



RESEARCH ARTICLE

Local Perceptions of Benefits from Protected Area Under Participatory Management

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ARTICLE INFO	ABSTRACT
Received: Jul 19, 2025	Protected Areas are vital for conservation and generate socio-economic impacts but lead to conflicts, particularly due to restricted access to resources, insufficient benefits, and poor communication. The aims of this study are to analyze the socio-economic dynamics of participatory management in the Lama Forest Reserve to understand the interplay between conservation and development goals. The hypothesis tested is that communities experience a differentiated distribution of benefits from the protected area, depending on their village of residence. A structured, pre-tested questionnaire was used to collect socio-cultural, socio-demographic, and perceptual data from respondents in six representative villages. The sample size was calculated based on Dagnelie formula. Descriptive statistics and Firth's binary logistic regression were performed to analyze the differentiated distribution of benefits. The results confirm the hypothesis with significant findings. The study found a strong predominance of the Holli' and Fon' communities. Men represented 52.9% of the sample, while 93.8% of respondents had a primary school education level. The probability of citing various benefits, such as bridge building (Zalimey: ~70% vs. other villages: <20%) and market building (Toffo-gare: ~80% vs. other villages: <10%), varied drastically among villages. Conversely, some benefits like community savings bank and non-Timber Forest Products collection had a low probability of citation across all villages. The regression analysis revealed that village of Zalimey has a higher overall probability of benefiting, while the perception of employment in that same village is negative. The study's findings strongly confirm that benefit distribution is highly differentiated across villages. Future research should use qualitative methods to explore the reasons behind the low or negative perception of certain benefits to better align conservation efforts with livelihood improvements.
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INTRODUCTION

The sustainability of Protected Areas (PAs) hinges on securing the support of local communities, a concept increasingly recognized as pivotal for long-term conservation success (Htay et al., 2022). While PAs are a cornerstone of biodiversity conservation, they also introduce significant socio-economic impacts on local populations, which can be either positive or negative. The effectiveness of a PA's management directly influences these impacts, shaping community attitudes toward conservation efforts (Zhang et al., 2025).

A key challenge in PA management is the prevalence of conflict between reserve authorities and local communities. Literature identifies the primary sources of these conflicts as restricted access to resources, an insufficient share of benefits, and communication barriers (Thondhlana and Cundill, 2017; Leite et al., 2024). To address these tensions and align conservation goals with community well-being, the involvement of local people in management initiatives is deemed crucial (Thondhlana and Cundill, 2017). This has led to the adoption of collaborative governance models, such as community forestry and Participatory Forestry Management (PFM), which aim to directly engage

communities in the sustainable management and use of forest resources (Newton et al., 2015; Savilaakso et al., 2016; Muluneh and Sime, 2024).

These management systems are increasingly being promoted for their potential to enhance forest ecosystems and provide tangible benefits, including fair profits, improved livelihoods, and poverty reduction (Permadi et al., 2018; Muluneh and Sime, 2024). However, the literature also reveals a more complex reality, with mixed outcomes and significant challenges. Insights into the socio-economic impacts of these models, particularly for large-scale tree plantations in rural Sub-Saharan Africa can be both positive and negative (Kainyande et al., 2023), sometimes even exacerbating poverty and inequality (Hofflinger et al., 2021). Key obstacles to effective implementation include uneven participation, inequitable benefit-sharing, weak institutional support, and a lack of coordination (Muluneh and Sime, 2024).

A critical research gap lies in the limited understanding of how benefits are perceived and distributed at the local level. Community acceptance of these benefits varies greatly from village to village, and the willingness to support conservation is intrinsically linked to receiving tangible advantages (Kegamba et al., 2023). It is clear that benefit-sharing must be carefully tailored to the unique cultural and local contexts of communities living near protected areas (Kegamba et al., 2023). While the impact of communities on conservation outcomes is well-known, a clearer understanding of the economic importance of environmental resources to local households is needed to develop efficient conservation policies (Jiao et al., 2019).

Against this background, this study analyzes the socio-economic dynamics of participatory management in the Lama Forest Reserve. By examining the practical implementation and its on-the-ground impact, we aim to provide a nuanced understanding of the complex interplay between socio-economic development and conservation goals. The following hypothesis will be tested: Communities experience a differentiated distribution of benefits from the protected area, depending on their village of residence.

This research will offer critical lessons for policymakers and conservation practitioners, guiding the development of more effective and equitable management strategies.

MATERIAL AND METHODS

Study area

The study was carried out in the Lama Forest Reserve (Benin), managed by Société Nationale du Bois (SONAB). Located between 6°55' and 7°00' N and 2°04' and 2°12' E (Figure 1). The Lama Forest Reserve (LFR) is a semi-deciduous rainforest consisting of a central core (a strictly protected natural forest) and a peripheral zone (plantations of *Tectona grandis* and *Gmelina arborea* and cultivated land).

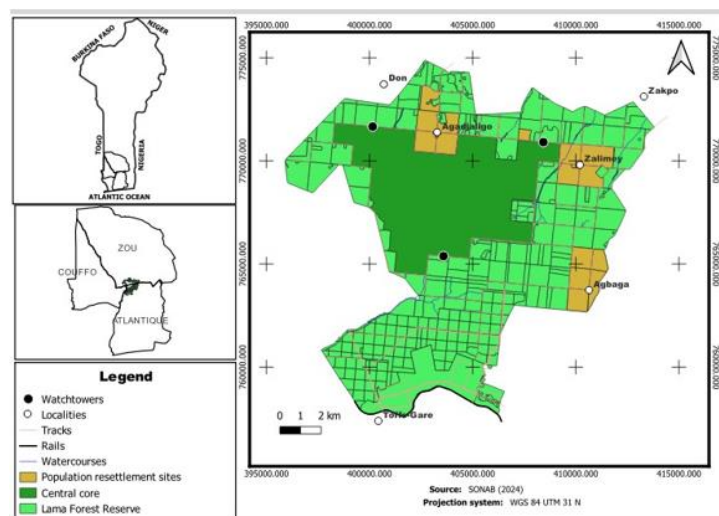


Figure 1: Study area

Covering 16,250 hectares, the LFR is the largest remaining forest in the Dahomey Gap, a semi-arid zone stretching along the coastline around the Ghana-Togo-Benin-Nigeria borders. It has been

legally protected since 1946 as a Forest Reserve, which means that entry is prohibited and access to resources is therefore limited for local populations. However, many ecosystem services, including wood, are available in the buffer zone and near residential areas. There are fifteen villages located within or near the forest (ONAB, 2011; Agbahoungba *et al.*, 2016). Holli, Fon and Aizo socio-cultural groups mainly inhabit the forest.

Sampling

Prior to the interview phase, a preliminary survey was conducted with 30 randomly selected respondents (over 18 years old) from six representative villages (Three inside and three around the LFR) (ONAB, 2011; INSAE, 2016a, 2016b). The objective of this initial phase was to estimate the proportion (p) of respondents able to identify at least one benefit derived from the LFR' management system. Based on the estimated proportion of positive responses ($p = 0.90$), the required sample size (n) was calculated (Eq.1) using the following Dagnelie formula (Dagnelie, 1998).

$$n = (U_{1-\alpha/2}^2 \times p(1 - p)) / d^2 \quad (1)$$

where $U_{1-\alpha/2}^2$ ($\alpha = 0.05$) = 1.96, d the margin error = 5 %.

A total of 208 representative people (over 18 years old) (Masud *et al.*, 2022) were randomly selected in the six villages of Agadjaligbo (Agad) (Folahan *et al.*, 2018), Agbaga (Agb) (Nitiema *et al.*, 2024) and Zalimey (Zal) (Folahan *et al.*, 2018) inside the LFR but also Don (Don), Hlagba-Zakpo (Hlz), Toffo-gare (Tg) around the LFR.

Data collection

Authorization to conduct the survey was obtained from Société Nationale du Bois (SONAB). Each survey was carried out after obtaining verbal consent from the participants, with a local field assistant (Gouwakinnou *et al.*, 2019) for translation. Data was collected through a survey using face-to-face interviews. A structured questionnaire was used to allow all respondents to express their perceptions. The questionnaire was pre-tested and refined, and interviews were conducted in local languages (Yetein *et al.*, 2025). The survey collected socio-cultural and socio-demographic data on respondents (age, gender, education level, village of residence, socio-cultural group). In addition, participants were asked about benefits from the protected area using binary variables (Heritier and Ronchetti, 2004).

Data analysis

Statistical analysis was performed using RStudio (version 2024.09.1 / build 394) (Posit team, 2024). Both descriptive and inferential methods were used. Descriptive statistics, such as frequencies, was calculated and graphically visualized using the dplyr, scales and ggplot2 packages (Posit team, 2024; Zeratsion *et al.*, 2024; Ying *et al.*, 2025).

Firth's logistic binary regression (Puhr *et al.*, 2017; Kim *et al.*, 2024; Posit team, 2024) was performed with car, dplyr, pROC, caret, logistf, forcats, stringr, emmeans, and brglm2 packages to analyze whether the perception of benefits differs significantly depending on the village of residence.

RESULTS

Table 1 shows the distribution of respondents by village, gender, sociocultural group and education level.

Table 1. Characteristics of respondents

Characteristics	Number	Frequency (%)
Village		
Agadjaligbo	35	16.8
Agbaga	35	16.8
Don	37	17.8
Hlagba-Zakpo	30	14.4
Toffo-gare	35	16.8
Zalimey	36	17.3
Gender		

Male	110	52.9
Female	98	47.1
Socio-cultural group		
Holli	106	51
Fon	95	45.7
Aizo	4	1.9
Adja	2	1
Mina	1	0.5
Education level		
None	1	0.5
Primary	195	93.8
Secondary	8	3.8
Higher	4	1.9

There is a strong predominance of two groups: Holli' community represents 51% of the sample and Fon' community 45.7%. The other groups (Aizo, Adja, Mina) are in the minority, totaling less than 5% among them.

The villages of Don (Don) and Zalimey (Zal) have the highest representation at 17.8% and 17.3%, respectively. The villages of Agadjaligbo (Agad), Agbaga (Agb), and Toffo-gare (Tg) all have the same representation at 16.8%, while the village of Hlz has the smallest share at 14.4%.

It can be observed that men represent 52.9% of the sample, while women represent 47.1%. The distribution is therefore relatively balanced, with a slight majority of men.

There is a strong predominance of people having primary school level representing 93.8% of the sample.

Local perceptions of benefits

The advantage representing the benefits of the protected area cited by respondents are: Market (Mar), Employment (Empl), Raising awareness (Rais_aw), Exploitation of wood stumps (Expl), Public square development (Publ), Community savings bank (Com_b), Track development (Tra_dv), Non-timber forest products collection (NTFP), Building or fitting out school (School), Plots of land (Land), Bridge (Bridge), Well (Well), and Training (Training).

Figure 2 shows a significant difference in the probability of citing the "Bridge" advantage among the villages. Zal has a very high estimated probability of around 70%, which is much higher than that of all other villages, while Agb and Tg have the lowest probabilities.

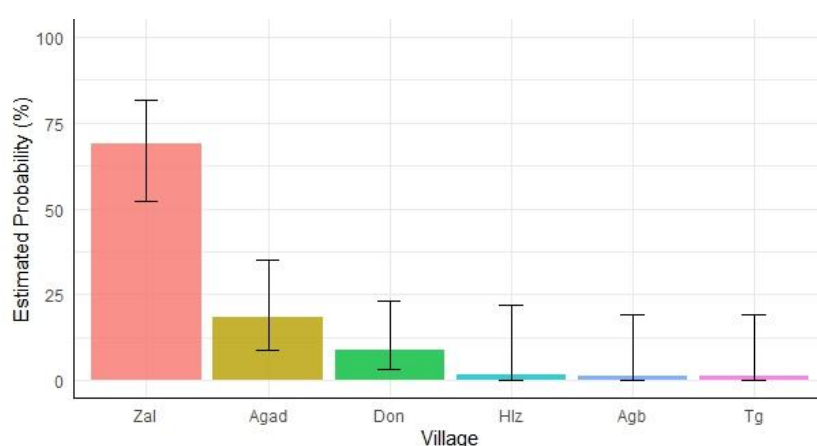


Figure 2: Probability of citing the 'Bridge' Advantage

Figure 3 shows that the estimated probability of citing the Community savings bank "Com_b" advantage is very low across all villages, with all probabilities well below 10%, suggesting this advantage is not considered important by the sampled communities.

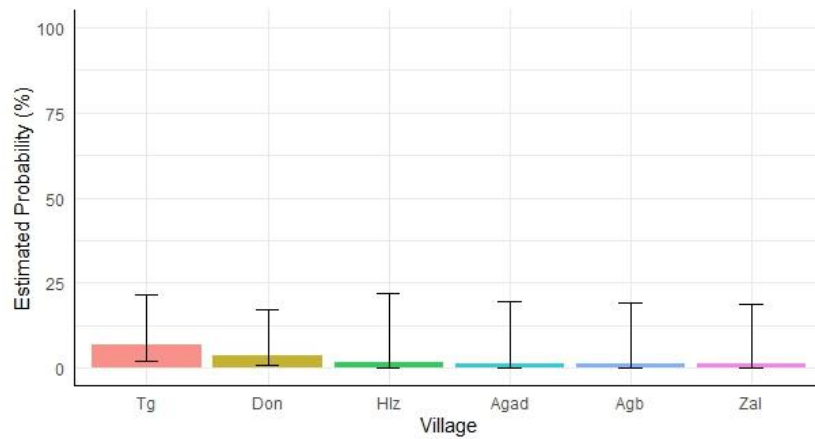


Figure 3: Probability of citing the community savings bank advantage

Figure 4 shows that the estimated probability of citing the employment "Empl" advantage varies among the villages. Agad shows the highest probability, at around 35%, while Hlz shows the lowest at close to zero.

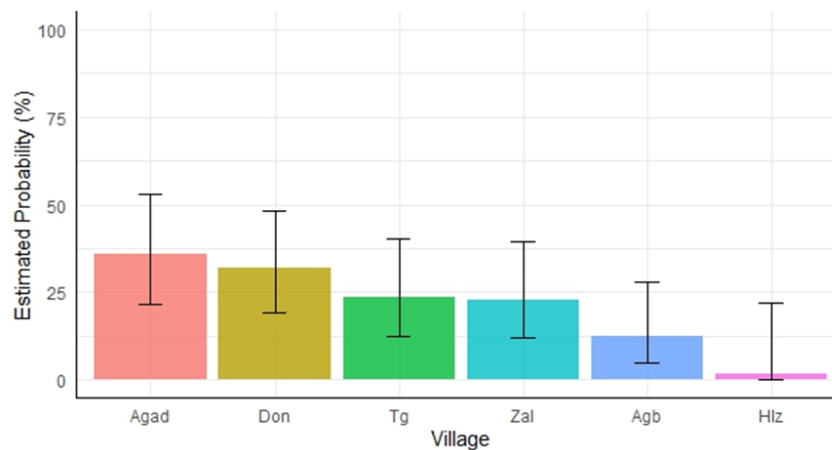


Figure 4: Probability of citing the employment advantage

Figure 5 indicates that the estimated probability of citing the exploitation of wood stumps "Expl" advantage is low across all villages, with all probability below 25%, suggesting this advantage is not widely perceived. Agb shows the highest probability at around 20%, while the other villages have significantly lower probabilities,

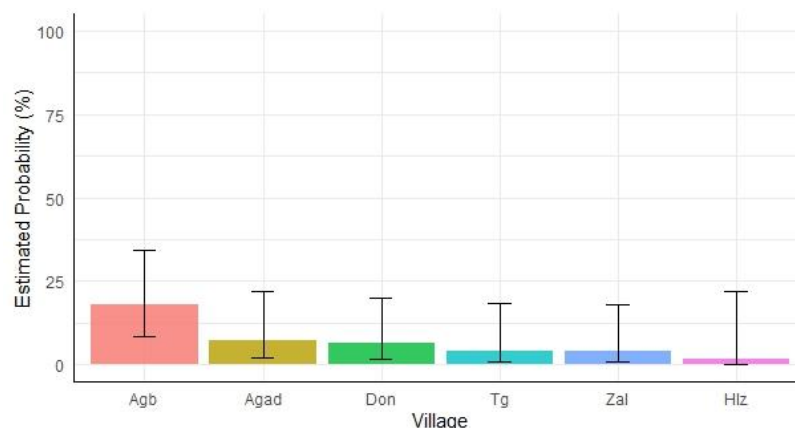


Figure 5: Probability of citing the exploitation of wood stumps advantage

Figure 6 shows a significant difference in the probability of citing the plots of land "Land" advantage among the villages. Agb has the highest estimated probability, at around 40%, while Hlz and Tg have the lowest, being close to zero.

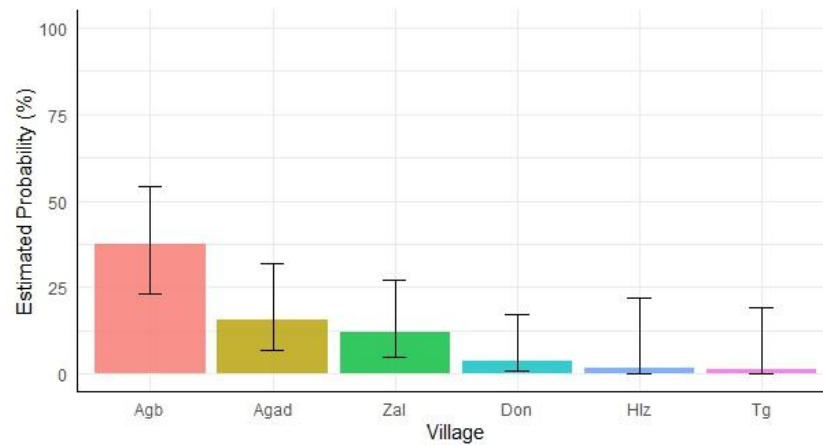


Figure 6: Probability of citing the plots of land advantage

Figure 7 reveals a stark difference in the estimated probability of citing the market "Mar" advantage among the villages. The village of Tg shows an exceptionally high probability of around 80%, while all other villages have a negligible probability of citing this advantage, with their values close to zero.

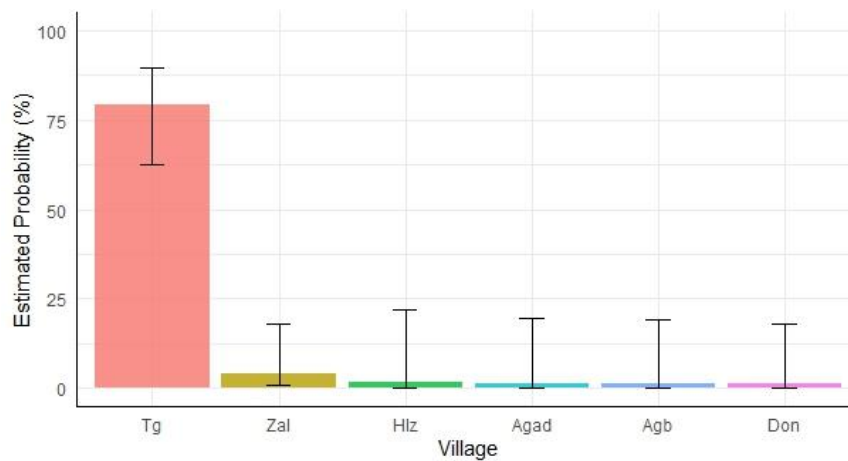


Figure 7: Probability of citing the market advantage

Figure 8 indicates that the estimated probability of citing the Non-timber forest products collection "NTFP" advantage is very low across all villages, with all probabilities below 10%, suggesting this advantage is not sufficiently perceived by the communities.

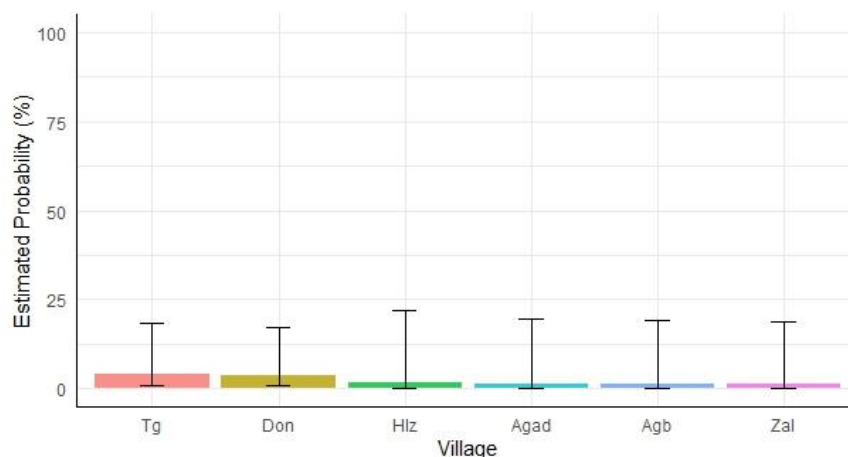


Figure 8: Probability of citing the non-timber forest products collection advantage

Figure 9 shows a significant difference in the estimated probability of citing the public square development "Publ" advantage across the villages. Zal has a very high probability, at around 65%, which is much higher than all other villages. Hlz and Agb show very low probabilities, close to zero.

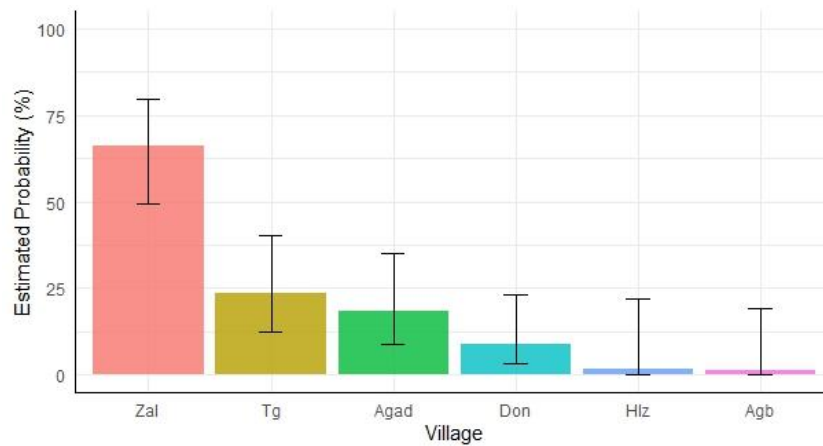


Figure 9: Probability of citing the public square development advantage

Figure 10 indicates that the estimated probability of citing the raising awareness "Rais_aw" advantage is very low across all villages, with all probabilities below 10%, suggesting that this benefit is not well perceived by communities.

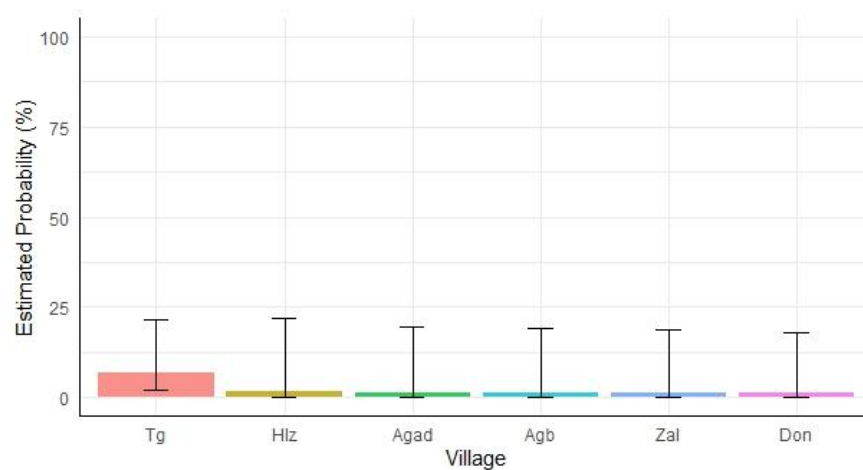


Figure 10: Probability of citing the raising awareness advantage

Figure 11 shows a significant difference in the estimated probability of citing the building or fitting out school "School" advantage among villages. Zal has the highest probability, at around 80%, while Hlz has the lowest, close to zero.

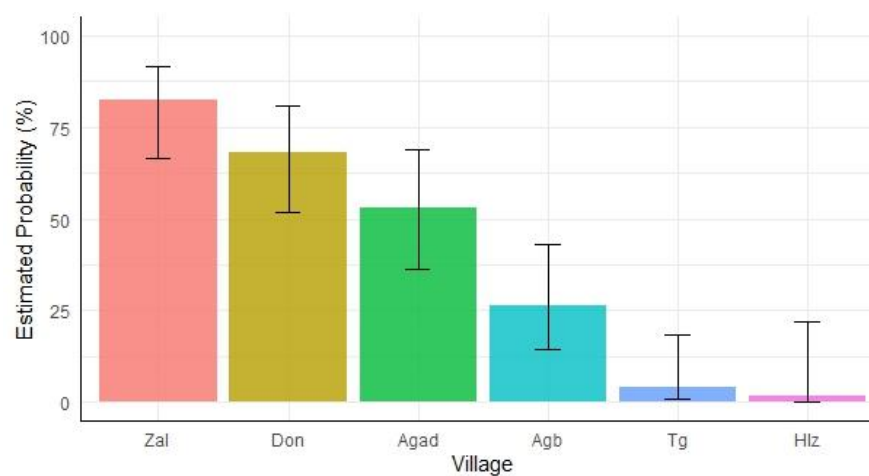


Figure 11: Probability of citing the building or fitting out school advantage

Figure 12 indicates a significant difference in the estimated probability of citing the track development "Tra_dv" advantage across the villages. Zal shows the highest probability at over 70%, while Hlz has the lowest, close to zero.

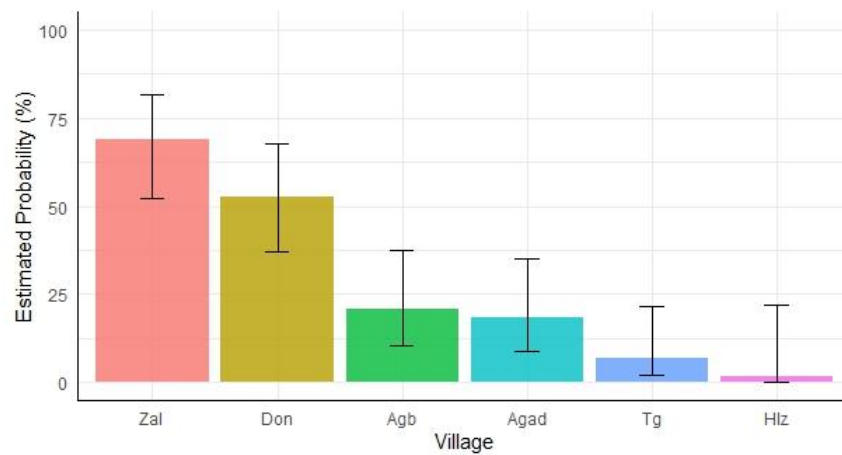


Figure 12: Probability of citing the track development advantage

Figure 13 indicates that the estimated probability of citing the "Training" advantage is relatively low across all villages. Hlz has the highest probability at about 20%. Agb and Don have the lowest, close to zero.

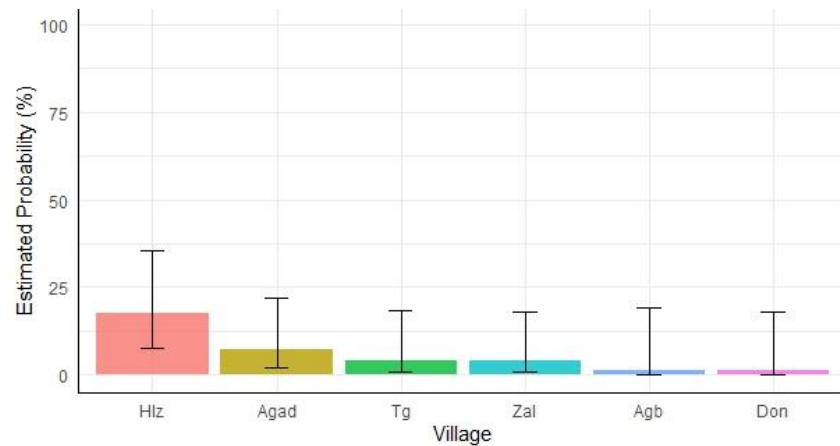


Figure 13: Probability of citing the training advantage

Figure 14 indicates a low estimated probability of citing the "Well" advantage across most villages. Zal shows the highest probability at around 25%, while Hlz, Tg, Agb and Don have very low probabilities, all close to zero.

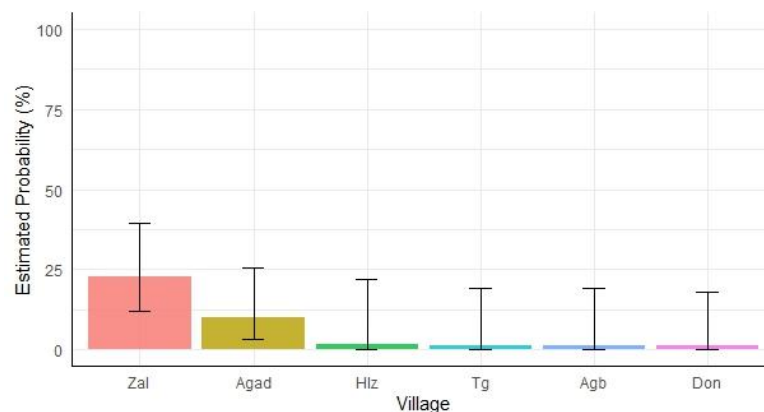


Figure 14: Probability of citing the well advantage

Table 2 presents the results of Firth's binary logistic regression, which analyzes how the perception of the benefits of the Lama Forest Reserve differs among local populations based on their village of residence.

Table 2. Regression coefficients and significance test results

Coefficients	Estimate	Std. Error	Pr(> z)
(Intercept)	-1.478e+00	4.410e-01	0.000803 ***
VillageAgb	-2.785e+00	1.510e+00	0.065200 .
VillageDon	-8.387e-01	7.188e-01	0.243289
VillageHlz	-2.633e+00	1.515e+00	0.082233 .
VillageTg	-2.785e+00	1.510e+00	0.065200 .
VillageZal	2.274e+00	5.694e-01	6.48e-05 ***
AdvantageCom_b	-2.756e+00	1.511e+00	0.068160 .
AdvantageEmpl	8.903e-01	5.680e-01	0.116992
AdvantageExpl	-1.087e+00	7.987e-01	0.173589
AdvantageLand	-2.015e-01	6.454e-01	0.754837
AdvantageMar	-2.756e+00	1.511e+00	0.068160 .
AdvantageNTFP	-2.756e+00	1.511e+00	0.068160 .
AdvantagePubl	9.086e-17	6.237e-01	1.000000
AdvantageRais_aw	-2.756e+00	1.511e+00	0.068160 .
AdvantageSchool	1.593e+00	5.590e-01	0.004390 **
AdvantageTra_dv	4.233e-16	6.237e-01	1.000000
AdvantageTraining	-1.087e+00	7.987e-01	0.173589
AdvantageWell	-7.191e-01	7.220e-01	0.319245
VillageAgb:AdvantageCom_b	2.756e+00	2.541e+00	0.278044
VillageDon:AdvantageCom_b	1.854e+00	1.821e+00	0.308707
VillageHlz:AdvantageCom_b	2.756e+00	2.546e+00	0.279116
VillageTg:AdvantageCom_b	4.423e+00	2.193e+00	0.043736 *
VillageZal:AdvantageCom_b	-2.331e+00	2.121e+00	0.271696
VillageAgb:AdvantageEmpl	1.426e+00	1.634e+00	0.382671
VillageDon:AdvantageEmpl	6.750e-01	8.750e-01	0.440411
VillageHlz:AdvantageEmpl	-8.903e-01	2.127e+00	0.675510
VillageTg:AdvantageEmpl	2.198e+00	1.602e+00	0.170065
VillageZal:AdvantageEmpl	-2.896e+00	7.805e-01	0.000207 ***
VillageAgb:AdvantageExpl	3.837e+00	1.708e+00	0.024672 *
VillageDon:AdvantageExpl	7.226e-01	1.183e+00	0.541210
VillageHlz:AdvantageExpl	1.087e+00	2.200e+00	0.621256
VillageTg:AdvantageExpl	2.214e+00	1.855e+00	0.232556
VillageZal:AdvantageExpl	-2.874e+00	1.217e+00	0.018243 *
VillageAgb:AdvantageLand	3.953e+00	1.620e+00	0.014676 *
VillageDon:AdvantageLand	-7.006e-01	1.204e+00	0.560746
VillageHlz:AdvantageLand	2.015e-01	2.149e+00	0.925277
VillageTg:AdvantageLand	2.015e-01	2.142e+00	0.925043
VillageZal:AdvantageLand	-2.572e+00	8.979e-01	0.004178 **
VillageAgb:AdvantageMar	2.756e+00	2.541e+00	0.278044
VillageDon:AdvantageMar	7.290e-01	2.164e+00	0.736267
VillageHlz:AdvantageMar	2.756e+00	2.546e+00	0.279116
VillageTg:AdvantageMar	8.354e+00	2.131e+00	8.87e-05 ***
VillageZal:AdvantageMar	-1.204e+00	1.768e+00	681 0.495812
VillageAgb:AdvantageNTFP	2.756e+00	2.541e+00	0.278044
VillageDon:AdvantageNTFP	1.854e+00	1.821e+00	0.308707
VillageHlz:AdvantageNTFP	2.756e+00	2.546e+00	0.279116
VillageTg:AdvantageNTFP	3.883e+00	2.255e+00	0.085056 .
VillageZal:AdvantageNTFP	-2.331e+00	2.121e+00	0.271696
VillageAgb:AdvantagePubl	7.503e-15	2.136e+00	1.000000
VillageDon:AdvantagePubl	-4.058e-17	1.016e+00	1.000000
VillageHlz:AdvantagePubl	5.077e-15	2.142e+00	1.000000
VillageTg:AdvantagePubl	3.089e+00	1.623e+00	0.057012 .
VillageZal:AdvantagePubl	-1.234e-01	8.018e-01	0.877694
VillageAgb:AdvantageRais_aw	2.756e+00	2.541e+00	0.278044
VillageDon:AdvantageRais_aw	7.290e-01	2.164e+00	0.736267
VillageHlz:AdvantageRais_aw	2.756e+00	2.546e+00	0.279116
VillageTg:AdvantageRais_aw	4.423e+00	2.193e+00	0.043736 *

VillageZal:AdvantageRais_aw	-2.331e+00	2.121e+00	0.271696
VillageAgb:AdvantageSchool	1.644e+00	1.596e+00	0.302741
VillageDon:AdvantageSchool	1.476e+00	8.692e-01	0.089556 .
VillageHlz:AdvantageSchool	-1.593e+00	2.125e+00	0.453505
VillageTg:AdvantageSchool	-4.653e-01	1.765e+00	0.792022
VillageZal:AdvantageSchool	-8.429e-01	7.963e-01	0.289778
VillageAgb:AdvantageTra_dv	2.928e+00	1.627e+00	0.072015 .
VillageDon:AdvantageTra_dv	2.419e+00	9.037e-01	0.007423 **
VillageHlz:AdvantageTra_dv	3.739e-15	2.142e+00	1.000000
VillageTg:AdvantageTra_dv	1.667e+00	1.708e+00	0.328941
VillageZal:AdvantageTra_dv	-7.104e-16	8.052e-01	1.000000
VillageAgb:AdvantageTraining	1.087e+00	2.193e+00	0.620211
VillageDon:AdvantageTraining	-9.402e-01	1.743e+00	0.589686
VillageHlz:AdvantageTraining	3.664e+00	1.722e+00	0.033415 *
VillageTg:AdvantageTraining	2.214e+00	1.855e+00	0.232556
VillageZal:AdvantageTraining	-2.874e+00	1.217e+00	0.018243 *
VillageAgb:AdvantageWell	7.191e-01	2.166e+00	0.739938
VillageDon:AdvantageWell	-1.308e+00	1.710e+00	765 0.444247
VillageHlz:AdvantageWell	7.191e-01	2.173e+00	0.740705
VillageTg:AdvantageWell	7.191e-01	2.166e+00	0.739938
VillageZal:AdvantageWell	-1.287e+00	8.989e-01	0.152181

The results show that the impact of a benefit (such as employment, market access, or training) is not the same across all villages.

In VillageTg, the market advantage (AdvantageMar) has an extremely strong and positive impact ($p < 0.001$), suggesting that residents of this village cited this advantage much more than those of other villages. Conversely, the impact of employment (AdvantageEmpl) in VillageZal is highly significant but negative ($p < 0.001$), which is a striking result. This means that employment-related benefits are not perceived in the same way in this village. Furthermore, contrasting effects are seen for the exploitation advantage (AdvantageExpl): it is significantly positive in VillageAgb ($p < 0.05$) but negative in VillageZal ($p < 0.05$). These results perfectly illustrate the differentiated distribution of benefits.

In addition to the interactions, some "village" variables have a significant direct effect. For example, VillageZal has a highly significant and positive individual coefficient ($p < 0.001$), indicating that, overall, its residents have a higher probability of benefiting from the advantages. The results do more than just show that some villages are more advantaged than others; they demonstrate that the very nature of these advantages has a variable and significantly different effect from one village to another.

DISCUSSION

Relevance and limits of the methodological approach

The methodology employed is relevant for testing the hypothesis of a differentiated distribution of benefits. The use of a structured, pre-tested questionnaire administered in local languages allowed for the collection of all participants' perceptions (Rahman et al., 2017). The collection of socio-cultural and socio-demographic data is crucial for contextualizing the results. The methodological approach is particularly robust in its choice of statistical analysis. Firth's binary logistic regression was used to analyze the differentiated distribution of benefits from the Forest Reserve to local populations, based on their village of residence. This choice is crucial and relevant because it allows for managing the problem of data separation (Puhr et al., 2017; Kim et al., 2024) that can occur in standard logistic models, thus providing more reliable results.

However, although the six villages studied are representative, the generalization of the results to all surrounding communities should be approached with caution. Also, in addition to the village, other factors can also influence benefit sharing (Shishany et al., 2020; Kamlun et al., 2024).

Perceptions of protected area benefits and their distribution among local communities

The study's results confirm the hypothesis that community's benefit from a differentiated distribution of advantages from the protected area based on their village of residence. The analyses reveal significant differences in the perception of numerous benefits from one village to another (Ma Caliste Omam et al., 2024). The results perfectly illustrate this differentiated distribution, with certain village variables having a significant direct effect. For example, the village of Zalimey (Zal) has a very significant and positive individual coefficient, indicating a higher probability for its residents to benefit from the advantages compared to the reference villages.

Perceptions of advantages vary surprisingly depending on the village. For example, the "Market" (Mar) advantage has an exceptionally strong and positive impact in the village of Tg, where the probability of citing it is around 80%, while it is negligible in other villages. This result highlights the importance of income-generating activities and the diversification of livelihoods (Jabeen et al., 2024).

On the other hand, the results for the "Employment" (Empl) advantage are contrasted. Employment is perceived positively in the villages of Agad and Don, which aligns with the literature that promotes the involvement of local populations in economic activities (Rahman et al., 2017). However, the impact of employment is negative and very significant in the village of Zal, which is a striking result. This negative perception could be linked to management issues or unequal participation (Alquran et al., 2021; Jabeen et al., 2024).

Similar contrasted effects are observed for the "Exploitation of wood stumps" (Expl) advantage: it is perceived as significantly positive in Agb but negatively in Zal. The significant differences in the perception of infrastructures, such as the development of the "School" and "Track development" (Tra_dv), in villages like Zal and Don, confirm that tangible elements like infrastructure and training are highly valued by the communities (Queiros and Mearns, 2019; Shishany et al., 2020). This reinforces the idea that managers should value education and alternative income-generating activities.

Finally, advantages such as "non-timber forest products collection" (NTFP), "Community savings bank" (Com_b), and "Raising awareness" (Rais_aw) have a very low probability of being cited in all villages, without a significant difference in perception. This suggests that these advantages are not considered important by the sampled communities. These results contradict the literature which highlights the collection of non-timber forest products (NTFP) as an important subsistence activity (Ma Caliste Omam et al., 2024) and awareness-raising as a major opportunity for building trust and community management (Queiros and Mearns, 2019). This low perception could be a weakness in the management plan and implementation policy. This can be explained by the restriction of the core zone and plantations for harvesting.

Implications of results and future research perspectives

The results of this study have the important implications for the management of protected areas. They demonstrate that benefits must be shared in a more targeted manner and adapted to the specificities of each community (Queiros and Mearns, 2019).

The Forest Reserve' managers should rethink the development and integration of local communities in ecotourism activities (Cobbinah et al., 2017; Spenceley et al., 2017; Alquran et al., 2021; M.Z. et al., 2025; Yamin et al., 2025) and beekeeping by involving local populations, who can be important economic drivers, particularly in terms of employment.

The results also question the negative perception of certain benefits. The losses for the communities are mainly linked to restricted access to natural resources. Future studies could explore the causes of these negative perceptions in order to reconcile biodiversity conservation with the improvement of local populations' livelihoods.

Future research could also focus on the reasons for the low perception of benefits such as non-timber forest products (NTFP) collection and awareness-raising. A qualitative approach could help to identify shortcomings in management policies or on-the-ground implementation. The study of socio-economic factors such as age, gender, income, or length of residence is also a relevant avenue for future research, as the literature suggests they influence the relational values and perceptions of the population.

CONCLUSION

The results of this study strongly confirm the hypothesis that community's benefit from a differentiated distribution of advantages from a protected area, depending on their village of residence. The discussion of the results highlighted that perceptions of benefits vary significantly among villages, as evidenced by the positive effects of the market in Tg or the contrasting perceptions of employment and exploitation of firewood between the villages of Agad and Zalimey. These results underscore the inefficiency of a uniform management approach, as they demonstrate that tangible benefits such as infrastructure are highly valued, while others, such as the collection of non-timber forest products (NTFP) or awareness-raising, have a low probability of being cited. These findings have crucial implications for the management of protected areas. To maximize community satisfaction and engagement, managers should focus on the advantages most valued by the communities, while seeking to understand and resolve the sources of negative perceptions. Looking ahead, future research, particularly qualitative studies, is needed to explore the reasons for the low perception of certain advantages and the causes of negative perceptions, in order to better reconcile biodiversity conservation with the improvement of livelihoods. The study of the influence of socio-economic factors is also a promising avenue for refining the understanding of these dynamics.

Authors' contribution

RRSS performed the conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, visualization, writing – original draft, writing – review and editing.

SGAN participated in the conceptualization, funding acquisition, methodology, project administration, resources, software, supervision, validation, visualization, writing – review and editing.

All authors read and approved the final manuscript.

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