Myanmar. The willingness of forest users to conserve their forest for long-term might implicate benefits provided by CF. Further study is warranted to verify our findings in large-scale trials.

Conclusions/ wider implications of findings

Adopting CF is likely an effective approach for forest conservation partially contributing income and benefits to the community who involve in forest management. Increasing the benefits from forest, the conflict between the common pool users of forest products may occur because the right and access to benefits from CF depends on membership of CF. The policy and law enforcement that secure the right and access to use of forest products for long-term should be formulated to be sustainable production and promoted to members of forest users group FUG) to reduce the conflicts among them for the well-being of CF. Socio-demographic characteristics of households should be monitored to improve the forest conservation for long-term. Myanmar's long political conflict among more than 135 ethnics has been occurring for equity and equality for sharing natural resources and for their custodial right. This CF managed by two ethnic groups is a sample of forest resources management. The result of different willingness to improve forest conservation derived from ethnicity, landholding and accessibility to natural resources highlighted some important consideration to the authorities and policy makers regarding the equity and equality of sharing the benefits among the society. Willingness to pay derived from their purposes to use of forest ecosystem services highlights that the improved forest could stimulate and motivate the forest users their forest conservation because they practically benefit from their forest in accord with their origin target of CF management. The communication between the forest user group and Forest

Department should be improved for technical knowledge and suggestion for forest management according to community forestry instruction.

Acknowledgements

Special thanks to the village communities and my junior colleagues, Mr. Htet Aung, Mr. Sithu Aung, Mr. Shwe Win, Mr. Ye Soe Oo and Mr. Aung Kyaw Thu for assist during data collection in study area. We would like to appreciate the Headmaster and teachers of Maingthauk Orphanage for accommodation. We particularly thank German Academic Exchange Service – DAAD for funding support to this project.

References

Acharya, K., 2002. Twenty-four years of community forestry in Nepal. The International Forestry Review, 4(2), pp. 149-156.

Ahammad, R., Hossain, M. K., Husnain, P., 2014. Governance of forest conservation and co-benefits for Bangladesh under changing climate. Journal of Forestry Research, 25(1), p. 29–36.

Anup et al., K. C., 2018. Increase of forest carbon biomass due to community forestry management in Nepal. Journal of Forestry Research. Springer Berlin Heidelberg, 29(2), p. 429–438.

Baiyegunhi, L. J. S., Oppong, B. B., Senyolo, M. G., 2016. Socio-economic factors influencing mopane worm (Imbrasia belina) harvesting in Limpopo Province, South Africa. Journal of Forestry Research. Northeast Forestry University, 27(2), p. 443–4.

Bakaki, Z. and Bernauer, T., 2016. Measuring and explaining the willingness to pay for forest conservation: evidence from a survey experiment in Brazil. Environmental Research Letters, 11(114001), pp. 1- 8.

Bamwesigye, D., Others. 2020. Charcoal and wood biomass utilization in uganda: the socioeconomic and environmental dynamics and implications. Sustainability, 12(20), p. 8337.

Chowdhury, M. S. H. and Koike, M., 2010. An overview on the protected area system for forest conservation in Bangladesh. Journal of Forestry Research, 21(1), p. 111–118.

Chukwuone, N. A. and Okorji, C. E., 2008. Willingness to pay for systematic management of community forests for conservation of non-timber forest products in nigeria's rainforest region: Implications for poverty alleviation. In: R. B. Dellink and A. Ruijs, eds. Economics of Poverty, Environment and Natural Resource Use. s.l.:Springer Netherlands, pp. 117-137.

Lingani, P.C., Others. 2014. Participatory forest management in Burkina Faso: Members' perception of performance. Journal of Forestry Research, 25(3), p. 637–646.

Gupta, R. D. and Shaw, R. 2017. Perceptive insight into incentive design and sustainability of participatory mangrove management: a case study from the Indian Sundarbans. Journal of Forestry Research. Springer Berlin Heidelberg, 28(4), p. 815–829.

Endalew, B., Wondimagegnhu, B. A., Tassie, K., 2020. Willingness to pay for church forest conservation: a case study in northwestern Ethiopia. Journal of Forest Science, 66(3), p. 105 –116.

Getachew, T., 2018. Estimating willingness to pay for forest ecosystem conservation the case of wof-washa forest, north shewa zone, amhara national regional state, ethiopia. Journal of Resources Development and Management, Volume 46, pp. 46-61.

Gordilloa, F., Elsasser, P., Günter, S., 2019. Willingness to pay for forest conservation in Ecuador: Results from a nationwide contingent valuation survey in a combined “referendum” -“Consequential open-ended” design. Forest Policy and Economics, Volume 105, pp. 28-39.

Islam, K. K. Others. 2012. Economic contribution of participatory agroforestry program to poverty alleviation: A case from Sal forests, Bangladesh. Journal of Forestry Research, 23(2), p. 323–332.

Jo, J.-H., Lee, C.-B., Cho, H.-J., Lee, J., 2021. Estimation of Citizens’ Willingness to Pay for the Implementation of Payment for Local Forest Ecosystem Services: The Case of Taxes and Donations. Sustainability, 13(6186), pp. 1-14.

Khalyani, J. H., Others, 2014. Development and evaluation of local communities incentive programs for improving the traditional forest management: A case study of Northern Zagros forests, Iran. Journal of Forestry Research, 25(1), p. 205–210.

Maharjan, M. R., Others, 2009. Improving the benefits to the poor from community forestry in the Churia region of Nepal. International Forestry Review, 11(2), pp. 254-267.

Manzoor Rashid, Others, A. Z. M., 2013. A journey towards shared governance: Status and prospects for collaborative management in the protected areas of Bangladesh’,. Journal of Forestry Research, 24(3), p. 599–605.

Conchie, J. A. M. and Cheng, M. H., 2003. MIGIS—an effective tool to negotiate development interventions relating to forestry. Journal of Forestry Research, 14(1), p. 9–18.

Melaku, E., Ewnetu, Z., Teketay, D., 2014. Non-timber forest products and household incomes in Bonga forest area, southwestern Ethiopia. Journal of Forestry Research, 25(1), p. 215–223.

Ming-hai, Z. and Shuang-ling, W., 2004. Co-management: Transformation of community affair model in Chinese nature reserves. Journal of Forestry Research, 15(4), p. 313–318.

Moradi, S., Others. 2017. Quantitative and financial evaluation of non-timber forest products (case study: Zemkan basin forests, West of Iran). Journal of Forestry Research. Springer Berlin Heidelberg, 28(2), p. 371–379.

Obeng, E. A. and Aguilar, F. X., 2021. Willingness-to-pay for restoration of water quality services across geo-political boundaries. Current Research in Environmental Sustainability, 3(100037), pp. 1 - 12.

Viana, V., Others. 2012. REDD+ and community forestry: lessons learned from an exchange of Brazilian experiences with Africa, Manaus, Brazil: The World Bank/Amazonas Sustainable Foundation.

Vincent, J. R., Others. 2014. Tropical countries may be willing to pay more to protect their forests. PNAS, 111(28), p. 10113 –10118.