ASSESSING TAGAL COMMUNITY DEPENDENCY ON ECOTOURISM-BASED TAGAL: A CASE STUDY FROM THE WEST COAST DIVISION OF SABAH, MALAYSIA

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Abstract: The present study investigates the dependency level demographic factors that affect the rural community on the ecotourism-based *Tagal* that has been widely applied throughout the West Coast division of Sabah. As the Department of Fisheries (DoF) Sabah indicated, 15 *Tagal* involving ecotourism were selected around Sabah, and 400 respondents were picked using proportional random sampling. A standardised questionnaire was used to conduct in-depth interviews with household heads. The ratio of their monthly Tagal income to their total monthly income from other sources was calculated to calculate the household's dependency. A descriptive statistical research revealed that 87.3% of *Tagal* community families depend little on ecotourism-based *Tagal*. The link between reliance and the socioeconomic characteristics of respondents was investigated using ordinal regression analysis. In conclusion, the data revealed that a considerable percentage of the population demonstrated a low reliance on ecotourism-based *Tagal*, indicating that it has not yet become a substantial source of revenue for the community. In addition, the study underlined the impact of gender and family size on the degree of dependency.

Keywords: Sustainability, community-based, ecotourism, dependency, *Tagal*.
Abbreviations: Community-based fisheries management (CBFM), community-based ecotourism (CBET), Department of Fisheries (DoF).

Introduction

Riverine fisheries have long provided subsistence for inland tribes in Sabah's interior (Kadfak, 2019). Freshwater fish are an essential protein source, and riverine fisheries have historically been the primary source of income for rural populations. The State Government of Sabah and the Department of Fisheries (DoF) of Malaysia adopted both freshwater aquaculture and the concept of community-based fisheries management (CBFM) to revitalise Sabah's freshwater fisheries resources (Wong *et al.,* 2009). CBFM concept involves communities in decisions related to fishing practices, resource allocation, and conservation measures to ensure the long-term viability of fish stocks and aquatic ecosystems (Hossain & Rabby, 2019).

The *Tagal* system, a "smart partnership" between local communities and the Sabah State Government, was adopted to protect and recover Sabah's depleted freshwater fisheries resources. The *Tagal* system, which was designed as a traditional technique of preservation and conservation, was amended so that it could be used for legal protection, recovery, preservation of natural resources, and administration of the nation's freshwater fisheries and aquaculture, particularly in Sabah (Wong *et al.,* 2009).

The Kadazan-Dusun word "Tagal" means "do not" or "prohibit"; it is also known as "Bombon" (Chung & Mojiol, 2020). Additionally, Sarawak employs the term "Tagang" (Ansley *et al.,* 2017). Consequently, *Tagal* is the name used by indigenous communities in Sabah to identify the type of water conservation practice they employ. According to the *Tagal* system, however, affected people are still permitted to harvest river resources but only sustainably. Sabah

was the first state to incorporate indigenous resource management methods into state-led conservation practices (Sansalu, 2008). It has been a long-standing tradition for indigenous people in the state of Sabah, who have long been recognised and considered indigenous (Sansalu, 2008), to practise environmental preservation (Vaz & Agama, 2013).

The concepts of "dependency" and "community" regarding community-based ecotourism (CBET) are, in fact, highly connected. CBET requires the participation and engagement of local communities in planning, developing, and managing tourism activities in their area (Mazengiya, 2022). Most of the world's rural population relies heavily on natural resources and services given by the natural environment to maintain their way of living (Johnson *et al.,* 2013; Kamwi *et al.,* 2015; Ali *et al.,* 2020).

The *Tagal* system has been recognised for its advantages in prior research. Local communities act to manage their resources for sustainable livelihood through tourism (*Tagal* system) as one of the initiatives (Musa *et al.,* 2020). Foo (2019) stated that the effectiveness of this tagal system is highly beneficial to the community as the community willingly gives full commitment to obeying all the rules regarding this system, which affects the well-being of the *Tagal* as the river water is clean, indicating increased fish abundance. Co-management by the involvement of the local community has made environmental conservation work together with the community (Er, 2012). Understanding the unique characteristics, challenges, and opportunities of the ecotourism-based *Tagal* system is essential for promoting sustainable tourism development and community empowerment (Jonut & Bagul, 2020).

Therefore, the present study investigates the dependency and demographic factors that affect the local communities towards the ecotourism-based *Tagal*. This study is essential for comprehending the efficacy of ecotourism-based *Tagal* in supporting the local community and preserving the ecosystem. Exploring the differences in dependency levels, the factors that influence them, and their consequences for community resilience and resource management can provide useful insights for developing context-specific strategies and policies.

Methods

Study Area and Sampling

The research was conducted in different *Tagal* villages along the West Coast of Sabah. DoF evaluated and authorised the selection of *Tagal*-based. As stated in Table 1, the DoF recommended 15 *Tagal* engaged in the ecotourism industry up to 2022. Figure 1 depicts the *Tagal* region, which is dispersed across the Sabah map and includes five districts: Ranau, Papar, Penampang, Beaufort, Tuaran, and Kota Belud.

Due to the various population sizes in each of the selected *Tagal*, proportional random sampling was utilised in this study to establish the sample size for each *Tagal*. Proportional random sampling guarantees that each community segment is adequately represented within the total sample population of a research study (Hayes, 2022). A total of 15 *Tagal* comprised 1,224 registered *Tagal* committees; however, only 400 respondents were randomly selected for this study. Table 1 presents the sample size or total number of responses from each tagal in bold figures.

Data Collection

From March 2021 to July 2022, primary data were collected from 15 *Tagal* participating in the ecotourism industry. Before developing the questionnaire as the research instrument for this study, a preliminary inquiry was undertaken to obtain vital information regarding ecotourism-based *Tagal* and the residents. The data collection in this study was based on interviews using a questionnaire pre-tested on a representative community sample. The preliminary evaluation of the questionnaire was undertaken at three *Tagal* with 30 randomly selected samples to identify any potential issues with the survey

Table 1: List of *Tagal* by DoF as the study area and the sample size taken in each area with different population sizes

No.	Ecotourism-based *Tagal*	District	Sample Size/Population Size
1	Luanti Baru Village	Ranau	24/75
2	Marakau Village	Ranau	16/50
3	Kilimu Village	Ranau	55/170
4	Sekolah Rendah Mandalipau	Papar	32/100
5	Kinolosodon Village	Papar	42/130
6	Toboon Minansar Village	Papar	16/50
7	Tinopikon Babagon Village	Penampang	10/30
8	Kibunut Atas Village	Penampang	26/80
9	Karangan Village	Beaufort	15/40
10	Moingob Murug Turug Ecotourism Village	Tuaran	30/92
11	Poturidong Kiulu Village	Tuaran	13/40
12	Nawoi Kiulu Village	Tuaran	10/30
13	Melangkap Tiong Village	Kota Belud	41/127
14	Tambatuon Village	Kota Belud	32/98
15	Talungan Village	Kota Belud	36/112

Note: The data of the latest ecotourism based on Tagal was provided by the DoF. Bold numbers are the number of respondents taken in each Tagal.
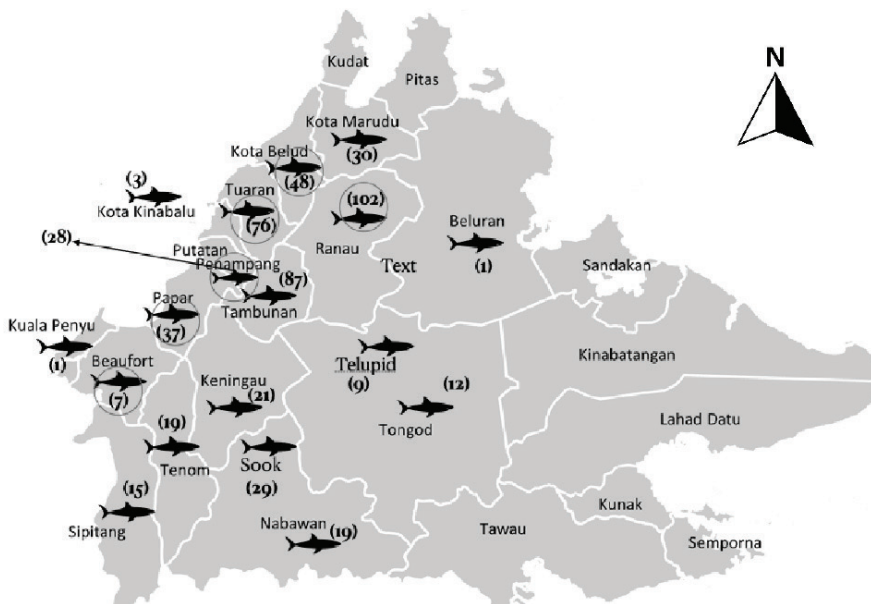

Figure 1: Distribution of *Tagal* by district in Sabah, Malaysia. Numbers in the bracket indicate the total number of *Tagal* in the respective area by DoF up to 2022. The circle marks indicate the selected *Tagal* as the study area in this study

procedure or questions. Given that the research was conducted in a rural location with an indigenous population, the survey questionnaires were verbally translated into the native language to improve comprehension and feedback.

The major purpose of the questionnaire was to collect information from respondents to expedite and reduce the cost of data collection from a large sample size. The investigation centred on numerous essential variables, such as socioeconomic factors such as age, gender, educational attainment, marital status, and family size, and their impact on the ecotourism-based region of *Tagal*. The survey also investigated the respondents' sources of income as well as their attitudes and awareness of *Tagal's* ecotourism industry.

Statistical Analysis

The analysis of quantitative data was conducted with the aid of descriptive statistics, including means, ranges, and percentages, all of which were computed using SPSS statistics version 27. In the context of this study, the term "income" refers to the entire amount of money earned by each household. Calculating the percentage of a household's total net income that comes from ecotourism-based *Tagal* about the total revenue from all households is the instrument used to assess the degree of reliance of the *Tagal* community on ecotourism-based *Tagal*. Then, the results were used to divide the sample households into three groups based on their share of net income from *Tagal* and thus their dependence on *Tagal*, and these groups were interpreted in terms of livelihood strategies (LS): LS 1, 20% = less dependent; LS 2, 20% – 50% = moderately dependent; and LS 3, > 60% = highly dependent (Xu *et al.,* 2015). Total household net income is categorised into four categories: Net agriculture income, net non-farm income, net livestock income, and net *Tagal* income (Table 2).

The revenue was determined using the gross value obtained from the extraction of raw materials or services from *Tagal*, agriculture, livestock, and non-agricultural income. The ratio of *Tagal's* monthly revenue to the total monthly income from all other sources is used to calculate their degree of dependence (agriculture, off-farm employment, and livestock). The methods utilised to derive income from each source are outlined in the subsequent section.

Household monthly income = Σ (Tagal income + Agriculture income + Off-farm income + Livestock income) (1)

Ordinary logistic regression (OLR) was utilised to assess the association between the demographic state of the *Tagal* population and their reliance on ecotourism-based *Tagal*. Logistic regression has been widely used in the past to examine the dependence of rural livelihoods on natural resources (Masozera & Alavalapati, 2004; Tieguhong & Nkamgnia, 2012; Adam & Tayed, 2014; Jain & Sajjad, 2016; Ali *et al.,* 2020).

Table 2: Type of income in the *Tagal* community

Type of Income	Items
Agriculture	Herb cultivation, small-scale cultivation, fruit orchards, rubber tree plantations, rice fields, etc.
Livestock	Fish farming (aquaculture), cattle, and chickens.
Off-farm	Income gained outside of the village such as government servants, working in the public sector, and businesses.
Tagal	Ticket selling, Tagal wages, homestay rents, and merchandise selling.

Note: The definition of the type of income is obtained and modified from the PEN technical guidelines (Poverty Environment Network, 2007; Fekadu *et al*., 2021). The Forest income was substituted with the *Tagal* income. Each item from the type of income is based on the discussions with the head of *Tagal* and DoF.

Results

This study examined the reliance of the *Tagal* community on ecotourism-based *Tagal* as its key variable and the demographic factors that determine this reliance. Both descriptive and inferential statistical analyses have been given below with 400 families as respondents.

Descriptive Statistics

In this study, 301 (75.3%) of the 400 homes are headed by men, while 99 (24.8%) are led by women. In addition, 363 (90.8%) were individuals between 20 and 60, while only 37 (9.3%) were seniors aged 61 and older. Youths still in school and do not have a source of income were not included in this study, as the respondents of interest are heads of homes. The household size was more evenly distributed; 111 (27.8%) have two or fewer family members, 170 (42.5% of households) have between three and five family members, and 119 (29.8%) have more than five family members. Only 23 (5.8%) were single, whereas 310 (77.5%) were married and 67 (16.8%) were divorced or widowed. The

employment situation of the 400 households was as follows: 33 (8.3%) were unemployed, 27 (6.8%) were government employees, 90 (22.5%) were in the private sector, and a significant number, 250 (62.5%), were self-employed (Table 3).

Low, medium, and high categories were assigned to the extent of dependence of the *Tagal* community on the ecotourism-based *Tagal* to classify the three categories into which households may fall. This study found that 349 (87.3%) out of 400 Tagal households have a low reliance on ecotourism. 24 (6%) and 27 (6.8%) individuals, respectively, fell into the medium and high reliance groups (Figure 2).

Inferential Statistic

This analysis found that just two of the factors, namely gender and household size, were statistically associated with the dependent variable. Table 4 displays these results, which showed that gender and household size may

Table 3: Frequency distribution table of the respondent's profile

Variables	Categories	Total Sample (%)	LOD of Households			p-value*
			Low	Medium	High	
Gender	Male	301 (75.3)	270 (89.7)	18 (6.0)	13 (4.3)	*0.003
	Female	99 (24.8)	79 (79.8)	6 (6.1)	14 (14.1)	
Age	Adult (20 - 60)	363 (90.8)	318 (87.6)	21 (5.8)	24 (6.6)	0.791
	Senior (Above 61)	37 (9.3)	31 (83.8)	3 (8.1)	3 (8.1)	
Household size	≤ 2	111 (27.8)	89 (80.2)	6 (5.4)	16 (14.4)	*< .001
	3 − 5	170 (42.5)	160 (94.1)	7 (4.1)	3 (1.8)	
	> 5	119 (29.8)	100 (84.0)	11 (9.2)	8 (6.7)	
Marital status	Single	23 (5.8)	20 (87.0)	2 (8.7)	1 (4.3)	0.097
	Married	310 (77.5)	52 (77.6)	6 (9.0)	9 (13.4)	
	Divorced/Widowed	67 (16.8)	277 (89.4)	16 (5.2)	17 (5.5)	
Job	Unemployed	33 (8.3)	29 (87.9)	0	4 (12.1)	0.102
	Government	27 (6.8)	24 (88.9)	1 (3.7)	2 (7.4)	
	Private	90 (22.5)	85 (94.4)	2 (2.2)	3 (3.3)	
	Self-employed	250 (62.5)	211 (84.4)	21 (8.4)	18 (7.2)	
Total		400	349 (87.3%)	24 (6.0%)	27 (6.8%)	

Note: The *p-values* were calculated using the chi-square test. *Significant at α = 0.05.
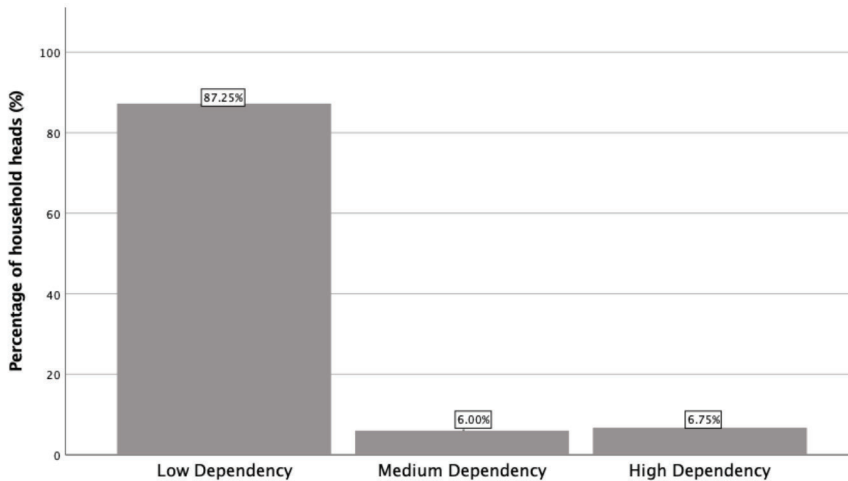
Figure 2: Frequency distribution of dependency among 400 households shown in percentage
(Low; 0 - 20%, Medium; 21 - 50%, High; 51 - 100%)

be significant variables when studying the link between these covariates and the outcome variable.

In particular, Table 4 demonstrates the statistical significance of the link between gender, household size, and the outcome variable, whereas the remaining covariates exhibited no statistically significant association. As indicated by a chi-square value of X2 (2, N = 400) = 11.486, p = 0.003, the results of this study revealed a statistically significant correlation between gender and the degree of *Tagal* dependence. This data implies that gender may play a role in determining the degree of a household's reliance on the *Tagal*. Males displayed a substantially higher degree of reliance on *Tagal* than females, according to the findings of the study, X2 (4, N = 400) = 20.771, p = 0.001, indicates that there is also a significant correlation between the degree of dependence and the size of the household. These results indicate that reliance on *Tagal* tends to decrease as household size increases.

In this study, multicollinearity issues were examined. Thus, collinearity diagnostics and tolerance statistics were employed to identify the probable issue (Sieber & Tolich, 2013). According to the test, there is no evidence of multicollinearity in the data. In addition, robust standard errors were included for constructing the z statistics for this study to prevent the heteroscedasticity of the independent variable from distorting the findings. The model's Pseudo R2 is 0.186. Table 4 presents the findings of the multivariable ordinal logistic regression analysis.

At a significance level of 5%, the gender of household heads was shown to be statistically significant in the statistical analysis. The data imply that males are much more likely than female-headed households to have a high degree of dependency, with an estimated odds ratio of 2.91 (95% CI, 1.23-6.93). The results reveal a gender gap in *Tagal's* dependence on ecotourism, with men demonstrating a greater propensity to gain from it than women.

Moreover, there was a strong relationship between household size and reliance on ecotourism in *Tagal* (OR = 0.364, 95% CI: 0.136-0.977). Less than or equal to two-person households are 0.364% less likely to depend on ecotourism-based *Tagal* than larger households. Consequently, this data shows that bigger household sizes rely on ecotourism-based *Tagal* more than smaller ones. One possible explanation for this association is that larger

Table 4: Ordinal logistic regression estimates

Variables	Categories	Estimate	S.E	p-value	OR	95% CI for OR		Wald
Gender	Male Female	0.662	0.344	**0.015***	2.919 1	1.229	6.933	5.891
Age	Adult (20 - 60) Senior (Above 61)	0.580	0.608	0.668	0.725 1	0.166	3.163	0.184
Household size	≤2 3 - 5 ≥5	-0.145	0.042	**0.045*** 0.062	0.364 3.748	0.136 0.933	0.977 15.052	4.026 3.470
Marital status	Single Married Divorced/Widowed	-0.333	0.05	0.579 0.333	1.842 0.614	0.213 0.228	15.936 1.649	0.308 0.937
Job	Unemployed Government Private/Self-employed	-0.185 -0.016 -1.290	0.033	0.501 0.842 0.158	0.627 0.847 2.558	0.161 0.167 0.695	2.444 4.292 9.419	0.453 0.040 1.994

Note: Parallel line test: 0.986, goodness-of-fit test overall model: Deviance, p-value = 1, Nagelkerke's R = .186, S.E: standard error, OR: Odds ratio, CI: 95% confidence interval for coefficients. *Significant at α = 0.05.

households have greater subsistence demands (Menard, 1995; Gunatilake, 1998), resulting in greater reliance on all types of revenue, including the Tagal's income.

Discussion

According to the findings of this study, 87.3% of respondents have a low reliance on ecotourism-based *Tagal*. Consequently, the results of this study showed that ecotourism-based *Tagal* has not yet matured to the point where the *Tagal* community can rely on it as a source of revenue. It demonstrates that the ecotourism industry in *Tagal* is in its infancy. This can be attributed to several factors.

The low dependency on ecotourism-based Tagal may be due to limited awareness and promotion of the Tagal system as a tourist attraction. The lack of marketing and promotion efforts may result in limited tourist interest and visitation to the *Tagal* community, leading to low revenue generation (Smith, 2003).

Also, the underdevelopment of infrastructure and facilities in the *Tagal* community may hinder the growth of the ecotourism industry. Insufficient accommodation options, transportation services, and visitor amenities can deter tourists from visiting and spending time in the area (Suksmawati *et al.,* 2021). The lack of necessary infrastructure may also limit the community's ability to provide quality services and experiences to visitors.

Additionally, the *Tagal* community may face challenges in capacity building and skills development related to ecotourism management. Community members may require training and support to engage effectively in ecotourism activities, such as guiding, interpretation, and hospitality services (Fennell & Dowling, 2003; Hall, 2010). The lack of expertise and knowledge in these areas may impact the quality of the visitor experience and limit the community's ability to generate revenue from ecotourism.

Furthermore, external factors such as the COVID-19 pandemic may have further hindered the growth of the ecotourism industry in Tagal. Travel restrictions, reduced tourist arrivals, and the overall decline in tourism activities have impacted communities reliant on tourism, including the *Tagal* community (Gössling *et al*.,

2021). The pandemic has disrupted the tourism industry globally, and the *Tagal* community may still be recovering from the effects of the crisis.

Even though they have developed ecotourism, it appears that they joined the *Tagal* community and registered to preserve their culture and protect their river (Foo, 2019). This conforms to the departure from the traditional. Even throughout the interviews and discussions with respondents about their responses, many have exhibited a strong desire to safeguard the river and its resources (Foo & Noor, 2012).

Most households in this study were involved in agricultural labour, such as managing rice fields, durian orchards, and rubber tree tapping. The data indicate that the respondents' principal occupation is connected to the agriculture sector, a traditional income source in many rural regions (Mazlan & Juraimi, 2014). Involvement with *Tagal* is one of the empowerment approaches other than agriculture activities, as a community is relatively efficient in managing its finances as it is in close contact with nature and surroundings (Hassan *et al.,* 2018).

The availability of public sector employment is another aspect that contributes to *Tagal's* low dependence. Typically, the public sector offers more secure work prospects and a more consistent income than ecotourism-related enterprises (Kunjuraman, 2021). The perceived job security and accompanying advantages, such as pensions and social security, make employment in the public sector an attractive alternative for many people (Kunjuraman, 2021). Consequently, households may prioritise these stable income sources above the possibly unpredictable returns from ecotourism activities in *Tagal* (Mariapan *et al.,* 2020).

As revealed by the findings of an Ordinal Logistic Regression analysis, the gender of the household head and the size of the household have a strong association with their level of dependency (Xu & Gu, 2018). It was discovered that male family heads depend more on ecotourism-based *Tagal* than female household heads. Consistent with earlier research that has highlighted the difficulties women have in accessing and participating in decision-making processes about natural resource management and conservation, the current finding demonstrates that women continue to confront obstacles in these areas (Agarwal, 1997; Leach *et al.,* 1999). Another argument is that men are more likely to be promoted within an organisation, while women are relegated to support roles. Men have traditionally held positions of authority and decision-making power inside households in many countries (Kabeer, 1999; Mosedale, 2005; Buvinic *et al.,* 2013). In ecotourism, women commonly hold low-status, low-paying professions or engage in unpaid work as an extension of their domestic duties (Schyvens, 2000; Schyvens, 2007).

Moreover, the results of this study indicated that, in addition to gender, household size is the most important factor in predicting the degree to which a *Tagal* community depends on ecotourism-based *Tagal*. Generally, households with a larger number of members may have greater financial needs, hence increasing their reliance on *Tagal* ecotourism as a source of income. For instance, Kimengsi *et al.* (2019) discovered that household assets, such as the number of family members, were positively correlated with ecotourism engagement. Snyman (2014) discovered that households with greater family sizes were likely to engage in ecotourism activities. In addition, Adhikari *et al.* (2004) discovered that households with bigger family sizes in rural Nepal were more likely to engage in numerous income-generating activities.

Overall, these results indicate that household size is a crucial aspect to consider when creating *Tagal* ecotourism initiatives that aim to promote sustainable livelihoods and conservation. By knowing the requirements and peculiarities of individual households, *Tagal* ecotourism projects can be adjusted to maximise their advantages for local communities and the environment.

Conclusions

The data revealed that a considerable percentage of the population demonstrated a low reliance on ecotourism-based *Tagal*, indicating that it has not yet become a substantial source of revenue for the community. In addition, the study emphasised the impact of gender and household size on the degree of dependency. It is proposed that additional studies be conducted to enhance our understanding of the *Tagal* community and ecotourism-based *Tagals*, thereby permitting more thorough and focused interventions in the ecotourism industry.

Acknowledgement

Conflict of Interest Statement

The authors declare that they have no conflict of interest.

References

Adam, Y. O., & Tayed, A. M. E. (2014). Forest dependency and its effect on conservation in Sudan: A case of Sarf-Saaid reserved forest in Gadarif state. *Agriculture & Forestry, 60*, 107-121. https://www.scirp.org/(S(czeh2tfqw2orz553k1w0r45))/reference/referencespapers.aspx?referenceid=3097727

Adhikari B., Falco S. D., & Lovett J. C. (2004). Household characteristics and forest dependency: Evidence from common property forest management in Nepal. *Ecological Economics, 48*(2), 245-257. https://doi.org/10.1016/j.ecolecon.2003.08.008

Agarwal, B. (1997). "Bargaining" and gender relations: Within and beyond the household. *Feminist Economics, 3*(1), 1-51. https://doi.org/10.1080/135457097338799

Ali, N., Hu, X., & Hussain, J. (2020). The dependency of rural livelihood on forest resources in Northern Pakistan's Charlotte Valley. *Global Ecology and Conservation, 22*. https://doi.org/10.1016/j.gecco.2020.e01001

Ansley, A. A., Kiong, W. S., & Sanggin, S. E. (2018). Tagang system and the benefits to the community at Kampung Terbat Mawang, Serian, Sarawak. *Journal of Borneo-Kalimantan, 3*(2). https://doi.org/10.33736/jbk.622.2017

Buvinic, M., Furst-Nichols, R., & Pryor, E. C. (2013). *A roadmap for promoting women's economic empowerment*. Washington, DC: The UN Foundation. Retrieved from https://www.fsnnetwork.org/sites/default/files/WEE_Roadmap_Report_Final_1.pdf

Chung, K. C. L., & Mojiol, A. R. (2020). Public perception of fish massage impact at the 'Tagal' areas in Sabah. *Transactions on Science and Technology, 7*(2), 44-49. Retrieved from https://tost.unise.org/pdfs/vol7/no2/7x2x44-49xOA.html

Er, A. C., Selvadurai, S., Lyndon, N., Chong, S. T., Adam, J. H., Mohd-Fuad, M. J., Habibah, A., & Hamzah, J. (2012). The evolvement of tagal on ecotourism and environmental conservation: A case study in Kampong Luanti Baru, Sabah. *Advances in Natural and Applied Sciences, 6*(1), 61-64.

Fekadu, A., Soromessa, T., & Dullo, B. W. (2021). Role of forest provisioning services to local livelihoods: Based on Relative Forest Income (RFI) approach in southwest Ethiopia coffee forest. *Environmental Systems Research, 10*(17), 1-15. https://doi.org/ 10.1186/s40068-021-00223

Fennell, D. A., & Dowling, R. K. (2003). *Ecotourism policy and planning*. CABI Digital Library.

Foo, J. (2019). Penerapan adat dan budaya dalam pengurusan sistem biosfera melalui sistem tagal. In *Kesusasteraan & kebudayaan Borneo*. Universiti Pendidikan Sultan Idris. Retrieved from https://www.researchgate.net/publication/334362922_PENERAPAN_ADAT_DAN_BUDAYA_DALAM_PENGURUSAN_SISTEM_BIOSFERA_MELALUI_SISTEM_TAGAL

Foo, J., & Noor, H. M. (2012). Respons masyarakat tempatan terhadap pelaksanaan sistem Tagal. *Malaysia Journal of Society and Space, 8*(2), 30-37. Retrieved from https://www.ukm.my/geografia/images/upload/4.geografia-peb%202012-themed%20issue-.Jurry-ums-melayu-1-22.2-1.pdf

Gössling, S., Scott, D., & Hall, C. M. (2021). Tourism and COVID-19: Impacts and implications for advancing and resetting industry and research. *Journal of Sustainable Tourism,* 1-20.

Gunatilake, H. M. (1998). The role of rural development in protecting tropical rainforests: Evidence from Sri Lanka. *Journal of Environmental Management, 53*(3), 273-292. https://www.sciencebase.gov/catalog/item/5053 d007e4b097cd4fcf20d4

Hall, C. M. (2010). *Tourism planning: Policies, processes and relationships*. Pearson Education.

Hassan, A. A. G., Ngah, I., & Applanaidu, S. D. (2018). Agricultural transformation in Malaysia: The role of smallholders and area development. *Conferences World Bank - Agricultural Transformation and Inclusive* Growth (pp. 1-56). The Institute for Agricultural and Food Policy Studies, UPM.

Hayes, A. (2022). *How stratified random sampling works, with examples*. Investopedia. Retrieved from https://www.investopedia.com/terms/stratified_random_sampling (accessed on 10 November 2022).

Hossain, M., & Rabby, A. (2019). Institutional constraints to fishers' resilience: Community-based fishery management in Bangladesh. *International Journal of the Commons, 1*(13), 507. https://doi.org/10.18352/ijc.902.

Jain, P., & Sajjad, H. (2016). Household dependency on forest resources in the Sariska Tiger Reserve (STR), India: Implications for management. *Journal of Sustainable Forestry, 35*, 70-74. https://doi.org/10.1080/10549811.2015.1099108.

Johnson, T. S., Agarwal, R. K., & Agarwal A. (2013). Non-timber forest products as a source of livelihood option for forest dwellers: Role of society, herbal industries, and government agencies. *Curriculum Science, 104*(4), 440-443. https://www.currentscience.ac.in/Volumes/104/04/0440.pdf

Jonut, C., & Bagul, A. H. B. P. (2020). Tagal ecotourism and empowerment for local community: Case study of Tagal Ecotourism Tinopikon Park, Notoruss Penampang, Sabah. *Solid State Technology, 63*(1), 728-736. Retrieved from http://solidstatetechnology.us/index.php/JSST/article/view/759

Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and Change, 30*(3), 435-464. https://doi.org/10.1111/1467-7660.00125

Kadfak, A. (2019). More than just fishing: The formation of livelihood strategies in an urban fishing community in Mangaluru, India. *The Journal of Development Studies, 56*(11), 2030-2044. https://doi.org/10.1080/00220388.2019.1650168

Kamwi, J. M., Chirwa, W. C., Manda, M. O. S., Graz, F. P. & Katcsh, C. (2015). Livelihoods, land use and land cover change in the Zambezi region, Namibia. *Population-Environment, 37*, 207-230. https://link.springer.com/article/10.1007/s11111-015-0239-2

Kimengsi, J. N., Kechia, M.A., Azibo, B. R., Pretzsch, J., & Kwei, J. (2019). Household assets dynamics and ecotourism choices in the Western Highlands of Cameroon. *Sustainability, 11*(7), 1844. https://doi.org/10.3390/su11071844

Kunjuraman, V. (2021). Local community participation challenges in community-based ecotourism development in Sabah, Malaysian Borneo. *Community Development Journal, 2021*, 1-22. https://doi.org/10.1093/cdj/bsaa065.

Leach, M., Mearns, R., & Scoones, I. (1999). Environmental entitlements: Dynamics and institutions in community-based natural resource management. *World Development, 27*(2), 225-247. https://doi.org/10.1016/S0305-750X(98)00141-7

Mariapan, M., Lin, E. L. A., Bidin, S., Zawawi, A., Abidin, Z. A. Z., & Jumaat, N. J. (2020). *Ecotourism in Malaysia: Current scenario*. Universiti Putra Malaysia, Malaysia. https://forenv.upm.edu.my/upload/dokumen/20200904104709ECOTOURISM_IN_MALAYSIA_CURRENT_SCENARIO.pdf

Masozera, M. K., & Alavalapati, J. R. R. (2004). Forest dependency and its implications for protected areas management: A case study from the Nyungwe Forest Reserve, Rwanda. *Scandinavian Journal of Forest Research, 19*, 85-92. https://doi.org/10.1080/14004080410034164

Mazengiya, M. (2022). Review on the impacts of community-based ecotourism on household financial asset improvement and its determinants in Ethiopia. *Advances in Agriculture, 2022*, 1-6. https://doi.org/10.1155/2022/9238244

Mazlan, N., & Juraimi, A. S. (2014). Development and challenges of agritourism in Malaysia. *Journal of the International Society for Southeast Asian Agricultural Sciences, 20*(1), 131-138.

Menard, S. (1995). *Applied logistic regression analysis*. Newbury Park: Sage Publications. Retrieved from https://www.abebooks.com/first-edition/Applied-Logistic-Regression-Analysis-Menard-Scott/7253306522/bd

Mosedale, S. (2005). Assessing women's empowerment: Towards a conceptual framework. *Journal of International Development, 17*(2), 243-257. https://doi.org/10.1002/jid.1212

Musa, F., Rashid, A. R., & Mohd-Hazan, N. A. (2020). Local communities' willingness to pay for Tagal conservation at Kiulu River in Sabah, Borneo. In *Proceeding Sustainable Tourism Shaping a Better Future, 20-21 July 2020, Bangkok, Thailand*. Retrieved from https://www.researchgate.net/publication/344589393_Local_Communities'_Willingness_to_Pay_for_Tagal_Conservation_at_Kiulu_River_in_Sabah_Borneo

Poverty Environment Network. (2007). *Poverty Environment Network (PEN) technical guidelines*. Retrieved from http://www.cifor.org/pen/research-tools/the-pen-technical-guidelines.html/

Sansalu, D. (2008). *Kadazan Dusun di Sabah: Pendidikan dan proses pemodenan 1881-1967*. Kuala Lumpur: Dewan Bahasa dan Pustaka. Retrieved from https://library.sabah.gov.my/index.php/ms/kadazandusun-di-sabah-pendidikan-dan-proses-pemodenan-1881-1967

Scheyvens, R. (2000). Promoting women's empowerment through involvement in ecotourism: Experiences from the third world. *Journal of Sustainable Tourism, 8*(3), 232-249. https://doi.org/10.1080/09669580008667360

Scheyvens, R. (2007). Ecotourism and Gender Issues. In Higham, J. (Ed.), *Critical issues in ecotourism* (pp. 185-213). Butterworth-Heinemann: Oxford. Retrieved from https://www.researchgate.net/publication/275342494_Chapter_10_Ecotourism_and_gender_issues

Sieber, J. E., & Tolich, M. B. (2013). *Planning ethically responsible research* (2nd ed.). Thousand Oaks: SAGE Publications Ltd. Retrieved from https://methods.sagepub.com/book/planning-ethically-responsible-research-2e.

Smith, S. L. J. (1989) Tourism Analysis: A Handbook, Longman, Harlow. https://www.semanticscholar.org/paper/Tourism-Analysis%3A-A-Handbook-Smith/4b51afa5a02df3ef9e04b973e12cd1040a0aae62

Snyman, S. (2014). The impact of ecotourism employment on rural household incomes and social welfare in six southern African countries. *Tourism and Hospitality Research, 14*(1-2), 37-52. https://doi.org/10.1177/1467358414529435

Suksmawati, H., Rahmatin, L., & Firdaus, P. (2021). Recreation opportunity spectrum analysis of strategic area tourism destination Pelang region. *E-Journal of Tourism*, *172*. https://doi.org/10.24922/eot.v8i2.77562

Tieguhong, J. C., & Nkamgnia, E. M. (2012). Household dependence on forests around Lobeke National Park, Cameroon. *The International Forestry Review, 14*(2), 196-212. https://doi.org/10.1505/146554812800923426

Vaz, J., & Agama, A. L. (2013). Seeking synergy between community and state-based governance for biodiversity conservation: The role of indigenous and community-conserved areas in Sabah, Malaysian Borneo. *Asia Pacific Viewpoint, 54*(2), 141-157. https://doi.org/10.1111/apv.12015

Wong, J. Z., Etoh, S., & Sujang, A. B. (2009). Towards sustainable community-based fishery resources management: The ecotourism-based Tagal of Sabah, Malaysia. *Southeast Asian Fish for the People, 7*(2), 18-23. https://repository.seafdec.org/handle/20.500.12066/791

Xu, H., & Gu, H. (2018). Gender and tourism development in China. *Journal of China Tourism Research, 14*(4), 1-13. https://doi.org/10.1080/19388160.2018.1539426

Xu, D., Zhang, J., Rasul, G., Liu, S., Xie, F., Cao, M., & Liu, E. (2015). Household livelihood strategies and dependence on agriculture in the mountainous settlements in the three gorges reservoir area, China. *Sustainability, 7*(5), 4850-4869. https://doi.org/10.3390/su7054850